Recruiting the Next Generation of Investigators: Using University Partnerships to Advance Air Safety

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The views expressed in this paper are those of the author and not necessarily the views of the University of Southern California.

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Introduction

The future of air safety depends on the next generation of air safety investigators and professionals. This is not a question, nor is it a conclusion. It should be a goal that forms the groundwork for expanded methods for recruiting and preparing that next generation; be they the next generation of entry-level aviation and investigation professionals, first time air accident investigators, or investigators-in-command. With great deference to the context of current generations of air safety investigators and the environment in which they operate, academic centers formed by partnerships of universities, industry, and government agencies can achieve this goal.

Even with the technical and real-world experience demanded by air safety investigation, university partnerships and academic centers can significantly aid the next generation. They can identify and recruit a wider range of potential investigators and successfully educate and train them. They can provide a greater depth, completeness, and thoughtfulness to air safety research, especially in less technical fields such as human factors and safety management systems. Finally, with the participation of all parties invested in air safety, an academic center can facilitate a continuous open forum for the discussion and advancement of air safety.

An outline of some current career paths taken by investigators

An air safety academic center that successfully prepares new investigators and serves current investigators must be founded in the context of the experiences of current and past air safety investigators. The best way to establish this context is to speak directly with current and past air safety investigators. To provide the context of successful recruitment, particular attention should be given to the investigators' career paths. Discussions with those possessing investigator-in-command and senior management experience are particularly valuable, as their career paths may provide the best lessons for future recruitment. While no survey of investigators could hope to create an outline summarizing the career paths of each and every investigator, the career paths described below should sound familiar to most in the field.

Traditional Path: Keith McGuire, former Northwest Regional Director, NTSB

Keith McGuire first entered aviation with the United States Air Force (1). Commissioned through the Air Force's Officer Training School, he spent six years in Europe flying Lockheed C-130s with the 7406th Support Squadron, which specialized in electronic intelligence. Along the way Mr. McGuire volunteered to become a flight safety officer. After retiring from the Air Force, Mr. McGuire jumped from aviation job to aviation job before joining the National Transportation Board (NTSB) at age 32.

Mr. McGuire took the traditional path. He began his professional career in aviation, then by personal or managerial decision used an existing framework to transition to his first air safety position with the USAF, and despite moving between jobs, remained in aviation and air safety for the remainder of his entire career. Another traditional path would be beginning a career as an aviation mechanic, becoming a safety officer for the organization, and then becoming an investigator specializing in maintenance factors. Or someone on the traditional path might pursue aviation-related coursework in university, accept a safety internship or co-op with a manufacturer, operator, or government agency, then accept a position with that organization upon graduation. The timeline for starting a career in aviation, transitioning to air safety investigation, and working in investigation until retirement may vary greatly, but the steps remain the same. Many among the next generation of investigators will undoubtedly follow this path.

However, while this paper labels this path from a technical aviation career to air safety investigation as traditional, it was anything but. To begin, the NTSB hired Mr. McGuire only after their prime candidate dropped out, and the position would be lost if not immediately filled. He lacked the airframe and powerplant certificate the NTSB desired, his medical certificate was lapsed, and at age 32, he became the youngest new investigator the NTSB ever hired. He was 21 years younger than the average investigator age of 53. Keith's example shows that even in the traditional path, expanded recruitment can develop successful investigators.

Investigative Path: Thomas Anthony, Director, USC Aviation Safety & Security Program

Thomas Anthony began his professional career as a high school teacher, but a long-time interest in aviation led him to answer a newspaper help wanted ad for air traffic controllers (2). Mr. Anthony earned his air traffic control certification and worked as a controller for seven years before finding an opportunity to become a Federal Aviation Administration (FAA) equal employment officer. However, as he had a university background in constitutional and civil liberties law, Mr. Anthony instead became an equal employment office investigator. While still working as a controller, Mr. Anthony investigated equal employment opportunity claims for the next two years.

He left investigation for almost four years to manage various flight service stations in California, and then reentered investigation via an aviation security officer at FAA headquarters. For two years he trained FAA investigators, and then spent two and a half years as the FAA's headquarters branch manager for investigation. His office conducted many types of aviation investigations, including those with accident, criminal, medical, airport, and espionage

components. He then became deputy division manager for civil aviation security in the FAA's western pacific region, where he inspected and investigated criminal, internal, and industry regulations for operations across the Pacific Rim. Five years later he was promoted to the regional director, where he spent another five years until the TSA took over security operations in 2002. He remained with the TSA for another three years, left government to work in industry for two years, and then became director of USC's Aviation Safety & Security program.

A long career path with many positions can be traditional, but an introduction to investigation outside of a technical field is not. An investigation background in equal employment, criminal, espionage, security, or medical investigations may not provide the unique technical experience required for accident investigation, but it does build good investigative qualities such as thoroughness, accuracy, objectivity, and interpersonal skills (3). The success of the next generation of investigators depends on these attributes, and investigators from non-air safety backgrounds are too valuable as candidates to not recruit for accident investigation.

Determined Path: Michael Huhn, Air Safety Investigator, Western Pacific Office, NTSB
Like those on the traditional path, Michael Huhn started his career in aviation (4). He wanted to become an accident investigator, but poor vision kept him from earing the required flight hours with the military or civilian operators. Instead, he graduated in 1978 with an engineering degree and starting working as a flight test engineer on the A-10 ground attack aircraft for Fairchild Republic. However, after three months, he moved to a replica aircraft manufacturer. He quickly became concerned with the safety of the replicas, and left the company after less than a year.

He returned to flight test engineering, spending the next seven years with Douglas Aircraft. Knowing that investigation required a wide range of technical skills, he began moving from job to job to gain experience. Positions included the F-18 project with Northrop Grumman and space shuttle aerodynamics with Rockwell. Along the way, he enrolled in coursework at USC's Aviation Safety & Security program, paying his own tuition. He started pursuing a master's degree at USC, but decided that it did not provide enough technical experience. He then left Rockwell to earn an airframe and powerplant mechanic's certification. He started at a community college, but frustrated by the long timeframe, dropped out to enroll in a private accelerated program.

After graduation he returned to Douglas as an operator, then manager, for the mechanical design group for the next three years. Now in an investigation position, he moved the group to a proactive focus for investigating and preventing operator errors with Douglas aircraft. He then spent thirteen years as an investigator for the Air Line Pilots Association, then one year in consulting.

Throughout his career, starting shortly after graduation from university, Mr. Huhn applied for various positions with the NTSB. He even once traveled to NTSB headquarters to inquire why he never moved past the short list of candidates. Yet in August 2006 he again applied to the

NTSB, received a call back the next December, sat for an interview the next spring, and was hired to the agency in April 2007.

Mr. Huhn began his career in aviation and entered investigation through aviation, but without an existing framework, his path to becoming an investigator was self-guided, traveling though many positions and self-financed education before his first investigative position. This path shows that while willpower can substitute for a pre-existing path into accident investigation, new paths should be created by expanding the recruitment for future investigators.

Identifying the next generation of investigators

To create a plan to recruit and prepare the next generation of investigators, we must choose a next generation on which to focus. For example, the next generation of senior government investigation agencies is already in the workforce. For example, the NTSB has historically employed an older workforce, with many employees in their fifties (5). The next generation of these investigators is now in their mid to late 20s, perhaps even in their thirties, and have likely participated in investigations. Current training courses and mentoring, following the traditional path mentioned above, is most appropriate for this generation.

The next generation of first-time investigators consists of recent university graduates, recent hires by aircraft operation and maintenance firms, early career military working in aviation, or early-career investigators fields in other than aviation safety. This generation is early enough into their careers to easily transition into air safety and have time to gain the necessary investigative or technical experience. For example, the FAA had great success in recruiting aviation security investigators from both the more technical airlines the more investigation-focused law enforcement agencies (2). Those in this generation on the traditional path will soon transition from various aviation positions to air safety positions, but this is also the ideal time to recruit those on the investigative and determined paths. But expanded recruitment necessitates expanded training, and an academic center would have the resources necessary to educate those not quite ready to work investigations. A distance education curriculum, available anywhere at any time, would especially benefit this generation.

The youngest generation to recruit consists of university and trade school students, new military recruits, and even secondary students. As they are still in the educational stage of their careers, this may be the easiest generation to recruit. Many students are preparing for aviation or investigation careers, but a much smaller number are studying both. However, offering an introductory course on air safety to students taking aerospace or investigative coursework can be very effective in recruiting new students (6). This is also the generation currently working in air safety-related internships and co-ops; critical and extremely effective tools for giving future investigators real world experience as early into their careers as possible (1)(6). Finally, as many among this generation are in higher education, they would benefit most from a university-affiliated academic center.

What are academic centers?

An academic department focusing on aviation safety is not a new idea. A few universities, such as Embry-Riddle Aeronautical University, offer curriculum in the field, and Saint Louis University operates a small Center for Aviation Safety Research that is primarily funded by a $4.25 million FAA grant (7)(8). But to know what a large, regulatory authority affiliated academic center might look like; we can look to the Centers of Excellence affiliated with agencies of the U.S. federal government.

One Center of Excellence is the National Center for Risk and Economic Analysis of Terrorism Events (CREATE) at the University of Southern California, affiliated with the Department of Homeland Security (DHS) (9). Started in 2003 after USC won a competition to host DHS's first Center, CREATE researches topics submitted by non-CREATE personnel and approved by the DHS and its Scientific Advisory Committee. Furthermore, CREATE spends $1.2 million annually to fund theoretical and applied research at other universities (10).

By using Centers of Excellence such as CREATE, the DHS can access research with a depth, completeness, and thoughtfulness not found in-house or with private firms. But to keep an academic bubble from forming around the Center, CREATE sends its researchers on two to three months rotations to directly work for the DHS. However, it fulfills an academic mission by providing $100,000-$200,000 in fellowships to doctoral students and seeks to groom other students for security careers. However, CREATE is not a degree-granting academic department, and relatively isolated to students who don't seek the Center out. If the DHS provided for more student outreach, such as an introduction to security class similar to the introduction to air safety courses at Embry-Riddle, student outreach would improve, and newly-interested students could pursue opportunities with the Center.

Similarly, the FAA maintains affiliations with ten Centers of Excellence across the United States, with one or more centers focusing on airport technology, intermodal transport environments, general aviation, aircraft noise and emissions, materials, and commercial spaceflight (11). The centers draw upon a $500 million annual budget; half provided by the FAA and the other half raised by universities from any non-federal source. Research topics come from funding requests by FAA departments, subject to approval by FAA administrators. Furthermore all center directors meet together with the FAA twice a year to coordinate research (12).

While no FAA Center of Excellence has an all-encompassing primary safety mission, safety is an important factor in the current research at all centers. A center announced in September 2012, the Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS), does focus strongly on safety, human factors, and system safety management, but within the scope of general aviation (13). It's too early to tell if the less-than-one-year-old PEGASAS's GA focus will benefit all forms of aviation (as of July 2013, the center listed no publications), but it is an encouraging start (14).

An Air Safety Academic Center

Before planning an academic center for air safety, its managing partners must be identified. First, a lead investigation agency such as the NTSB should not head such a center. Such

agencies would benefit from coordinating with a center, but the importance of these agencies' independence, combined with the extremely limited number of academics qualified to participate as leading parties in investigations (1), means the benefits of running a center would be limited.

A center affiliated with a regulatory authority such as the FAA would be ideal, but the FAA Centers have found success keeping safety research topics within the Center's larger mission (12). A center focused on safety factors that affect all types of aviation, such as human factors and safety management systems (SMS), may be the best option. PEGASAS does cover these topics within general aviation, but a precedent for overlapping FAA Centers of Excellence exists; PEGASAS is the second Center focusing on general aviation (11). Furthermore, other FAA Centers, such as the Joint Center for Advanced Materials Research (JAMS), research topics relevant to all forms of aviation.

A human factors-SMS academic center will need research, and safety data collection and analysis is a great place to start. ICAO Annex 13 recommends mandatory and voluntary databases and data analysis pertaining to air safety (15), and a university center could bring together the engineering, computer science, and phycology resources necessary to fulfill these recommendations. Furthermore, if investigation, regulatory, operator, and manufacturing parties all contributed to and assisted with the analysis of the databases, the center could develop into a continuous open forum for all parties; something that doesn't currently exist (2).

However, technical experience, especially investigative experience, is critically important to such a center. The United States Military Academy (USMA) provides a model for bringing that experience. The USMA selects mid-career U.S. Army officers with recent graduate degrees to serve two to three year deployments at the Academy as rotating faculty (16). Having an experienced investigator or air safety professional spend two-plus years at a university may not be practical or even a good idea, but involvement with the center for shorter terms would greatly enhance the center's work.

Lastly, an academic center could greatly increase the recruitment and preparation of new air safety investigators. Similar to a co-op or internship, the opportunity to work in air safety, perhaps with a visiting investigator, would provide invaluable experience to students before graduation. Current research and visiting investigators and professionals could also create an air safety curriculum, particularly introductory courses for technical or investigation students. Students attracted to and excelling at this curriculum would then have the center to mentor them until graduation. Finally, the university or universities affiliated with the center could include it as part of their undergraduate student recruitment, bringing a much-needed introduction to air safety into secondary schools (6).

Conclusion

A next generation of air safety investigators will always exist, so any initiative or institution to recruit and prepare the next generation must last beyond the first generation for which it was created. It must also have the flexibility and innovation to effectively recruit the next next

generation, along with the next generation after that. Whether that next generation pursues an air safety investigation career on a path of traditional promotion, brings a wealth of investigation experience to their first air safety assignment, or is guided by sheer determination, these initiatives and institutions must bring them together, make them better investigators, provide continuous open forums for their ideas and concerns, and facilitate further long-term academic study to support their investigations.

The air safety investigation community has excellent individual air safety training; the present excellent air safety record reflects that. However partnering with universities will promote air safety study; academic research founded in the lessons of previous generations of air safety investigators. The depth, completeness, and thoughtfulness of research, especially in the less technically demanding areas of human factors and safety management systems, could potentially bring further air safety advances. After all, the best way to prepare the next generation of air safety investigator is to reduce the number of accidents and incidents they will eventually investigate.

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