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Male-Female differences in Aviation (with focus on incidents/accidents)

Aircraft developed into more sophisticated machines and aircrews grew in members, leading to the need for examination of how these crews interact and communicate to ensure safety of flight. With the inclusion of a greater number of female pilots in a traditionally male crew environment, it is imperative to investigate how gender characteristics impact crew communication.

When examining aviation incidents or accidents, investigators traditionally focused on the perspectives of human-human interaction, human-machine interaction, and machine malfunction. Katerinakis (no date), outlined a number of studies that showed pilot error, as the cause for an aviation accident or incident, was more closely aligned with deficiencies in team communication and collaboration (human-human) than in technical proficiency (human-machine). Multiple studies indicated that approximately 70 to 80 percent of aviation accidents could at least in part be attributed to human error (O'Hare, Wiggins, Batt, & Morrison, 1994; Wiegmann & Shappell, 1997). Earlier research by Tompkins (1991) found that more than 60 percent of the incident reports in the Aviation Safety Reporting System (ASRS) reflected communication errors as a causal factor. Kanki and Palmer (1993) reported this statistic as 70 percent when describing a 1981 Billings and Cheaney study of the ASRS reports submitted by aircrew members and air traffic controllers (ATCs) from 1976 through 1981. The study findings indicated information transfer problems were related to lack of transmission due to belief by the individual possessing the information that its transmission was not necessary, or to inaccurate transmission of information (Billings & Cheaney, 1981 in Kanki & Palmer, 1993). Studies of aviation communication include investigations related to within-crew or cockpit interaction, flight deck (cockpit)-cabin crew communication, and interaction between pilots and ATCs. Driscoll (2002) studied accident reports and cockpit voice recorder transcripts to examine within-crew interaction for three cases in which the accidents were classified as controlled flight into terrain (CFIT), using discourse analysis methods. She found that there was a shared relationship between communication problems and the crew's loss of situational awareness; each led to issues with the other. Endsley and Jones (2012) defined situational awareness as an individual's awareness of "what is happening around" him or her, and the related ability to "understand what that information means ... now and in the future" (pg. 13). Within the discipline of aviation, this construct would relate to how a pilot or flight crew collects, interprets, and uses data during flight operations. Nevile and Walker (2005) examined crew conversation, describing a conversation analysis methodology in which typical sound recordings from normal crew communication served as a baseline for analyzing communication recordings from the 1995

Westwind 1124 CFIT accident. Results of the study indicated that incorrectly set descent altitude, recognized as the error that led to the accident, was in part related to faulty communication and interaction processes between crew members.

Communication on an aircraft also includes transfer of information between aircrew and cabin crew. Armentrout-Brazee and Mattson (2004) related the findings of a Purdue University study of communication between flight crews, cabin crews, and aviation maintenance personnel. Issues within the aircraft cabin tended to be communicated to flight crews late in the flight when both groups had multiple task requirements, leading to greater likelihood of incomplete or inaccurate information transmission (Armentrout-Brazee, & Mattson, 2004). A gatekeeper mentality generally reflects a perceived hierarchy of position rather than a team concept. Ford, O'Hare, and Henderson (2013) studied how social categorization and social identity theory could be used to engender more effective teamwork and communication between flight crews and cabin crews, and within cabin crews. They found that cabin crew members who completed a questionnaire in which their organization was the item focus were more willing to participate in coordinated team actions than those who first completed a questionnaire in which items focused on individual or personal perceptions

Historically, aviation has been readily described as a male domain, though in recent decades there has been an increase in the number of experienced female pilots. According to Hynes and Puckett (2011), there were some studies of gender issues in aviation in the 1990s and early 2000s, but the research area is still considered a significantly under-developed category. McFadden and Towell (1999) quoted a 1974b Novello and Youssef study that is recognized as seminal research, in which investigators found that personality characteristics of pilots transcended the male-female dichotomy. Female pilots exhibited more traits associated with male pilots than they did with other females in the general population. In the same study, Novello and Youssef (1974a) found male pilots were more prone to exhibit traits such as achievement, exhibition, dominance, change, and heterosexuality than males in the general population. They were less likely to exhibit deference, order, affiliation, succorance, abasement, nurturance, and endurance. Levine, Lee, Ryman, and Rahe (1976) studied military pilot behavioral attitudes, and found that the characteristic of adventurousness, an attribute that one could link to the traits of exhibition and change in Novello's and Youssef's (1974a) study, was highly correlated with aircraft carrier accidents. Aviation history is filled with stories of high risk, from the death-defying antics of the barnstormers to Chuck Yeager's and Jackie Cochran's pursuit of their spots in history breaking the sound barrier to today's commercial race to space, common behavior traits in many aviators continue to be achievement, exhibition, and adventure. These traits are more closely associated with risk-taking than with risk-avoiding. The combination of the hazards associated with flight and risk-taking nature of aviators engender a natural concern that pilot-error might be the predominant cause for incidents and accidents. McFadden (1996) studied the possibility that pilot-error accident rates differed for male and female U.S. pilots working for major airlines. An initial look at the data indicated that female pilots working for major airlines from 1986 through 1992 had a significantly higher accident rate than males. It appeared that age, experience in

terms of total flying hours, risk exposure defined as flying hours within the previous six months, and whether the pilot worked for a major or non-major airline, were the variables most closely related to significant differences in accident rates. McFadden (1996) suggested that the reason for female pilots appearing to have higher accident rates than males in the initial examination was that during the data collection period, women were only beginning to fly for major airlines. Previous studies (Baker, Lamb, Li, & Dodd, 1993; Golaszewski, 1983; Kay, Harris, Voros, Hillman, Hyland, & Deimler, 1993; McFadden, 1993) indicated that accident rates decreased as pilot age increased, as flying experience increased, and for pilots employed by major carriers versus non-major airlines. Given that more than 20 years have passed since the timeframe of McFadden's data collection, a follow-on study is necessary to examine possible gender-related differences now that there are more female pilots with higher experience levels who could be included in the sample. Recent studies of gender differences in aviation have examined accidents in the general aviation (GA) arena. Baker, Lamb, Grabowski, Rebok, and Li (2001) presented findings that GA accidents involving male pilots were more likely due to inattention or flawed decision-making; those involving female pilots were more likely due to mishandling of the aircraft. Bazargan and Guzhva (2011) also examined possible relationships between the variables of gender (described as male or female), age, and experience level, and pilot error and fatal accidents within the GA community. Their findings indicated no difference in pilot-error accidents between male and female pilots, but that male pilots were more likely to have fatal accidents than female pilots. A general conclusion from the review of these studies, combined with the previously discussed examinations of differences in personality traits for males and females, would be that younger or less experienced pilots (male or female) tend to be involved in more incidents and accidents than those who have more experience. However, the reasons behind the incidents and accidents, and the consequences or outcomes, seem to follow different patterns for males and females. Males seemed to make mental mistakes (flawed decisions) that could prove fatal. Females seemed to make procedural or physical mistakes (handling errors). Given the technological advances in more modern aircraft and related equipment, the aircraft might be more forgiving of a handling error than a bad flying decision.

Conclusion

Crew communication and crew resource management are readily recognized as critical to safety of flight. With the inclusion of a greater number of female pilots in a traditionally male crew environment, it is imperative to investigate how gender characteristics impact crew communication. This study was a meta-review of existing literature. There have been a number of studies that examined differences in masculine versus feminine communication characteristics in general. Additional work has been done in the field of aviation, some with respect to differences between male pilots and female pilots and some with respect to the role communication deficiencies or breakdown played in aviation incidents or accidents. However, most researchers recognized the relative dearth of current studies of the effect of gender integration with respect to the collaboration and communication necessary for effective use of increasingly more technologically advanced

equipment. This study should serve as a framework for examining more current practices in how possible gender differences in communication might be related to aircraft incidents or accidents, with the overarching purpose to inform current and future training programs so that the human side of aviation keeps pace with the increasingly more advanced technological side.

References

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