

Wright State University

CORE Scholar

International Symposium on Aviation
Psychology - 2011

International Symposium on Aviation
Psychology

2011

Use of Digital Performance Data in the Flight Training Environment

Lauren M. Vala

Michael S. Nolan

Brian G. Dillman

John P. Young

Follow this and additional works at: https://corescholar.libraries.wright.edu/isap_2011



Part of the [Other Psychiatry and Psychology Commons](#)

Repository Citation

Vala, L. M., Nolan, M. S., Dillman, B. G., & Young, J. P. (2011). Use of Digital Performance Data in the Flight Training Environment. *16th International Symposium on Aviation Psychology*, 172-177.
https://corescholar.libraries.wright.edu/isap_2011/87

This Article is brought to you for free and open access by the International Symposium on Aviation Psychology at CORE Scholar. It has been accepted for inclusion in International Symposium on Aviation Psychology - 2011 by an authorized administrator of CORE Scholar. For more information, please contact library-corescholar@wright.edu.

USE OF DIGITAL PERFORMANCE DATA IN THE FLIGHT TRAINING ENVIRONMENT

Lauren M. Vala
Michael S. Nolan
Brian G. Dillman
John P. Young

Department of Aviation Technology, Purdue University
West Lafayette, Indiana, USA

The ability to record and monitor flight data in primary training aircraft has dramatically changed in the last decade. By taking advantage of digital data recording equipment on single engine aircraft, the implementation of Flight Operations Quality Assurance (FOQA) programs is now feasible for non-airline operations. The integration of FOQA data into training and evaluation will provide multiple opportunities for utilization of this data in a variety of applications. Differences between the operational environments of airlines and collegiate training programs must be addressed if FOQA is to be properly integrated into a collegiate training environment. Through interviews of key university, technology, and regulatory personnel, protocols will be developed that will aid in the establishment of a collegiate FOQA program.

Flight Operations Quality Assurance (FOQA) programs are voluntary safety programs which use aggregate flight data to identify unsafe flight conditions or deviations from policy. In recent years, airlines have developed and successfully implemented these programs (FAA, 2004). FOQA programs are crucial for safety systems and can enhance training operations, safety and efficiency (Ramsey, 2005). The planned research will suggest implementation methodology for a university to establish its own functional FOQA program.

Background

As digital aircraft enter the general aviation market, numerous safety advancements are now possible. Developing a collegiate FOQA program has the potential to optimize the use of the data collected from aircraft. Evidence-based training such as Advanced Qualifications Programs (AQPs) or similar initiatives are now possible. Efficiency may be improved by student-tailored training made possible from the collection of user-specific data. Instead of utilizing uniform training procedures prescribed under standard Federal Aviation Regulations (FARs), FOQA data allows for individual training and skill improvement. This process can enhance each student's flight training experience as well as increase efficiency for the university and individual student.

The development of FOQA programs for collegiate flight schools is of high importance when considering the improved safety initiatives currently undertaken by the FAA. Training redesign has already occurred for commercial pilots through successful FOQA implementation, but efforts have not yet been made to convert such programs to general aviation pilot training. After careful comparison of commercial pilot and general aviation pilot training requirements, this project provides the guidelines for the implementation of a collegiate FOQA program. This information can aid university flight programs in development of their own FOQA programs. Improved safety and cost savings may be realized by flight departments if they so choose to develop a FOQA program based on the guidelines provided in this project.

FOQA System Operation

While determining the implementation requirements of a collegiate FOQA program, many areas highlighted by airline FOQA programs must be given appropriate attention. Specifically, the importance of a

functioning safety culture and the available integration of FOQA into Advanced Qualification Programs (AQP) are important. Also, data uses, security, and analysis must be approved by the FAA (FAA, 2004).

FOQA is a voluntary safety program that intends to make commercial aviation safer through the recording of objective, quantitative data gathering and analysis (Wiley, 2007; Mitchell, K., Sholy, B., & Stolzer, A., 2006; FAA, 2004; FSF, 1998). FOQA programs function primarily through the immense amount of data that is collected onboard an aircraft during flight. More advanced than the traditional flight data recorders (FDRs), quick access recorders (QARs) gather flight information that is available for analysis by software on a personal computer post-flight (FAA, 2004). Specialized processing and analysis software called Ground Data Replay and Analysis System (GDRAS) is used to convert information from the QAR during flight to usable data that is relevant to managers, pilots, and maintenance personnel (FAA, 2004). FOQA data differs from that gathered from an FDR in the amount of data recorded and purpose for data use. A standard FDR typically collects the last 25 hours of flight information leading up to an accident, and the data is then only accessed in the event of an accident (Wiley, 2007). A QAR for FOQA use records parameters at one second intervals, with data available for collection and analysis upon upload at the user's request. This electronic upload usually occurs between 3 and 20 operating days after the flight during which it was recorded, or during scheduled maintenance (FAA, 2004; Wiley, 2007).

The aforementioned data gathering processes should not occur as a standalone process, but rather be built into a total data gathering and analysis program. For airline purposes, the FAA (2004) lists multiple set-up phases for FOQA programs. These include the integration of a FOQA program into other systems within the aviation operation. Before a FOQA program or further safety management system can be launched at a university flight school, it must be determined if the cultural environment is in place to support it (Wiley, 2007). The FAA (2006b) states that, "the principles that make up the [Safety Management System] functions will not achieve their goals unless the people that make up that organization function together in a manner that promotes safe operation" (p. 4).

An airline FOQA program development guideline is available in Advisory Circular 120-82, which discusses the benefits, organization, and maintenance of such a program (FAA, 2004). This document also provides a template for the Implementation and Operations (I & O) plan development as well as key definitions that must be addressed during program establishment (FAA, 2004). In order to be fully operational in a collegiate flight school setting, a FOQA program must fit into the safety program goals and be supported by the college or university.

In order for FOQA data to be of use for a collegiate flight program, baselines must be established and caution must be taken in trending (Wiley, 2007). Wiley (2007) cautions that pilots must all operate under the same rules using the same tools, or else data collection could cause an apples to oranges type comparison. Routine Operational Measure (ROM) identification is a capability of the GDRAS system, which is the ability to find trends from which to later measure deviations. ROMs provide a snapshot look of a chosen parameter from which statistics such as mean, minimum and maximum can be determined (FAA, 2004). This information can lead to the establishment of baselines for normal operation (FAA, 2004). Establishing user-specific ROMs is a necessary part of the FOQA program adoption and set up.

Airline FOQA programs may attribute some of their success to confidentiality. On the other hand, collegiate FOQA programs must address different protocols for data protection due to their educational operation. The Family Education Rights and Privacy Act (FERPA) of 1974 protects the privacy of student educational records (U.S. DoE, 2010). Data collected from students in the collegiate training environment may be subject to protection under FERPA, necessitating a review of the laws and their applicability. Van Dusen (2010) states that education records are, "records that directly relate to a student and that are maintained by an educational agency or institution or by a party acting for the agency or institution." These documents may include written documents and computer media, but data compilation and administrative records kept exclusively by the creator of the records that are not

accessible to anyone else are not considered educational records. The latter falls outside of the FERPA disclosure guidelines (Van Dusen, 2010). As data collection for FOQA purposes is a subject not directly addressed in the FERPA laws, special care must be taken by a flight school establishing a FOQA program in order to ensure that data use complies with legal rights of students.

Airlines have discovered that once FOQA programs are in place, additional programs can be developed to improve training (FAA, 2006a). The most developed program which uses FOQA data is the Advanced Qualifications Program (AQP), which again has only been developed for use by airlines (Wright, 2003). According to the FAA (2006a), "AQP is a systematic methodology for developing the content of training programs for air carrier crewmembers and dispatchers. It replaces programmed hours with proficiency-based training and evaluation derived from a detailed job task analysis that includes crew resource management." The goal of an AQP is to create the "highest possible standard of individual and crew performance" (FAA, 2006a, p. i). Traditional Federal Aviation Regulations (FARs) are prescriptive, stipulating minimal levels of required performance, knowledge, or skills to be demonstrated before pilots may be certified. AQPs take a different approach by utilizing feedback and evaluation to conduct proficiency-based training (FAA, 2006a). This feedback, however, can only be made possible through the use of reliable quantitative data. Airlines that have established AQP programs have first gained FAA approval for the use of FOQA data (FAA, 2006a). As both programs are non-regulatory, airlines that have taken initiative to develop them and receive FAA program approval have successfully met or exceeded FAR requirements. As traditional FOQA programs have created additional safety and training opportunities for airlines, potential is shown for collegiate FOQA programs to do the same for university flight training operations.

The possibilities FOQA programs offer are too beneficial to be ignored by collegiate flight school operations. However, the process of adapting FOQA programs to college flight needs might prove daunting and cumbersome for traditional operators. Guidance from previous system implementations may assist with collegiate FOQA development, but attention must be paid to the legalities of data collection which relate to collection of student data. With support from management and a solid safety culture in place, a data collection system can be developed and standardized. Hopefully, collegiate flight schools realize many of the same benefits FOQA has provided to the airlines.

Design Process

For this project, two main information sources were used. The Federal Aviation Administration's (FAA) airline FOQA program establishment guide was analyzed and professionals in the flight training field were consulted. Airline FOQA program requirements were evaluated and tailored for suggested use in a university setting. Timelines and implementation schedules as recommended by the FAA were modified to reflect university flight training needs. Advisory Circular 120-82 was referenced as a main template. After airline FOQA establishment guidelines were analyzed, it was necessary to collect a listing of university-specific training requirements for pilots. This information was important for the next and final project step which was the creation of guidelines for the establishment of a collegiate FOQA program.

The most influential document for this research was Advisory Circular No. 120-82 published by the FAA. This document is the standard for airlines to use when developing a FOQA program, and best directed the formulation of guidelines for general aviation FOQA development. To address data security and student privacy issues, the Family Educational Rights and Privacy Act (FERPA) was examined.

Data collection hardware vendors were sought for their expertise regarding the proper selection of data capturing units. Similarly, the Purdue University Information Technology (IT) department was questioned as to data collection unit installation and integration with current university systems. To ensure compliance with legal

requirements regarding student records and FERPA policies, the Purdue University Registrar's Office was consulted. The advice of maintenance department management was also used regarding data requirements in their operations. Advice for many program establishment topics was sought from the Purdue Aviation Technology Department Head and director of operations for flight training, as they serve supervisory roles and have most direct authority over faculty in the aviation department. Lastly, Flight Standards District Office (FSDO) FAA employees from Indianapolis were consulted for their view on program integration in accordance with established FAA regulations. All data collection for the purpose of this research was conducted through interviews.

Concluding Remarks

This project will be completed by May 15, 2011. Final results will be published in a Directed Project for degree completion as per Purdue University's requirements for a Master's of Science in Aerospace Management. After this date, professionals with a research interest in this field may obtain final results of this project by contacting the lead author, Lauren Vala, at lvala@purdue.edu.

The possibilities FOQA programs offer are too beneficial to be ignored by university flight school operations. However, the process of adapting FOQA programs to university flight needs proves daunting and cumbersome for traditional operators. Guidance from previous systems may assist with collegiate FOQA development, but attention must be paid to the legalities of data collection which relate to collection of student data. With support from management and a solid safety culture in place, a data collection system can be developed and standardized. It is anticipated that university flight schools would provide similar benefits that airlines have realized from FOQA programs.

References

- Block, E.E., Sabin, E.J., & Patankar, M.S. (2007). The structure of safety climate for accident free flight crews. *International Journal of Applied Aviation Studies*, 7(1), 46-59.
- Federal Aviation Administration. (2006a). *Advanced Qualification Program*. (DOT Advisory Circular No. 120-54A). Washington, DC: U.S. Government Printing Office.
- Federal Aviation Administration. (2006b). *Introduction to safety management systems for air operators*. (DOT Advisory Circular No. 120-92). Washington, DC: U.S. Government Printing Office.
- Federal Aviation Administration. (2004). *Flight operational quality assurance*. (DOT Advisory Circular No. 120-82). Washington, DC: U.S. Government Printing Office.
- Flight Safety Foundation. (1998). Aviation safety: U.S. efforts to implement flight operational quality assurance programs. *Flight Safety Digest*, 17(7-9), 1-54.
- Mitchell, K., Sholy, B., & Stolzer, A. (2006, December 21). General aviation aircraft flight operations quality assurance: Overcoming the obstacles. *IEEE Aerospace and Electronic Systems Magazine*, 22(6), 9-15
- Ramsey, J. (2005, December 15). FOQA: Training tool, and more. *Avionics*, 29(12).
- United States Department of Education. (2010). *Family Educational Rights and Privacy Act (FERPA)*. (20 U.S.C. 1232g; CFR Part 99). Washington, DC: U.S. Government Printing Office.

Van Dusen, W. R. (2010). *FERPA: Basic guidelines for faculty and staff, a simple step-by-step approach for compliance*. Vancouver, WA: Clark College.

Wiley, J. (2007, June). C-FOQA: Has its time arrived? *Business & Commercial Aviation*, 100(6), 76-82.

Wood, M., Dannatt, R., & Marshall, V. (2006, June). *Assessing institutional resilience: A useful guide for airline safety managers?* (Australian Transport Safety Bureau No. B2004/0240). Canberra City: Australian Capital Territory.

Wright, R. (2003, July). Changes in general aviation flight operations and their impact on system safety and flight training. Proceedings from AIAA/ICAS International Air and Space Symposium and Exposition: *The Next 100 Y*. Dayton, OH.

Appendix 1: Research Interview Questions

1. Should a collegiate flight program considering the establishment of a FOQA program first establish a steering committee? Who should be on this committee? What should the steering committee's function be?
2. How should a university aviation program go about establishing goals and objectives? Who should be in charge of developing goals and objectives? What should the goals of a collegiate FOQA program be? How should a FOQA program fit into the operational environment of a collegiate aviation program? What safety improvements should be addressed in the formation of goals and objectives?
3. How should stakeholders in a collegiate FOQA program be identified? Who might be some of the stakeholders in a collegiate FOQA program? What are the roles of each identified stakeholder in a FOQA program's daily operation?
4. What is the most appropriate and cost effective technology (hardware and software) needed for a university aviation program to operate a collegiate FOQA program? What are the aircraft requirements for operating a collegiate FOQA program? What steps are necessary for integrating data collection and analyzing technology into the established university technology structure?
5. What personnel need to be assigned to daily FOQA operation tasks? Do personnel need to be solely assigned to FOQA tasks or may they also have other roles in the university flight program? Should additional personnel be hired to perform or manage daily FOQA tasks? Which personnel should have access to identified student pilot information? Which university personnel need to have a working knowledge of FOQA programs and operation? Should student pilots in the program be briefed or trained on FOQA data collection and use?
6. What safeguards must be developed for a collegiate FOQA program to meet university requirements? What are the FERPA law implications for the collection and use of student data in a collegiate flight program? Are there any other pertinent policies or regulations regarding the collection and use of student flight data? What data security requirements must be met in order to ensure compliance with university and other requirements? Is there any reason student information should be de-identified from pilot records? Is there any specific training that individuals who will come into contact with student flight information should complete before working with flight data?
7. What critical events must be defined for data collection in a collegiate FOQA program? How should normal operating parameters for student training aircraft be determined? What critical events are necessary to define for maintenance personnel to conduct appropriate aircraft health monitoring? What is the most appropriate method for a maintenance department to receive health monitoring data?
8. Do FERPA laws require a signed agreement be on file for each student for which data will be collected? Does the FAA require any student-university agreements for the collection and use of FOQA data? What are student's rights in dealing with collected flight data? What are the FAA's rights in using flight data for enforcement or administrative purposes?
9. Should the airline Implementation and Operations (I&O) plan format published by the FAA be followed when developing a collegiate FOQA program? Who should be responsible for developing the collegiate I&O plan? How often should the document be reviewed and/or updated? Who should be charged with reviewing/updating the I&O plan? What are the college's rights in reviewing/updating a formal I&O plan?