International Journal of Aviation, Aeronautics, and Aerospace

Volume 2 | Issue 3 Article 1

6-19-2015

Validating the Knowledge, Skills, and Abilities Composite Measure: An Aviation Industry Pilot Study

Aaron M. Glassman
Embry-Riddle Aeronautical University - Worldwide, glassf10@erau.edu
Jason M. Newcomer
Embry-Riddle Aeronautical University - Worldwide, jason.newcomer@erau.edu
Matthew P. Earnhardt
Embry-Riddle Aeronautical University-Worldwide, earnharm@erau.edu
Rose A. Opengart
Embry-Riddle Aeronautical University - Worldwide, opengarr@erau.edu
Daryl V. Watkins
Embry-Riddle Aeronautical University - Worldwide, watkind4@erau.edu
James W. Marion
Embry-Riddle Aeronautical University - Worldwide, marionj@erau.edu

Validating the Knowledge, Skills, and Abilities Composite Measure: An Aviation Industry Pilot Study

Cover Page Footnote
We are extremely grateful for the rich feedback provided by the eight expert panel members. We would also like to thank the two anonymous reviewers who contributed to the quality of our study. Thank you for your kind, professional, and timely contribution to the development and validation of the KCM.

There are over 100 post-secondary education institutions across the United States that offer aviation or aerospace-focused programs (UAA, 2015). The programs—ranging from certificates to doctoral degrees—provide the depth and breadth of theoretical knowledge to produce graduates who are able to meet the rapidly changing demands of the aviation industry (Fullingim, 2011). Coincidentally, and largely driven by federal requirements, some of the aviation institutions, along with state, federal, and private organizations offer certifications to professionals in various fields that are designed to instill graduates with the practical skills necessary to safely perform their respective functions (Kraus & Gramopadhye, 2011; Sadasivan & Gramopadhye, 2009; Yadav & Nikraz, 2012).

During their exploration of the aviation management education paradigm shift, Earnhardt, Newcomer, Watkins, and Marion (2014) indicated that education, certification, and experience (ECE) were all important in the aviation industry; however, the range of importance varied between managers depending on their field. Overall, the results identified experience as the most important factor, followed by certification, then education. Furthermore, the authors made a connection between ECEs and a potential employee's knowledge, skills, and abilities (KSAs), which would ultimately be used by managers to make a hiring decision. Understanding the relationship between ECE and KSAs is paramount to understanding the right mix of KSAs within the aviation industry because KSAs not only influence hiring decisions, but they also drive retention decisions (Shawn, Kim, and Jitendra, 2014). The purpose of this mixed-methods sequential exploratory pilot study was to develop, validate, and test the reliability of the *KSA composite measure (KCM)*, a data collection device to measure the connection between ECE and KSAs.

Summary of the Literature

Post-secondary education's relationship with aviation dates back to the beginning of flight (Radigan, 2011). Formal education is viewed as an important pathway to gaining aviation experience and often the desire to fly is the main reason students choose aviation-centric programs (Clark, 2006; Fullingim, 2011). Though research on the importance of post-secondary education in aviation is limited, Newcomer, Marion and Earnhardt (2014) found that aviation managers consider education an essential component for newly hired employees. In a follow-on study, Earnhardt et al. (2014) found that education was important for upward mobility in the aviation industry, particularly for roles involving management.

A component related to many jobs in the aviation industry is professional certification. Certifications are a requirement for those who operate, maintain, or service aircraft (Sadasivan & Gramopadhye, 2009). In the United States, the Federal Aviation Administration (FAA) manages the certification program within a specific process (such as applicant seeks certification and the FAA is the certification authority; Loh, Bian, & Roe, 2009). Many certifications required in the aviation industry are a rigorous process of intense initial training, written exams, on-the-job training, performance measures, follow-on training, and recertification. Earnhardt et al. (2014) found that certification is essential to certain aviation career fields and an important factor when selecting new employees.

According to Earnhardt et al. (2014), aviation managers consider experience the most important requirement when hiring new team members. Traditionally, the aviation industry relied on experienced operators (primarily from the military) to fill its ranks (Smith, Herchko, Niemczyk, Nullmeyer, Paasche, & NewMeyer, 2013). In a study of peer-assessment of aviation performance, Roth and Mavin (2015) found that pilot experience was an important component of judging performance. Huang (1990) discussed that pilot experience and expertise are important resolving in-flight emergencies. Therefore, experience is a critical component to aviation industry hiring practices.

Knowledge, skills, and abilities (KSAs) are general descriptions of minimum qualifying competencies within a trade or career (Johnson, Lenartowicz, & Apud, 2006). An employee's match with the job KSAs is an important hiring criterion since training employees without the right mix will cost the organization additional training dollars (Kristof-Brown, 2000; Moy & Lam, 2004; Neistadt, & Murphy, 2009). Understanding what competencies are required for the job and how the employee matches those competencies is critical. KSAs are often job dependent in the aviation industry. An aircraft pilot would have a different KSA mix than a mechanic or an air traffic controller (Liu, Reynolds, Vincenzi & Doherty, 2013). Though KSAs are thought of in individual terms, they extend beyond individual performance as KSAs needed to work successfully in a team may differ (Aguando, Arranz, Valera-Rubio, & Marin-Torres, 2011). Earnhardt et al. (2014) found that aviation managers are looking for team members with a combination of knowledge, skills, and abilities related to hiring decisions. Figure 1 provides an illustration of the theoretical framework connecting ECEs with KSA.

DOI: https://doi.org/10.15394/ijaaa.2015.1067

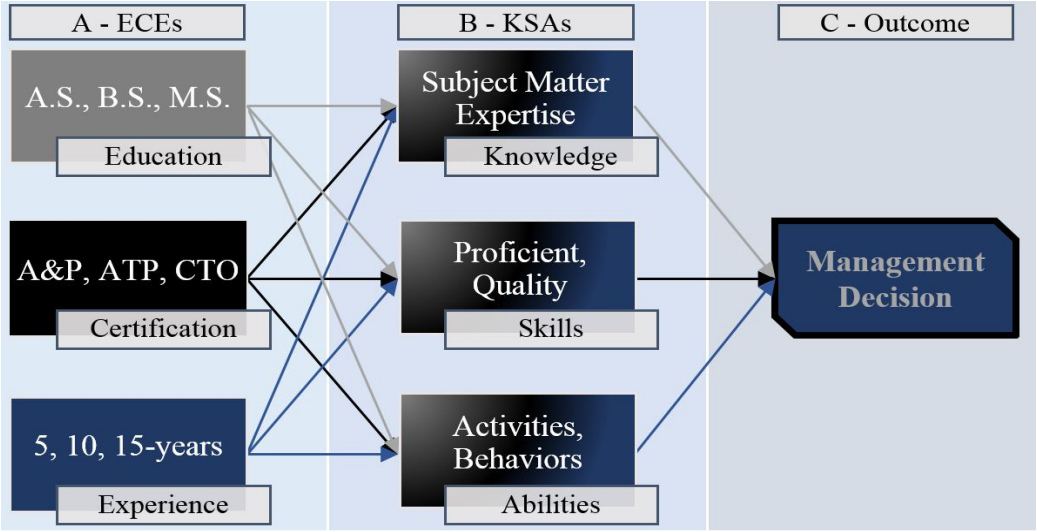

Figure 1. The KSA Composite Framework used to develop the KCM. Adapted from "An Inquiry into the Aviation Management Education Paradigm Shift" by M. P. Earnhardt, J. M. Newcomer, D. V. Watkins, and J. W. Marion, *International Journal of Aviation, Aeronautics, and Aerospace*. Reprinted with permission.

Methods

This mixed-methods sequential exploratory study consisted of three phases: (a) an expert panel review by eight research, aviation, and human resource professionals to ensure validity, (b) an institutional review board (IRB) review, and (c) a live pilot using professionals from the aviation industry to test reliability. According to Creswell (2009), the selected method is most appropriate for research efforts where authors combine both qualitative and quantitative data in a phased approach where one method supports the data from the previous. Because each phase of this study is built upon the previous and used a combination of qualitative, then quantitative methods, the sequential exploratory strategy was most appropriate. Specific sample size and strategy, as well as, the specific method used for each phase is detailed in the following sections.

Phase A: Validity by a Panel of Experts

An instrument's validity is the extent by which it is able to measure what it is intended to measure (Lameck, 2013). Because the KCM was a new instrument, establishing it as valid was of the utmost importance. In social science survey development, the arrangement, wording, and relevance of the questions can all impact the quality of the findings (Lameck, 2013). For this reason, we

sought a panel of experts (n = 8) in the areas of aviation, human resource management, and research; a method similar to that used by Ison, Weiland, McAndrew, and Moran (2015) to validate their instrument. We provided the experts (a) a link to the initial KCM, (b) a concept paper that described the intent of the study and (c) a feedback form. The feedback form contained drop-down selections with yes (Y)/no (N) responses as well as areas to rate the effectiveness of the study in the following categories (see Table 1):

- General
- Reliability and Validity
- Specific Question
- and Construct

The data presented in Table 1 was supported by qualitative open-ended questions for each major area. Table 2 summarizes the primary themes that impacted the changes to the draft KCM.

As indicated in Table 2, most panel members felt that the large number of demographic questions was unnecessary, would make participants uncomfortable, and possibly prevent them from completing the survey. This was the primary reason for the majority of panel members selecting "N" for question G4. As a corrective measure, we deleted all of the demographic questions that did not directly relate to the research question. For example, questions such as age, race, and sex were removed, while other questions such as industry sector, specific function, and years of experience remained. We did not delete the question regarding salary; however, we did change it from mandatory to optional. One panel member suggested placing the demographic questions at the end of the survey; however, because of the smart logic in the survey—that eliminates ECE/KSA questions based on the demographic data—we did not implement that recommendation. For example, if a participant answers that they do not possess a certification in their aviation field, the option to rate the importance of certification as it contributed to KSAs was not made available to them.

There were a total of nine comments that suggested spelling/grammar corrections, larger font size, and/or a significantly shortened informed consent/introduction section. Because the study was exempt from human subjects research by Title 32 of the Code of Federal Regulation part 219.101(b) (see IRB section below), we shortened the informed consent and introduction to remove most of the information that would have otherwise been mandated by law to provide. We also corrected the small font in the definitions sections and proofed the survey for any residual spelling or grammar errors.

DOI: https://doi.org/10.15394/ijaaa.2015.1067

Table 1
Results of the Expert Panel Review

Abbreviated Question	Code	Responses							
Panel Member	PM	1	2	3	4	5	6	7	8
Aviation Expertise	**PA**		*	*	*		*	*	
Human Resource Management Expertise	**PH**	*			*	*			*
Research Expertise	**PR**	*	*	*	*	*	*	*	
Are sections useful/informative?	G1	Y	Y	Y	Y	Y	Y	Y	Y
Is the survey easy to read/respond to?	G2	Y	Y	N	Y	Y	Y	Y	Y
Is the flow logical?	G3	Y	Y	Y	Y	Y	Y	Y	Y
Is the survey ready to use w/o changes?	G4	N	N	Y	N	N	N	N	N
General Effectiveness (1-5)	**GE**	**5**	**3**	**5**	**5**	**4**	**3**	**4**	**4**
Are terms clearly defined?	R1	Y	Y	Y	Y	Y	Y	Y	Y
Research questions/hypothesis consistency?	R2	Y	Y	Y	Y	X	Y	Y	Y
Will the survey produce meaningful data?	R3	Y	X	Y	Y	X	N	Y	Y
Are lines of thinking/questions sufficient?	R4	N	Y	Y	Y	N	N	Y	Y
Will the survey generate reliable data?	R5	Y	X	Y	Y	Y	N	Y	Y
Reliability/Validity Effectiveness (1-5)	**RE**	**4**	**3**	**5**	**5**	**4**	**1**	**4**	**4**
Free of survey questioning errors?	S1	Y	N	Y	Y	Y	Y	N	Y
Are choices/ranges mutually exclusive?	S2	Y	N	N	Y	Y	N	Y	Y
Are the answer choices inclusive?	S3	N	N	N	Y	Y	Y	N	Y
Is the survey sufficient w/o changes?	S4	N	N	Y	Y	N	Y	Y	N
Specific Question Effectiveness (1-5)	**SE**	**5**	**2**	**5**	**5**	**3**	**3**	**4**	**4**
Language appropriate to the population?	C1	Y	N	Y	Y	N	Y	Y	Y
Free from errors/confusing verbiage?	C2	Y	Y	N	Y	Y	N	N	Y
Is the design visually appealing?	C3	Y	N	Y	Y	N	Y	Y	Y
Ready without layout/design changes?	C4	N	N	Y	N	N	Y	Y	N
Construct Effectiveness (1-5)	**CE**	**4**	**3**	**5**	**5**	**4**	**4**	**4**	**4**
Average Effectiveness Rating	**AE**	**5**	**3**	**5**	**5**	**4**	**3**	**4**	**4**

Note. Y = Yes, N = No, X = N/A, * = Qualified. See Appendix A for the expanded version of the questions asked.

Finally, two panel members commented on the unipolar Likert-type scale used to measure the relationship between ECE and KSAs, and the associated open-ended questions under each of the three areas (two for those without a certificate in their field). To reduce the chances of a participant quitting the survey due to the open-ended questions, we changed those questions from mandatory to optional. Although the panelists offered wise counsel concerning our selected Likert-type scale, we did not accept the recommendations to change the scale from a unipolar design to a bipolar design. The decision to employ the unipolar scale was deliberate because of the information we intend to collect concerning

the importance various ECE elements have in developing KSAs. According to the Siegle (2010), there are no levels of unimportance; there is either none, or some measure of it (much like rays of light). Appendix B contains the chosen Likert-type scale used in the KCM.

Table 2
Coded Open-Ended Expert Panel Responses

Theme	*f*
Excessive/Inappropriate Demographic Questions	5
Design/Layout - Font Size	4
Consent/Introduction is too Long	3
Spelling or Grammar Errors	2
Likert Scale for ECE/KSA Questions	2

Phase B: Ethics Review by an IRB

The U.S. Code of Federal Regulations, Title 45 – *Public Welfare*, Part 46 – *Protection of Human Subjects* outlined specific protective guidelines for research involving human subjects (U.S. Department of Health and Human Services, 2009). As part of validating the KCM, we submitted the survey and data collection procedures for university IRB review to ensure the KCM and associated collection process met ethical guidelines and legal exemptions that allow simple surveys of adults to avoid a full-panel IRB review. After a minor modification to the consent form, the IRB deemed that the KCM and collection procedures were exempt in accordance with 45 CFR 46.101(b).

Phase C: Internal Consistency Estimates of Reliability

Upon completion of the expert panel and IRB review, we sought to confirm the reliability of the KCM and test our data collection technique via a pilot study. A sample of aviation professionals (n = 45) were surveyed using purposefully selected aviation affiliated groups on LinkedIn™ as a forum for distributing the hyperlink to the KCM. A consent form and qualification question served as a means to screen volunteer, qualified survey applicants who were U.S. aviation professionals from various fields. Unqualified or incomplete survey submissions were scrubbed from the data sheet prior to analysis.

Factor Analysis

To verify the dimensions of the KCM, we conducted a confirmatory factor analysis (CFA) using the pilot data (Green & Salkind, 2011). CFAs are popular

DOI: https://doi.org/10.15394/ijaaa.2015.1067

among social researchers and used verify the dimensions of a measurement. The results of the CFA are listed in Table 3. As predicted, (a) education, (b) certification, and (c) experience emerged as independent dimensions on the KCM. The foregoing served as the basis for the reliability testing (Green & Salkind).

Table 3
Factor Analysis of the KCM Items

	Factors		
Items	Education	Certification	Experience
Education's contribution to…			
… overall level of knowledge?	**.77**	-.11	-.18
… overall level of skills?	**.80**	-.09	.14
… overall level of abilities?	**.95**	.04	.05
Certification's contribution to…			
… overall level of knowledge?	-.15	**.46**	.02
… overall level of skills?	-.04	**.99**	.13
… overall level of abilities?	.01	**.75**	.37
Experience's contribution to…			
… overall level of knowledge?	-.19	-.27	**.18**
… overall level of skills?	-.20	.30	**.67**
… overall level of abilities?	.23	.02	**.95**

Reliability

We used Cronbach's α to test the internal consistency estimates of reliability for the KCM. The KCM was deemed reliable because the measure yielded consistent scores across cases (Green & Salkind, 2011). The general guidelines for α values: 0.90 to 1.0 are excellent, 0.80 to 0.89 are good, 0.70 to 0.79 are acceptable, 0.60 to 0.69 are questionable, 0.50 to 0.59 are poor, and below .50 are unacceptable (George & Mallery). Table 4 contains the results of the reliability analysis by factor.

Table 4
Cronbach's α *by Factor*

Factor	Cronbach's α	Rating
Education	.851	Good
Certification	.802	Good
Experience	.717	Acceptable

Conclusion

The purpose of this mixed-methods sequential exploratory pilot study was to develop, validate, and test the reliability of the KCM, a data collection device that will measure the connection between ECE and KSAs. The KCM was submitted to (a) an expert panel for validity review, (b) an IRB for ethics review, and (c) tested using a CFA and Cronbach's α for reliability. After extensive testing, we determined the KCM to be valid, adhere to legal and ethical guidelines, and produce reliable data for statistical analysis. The positive results of this pilot study will be paramount to the starting an examination of the relationship between ECE and KSAs in the aviation industry. Utilizing the KCM, the research endeavor will attempt to establish a baseline for the industry regarding the importance and distribution of factors that contribute to success in the industry.

Although the KCM was originally developed for use in the aviation industry, the KCM framework is transferrable to other fields by replacing the current demographic questions with those appropriate to the industry, organization, or individual being examined. The demographic questions and a copy of the KCM questions are available in Appendix B.

Note: Researchers are welcome to use the KCM instrument; however, we kindly request that they cite and reference the authors and publisher appropriately.

DOI: https://doi.org/10.15394/ijaaa.2015.1067

Author Biographies

Dr. Aaron Glassman is an Assistant Professor of Management with Embry-Riddle Aeronautical University–Worldwide. He serves as the Chair for the Master of Science in Management Program. He holds a DM from the University of Maryland University College and a Master of Aeronautical Science degree from Embry-Riddle.

Dr. (Major) Jason Newcomer is the Deputy Director for Air Traffic Control and Landing Systems Logistics and Maintenance at the U.S. Air Force Flight Standards Agency and an Adjunct Assistant Professor of Aeronautics and Business at Embry-Riddle Aeronautical University–Worldwide. He holds a Doctorate in Business Administration (DBA) from Walden University and a Master of Aeronautical Science from Embry-Riddle.

Dr. Matthew Earnhardt is an Assistant Professor with Embry-Riddle Aeronautical University–Worldwide. He holds a PhD in Organizational Leadership from Regent University. He has a MBA, and is working toward a Master of Aeronautical Science specializing in Human Factors and Aviation/Aerospace Education Technology.

Dr. Rose Opengart is is an Assistant Professor of Business Administration with Embry-Riddle Aeronautical University–Worldwide. She holds a PhD in Human Resources/Organizational Development from the University of Georgia, a post-doctoral certificate from AACSB in Marketing and Management, and a professional certification in Human Resources.

Dr. Daryl Watkins is an Assistant Professor of Leadership with Embry-Riddle Aeronautical Universityr–Worldwide and former U.S. Navy aviator. He holds a Doctorate of Management (DM) in Organizational Leadership from the University of Phoenix, a MBA in Information Technology Management from the University of California, Irvine, and a Bachelor of Science degree in History from the U.S. Naval Academy.

Dr. Jim Marion is an Assistant Professor with Embry-Riddle Aeronautical University–Worldwide. He serves as the Chair of the MS in Engineering Management program and teaches in the MS in Project Management program. He has a PhD in Organization and Management with an Information Technology Management Specialization from Capella University. He also holds an MS in Engineering and a MSc. and an MBA in Strategic Planning.

References

Aguado, D., Arranz, V., Valera-Rubio, A., & Marín-Torres, S. (2011). Evaluating a blended-learning program on developing teamwork competence. *Psicothema, 23*(3), 356. Retrieved from http://www.psicothema.com/

Clark, J. M. (2006). The face of collegiate aviation: Factors impacting self-selection of collegiate aviation programs. *Collegiate Aviation Review, 24*(1), 42-57. Retrieved from http://www.imis100us1.com/UAA

Earnhardt, M. P., Newcomer, J. M., Watkins, D. V., & Marion, J. W. (2014). An inquiry into the aviation management education paradigm shift. *International Journal of Aviation, Aeronautics, and Aerospace, 1*(4). doi:10.15394/ijaaa.2014.1037

Fullingim, J. F. (2011). The marketability of higher education aviation graduates as perceived by regional airline pilots. *Collegiate Aviation Review, 29*(1), 28–44. Retrieved from http://www.imis100us1.com/UAA

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. 11.0 update (4th ed.). Boston: Allyn & Bacon.

Green, S. B., & Salkind, N. J. (2011). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Huang, S. C. (1990). The medical risk of airline pilots over age 60. *Flight Safety Digest*. Retrieved from http://flightsafety.org/fsd/fsd_dec90.pdf

Ison, D. C., Weiland, L., McAndrew, I. & Moran, K. (2015). Identification of air traffic management principles influential in the development of an airport arrival delay prediction model. *Journal of Aviation/Aerospace Education & Research, 24*(2), 39 – 53. doi:10.15394/jaaer.2015.1618

Johnson, J. P., Lenartowicz, T., & Apud, S. (2006). Cross-cultural competence in international business: Toward a definition and a model. *Journal of International Business Studies, 37*, 525-543. doi:10.1057/palgrave.jibs.840020

DOI: https://doi.org/10.15394/ijaaa.2015.1067

Kraus, D. C. & Gramopadhye, A. K. (2001). Effect of team training on aircraft maintenance technicians: computer-based training versus instructor-based training. *International Journal of Industrial Ergonomics, 27*(3), 141–157. doi:10.1016/S0169-8141(00)00044-5.

Kristof-Brown, A.L. (2000). Perceived applicant fit: distinguishing between recruiters' perceptions of person-job and person-organization fit. *Personnel Psychology, 53*(3), 643-671. doi:10.1111/j.1744-6570.2000.tb00217.x

Lameck, W. U. (2013). Sampling design, validity and reliability in general social survey. *International Journal of Academic Research in Business and Social Sciences, 3*(7), 212-218. doi:10.6007/IJARBSS/v3-i7/27

Liu, D., Reynolds, C., Vincenzi, D., & Doherty, S. (2013). Effect of pilot and air traffic control experiences and automation management strategies on unmanned aircraft systems mission task performance. *Human Factors and Ergonomics in Manufacturing & Service Industries, 23*(5), 424-435. doi:10.1002/hfm.20330

Loh, R., Bian, Y., & Roe, T. (2009). UAVs in civil airspace: Safety requirements. *IEEE Aerospace and Electronic Systems Magazine, 24*(1), 5-17. doi:10.1109/MAES.2009.4772749

Moy, J. W., & Lam, K. F. (2004). Selection criteria and the impact of personality on getting hired. *Personnel Review*, *33*(5), 521-535. doi:10.1108/00483480410550134

Neistadt, J. & Murphy, T. J. (2009). Are we really saving resources with current hiring practices at local health departments? *Journal of Environmental Health, 71*(6), 12-4. Retrieved from http://www.neha.org/JEH/

Newcomer, J. M., Marion Jr., J. W., & Earnhardt, M. P. (2014). Aviation managers' perspective on the importance of education. *International Journal of Aviation, Aeronautics, and Aerospace, 1*(2). doi:10.15394/ijaaa.2014.1014

Radigan, J. A. (2011). The impact of specialized accreditation on program quality: Aviation students' perspectives. *Collegiate Aviation Review, 29*(2), 58–77. Retrieved from http://www.imis100us1.com/UAA/UAAMain/Publications

Roth, W., & Mavin, T. J. (2015). Peer assessment of aviation performance: Inconsistent for good reasons. *Cognitive Science, 39*(2), 405-433. doi:10.1111/cogs.12152

Sadasivan, S. & Gramopadhye, A. K. (2009). Technology to support inspection in the general aviation industry: Specification and design. *International Journal of Industrial Ergonomics, 39*(4), 608–620. doi:10.1016/j.ergon.2008/09/002

Shawn, M., Kim, M., & Jitendra, M. (2014). Elderly workers in the workforce. *Advances in Management, 7*(3), 1–5. Retrieved from http://econpapers.repec.org/article/mgnjournl/

Siegle, D. (2010). Likert scale. Neag School of Education—University of Connecticut. http://www.gifted.uconn.edu/siegle/research/instrument%20reliability%20and%20validity/likert.html

Smith, G. M., Herchko, D., Niemczyk, M., Nullmeyer, R., Paasche, J. & NewMeyer, D. A. (2013). The 2012 pilot source study (Phase III): Response to the pilot certification and qualification requirement for air carrier operations. *Journal of Aviation Technology and Engineering*, *2*(2), 13-23. doi:10.7771/2159-6670.1071

Yadav, D. K. & Nikraz, H. (2012). An insight into professional registration of technical personnel in aeronautical engineering industry, *Aviation*, *16*(2), 51–55. doi:10.3846/16487788.2012.701854

DOI: https://doi.org/10.15394/ijaaa.2015.1067

Appendix A
Full Expert Panel Survey Questions

Full Question	Code
GENERAL	
Are the survey instructions, help sections, and informed consent useful and informative to the respondent?	G1
Is the survey easy to read and respond to considering the nature of the questions asked?	G2
Are the question order and page breaks logical and lead the respondent through the survey?	G3
Is the survey ready to use without any additions, subtractions, or changes?	G4
Open-Ended Question	GO
General Effectiveness (1-5)	GE
RELIABILITY/VALIDITY	
Are all terms used within the survey clearly defined and use of terms explained to the respondent?	R1
Does the survey address constructs consistent with the research questions/hypothesis?	R2
Will the survey produce meaningful data that can be used to address the research questions/hypothesis?	R3
Are the lines of thinking and questions sufficient as is?	R4
Will the survey generate reliable, consistent data base on the design of the survey and questions asked?	R5
Open-Ended Question	RO
Reliability/Validity Effectiveness (1-5)	RE
SPECIFIC QUESTIONS/ANSWERS	
Is the survey free of questions that are leading, loaded, double-barrel, overlapping, and/or require the respondent to guess?	S1
Are answer choices/ranges mutually exclusive and provide discrete values?	S2
Are the answer choices inclusive and cater to all respondents and demographics?	S3
Is the survey sufficient without any special questions that need to be added or removed?	S4
Open-Ended Question	SO
Specific Question Effectiveness (1-5)	SE
CONSTRUCTION	
Is the survey authored using language appropriate to the target population?	C1
Is the survey free from grammatical errors or confusing verbiage?	C2
Is the survey visually appealing or easy to view?	C3
Is the survey ready without the need to change any layout or design elements?	C4
Open-Ended Question	CO
Construct Effectiveness (1-5)	CE

Appendix B

KSA Composite Measure (KCM)

Aviation Industry Demographic Questions used with the KCM

1. Are you currently working, or have worked, in an aviation or aerospace field?
2. What sector of aviation do you presently or have most recently worked in?
3. What is or was your job within the aviation industry sector you selected?
4. How many years of experience do you have in your current or previous job?
5. Which of the following best describes your current or most recent employer?
6. What is your current salary before taxes?
7. What is your present level of education?
8. Are you certified in your current occupation (e.g. A&P, ATP, CTO, PMP…)?

KCM Questions

Considering your role in aviation and your current or former job function, answer the following questions. How important is…

1. EDUCATION in contributing to your overall level of KNOWLEDGE?
2. EDUCATION in contributing to your overall level of SKILLS?
3. EDUCATION in contributing to your overall level of ABILITIES?

*Open Ended: Briefly explain why you chose the rating distributions above (e.g. "most of what I have learned was from experience which contributed most to my knowledge, skills, and abilities to refuel aircraft.")

4. CERTIFICATION in contributing to your overall level of KNOWLEDGE?
5. CERTIFICATION in contributing to your overall level of SKILLS?
6. CERTIFICATION in contributing to your overall level of ABILITIES?

*Open Ended

7. EXPERIENCE in contributing to your overall level of KNOWLEDGE?
8. EXPERIENCE in contributing to your overall level of SKILLS?
9. EXPERIENCE in contributing to your overall level of ABILITIES?

*Open Ended

Likert-type scale used with KCM questions 1 – 9:

Unimportant	Of Little Importance	Moderately Important	Important	Very Important

10. Considering your current or former role in aviation, rank the following items from MOST IMPORTANT (1) to LEAST IMPORTANT (3) as they relate to the requirements of your job: Education, Certification, and Experience

DOI: https://doi.org/10.15394/ijaaa.2015.1067