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Pilot Study for Cabin Crew's Willingness to Operate on Single Pilot Operations

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Single-pilot operations are already in place within military aircraft, small modes of commercial passenger transportation, and cargo operations. NASA, aircraft manufacturers, and airlines are collaborating on projects that birth safe and efficient single-pilot operation suitable technology for commercial airliners. A stipulated number of cabin crew is required per number of passengers on commercial airliners for safety, security, and medical purposes. The purpose of this pilot study was to determine what scales are valid to assess factors that affect a cabin crew's willingness to operate on single pilot operations. With the selection of appropriate scales, such findings could aid industry regulators, government bodies, and airlines with training programs, educational conferences, and procedural development. The pilot study surveyed members of the cabin crew population using voluntary response sampling. The cabin crew was presented with a survey that collected demographic data, affect ratings, technology acceptance model perceptions, personality traits, and willingness to operate scores. The validity of the scales was tested using Cronbach's Alpha in SPSS, and the usability of the survey instrument was assessed. The affect scale was shown not to be valid. In a follow-up study, the aim will be to use a survey containing the six remaining valid scales and collect demographic data to determine which predictors will be significant in a regression model.

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Introduction

Cabin crews are mandated to communicate any safety, security, or medical abnormalities clearly, concisely, and in a timely manner to the flight crew (IATA, 2020). The flight crew will evaluate the situation, liaise further with the cabin crew, and carry out any action that is deemed necessary. Cabin crew also rely on the flight crew for support, information, or authorization for action regarding concerns or emergencies with the passengers, the aircraft, or other crew members. Crew resource management programs have fostered better teamwork and communication between flight crew and cabin crew (Kanki et al., 2019; Salas et al., 2006). Communication between the two crews has become more respectful, open, and of an informative nature (Federal Aviation Administration [FAA], 2004; Thomas, 1989). Soft skills such as self-awareness, decision-making, leadership, and situational awareness are promoted by stressing the importance and value of all resources towards safe flight. A reduction from two or more flight crew to a single onboard pilot could impact the dynamic between the cabin crew and the flight crew. Pilot unions have voiced their concern over the safety of single-pilot operations (SPOs) (Air Line Pilots Association, 2019). However, limited research has been conducted into the effect SPOs may have on the cabin crew role.

The implementation of a flight deck with single pilot capacity on commercial airliners has recently been further popularized by Airbus (Frost, 2021). Airlines such as Cathay Pacific and Lufthansa have been named as collaborators on the venture entitled 'Project Connect', which investigates reduced crew operations on long-haul sectors during high-altitude cruises (Frost, 2021). The promotion of a single pilot system being incorporated into the design phase of the Airbus 350 flight deck has generated the interest of the public, industry, government, and regulatory acceptability (Frost, 2021). The cabin crew's willingness to operate (WTO) on SPOs could be impactful to the operational success of SPOs. The aim of this pilot study was to verify a survey instrument and validate scales that would determine cabin crew WTO on SPOs.

Statement of the Problem

Cabin crew and flight crew communicate on a periodical basis, more so should a safety, security, or medical abnormality or emergency arise (IATA, 2020). Currently, two or more flight crew may be seated on the flight deck of a commercial airliner. The workload of the onboard pilot in SPOs is highlighted as an area of concern in research (NASA, 2005; Schmid & Stanton, 2019, 2020; Schutte, 2015; Stanton et al., 2017; Vu et al., 2018; Wyman, 2017; Young et al., 2015). The level of involvement that the single onboard pilot will be able to maintain with cabin operations and flight planning may be limited (Myers et al., 2021). This could also mean that the level of interaction the single onboard pilot will be able to maintain with the cabin crew may be limited. There is limited research on how the cabin crew role may have to evolve under SPOs. Further, there is limited research on how cabin crew view operating on SPOs and what factors would influence their WTO on SPOs.

The purpose of this paper is to present a pilot study for the proposed research, in which a non-experimental, quantitative study on a non-probability, voluntary response sampling of cabin crew will be conducted. Scales were validated, and the survey instrument was tested so that in a follow-on study, cabin crew WTO on SPOs could be evaluated. A hypothesis was presented in a survey format, and cabin crews were asked about their WTO on SPOs, using the willingness to pilot an aircraft scale created by Rice et al. (2020) and adapted in Vempati et al.'s (2021) Pilots' WTO in Unmanned Aircraft System Integrated Airspace research. Affect ratings were collected on the hypothesis (Ekman & Friesen, 1971). Using a five-point Likert scale, ratings were collected on the complexity of SPOs, familiarity with SPOs, perceived safety of SPOs, and the participant's wariness of new technology, concepts deduced from Davis' (1989) technology acceptance model. Personality traits were collected (Donnellan et al., 2006), as well as demographic data (age, gender, nationality, operational grade, and total time spent as cabin crew). Data was analyzed to determine which scales were valid, as well as assess the usability of the survey instrument.

Significance of the Study

Members of the public and industry affiliates have voiced their discomfort regarding SPOs on commercial airliners (Air Line Pilots Association, 2019). The following arise as concerns: reduced situational awareness, increased workload, ability to handle an emergency solo (single onboard pilot), ability to handle an emergency solo (ground pilot), human factors issues between crew (flight crew, ground crew, cabin crew, airline operations, or air traffic control), medical emergencies on the flight deck, handling of inevitable contingency planning, loss of air-to-ground communications, technology readiness, technology failure, overreliance on automation, cybersecurity, and security risks (Air Line Pilots Association, 2019). Industry regulators and government agencies are in discussions about the necessary policies and procedures that would need to be in place before certification. There is limited knowledge of the cabin crew's perspective regarding SPOs. This pilot study identified the appropriate scales to measure quantitative research that aims to bridge the gap in knowledge regarding cabin crew WTO on SPOs. This pilot study also tested the survey instrument so it can be adapted for use in a larger study. A follow-up study will aim to identify factors that influence cabin crew WTO on SPOs. The findings could aid industry regulators, government bodies, and airlines in administering training programs, hosting educational conferences, and conducting procedural development.

Proposed Research Questions and Hypotheses

The current pilot study used quantitative methods and a non-experimental research design to test a survey instrument that identifies factors that could predict a cabin crew's WTO on SPOs. The survey instrument was designed using potential follow-on study research questions:

RQ_1: What demographic variables (age, biological sex, nationality, education level, operating grade, or the number of years as cabin crew) are significant predictors of a cabin crew's WTO on SPOs?

H_{A1}: At least one demographic variable is a significant predictor of a cabin crew's WTO on SPOs.

RQ_2: Which of Ekman and Friesens' (1971) six (anger, disgust, fear, happiness, sadness, and surprise) universal emotions (affect) are significant predictors of a cabin crew's WTO on SPOs?

H_{A2}: At least one affective emotion (of the six universal emotions) is a significant predictor of a cabin crew's WTO on SPOs.

RQ_3: Which of Donnellan et al.'s (2006) big five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and intellect/imagination) are significant predictors of a cabin crew's WTO on SPOs?

H_{A3}: At least one of the personality traits is a significant predictor of a cabin crew's WTO on SPOs.

RQ_4: Which of Davis' (1989) technology acceptance model concepts adapted by Rice et al. (2019) into the scales: complexity, familiarity, value, fun, and wariness of new technology are significant predictors of a cabin crew's WTO on SPOs

H_{A4}: At least one technology acceptance model concept is a significant predictor of a cabin crew's WTO on SPOs.

Literature Review

The Cabin Crew's Role

The cabin crew's role is to maintain the safety, security, as well as well-being of the flight crew, other cabin crew, and passengers whilst on the aircraft (International Air Transport Association [IATA], 2020). These responsibilities frequently require the input of other stakeholders, such as ground staff, security personnel, engineers, medical professionals, and the flight crew. Whether in-flight or on-ground, the cabin crew may liaise with such stakeholders through the flight crew. The telecommunications technology used to connect the crew on the aircraft and stakeholders on the ground may only be in the flight deck.

The chain-of-command dictates that the cabin crew inform the flight crew of any observed safety, security, or medical abnormalities (FAA, 2020a; IATA, 2020). With two flight crews on the flight deck, one can take control of the aircraft, and the other can address the cabin crew's concerns. The cabin crew may require direct input from the flight crew regarding a situation, for example, offloading a disruptive passenger or diverting due to a medical case. These types of requests would increase the workload of the flight crew.

Communications between Cabin Crew and Flight Crew

The Chute and Wiener (1994, 1995, 1996) studies highlighted how ineffective communications between cabin crew and flight crew could be detrimental to safe practices. Crew resource management (CRM) has been implemented within the commercial aviation industry, and joint training sessions between the flight crew and cabin crew are encouraged. In CRM, soft skills such as leadership, decision-making, self-awareness, communication, fatigue, and stress are the focus. Individuals are encouraged to nurture a mindset that fosters healthy teamwork and values each resource for the contribution they can make toward a safe flight. Perceptions towards cabin crew contributing information on safety scenarios have changed over the decades (Chute &

Wiener, 1994). However, constant reinforcement of the importance of cabin crew contribution from an authoritative figure for junior, less experienced, or under-confident cabin crew can persuade them that their input is valuable (Bienefeld & Grote, 2012, 2013; Chute & Wiener, 1995, 1996). CRM has cultivated a positive evolution in communication etiquette between the flight crew and cabin crew over the past 30 years (Edwards, 1992; Kanki et al., 2019; Martin, 2017; Salas et al., 2006). Thus, the removal of a flight crew member from the flight deck for SPO could impact cabin crew operations, which may affect the cabin crew's perception of how effectively they could operate with a single pilot.

Commercial Airline Single Pilot Operations

Over the past 80 years, the flight deck has become less crowded. Advancements in technology have resulted in the reduction of navigators, radio operators, relief first officers, and flight engineers (Frow, 2016). Currently, the United States Federal Aviation Administration (FAA) regulations CFR 14 Part 121.385 require that a minimum of two persons are required to fly a large plane safely (FAA, 2020b).

In a step towards further reducing occupancy of the flight deck during long-haul flights whilst at high altitudes, Airbus has partnered with Cathay Pacific and Lufthansa (Frost, 2021). All flight crew must be present during critical phases of the flight. However, during the cruise phase, one single flight crew member remains on the flight deck, and the remaining crew members may rest in the crew bunks (Matessa, 2014); this arrangement is called reduced crew operations (RCOs), and the Airbus/Cathay Pacific/Lufthansa collaboration, entitled "Project Connect", has the agenda of delivering A350s with in-flight single-pilot capacity by 2025 (Frost, 2021).

In SPOs, only one pilot would be present onboard the aircraft to operate alongside integrated ground support systems (Matessa et al., 2014; Vu et al., 2018). The US House and Senate voted in favor of a bill that would order the FAA to research remote and computer piloting of SPOs for cargo aircraft (FAA Reauthorization Act of 2018, 2018; Reed, 2018). The FAA is coordinating with NASA and other agencies (Comerford et al., 2013), with research broadening to SPO adoption by commercial airliners.

Technological advances and industry investment are not waning, despite critique of the SPO configuration. There is skepticism towards the capability of autonomous or automated flight. The separation and fragmented dynamics between the single onboard pilot and integrated ground support systems cause a lack of situational awareness and a breakdown in crew resource management (Brandt et al., 2015; Lachter et al., 2014; Lachter et al., 2017). Positive public perception of SPOs is driven by familiarity with the technology, level of understanding about the technology, adaptability to technological advances, and age (Rice & Winter, 2015; Rice et al., 2019; Vance & Malik, 2015). There is also the fear that SPOs will catalyze the concept of human being replaced by machines, leading to fully autonomous flight, and cause a loss of high-paying flight crew positions, which, for some, is a benefit. Airlines highlight the potential savings of SPOs, eliminating 50% of the human resources from the flight deck, as well as easing the looming pilot shortage forecast by industry growth projections (Airbus, 2019; Boeing, 2020; IATA, 2007; Murray, 2021; Rice, 2019).

Variables and Scales

Predictive Factors of Interest as Independent Variables

The section below lists studies that evaluate dependent variables of willingness. The studies listed below demonstrate that willingness can depend on factors such as demographics, emotional reaction (affect), experience and exposure, and personality traits. Therefore, this current study explored 23 such predictors that may influence cabin crew WTO on SPOs. They are listed in Table 1.

Table 1
Predictor Variables and How They Are Measured

Independent Variable	Scale	Measurement Type
Age	Free Response	Interval
Gender	Multiple Choice	Categorical
Nationality	Free Response	Categorical
Education	Multiple Choice	Categorical
Years working as Cabin Crew	Multiple Choice	Continuous
Operational Grade	Multiple Choice	Categorical
Years working in Grade	Multiple Choice	Continuous
Anger (Affect Scale)	Likert-type question*	Interval
Disgust (Affect Scale)	Likert-type question*	Interval
Fear (Affect Scale)	Likert-type question*	Interval
Happiness (Affect Scale)	Likert-type question*	Interval
Sadness (Affect Scale)	Likert-type question*	Interval
Surprise (Affect Scale)	Likert-type question*	Interval
Complexity Perception Scale	Likert-type question**	Interval
Familiarity Scale	Likert-type question**	Interval
Value Scale	Likert-type question**	Interval
Fun Factor Scale	Likert-type question**	Interval
Wariness of New Technology Scale	Likert-type question**	Interval
Conscientiousness	Subscale of Mini-IPIP***	Interval
Extraversion	Subscale of Mini-IPIP***	Interval
Agreeableness	Subscale of Mini-IPIP***	Interval
Neuroticism	Subscale of Mini-IPIP***	Interval
Intellect/Imagination	Subscale of Mini-IPIP***	Interval

Note. ** (Ekman & Friesen, 1971), **(Davis, 1989), ***(Donnellan et al., 2006)*

Willingness to Operate as a Dependent Variable

The WTO scale was used in a study by Vempati et al. (2021). The WTO scale is validated and based on the updated willingness to fly (WTF) scale by Winter et al. (2020). WTO assesses a participant's willingness to work with, handle, or control under certain conditions. WTF assesses a participant's willingness to be flown under certain conditions. Rice, Mehta et al., (2015) created the WTF scale to predict consumer attitudes and behaviors. It has been utilized in studies to investigate WTF under different conditions, namely, WTF if pilots are taking depression medications (Rice, Winter, et al., 2015), WTF depending on the gender of the flight crew composition and flying under automation (Mehta et al., 2017), and WTF in autonomous commercial aircraft (Ragbir et al., 2018; Rice et al., 2019). The WTF scale was updated by Rice, Winter et al. (2020) and used to predict WTF during and after the 2019 Coronavirus disease (COVID-19) pandemic (Lamb et al., 2020), WTF in autonomous air taxis (Ward, 2020), WTF based on CEO diversity (Crouse & Lamb, 2021), and WTF domestically or internationally with a COVID-19 health passport (Crouse et al., 2021). The WTF scale has been adapted by researchers to fit their purpose, for example in willingness to ride (Anania et al., 2018), willingness to travel (Winter & Trombley., 2019), willingness to live (Winter & Trombley., 2019), willingness to undergo surgery (2019), willingness to pilot (Rice, Winter, et al., 2020), and willingness to operate (Vempati et al., 2021). The WTO scale has demonstrated validity and reliability and was used as a dependent variable in this current study.

Methodology

The following section describes the methodology for a non-experimental, quantitative study on a non-probability, voluntary response sampling of cabin crew.

Pilot Study

To verify the validity and reliability of the data collection device and scales, the researcher did a pilot study (Ruel et al., 2016). The pilot study also served to test the survey distribution platform, sampling choice, response rate, and data collection rate (Ruel et al., 2016). IRB approval was obtained. Moore et al. (2011) state that some researchers opt not to justify the sample size in a pilot study. In other research, a minimum of 60 – 100 participants, or 10% of the anticipated research sample size, is recommended (Gorsuch,1983; Hertzog, 2008; Kline,1994; MacCallum et al., 2001). Julious (2005) and van Belle (2002) presented evidence that a sample size of 12 participants per group improved the confidence levels of pilot studies, whereas increasing beyond 12 did not. Isaac and Michael (1995) recommend 10-30 participants for pilot studies using a survey approach. The current pilot study had a target sample size of 30.

Sampling

The current study was open to all cabin crew on a selected social network platform (SNS). It did not target one airline or one cabin crew organization. Non-probability sampling was used due to the lack of an international cabin crew database (Spence et al., 2016). A hybrid of voluntary response sampling, combined with a version of network-driven sampling (purposive sampling, respondent-driven sampling, and snowball sampling) was used to capture the maximum number of relevant participants using SNS (Babbie, 2013; Sibona & Walczak, 2012; Vogt et al., 2012).

SNS research

Due to the limited time frame of the current pilot study and the broad distribution of the target audience, an SNS was used to disseminate the data collection device. “Access to participants via SNSs is an increasing form of locating research participants versus traditional data gathering methods…with positive results” (Petitt, 2019, p. 82). Facebook groups are created around topics of interest. The cabin crew-centric Facebook groups targeted in this current study had a verification process prior to acceptance, which increased the probability that only verified cabin crew would view the initial 'call for participants' post.

Distribution Platform

A recruitment post was placed on cabin crew-related Facebook groups advertising the need for participants to complete a 15-minute survey. Willing participants were invited to click on a link and were redirected to a survey in Google Forms. The initial page was an informed consent form. Participants were then invited to commence answering survey questions. First, there were demographic inquiries and questions related to the length of employment. Second was Rice et al.'s (2020) WTO scale. Third was Donnellan et al.'s **(2006)** personality scale. Fourth was Ekman & Friesen's (1971) affect scale after reading a hypothetical scenario. Last, there were scales rating complexity, familiarity, value, fun, and wariness of new technology created by Rice et al. (2019) based on Davis' (1989) technology acceptance model. A detailed description of each survey instrument section is provided in Appendices A, B, C, D, and E.

Data Analysis Approach

An efficiency evaluation of the survey instrument was conducted. The data was downloaded from Google Forms, prepared in Excel, and imported into SPSS. The Cronbach's Alpha was calculated to assess the scales' validity. A Cronbach's Alpha of 0.7 or more represents acceptable internal consistency (Taber, 2018; Truong, 2016; Wilson & Joye, 2016).

Results

Thirty-six responses from three cabin crew-centric Facebook groups were collected over a period of seven days. A higher frequency response rate was expected. Other avenues of survey distribution will have to be considered for a follow-on study. The final sample size used for the pilot study was 30 (Female = 20, Male = 10). The surveys removed were either incomplete, had single-answer questions with multiple responses, or were from participants with three or more sections of unengaged, straight-lined responses. The mean age was 37.13 (SD = 6.46) years. A broad range of education levels, grades, years of cabin crew experience, and experience in grades were collected; the Facebook platform was effective for sampling cabin crew diversity. These are presented in Table 2, Table 3, and Table 4, respectively. The diverse range of nationalities may pose a challenge for data analysis. A nationality overview is presented in Table 5.

Table 2
Years of Experience as Cabin Crew and Years of Experience in Grade

	Tenure as Cabin Crew		Tenure in Grade	
	Total	Percentage	Total	Percentage
Less than 1 year	0	0%	2	6.7%
1 – 2 years	1	3.3%	5	16.7%
3 – 4 years	2	6.7%	3	10%
5 – 9 years	6	20%	13	43.3%
10 – 14 years	12	40%	6	20.0%
15 – 19 years	7	23.3%	1	3.3%
20 + years	2	6.7%	0	0
Total	30	100%	30	100%

Cronbach's Alpha was calculated on seven scales, Ekman & Friesen's (1971) affect scale, Rice et al.'s (2019) complexity, familiarity, value, fun, and wariness of new technology scales based on Davis' (1989) technology acceptance model, and Rice et al.'s (2020) WTO scale. The affect scale was shown to not be valid with a Cronbach's Alpha of < 0.7, which does not indicate good reliability (Taber, 2018; Truong, 2016; Wilson & Joye, 2016). The six other scales were shown to be valid. A summary of Cronbach's Alpha is presented in Table 6.

Table 3
Participant Education Levels

Education Level	Total	Percentage
High school Degree or Equivalent	3	10%
Sixth Form College or College Diploma Equivalent	1	3.3&
Bachelors Degree	17	56.7%
Master Degree	9	30%
PhD	0	0
Total	30	100%

Table 4
Participant Operational Cabin Crew Grade

Grade	Total	Percentage
Economy	4	13.3%
Business	2	6.7%
First	6	20%
Cabin Supervisor	6	20%
Purser	12	40%
Total	30	100%

Table 5
Participant Nationalities

Nationality	Total	Percentage
Australian	3	10%
British	2	6.7%
Bulgarian	2	6.7%
Chinese	1	3.3%
Egyptian	1	3.3%
Filipino	3	6.7%
German	1	3.3%
Greek	2	6.7%
Indonesian	1	3.3%
Jordanian	1	3.3%
Kazakh	1	3.3%
Lebanese	1	3.3%
Mauritian	1	3.3%
Moldovan	1	3.3%
New Zealand	1	3.3%
Panamanian	1	3.3%
Russian	2	6.7%
Spanish	1	3.3%
Tunisian	2	6.7%
Turkish	1	3.3%
Total	30	100%

Table 6
Cronbach's Alpha

Scale	Affect	Technology Acceptance Model Complexity	Technology Acceptance Model Familiarity	Technology Acceptance Model Value	Technology Acceptance Model Fun	Technology Acceptance Model Wariness of New Technology	WTO Scale
Cronbach's Alpha	0.480	0.792	0.897	0.875	0.919	0.818	0.963

Discussions and Recommendations

The purpose of this current pilot study was to assess the usability of the survey instrument and determine which scales were valid to assess factors that affect a cabin crew's WTO on SPO. The main study is feasible, with select changes to the protocol.

Implications

Research Instrument

The validity and reliability of the survey instrument could be increased by implementing the following edits. The "required feature", a feature that forces question completion, should only be enabled for the informed consent. In compliance with IRB standards, participants should be permitted not to answer any other section of the survey. As only one answer option is desired for demographic questions, the multiple-choice feature should be enabled and not the check box feature. Questions related to IVs should be placed first in the survey, and questions related to DVs should be placed afterward, which would minimize the chance of hypothesis guessing (Rea, 2014). The question order within each section should be shuffled so they do not appear in the same order for each participant; this would limit the influence of order effects (Rea, 2014). Where possible, the options in the questions should be shuffled so that they do not appear in the same order for each participant; this would limit the influence of order effects (Rea, 2014). Several questions in the personality scale should be reversed to reduce respondent fatigue or the potential for straight-lining (Rea, 2014) and the accuracy of data analysis (Truong, 2016).

Data Analysis

The affect scale Cronbach's Alpha is 0.480, which indicates a lack of validity of the scale (Truong, 2016). When reviewing the affect scale Item-Total Statistics, if Happiness is removed from the affect scale, then the Cronbach's Alpha increases to 0.839. However, removing Happiness may affect the factor structure and result in the omission of information (Truong, 2016). The effect scale and related research questions will be removed from the follow-on study.

For the Technology Acceptance Model Fun scale and WTO scale, a Cronbach's Alpha 0.9 < was obtained. Due to the tendency for redundancy with a Cronbach's Alpha of 0.9 < (Taber, 2018), these scales were simultaneously scrutinized for paraphrasing. Redundancy was not found to be present, so these scales will remain in the follow-up study. The six other scales were shown to be valid and will remain as such in the follow-on study.

Limitations and Delimitations

Accessibility

The survey instrument was created using Google Forms in English. Several potential participants anonymously provided feedback that the survey appeared in Arabic. Google Forms was found to automatically translate the surveys, which potentially hindered the researcher's ability to obtain a sufficient number of responses. The follow-on study will have a survey instrument created on a platform that does not automatically translate surveys.

Response Rate

The response rate was found to be lower than expected, with an average of fewer than 6 surveys completed per day. The invitation to complete the survey was placed on three cabin crew-centric Facebook groups with a combined total of approximately 37,680 members. The proposed 15-minute completion time could have been a deterrent, or the sampling population size too small. An incentive could attract more participants.

Recommendations

Streamlining the Data

The 20 nationalities presented by participants may pose a challenge for statistical analysis. Differentiating races as per continent or presenting common ethnicities were considered as options. However, due to the differing nationality, identity, and culture base, the allocation of ethnicity or race may not be indicative of any preference. Instead, allocating the individualistic or collective nature to a nationality could minimize variables and indicate the likelihood of technology acceptance (Huang et al., 2019; Lee et al., 2013), which would be done using the Geert Hofstede cultural dimension individualism tool.

Some predictors had more than two possible answer selections. It was noted that compression of variables may be possible and advantageous. Where there was a lack of contributing data, the number of choices could be reduced, which would also ease data analysis. Education level had the selections of a high school degree or equivalent, 6^{th} form college or a college diploma equivalent, bachelor’s degree, master’s degree, or doctoral degree. The data showed that 30% had a master’s degree, 56.67% had a bachelor’s degree, and 13.33% had a college or high school diploma. Thus, education level could be reduced to two choices: a bachelor’s degree or lower and a master’s or higher. Age was a free-response question. To ease analysis, age could be compartmentalized into multiple-choice, and then, if applicable, the selections could be further reduced.

Follow-up Study

The follow-on study will use the statistical analysis of backward stepwise regression. An assumption for backward stepwise regression is that with 17 variables, approximately (170 x 2) 340 participants are required, as per G*Power (Heinrich-Heine-Universität Düsseldorf., n.d.). Additional participants may be required to account for the margin of error. Thus, approximately 500 participants will be targeted in the follow-up study.

The factors that will influence a cabin crew's WTO on SPOs have not yet been studied. A quantitative research method with a non-experimental, correlational design will be used; this will provide statistical analysis for the follow-on exploratory study to investigate the research questions (Creswell & Creswell, 2018; Edmonds & Kennedy, 2016). Due to the exploratory nature of the research, backward stepwise regression is preferred. A saturated model including all 17 predictors will initially be present; then, variables will be eliminated one by one from the regression model to create a final model that best explains the data (Thayer, 2002). The best approach to gather the data required for a follow-up study will be a survey instrument.

The proposed follow-on study may impact aviation in the future, as the cabin crew's WTO on SPO contributes to its operational success. Furthermore, identifying areas of concern would allow operators and regulators to design supportive procedures and training for cabin crew operating on commercial aircraft with SPO. These actions may optimize the successful execution of the evolving cabin crew role on SPO and better support ground operations and the single onboard pilot in their respective roles.

Conclusion

The pilot study achieved its purpose of identifying the usability of the survey instrument. Areas for improvement have been identified, and the survey instrument has been refined. A revised survey instrument will be used to collect data. The scales have been assessed, and changes will be implemented to improve the validity of the execution of a full-scale survey. The completed pilot study demonstrated the validity of six scales to investigate a cabin crew's WTO on SPO. These results will inform the methodology of a follow-up study with a larger sample size. To ensure that the appropriate assumptions are met, a statistical analysis will be conducted to evaluate which predictors influence a cabin crew's WTO on SPO.

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