POST SEPTEMBER 11, 2001, FLIGHT TRAINING ENTRY STANDARDS: A MODIFIED POLICY DELPHI STUDY

By

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Submitted to the Faculty of the
Graduate College of the
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in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
December, 2005

POST SEPTEMBER 11, 2001, FLIGHT TRAINING ENTRY

STANDARDS: A MODIFIED POLICY

DELPHI STUDY

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ACKNOWLEDGEMENTS

Why would one initiate an academic study on flight training entry standards? The skies were closed to aircraft –- not inappropriately – in the immediate aftermath of the horrific spectacle of September 11, 2001. A quick and furious effort followed to cast an impenetrable protective net over the nation – but how best to achieve that was the question.

While aviators have never been eager to have their privileges to exercise their passion to fly restricted, perhaps the events of that day necessitated asking them whether there should be more stringent entry standards imposed on those who would learn how to take to the sky. So, the study began.

Understanding the issues required scrutinizing the multi-faceted development of aviation: its history, its regulatory framework and authorities, its economic impact, the effect of other aviation events, and the changes aviation brought to our lives.

The project was inordinately time-consuming, and would not have been possible without the help of many people. Thanking them all is not possible: Thanking them adequately is a challenge.

Heartfelt thanks go to my family, for whom I have tremendous gratitude. My husband, Chuck Sullivan – my wise and wonderful and witty mentor – has been gently, thoughtfully, proudly, and consistently supportive: He "owns" part of this, and remains, to me, the hero that he is, in actuality. My daughters, Laura Jergensen, Dr. Valerie Densmore, and Sarah Densmore, have been ever-quick to offer encouragement and grounding: They, too believed in me, and said so often. To my mother, Mary Louise Smith, I owe my propelling need for knowledge. Other family members have been kind enough to keep abreast of my progress, as well.

My committee deserves special thanks, too. Dr. Robert Nolan graciously stepped into the vacant chair/adviser position and provided invaluable guidance. Dr. Cecil Dugger, the only original committee member still serving, provided crucial counsel at pivotal times, and was consistently encouraging throughout, beginning with my master's work a decade ago. Dr. Mary Kutz acquiesced to step

in and serve when sorely needed. Finally, Dr. James Key's well-designed classes and his availability were remarkable and always helpful, as was his willingness to become the third – but best – outside member.

The Delphi respondents went far beyond what was merely acceptable, with their candidly expressed deliberations. Their wit, sarcasm, deep passion for – and understanding of – aviation kept my task of reading their thousands of words interesting.

Finally, I must express appreciation to Dr. H. C. "Mac" McClure for his vision, sage advice, and for making the process engrossing; to Dr. Al Carlozzi for his assistance; to my friend, Judy Tarver, for providing documents and perspective – and to my kid brother, Jay Smith, who provided a strong impetus to push to the end so we could "walk" together.

Thank you.

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NOMENCLATURE

Ab-initio	literally, "from the beginning." Used in aviation to indicate training of students who start training at the primary level; i.e., the private pilot level. Some institutions take students from ab-initio through ATP.
AME	Aviation Medical Examiner. A licensed physician who has undergone specialized training from the Federal Aviation Administration (FAA) and is certificated by the FAA to perform medical examinations of pilots in accordance with FAA standards, and to issue "the medical."
ATP license	airline transport pilot. This amounts to FAA certification that the holder of the ATP certificate has accumulated a minimum number of logged hours of instrument time, cross-country time, and night flying time, all as pilot in command (PIC). For all practical purposes, the ATP also holds a multi-engine rating. In addition, the holder has passed a written exam, oral exam and practical examination to specified standards.
Aviation attorney	licensed attorney has taken specialized training in aviation and holds her (him)-self out as a specialist in dealing with aviation issues in the law.
CFI	Certificated Flight Instructor. One who has met requirements of the FAA and has undergone training to flight instruct, and has passed written, oral and practical tests as part of the FAA's certification process. Also commonly called "Certified Flight Instructor.
Commercial license	FAA designated certificate that allows the holder to fly for hire. The practical standard for commercial pilots is higher than for private pilots, requiring more precision in executing maneuvers, as well as more logged time in specific categories (but less than for the ATP). For all practical purposes, every commercial pilot will also hold an instrument rating.

Expert	someone widely recognized as a reliable source of knowledge, techniques or skill whose judgment is accorded authority and status by the public of his or her peers. Experts have prolonged or intense experience through practice and education in a particular field (Wikipedia, 2005).
FAA aviation education counselor	FAA designation of aviation expertise that allows holder to consult on matters of aviation training, or to hold seminars. Special training from the FAA is required.
FAA Safety inspector	FAA designation of knowledge of aircraft and of FAA regulations that permit the holder to make recommendations regarding safety that are binding. Special training from the FAA is required.
FAA-designated pilot evaluators	persons who have gained enough experience in aviation and as instructors to be designated by the FAA to evaluate pilot candidates orally and in the practical examinations. The FAA-designated pilot evaluator differs from an FAA evaluator by virtue of employment: i.e., the FAA-designated evaluator may work for a training institution, to FAA standards, but not for the FAA directly, while the FAA evaluator works directly for the FAA.
FBI	Federal Bureau of Investigation. For some sensitive government positions, the FBI performs security checks on persons' backgrounds.
FBO	fixed base operator. A businessperson who provides services to pilots and aircraft, usually including fuel and supplies, and mechanics who are certificated by the FAA to perform maintenance on aircraft. The FBO frequently provides advisory services, as well, and may offer aircraft for rent or lease and training, usually ab-initio through CFI.

Glider rating	an FAA certificate showing that the person has received specialized training in the operation of gliders, and has passed a written, an oral and a practical exam.
Logbook hours	logged time. According to FAR 61.51, "Each person must document and record training and aeronautical experience. . . ." Restrictions are placed on pilots regarding the hours that they may log in their logbooks. Restrictions range from hours loggable within a 24-hour period, and types of piloting; i.e., PIC, second in command (SIC), instructor, student pilot, and so on. Logbooks become legal documents, admissible into court. Entering unauthorized (false) hours subjects pilots to penalties, including suspension or revocation of certificates and ratings held by that person, according to FAR 67.403.
"the medical"	airmen's medical. A certificate from an AME, issued within a specified time frame, showing that the person named is medically fit to fly, according to FAA standards, Part 67. Possession of a current medical is required for flight. The first medical becomes the license for solo flight for student pilots.
Part 121 operations	domestic, flag and supplemental operations (public transportation). Air carriers, air travel clubs, and operators are regulated under this part of the Department of Transportation's Title 14 of the Code of Federal Regulations.
Part 125 operations	Part 125 falls under the same general category as Part 121 operations but deals with the certification and operations of airplanes having a seating capacity of 20 or more passengers or a maximum payload of 6000 pounds or more, and also governs persons on board such aircraft. These operations fall under the rules of this part of the Department of Transportation's Title 14 of the Code of Federal Regulations.

Part 135 operations	Part 135 falls under the same general category as Part 121 operations, but regulates commuter and on demand operations and establishes rules governing persons on board such aircraft. These operations fall under the rules of this part of the Department of Transportation's Title 14 of the Code of Federal Regulations.
Part 141 operations	This subpart prescribes the regulations for issuing pilot school certifications, provisional pilot school certifications and the general operating rules applicable to a holder of a certificate or rating issued under this part. Flight training schools, both privately owned and those associated with universities such as Oklahoma State University operate under the rules of this part of the Department of Transportation's Title 14 of the Code of Federal Regulations (14CFR). Schools offering Veterans Administration (VA) training also operate under these rules. The syllabi are closely monitored and regulated by the FAA.
Part 142 operations	This subpart prescribes the regulations governing the certification and operation of aviation training centers under the rules of this part of the Department of Transportation's Title 14 of the Code of Federal Regulations. The syllabi are closely monitored and regulated by the FAA. These sophisticated training facilities may be associated with aircraft manufacturers, such as (the) DFW Customer Training Center, providing flight training for the Lear jets produced by the company.
Part 91 operations	Part 91 is concerned with air traffic (flight) and general operating rules.
Part 61	Independent instructors offering flight training to individuals operate under the rules of this part of the Department of Transportation's Title 14 of the Code of Federal Regulations. Part 61 is concerned with airmen. This part of the Department of Transportation's Title 14 of the Code of Federal Regulations specifies the requirements for seeking certification as a pilot, flight instructor, or ground instructor.

PIC	pilot in command. The pilot in command is directly responsible for, and is the final authority as to, the operation of that aircraft (FAR 91.3).
Policy Delphi	a technique designed to define a range of answers or alternatives to a current or anticipated policy problem. The goal is to expose all the differing positions and pro and con arguments, in order to know and understand the complex issues involved in the broad question. A Policy Delphi uses the traditional Delphi method of a series of questionnaires posed to select, unidentified panelists, through iterations until sufficient information has been exchanged.
Practical examinations	the third part of the examination of a pilot applicant, during which he demonstrates skills during actual flight to the standard required by the license or rating sought. An FAA-designated examiner/evaluator may administer the practical exam, in the aircraft provided by the applicant.
Private pilot with instrument rating	The private pilot certificate is the first level of licensing to fly aircraft, without restrictions other than weather or flying into certain classifications of airspace, that the FAA recognizes. The instrument rating is added to the private pilot certificate after specialized training, and allows the pilot the option to fly solely by reference to instruments – i.e., to fly into, or through, weather and reduced visibility. Persons with such usually fly only single engine aircraft, and may not fly for hire.
Professional	A professional works to receive payment for an activity (as a profession), which usually requires expertise and carries with it socially significant mores and. folkways (Wikipedia, 2005).
Rotary wing rating	certified by the FAA to fly helicopters.
TSA	Transportation Security Administration. The federal agency created to provide effective and efficient security for passenger and freight transportation in the United States

Type rating	a certificate showing that the pilot has received intense, specialized training to fly a particular type of aircraft, such as the Boeing 737 that is used by many airlines.

CHAPTER I

INTRODUCTION, RATIONALE, AND STATEMENT OF THE PROBLEM

Introduction and Rationale

There was a clear and present need, in the post September 11, 2001, period, to examine the regulatory standards for gaining the knowledge, skills and abilities necessary to fly aircraft in the United States.

In this study of the standards for commencing flight training in the United States, the events of September 11, 2001, must be included because of the use of airplanes as bombs, intended to kill innocent people and terrorize the world. On that day, four jetliners were commandeered by terrorists who came into the United States and began flight instruction, purportedly to learn enough to be able to fly an airborne jet into a target, with three jets being flown into high-profile landmarks: the two World Trade Center towers in New York City, and the Pentagon in Washington, DC. The fourth plane crashed in a field in Pennsylvania, believed to be en route to the White House. Almost three thousand innocent souls were abruptly and immediately killed, and countless more deeply affected. "September 11, 2001, was a day of unprecedented shock and suffering in the history of the United States. The nation was unprepared. How did this happen, and how can we avoid such tragedy again?" (Kean et al., p. xv). Radio talk show host Diane Rehm, talking with author Jeffrey Rosen on the air, said, "We need to know who's taking flying lessons!" (Rehm, 2004).

Since all flight training for powered aircraft in the United States is done under the Department of Transportation's Title 14 of the Code of Federal Regulations, this study must overview the development of the regulations. The Federal Aviation Administration (FAA) is the governing agency having broad regulatory authority over the areas of pilots, aircraft and their instruments, inspections, and certifications, as well as airports and air traffic control. Safety is the overarching concern of the FAA: safety of the pilot, the unsuspecting public over whom pilots fly, and safety of those who entrust pilots with their lives during commercial flights.

In addition, FAA regulations (FARs) govern pilots' actions while airborne, specifically prohibiting operating " . . . an aircraft in a careless or reckless manner so as to endanger the life or property of another" (FAR 91.13 in FAR/AIM, 2000, p. 144). Also, FAR 91.119 regulates the distances pilots are required to maintain from structures, people and property, and FAR 91.155 even specifies the minimum distances pilots must maintain from clouds. (FAR/AIM, 2000).

In a crossover ruling, through its aeromedical division, the FAA, in FAR 67.7, has authority to monitor pilots' or applicants' driving records, maintained by the National Driving Registry, and to revoke their pilot certificates under certain circumstances (FAR/AIM, 2005, Federal Register, 1998). Further, the FAA, in Part 67 of the regulations, mandates regular medical examinations for pilots. Along with the examination, the FAA maintains a list of prohibited medical conditions and medications, including alcohol, whose occurrence or usage would cause grounding. Pilots, then, retain their right to fly after training and evaluation on the basis of their current medicals — not on their licenses which are, in actuality, certificates that the applicant passed the two phase evaluation after meeting the (mandated minimum) training requirements.

The regulations do not prohibit an instructor's teaching anyone to fly, although the FAA has advised against teaching children to fly. Any person, then, with funding, reasonable strength, health and intelligence could, in 2001, learn the basics of flying without ever coming under the scrutiny of any regulatory authority. Under FAR 61.85, the first medical examination required of a pilot applicant is the student pilot certificate, which a student must obtain before solo flights are permitted. The student pilot certificate can only be issued to a person at least 16 years of age. Under FAR 61.103, an applicant must be at least 17 before becoming eligible for evaluation and certification for the private pilot certificate (FAR/AIM, 2000).

The typical progression for one seeking to be a professional pilot is: student pilot, private pilot, private pilot with an instrument rating, commercial pilot, then airline transport pilot. For those seeking to fly only for their own pleasure, most would have a private pilot certificate with an instrument rating (which allows flying without visual reference to the ground).

It is not until one seeks the airline transport pilot certificate and rating that any mention is made in the training regulations of the person's character. FAR 61.153 (c) states only that ". . . a person must . . . be of good moral character." (FAR/AIM, 2000, p. 85)

Statement of the Problem

Current federal regulations permit anyone with funding and reasonable health, vision and intelligence to commence flight training — without making application, submitting to background checks, or even having the ability to communicate in English at the beginning of training.

Purpose of the Study

The purpose of this study was to investigate the possible need to impose more stringent entry standards, ab initio, on flight students.

Objective of the Study

To achieve the purpose of the study, the following question was explored:
What do aviation experts judge to be adequate standards of admission into the study of aviation, in the light of the events of September 11, 2001?

Assumptions of the Study

For the purposes of this study, the following assumptions were made:

1. Respondents provided thoughtful insights from the vantagepoint of their own subspecialties of expertise during each round of the study.
2. Respondents' views represented the views of other aviation specialists in their areas and provided a rich source of data.
5. Respondents were motivated to participate fully.

Scope and Limitations of the Study

The scope of the study was limited to select respondents who had achieved expertise in different subspecialties of aviation.

The study was conducted from June 30, 2004, when the question was sent out in the first iteration, through September 5, 2004, when the final response of the third iteration was received. Respondents rated their findings in October 2005.

The study was limited to an initial study of the issues that would be involved in changing the standards for entry into ab initio flight training, in the light of the events of September 11, 2001, but without particular regard for a student's country of origin.

A limitation of the Policy Delphi method was that consensus was neither expected nor, particularly, desirable.

A further limitation of the Delphi method was that the researcher had no control over the commitment of Delphi panelists to participate in all three iterations.

Delimitations

The researcher presumed that the reader would have familiarity with the basics of the issue, including some knowledge of the history of the development of aviation in this century of flight. The time frame of the study concluded with the receipt of the last respondent's response in the discovery and discussion phase.

The researcher believed that the subject was best served by taking an insider view in writing.

Significance of the Study

This study was begun as the first study to examine the issue of ab initio pilot training standards since the events of September 11, 2001, and could include scrutiny of the applicant's character, ab initio. Pre-September 11, 2001, pilot training standards involved only the technical skills of performance (flying the aircraft to a specified standard) and testable knowledge of the practical areas of:

- aerodynamics
- meteorology
- navigation skills

- the pertinent federal regulations
- flight physiology
- adequate communication skills
- math techniques to perform complex weight and balance calculations**.** (FAR/AIM, 2000).

Information brought to light will be important in shaping further research and determining future policies regarding flight training.

CHAPTER II

REVIEW OF LITERATURE

Overview of Aviation Environment: Development, Safety, and Economic Issues

At Kitty Hawk, North Carolina, in 1903, at the beginning of manned, powered flight, there was no agency mandated to protect flyers, passengers, property, innocent bystanders going about their lives on the ground, or anything else even remotely tied to aviation. There were no regulations guiding the work of Wilbur and Orville Wright or any of the other early designer-experimenters with flight. Any person could try, as he deemed appropriate, to take to the skies. General aviation was born in 1903, and it was unrestrained (Boyne, 1980). The American public's view of aviation included the proponent view and the opponent view. The proponents saw it as a " . . . mechanical triumph with a significant future . . ." but others viewed it as a " . . . mechanical fad, and a dangerous one at that" (NASA, 1989, p. 3).

In this early environment of no regulatory restraints, complete freedom to experiment existed. Even at the time of the first aviation fatality in 1908, when Orville Wright's military flyer crashed and his passenger was killed, there were no agencies to investigate the crash or to take appropriate actions to insure that such would not happen again. No examiner hurried to the scene to verify Orville's credentials to fly, or the safety of his aircraft, or its airworthiness, for there were no examiners, no other-imposed credentials, and no standards. The Wrights were on their own to determine the cause of the first fatal crash (Burkhardt, 1989).

After the Wright brothers proved that manned, powered, heavier-than-air flight was possible, would-be aviators and designers around the world increased their efforts to create flying machines. Many were successful, so they, or those aviation enthusiasts who could afford to buy a plane and did so, and, with none to a modicum of instruction, held themselves out as pilots. These early pilots often flew exhibition flights, and, sometimes, their equipment failed. Crashes were a normal part of pilot training, at the time

(Millbrooke, 1999). Most accidents were not fatal, due to low airspeeds, but, sometimes, pilots died. In 1910 alone, 37 pilots were killed, a number that accounted for about one in seven pilots then flying in the United States (Christy, 1987). While the public was shocked, still no government agency offered any standards.

The United States Post Office saw a future in aviation, to carry air mail across a nation that had no single road stretching from the east coast to the west coast (National Air Tour, 2003). In 1911, the post office experimented with its first air mail flight.

France, Russia, Germany, Italy, and Great Britain were actively engaged in aeronautical research by 1911, to varying degrees, and some thoughtful aviation enthusiasts in the United States feared, then noted, that the United States had lost superiority in aircraft design and improvements. Pressure was brought upon the United States government to form a national aeronautical laboratory, but no progress was made until 1914, when Dr. Albert F. Zahm, of the Smithsonian Institution, went on a fact-finding tour of Europe and wrote a report pointing out the " . . . galling disparity between European progress and American inertia" (Bilstein, 1994, p. 31). Zahm's anger later spilled over into an attempt to discredit even the Wright brothers' achievement, attributing the first flight to Gustave Whitehead, but subsequent investigations disproved the Whitehead claims (Chmiel and Engler, 2001).

The positive result of Zahm's report, however, was that President Woodrow Wilson signed the Naval Appropriations Act in 1915 with a rider attached to create an independent, advisory group, (the) National Advisory Committee for Aeronautics (NACA), with a chartered mandate, " . . . to supervise and direct the scientific study of the problems of flight, with a view to their practical solution" (Bilstein, 1994, p.31). Even with a very small budget, the group set out to explore useful topics for both military and civil aviation.

By the onset of World War I, in 1914, aircraft had advanced to a state of usefulness to the military – initially, reconnaissance and artillery observations – so that aircraft production of trainers proliferated. After the war, there was a surplus of trainers in this nation and abroad, along with some 10,000 trained aviators and approximately the same number of aviation mechanics, in the United States alone (Bilstein, 1994). A need for the government to recover some of its costs, and the existence of military pilots now discharged from service, created a situation in which airplanes were sold inexpensively to the public, who

could then do with them as they wished. A few visionaries saw that aviation held great economic promise, and believed in the commercial viability of aviation. According to Walter Boyne (1980) the public, however, was aware of many problems surrounding the surplus aircraft, including: aging aircraft and engines; no network of landing fields, lights, beacons, or radios; pilots not licensed by a government agency; planes neither licensed nor inspected; routes not sanctioned, and fields not built to any safety standard. With all of these detriments in the minds of the public, investment money was not forthcoming for the not-yet commercially viable industry.

Still, after World War I, aviation had grown from just general aviation to become military aviation and civil aviation, with specialties (Boyne, 1980). The entrepreneurial spirit that was rampant in the United States at that time took expression in the development of faster and more reliable aircraft, the inventions of many advances in the field, and continued interest from the public. Safety standards were left to the individual pilots and operators.

The new pilot-owners, seeking a way to continue to fly and to earn some money, criss-crossed the country giving exhibition flights, barn-storming, taking local people up for 10 minute rides, and also used their aircraft for crop-dusting, advertising, and movies, and took photographers up for aerial shots (Burkhardt, 1989).

The airways system begun by the post office for its transcontinental routes sorely needed developing into an extensive network to expand coverage of commercial aviation and to attract investors. Lack of investment support caused many early operators to go out of business due to lack of government assistance during this fledgling period, before freight hauling increased revenue. At the time, European governments were providing direct subsidies to develop aircraft and establish airlines, but this practice was shunned in the United States. As an example, in 1921, German airlines carried 80,000 passengers compared to less than 1000 passengers in the entire United States (Wolfe & NewMeyer, 1985).

During the period from 1922-1924, there were 470 crashes with 221 deaths in the United States, according to newspaper reports, with editors' attributing 91 percent of the problem to inexperienced pilots or unsafe equipment, or both. During this period, New York City police made the first arrest on a reckless flying charge for a low-level aerobatic flight (Wolfe & NewMeyer, 1985).

Air races and competitions sent flyers across the nation and all over the world, especially during the twenties, greatly increasing the reliability of aircraft and the public's perception of their economic viability (Lopez, 1995).

Oversight Development

Congress noted the problems brought on by the increasing complexity and numbers of aircraft, the potential for commercial aviation as well as military uses, and the need to provide a standard, in order to insure safety and to promote aviation. Consequently, they began to take responsibility for developing aviation with federal intervention and, ultimately, the passage of laws and regulations for the control and furtherance of aeronautics (Wolfe & NewMeyer, 1985).

As the industry developed, regulations were written, often reactively, in response to a calamity or crisis or the increasing complexity and speed of the aircraft. Correspondingly, the regulations increased in number and strength of authority as the industry developed. An example of the continuing development of the regulations is Civil Air Regulation 61.742, amended in May of 1938 to specifically prohibit scheduled airline flights above 15,000 feet above sea level except to clear obstructions or to avoid hazardous weather (Civil Air Regulation; 05/31/1938). The aviation regulatory industry was, thus, born of the trial and error method.

By the time the Federal Aviation Act of 1958 was passed, understanding of aviation had evolved to make safety both the core issue and the mandate of the regulatory agency (O'Connor, 1995). The Federal Aviation Administration (FAA) that came about because of that act is still the regulatory agency charged with safety issues, with promoting aviation, and with enforcing regulations.

Regulatory History of Civil Aviation

1903: First Flight

No regulations existed regarding flying standards, even though Dr. Samuel P. Langley, head of the Smithsonian Institution in Washington, DC, holding a $50,000 grant from the War Department for developing a manned, heavier-than-air, powered airship, was known to be in active pursuit of the first flight achievement (Bilstein, 1994). After the Wrights' first flight, however, the brothers' major consideration

was getting a patent and protecting their invention from patent infringement, not concern over meeting a federally imposed standard. (Kelly, 1989; Lopez, 1995).

1908: First Fatal Crash

No agency existed to assist in determining the cause of the crash: The Wrights developed their own theories for the cause, and made corrections to the aircraft. Because the Wright Flyer had little practical use, federal intervention in the aeronautical industry was minimal (Wolfe & NewMyer, 1985).

1914: First Passenger Service

The route was established between St. Petersburg and Tampa, Florida. The owner/operator established his own standards for safety (Wolfe & NewMyer, 1985).

1915: First Government Intervention

(The) National Advisory Committee for Aeronautics (NACA) was formed, which had a research-only function, and did research to aid in the scientific study of the problems of flight. NACA supported programs during World War I to train pilots and improve aircraft, encouraged research in simple areas like the relationship between meteorology and flight, supported the United States Post Office in its efforts to obtain federal funds to fly the mail, and lobbied for federal legislation to regulate and promote aeronautics in the United States (Wolfe & NewMyer, 1985).

1918: First Regularly Scheduled Air Mail Service

The post office assigned its own standards, and began developing a lighted airway system to guide its pilots over the soon-expanded 2600-mile transcontinental airmail routes, which required 24-hour operation (Burkhardt, 1989; Wolfe & NewMyer, 1985). Of the 40 original air mail pilots flying the 24-hour operation, only nine survived, due to the harsh conditions in which they flew, and the lack of navigation aids (Bilstein, 1994). One of the surviving original air mail pilots was Charles Lindbergh.

1919: First Passenger and Air Mail Freight Service

Service was established from Florida to Havana, Cuba, using three seaplanes (Reyes, 1990). The route expanded northward during the summer, flying between New York City and Atlantic City, NJ. With no government regulations, the visionary airline president imposed very stringent safety rules on his airline, adhered strictly to its schedule, and emphasized efficiency, pilot and mechanic proficiency, and a safety-first concept (Wolfe & NewMyer, 1985).

1925: Air Mail Act of 1925 (aka Kelly Act)

This act was a spur to develop commercial air transportation by awarding contracts to private carriers of airmail, and by establishing air mail rates. The Aeronautics Branch of the Department of Commerce administered the regulatory authority (Wolfe & NewMyer, 1985).

1926: Air Commerce Act of 1926

Furthering federal intrusion into and control over the aviation industry, this act established sorely needed safety regulations, including registration of aircraft and airmen. It also established air navigation facilities and air traffic rules, marked aircraft, and initiated aircraft inspections for airworthiness. Additional responsibilities included the operation and maintenance of federal airways, with installations of navigation aids (navaids) such as lighted beacons, setting up emergency landing strips, mapping and publishing charts of the airway system for distribution, and carrying out aviation research and development. Penalties for noncompliance were established by the Civil Air Regulations (CARs), the predecessor of today's Federal Aviation Regulations (FARs) (Wolfe & NewMyer, 1985; Burkhardt, 1989; Bilstein, 1994; "Charting the next century of flight," 2003).

1930: Air Mail Act of 1930

This act changed the method of payment for air mail, which encouraged the development of larger aircraft and of using extra space for passengers, and provided payments for two-way radios (Wolfe & NewMyer, 1985). The change in methods for calculating pay also opened a Pandora's Box of graft and corruption, leading to government scrutiny.

1933: Changes Made in Air Mail

President F. D. Roosevelt revoked all air mail contracts and turned air mail service over to the army, after discovering the graft in the system, but after six months and 66 crashes with twelve deaths, he revoked his revocation then signed a corrective air mail bill in 1934 (Wolfe & NewMyer, 1985).

1934: Air Mail Act of 1934

Provisions of this act restored competitive bidding, separated the fledgling airlines from aircraft manufacturers, divided regulatory authority among three federal bodies, so that the post office awarded contracts, the Interstate Commerce Commission set air mail rates, and the Bureau of Air Commerce (previously, the Aeronautics Branch) operated the airways and regulated safety. It also created the Federal Aviation Commission to study aviation policy. The commission recommended a new comprehensive act encompassing all of aviation, for the first time (Wolfe & NewMyer, 1985).

1938: The Civil Aeronautics Act of 1938

This complicated act created the Civil Aeronautics Authority, with a three-member Air Safety Board, an administrator, and a five-person commission. By consolidating previous legislation, it established economic regulation of air carriers on a more rigorous basis, exercised continuing regulatory control over air safety, and assigned responsibility and authority for accident investigations to the Air Safety Board.

The commission oversaw legislative and judicial aspects of economic and safety regulations, and the administrator was tasked with promoting civil aeronautics and air commerce in the United States and abroad, encouraging the creation and maintenance of airways, landing fields and navigation facilities, and developing aircraft (Bilstein, 1994; Wolfe & NewMyer, 1985; Burkhardt, 1989).

1940: Further Refinement and Reorganization

In a further refinement and reorganization, the Civil Aeronautics Authority and the Air Safety Board consolidated into the Civil Aeronautics Board (CAB). According to Wolfe and NewMyer (1985), responsibilities of the CAB concerned economic regulation of commercial aviation, the entry of foreign

carriers into the United States, the promulgation of safety standards for all aircraft flight as well as for aircraft and air carriers, the authority to suspend and revoke safety certificates, and the investigation of aircraft accidents. The CAB promulgated the constantly being revised CARs while the Civil Aviation Administration (CAA) enforced them.

The Civil Aeronautics Administration (CAA), then, was responsible for civil aircraft operation, control towers, and to police the industry to insure compliance with safety regulations. Additionally, they were given authority to investigate aircraft accidents when delegated by the Air Safety Board, to administer funds for airport development, and to operate Washington National Airport, after its construction was completed as part of a congressional initiative to improve the nation's airports as part of a six-year program (Wolfe & NewMyer, 1985). As part of their research and development responsibility, the CAA began work to adapt radar for civilian use ("Charting the next century of flight," 2003).

1946: (The) Federal Airport Act of 1946

Although some airports had been built through the Works Progress Administration between 1935 and 1943, the effort was sporadic, so the Federal Airport Act of 1946 firmly established the government's role in airport development (Grolier, 1993). The act required devising a National Airport Plan to guide airport development, and established a Federal Aid Airport Program that authorized $75 million a year over seven years – later extended – for improvements. Most important, the act created standards for airports including site location, layout, grading, drainage, seeding, paving, lighting, and the safety of approaches. These airport regulations were added to the Code of Federal Regulations (Part 151) (Wolfe & NewMyer, 1985).

1958: (The) Federal Aviation Act of 1958

This important consolidation effort established the Federal Aviation Agency out of the Civil Aeronautics Administration, at least partly in response to several mid-air collisions of the 1950s which demonstrated a need for better airport management and improved safety regulations, reflecting the expansion of aviation and faster, larger, and heavier aircraft (Burkhardt, 1989). One safety measure

initiated was the early experimentation with computers to aid air traffic controllers ("Charting the next century of flight," 2003).

As a provision of the act, the Federal Aviation Agency was made into a separate government agency, and removed from the authority of the Department of Commerce. Many of the requirements of the Civil Aeronautics Act of 1938 were incorporated into the act. The CAB's safety role authority was transferred to the agency, the administrator of the agency was authorized to revoke or suspend a certificate, and was given clearer authority to allocate airspace between civil and military users. Air safety research and development efforts were consolidated and given to the agency. The safety regulations became known as the Federal Aviation Regulations (FARs) which are part of Title 14 of the Code of Federal Regulations, and the act was written thoughtfully, from the insider perspective, and proactively, with the long-term view in mind (Eichenberger, 1990).

1966: The Department of Transportation Act of 1966

Various transportation agencies were consolidated under the new Department of Transportation (DOT), giving the new DOT responsibility for coordinating the activities of its various "modal divisions" (administrations), according to Wolfe and NewMyer (Wolfe & NewMyer, 1985), including the FAA (Eichenberger, 1990). Also, the Federal Aviation Agency became the Federal Aviation Administration (today's FAA), and gave the FAA administrator preeminent authority in matters of aviation safety, with a proviso that the administrator's ruling could be appealed through the National Transportation Safety Board (NTSB), which the act also created (Wells, 1984). Accident investigation authority was transferred to, and vested in, the NTSB from the CAB.

When created as the Federal Aviation Agency, the precursor to today's Federal Aviation Administration, the agency's three primary functions were to make rules to govern and regulate civil aviation, to devise long-term policies that would both govern and foster aviation, and to enforce the rules that it made. A fourth area of responsibility now is embedded in the FAA's interrelationship with the National Transportation Safety Board, in which the NTSB functions as the appellate body in the regulatory enforcement process (Eichenberger, 1990; Hamilton, 1993).

Safety research focused on survivability and prompted new rules that required airlines to increase safety equipment for emergencies. Aircraft noise, runway safety and postcrash fires were also subjects of intensive research during the 1960s ("Charting the next century of flight," 2003).

1970: Airport and Airway Development Act of 1970

Replacing the Federal Airport Act of 1946, this act levied a series of taxes on aviation system users and created a trust fund to be applied to airport and airway development (Wolfe & NewMyer, 1985). The thrust of the act's mandate was a continual improvement in safety, but research and development expanded to include intensive security research ("Charting the next century of flight," 2003).

1978: Airline Deregulation Act

This act practically eliminated the government's airline economic regulatory authority, so that free market principles governed airlines' fortunes (Wolfe & NewMyer, 1985). Although many more safety regulations had evolved that governed the airline industry of 1978, the Airline Deregulation Act had the effect of recreating a market environment that hearkened back to some of the freedoms of the decades of the 1920s and 1930s in creating new markets. Key provisions of the act included an emphasis on competition with a prohibition on discriminatory practices, the phasing out of the CAB by 1985, allowing carriers flexibility on fares within a "zone of reasonableness without CAB approval" (Wolfe & NewMyer, 1985, p. 29). The Department of Justice would have authority regarding mergers and agreements.

1979: International Transportation Act of 1979

As aviation shrunk the world, it became necessary to open United States markets to carriers from other nations, reciprocally. The International Transportation Act of 1979 extended the principles of airline deregulation worldwide, with the proviso of cooperation from foreign governments; i.e., that foreign governments ascribe to free market principles (Wolfe & NewMyer, 1985).

1979: Aviation Safety and Noise Abatement Act of 1979

Continually seeking to improve safety in a more and more complex environment, this act developed land compatibility standards for airport and city boundaries, and provided assistance to insure continued safety in aviation (Wolfe & NewMyer, 1985).

1982: Airport and Airway Improvement Act of 1982

Recognizing the concept of obsolescence before new installations were even complete, this act strove to make best use of existing airport systems rather than expanding the systems, a joint use with the civilian sector of military airports, an upgraded air traffic control system and provided for funding of selected privately owned public use airways. In addition, the act emphasized that each user should bear a fair share of the cost of maintaining airports and airways.

1988: FAA Reorganization

In 1988, the FAA reorganized itself, in an effort to provide continuity at the mid-management level and to give its four executive directors more responsibility in the decision-making process. As the largest agency of the DOT, dealing with the ever-more-complex world of aviation, the FAA saw the need to make its own adjustments. With this reorganization, the FAA also increased its ability to touch, or intrude upon, the lives of anyone even remotely associated with aviation.

Late 1900s Research

Research in the 1980s and 1990s saw significant improvements in aircraft safety through improved inspection techniques, human factors guidelines, additional requirements placed on the airlines regarding cabin flammability standards, and impact and emergency procedures and equipment ("Charting the next century of flight," 2003).

Functions of the Federal Aviation Administration (FAA)

In this noncomprehensive discussion, the FAA's three primary functions – to make rules to govern and regulate civil aviation, to devise long-term policies that would both govern and foster aviation, and to

enforce the rules that it made – can be seen to show its concerns for safety, as related to the concerns of this research.

J. A. Eichenberger points out that, in its rule-making role, the FAA issues a Notice of Proposed Rulemaking (NPRM), which must allow a particular period of time for comment, unless certain emergency conditions exist. At the end of the comment process, the agency then issues its Final Notice of Rule Making, publishing the rule as it will be adopted, and giving the effective date for it (Eichenberger, 1990). The majority of aviation regulations are in Title 14 (Aeronautics and Space) of the Code of Federal Regulations and are updated daily and published annually in three chapters: FARs, for safety regulations; ERs, for economic regulations; and NASA regulations. Title 49 (Transportation) publishes the remainder.

The instruments of regulation can come from laws, regulations, orders, executive orders, airworthiness directives, and advisory circulars. In addition to published regulations, the FAA may issue orders, which may be an outgrowth of, and related to, a specific FAR, or issued in response to a directive from the DOT. An executive order may be issued by the office of the president, as well. Also, to correct an unsafe condition in a product, aircraft, aircraft engine or propeller or appliance, the FAA may issue an airworthiness directive, which is binding. As guidance, but not mandatory unless cited in a regulation, the FAA routinely issues Advisory Circulars (Wolfe & NewMyer, 1985). In addition, the marketplace "regulates" with acceptance and purchase power, or, negatively, by declining to purchase products or services, so the quite diverse aviation industry is regulated in many ways.

Aviation regulations are issued to control conduct in five areas: safety, economics, environment, consumer protection, and industry promotion. Safety relates to the public, whether flying or on the ground. Economics pertains to government control of air carrier business practices such as fares and market entry, which must carry a duty to the public of convenience and necessity. Environment regulations protect the quality of human and natural environment, especially noise pollution. Consumer protection regulations deal, particularly, with overbooked flights, lost luggage, and potential abuses. Industry promotion regulations promote the industry thorough airport development, planning, and aeronautical research (Wolfe & NewMyer, 1985).

Individual segments of the industry may also self-regulate with programs, standards or guidelines, associated with a professional accreditation program.

The FAA is charged with issuing six different types of certificates: airmen, aircraft, air carrier operators, air navigation facilities, air agency rating, and airport operators (Wolfe & NewMyer, 1985). Looking more closely at the processes for being certified, the stringent requirements to preserve safety become apparent.

For the airman certificate, whether pilot or nonpilot, the process is designed to insure competency through written exams, practical exams, and medical condition (Wolfe and NewMyer, 1985). The (pilot) airman certificates are: student, required before solo flight is permitted, but not before training is commenced; recreational; private; commercial; airline transport pilot; and certificated flight instructor. Aircraft certificates are issued in three categories: type, for new models, requiring extensive testing under FAA supervision; production, granted when 'type' has been successfully tested, but requiring that the manufacturing process must show continual compliance; and, airworthiness, stating that the aircraft continues to meet all the standards, and which must be on display in the aircraft at all times.
Air carrier operating certificates define the operating criteria for ensuring safety, and identify the network over which the carrier is permitted to operate.

Air navigation facility certificates are issued when the navaid meets FAA standards of Part 171 of the FARs.

Air agency rating certificates are issued to flight and ground training school as well as aircraft maintenance and repair facilities. Flight schools must have aircraft in good, safe operating condition and proper maintenance facilities, personnel and certificated instructors, and adequate classrooms with teaching equipment and an FAA-approved curriculum (Wolfe & NewMyer, 1985).

The FAA, then, in its supervisory and watchdog roles assures adherence to safety measures, but also delegates many regulatory functions to industry. In its role of establishing standards, the FAA attempts to achieve a safe and efficient aviation system, making adjustments as necessary by continually initiating new regulations and updating existing regulations, but always concentrating most of its efforts in the area of aviation safety. Although state and local governments have a significant impact on the

regulation of aviation, as well, their impact is limited primarily to proprietary issues, when airports are owned and operated by local governments.

Finally, it must be noted that, in September of 2001, the FARs specified no standard necessary to commence flight training. At that time, no certificate of any kind, including the medical certificate without which a person is not permitted to be pilot in command, or engage in solo flight as a student pilot, was necessary to begin receiving instruction from a flight instructor. Subpart C of Part 61 of the FARs, dealing with student pilots, in paragraph 61.83 under the heading "Eligibility requirements for student pilots" states, To be eligible for a student pilot certificate, an applicant must:

> (a) Be at least 16 years of age for other than the operation of a glider or balloon.
>
> (b) Be at least 14 years of age for the operation of a glider or balloon.
>
> (c) Be able to read, speak, write, and understand the English language. If the applicant is unable to meet one of these requirements due to medical reasons, then the Administrator may place such operating limitation on that applicant's pilot certificate as are necessary for the safe operation of the aircraft (FAR/AIM, 2000, p. 63).

It should be noted here, again, that it was not necessary to possess even a student pilot certificate to commence training, in 2001. Given the safety mandate upon the FAA to protect the innocent on the ground as well as those who might trust a pilot with his or her life in an airplane, should the eligibility requirements to begin flight instruction be changed – as many other regulations were changed over the years – in response to new situations?

Responses of Aviation Regulatory Authorities to Selected Aviation Calamities

As the aviation industry developed in complexity, the need for a protecting environment became increasingly apparent. Bit by bit, the web of protective regulations increased, to provide safety for all persons and properties from threats from aviation. Mostly, the framework was built in a reactionary manner, rather than proactively, and has become increasingly restrictive to accomplish its safety mandate.

The FAA will be shown to take its responsibility to respond to events that threaten safety quite seriously: Not always, however, does the FAA respond in a lightning quick, or expected, manner (Kean et al., 2004).

The first aviation fatality occurred on September 17, 1908, with Orville Wright as pilot and Lt. Thomas Selfridge as passenger. Since there was no regulatory authority, there was no aviation regulatory response to the accident that claimed the life of Selfridge, and seriously injured Wright.

During the period from 1922-1924, there were 470 crashes with 221 deaths in general aviation in the United States, according to newspaper reports, with editors' attributing 91 percent of the problem to inexperienced pilots or unsafe equipment, or both. These statistics became part of the impetus for passing the Air Commerce Act of 1926, which required pilot licensing, among other things. By comparison to the requirements and records of the transcontinental air mail pilots, the unlicensed pilot record was particularly appalling. The post office required pilot applicants to have a minimum of 500 hours of flying time and to pass a qualifying exam and periodic medical exams. After each mail run, each plane was subjected to a checklist of 180 items. The post office had 353 mechanics for fewer than 100 planes. During the period between 1922-1925, there were eight million miles flown with only ten fatal accidents among the early (prior to the onset of 24-hour operations) transcontinental post office pilots (Burkhardt, 1989).

On March 31, 1931, a Fokker Trimotor of Transcontinental and Western Air (later, to become Trans World Airlines) lost a wing, crashing on a Kansas farm, killing all eight passengers and the crew. The popular football coach, Knute Rockne, was one of the passengers, so a shocked American public demanded action. "Under authority delegated to the Aeronautics Branch of the Department of Commerce, the government grounded all Fokkers . . . and then restricted them to mail service only – no passengers" (Bilstein, 1994, p. 89).

In 1933, when air mail service was turned over to the army, in a period of six months, there were 66 crashes with twelve deaths. President Roosevelt took the air mail contract away from the army, and the Air Mail Act of 1934 was passed, increasing funding for navigational aids, among other provisions of the act.

In 1935, the replacement of choice for the Fokker Trimotor, the DC-2, also flown by Transcontinental and Western Air, crashed, killing the very popular senator Bronson M. Cutting of New

Mexico. Since this accident occurred soon after the fiasco with the army's carrying air mail, the outraged public again demanded answers and solutions. Congressional hearings laid the blame on two factors involved in the crash: the growing complexities of radio communications, and poor aviation weather forecasting. The Bureau of Air Commerce, also charged with aviation accident investigations, placed the blame on the airline and on the pilots. The airline responded with an articulate rebuttal showing that the pilot had been given a misleading weather report, thus underscoring the difficulties and the need for improvements and government assistance. President Roosevelt made airways modernization a priority of his second term, increased the Aeronautics Branch's budget by 60 percent so that safer airway and "radio range" broadcast stations were put in place and government operation of air traffic control centers was expanded (Bilstein, 1994, p. 98).

A 1956 mid-air collision over northern Arizona killed 128 people. The two planes had taken off from busy Los Angeles International Airport (LAX) within three minutes of each other on parallel runways, then encountered a thunderstorm and, in veering around it, had crashed. The review of the accident showed the problem of a divided air traffic control system, and that CAA funding was no longer adequate to keep pace with increasing air traffic with the upsurge in jet travel. Funds were especially needed for additional navaids, air traffic control (ATC) facilities, and ATC salaries. Partially as a result of recommendations concerning this accident, to create one regulatory agency to supersede the CAA and assume some responsibilities of the CAB, the proactive Federal Aviation Act of 1958 was passed, forming the Federal Aviation Agency, laying the groundwork for today's FAA. The agency would also regulate military traffic during peacetime (Burkhardt, 1989).

On December 16, 1960, a United Airlines DC-8 jet collided with a TWA Constellation over Staten Island. The investigation revealed that the United Airlines pilot, experiencing a partial failure of his navigation equipment, overshot his assigned holding fix, at an excessive speed, and collided with the TWA plane. Realizing that that problem surely would have been avoided had the pilot notified the FAA of his malfunction, new procedures for dealing with malfunctioning equipment were instituted. Paragraph 91.187 of the FARs now says, under, "Operation under IFR in controlled airspace: Malfunction reports"

(a) The pilot in command of each aircraft operated in controlled airspace under IFR shall report as soon as practical to ATC any malfunctions of navigational, approach, or communication equipment occurring in flight.

(b) In each report required by paragraph (a) of this section, the pilot in command shall include the following:

(1) Aircraft identification;

(2) Equipment affected;

(3) Degree to which the capability of the pilot to operate under IFR in the ATC system is impaired; and

(4) Nature and extent of assistance desired from ATC (FAR/AIM, 2005, p. 181).

Also in the early 1960s there was a series of Lockheed Electra crashes. In response, Lt. General Elwood Quesada, FAA administrator, ordered a reduction in the maximum speed at which the Electra could be flown and then worked with Lockheed officials to strengthen the plane's airframe (Kent, 1980).
On March 1, 1962, an American Airlines Boeing 707 crashed during takeoff from Idlewild Airport, killing 95 – the highest toll to date. The probable cause of the crash: an FAA-imposed procedural turn required as part of a noise-abatement policy due to encroaching residential areas. The ultimate result was to try to lessen jet-noise through research into noise-suppression devices, to strengthen airport planning procedures with an emphasis on proper land use and zoning (to insure clear approaches), and the establishment of certain ATC rules regarding takeoffs and landings (Kent, 1980).

On November 11, 1965, a United Airlines plane crashed at Salt Lake City, Utah. All 91 on board survived the impact of the crash but 43 souls perished in the ensuing smoke and fire. The aftermath was a new emphasis on the crashworthiness of modern aircraft, and major modifications in designs of upcoming generations of aircraft, including jumbo jets to improve the passenger evacuation procedures and to increase exits.

Between August of 1965 and February of 1966 four Boeing 727s crashed during landing operations, leaving 264 dead. The investigation revealed a training deficiency for pilots of the 727s, and in response, the FAA instituted new regulations to stiffen pilot training for the 727, paying particular attention

to the 727's high sinkrate during the landing phase, and adding appropriate new cockpit procedures to assure attention to altitude during descent (Kent, 1980).

In the 1960s, hijacking, often as a political protest, began to seriously impact airlines worldwide. Electronic metal detectors and intensified security in the United States were used to significantly reduce the incidence of hijackings.

October 2, 1970, saw a crash of a charter flight carrying the Wichita State University football team. The aftermath of that crash prompted the FAA to propose a drastic overhaul in the procedures governing charters, as well as procedures governing training and proficiency of pilots, with strengthened proficiency checks, more logged hours before the pilot could carry passengers and tougher requirements for flight instructors. An unnamed FAA official commented, "The days of a private certificate's being considered as a license for a man to either go out and learn to fly or kill himself are over" (Kent, 1980, p. 327).

In 1978, a jetliner crashed at Los Angeles International Airport during takeoff, when its tires blew out, killing two people. The NTSB investigation recommended that the FAA set limits on taxiing speed and distances and improve standards for retreaded tires.

The FAA works closely with the International Civil Aviation organization (ICAO) – a United Nations agency – whose mission is to develop methods of international air navigation and transportation and for discussion of safety issues. When the Soviets shot down an unarmed South Korean jetliner in 1983, the FAA persuaded ICAO to condemn the action as uncalled-for and violent, when the plane's crew had done nothing more wrong than navigate badly (Burkhardt, 1989).

During the 1980s, however, terrorists began to murder some hostages, and, sometimes used explosives to destroy planes and all humans aboard as a political protest against American involvement in the Middle East's political issues. On June 18, 1985, TWA Flight 847 was hijacked within minutes of taking off from Rome, with 145 passengers aboard (including 104 Americans). The event was not resolved until June 30, after a harrowing series of flights, with crazed fanatics in the cockpits making unrealistic demands on the flight crew, and the deliberate and grisly murder of a young U. S. Navy man. The result of this episode was a further strengthening of stringent luggage inspection and a general increase in security. American officials warned travelers about traveling in areas of the world with lax security (Bilstein, 1994).

As a response to small planes' being used in blatant drug smuggling from Mexico and Colombia in the mid-1980s, the FAA issued a regulation requiring a special permit before long range fuel tanks could be installed on small planes. In addition, stipulations requiring pilots to give position reports to the FAA and to request clearance to enter the U. S. coastal waters were put into the regulations. Failure to comply caused investigations and penalties from the agency. The FAA, without the authority to arrest, however, acted in concert with other agencies to arrest smugglers.

On April 29, 1988, a Boeing 737 flying in the Hawaiian Islands at 24,000 feet, suffered the catastrophic loss of one-third of the top of its fuselage, resulting in a sudden decompression that sucked one flight attendant out, and injured about 60 people on board. The plane landed safely fifteen minutes after the event. An investigation revealed undetected metal fatigue, with a hairline crack. As a result, inspection efforts were stepped up through better knowledge and expertise, and better maintenance.

In December, 1988, all 270 persons aboard a Pan Am flight from Germany to the United States were killed by an on-board bomb that exploded over Scotland, knocking the plane from the air, according to the investigation. In days to come, improved X-ray security devices in combination with new radiation machines were installed to detect possible bombs in luggage (Bilstein, 1994).

On May 21, 2003, a US Airways commuter crashed into a hangar only 37 seconds after takeoff from Charlotte, NC, killing all on board (NTSB, 2003, January 8). The NTSB's lead investigator, Lorenda Ward, said that the accident was probably a combination of an improperly loaded plane, " . . . and maintenance that inadvertently limited the pilots' options to regain control . . . " (Alonso-Zaldivar, 2003, p. A6) by improperly set turnbuckles, which control tension on elevator control cables, affecting the crew's ability to control a climb or dive. According to the National Transportation Safety Board preliminary hearing on the crash, the FAA will be forced to revise some of the safety rules affecting small commuter aircraft, and, " . . . are focusing on the accuracy of weight estimates, the rigor of maintenance procedures and the role of outside contractors in servicing aircraft" (Alonso-Zaldivar, 2003, p. A6).

Aviation accidents still happen with some regularity (NTSB, 2003). In recent years, it has become necessary to focus not only on unsafe pilots or equipment, but also on malicious intent from humans. The FAA has been shown to take its responsibility to respond to events that threaten safety quite

seriously (FAA, 2003): Not always, however, does the FAA respond in a lightning quick, or expected, manner.

Overview of the Aviation Environment Prior to the Attacks of 2001

Sun Tzu, paraphrased by Gary Gagliardi, says, "… to know your future, you must constantly talk to decision-makers about what they are thinking" (Gagliardi, 2003, p. 4).

To seek to understand how the attacks of September 11, 2001, in which airplanes were used as bombs, with the intention to kill innocent people and terrorize the world (Kean et al., 2004), could happen, one must look, then, at selected examples of the stance of the FAA, the thinking of other decision-makers in the nation, and at some key points relevant to training international students.

In February of 2000, The Rand Corporation held a symposium in Santa Monica, California to focus on domestic acts of terrorism, using weapons of mass destruction, particularly chemical and biological agents, as well as explosives and conventional weapons because, they stated, the United States, as a nation, was ill-prepared to deal with such events. The purpose, then, of the symposium was to seek to identify the elements of an integrated homeland defense, to identify critical gaps in federal, state and local government policies and programs, and to offer suggestions on how to achieve a relatively cost-effective homeland defense program. The transcript of the executive summary of the proceedings makes no mention of aviation as a vehicle for disseminating agents or as a weapon of mass destruction, although many methods of dissemination were discussed as the symposium progressed. Ms. Suzanne Spaulding, Executive Director of the National Commission on Terrorism and Co-Chair of the symposium, noted that terrorists' objectives had changed from that of forcing concessions in the mid-70s and 80s to "… groups that are messianic, vengeful, or ideological" (Spaulding, 2000, p. 5). She spoke, then, of concern about the likelihood of their use of a weapon of mass destruction to achieve their current objective to inflict mass casualties.

The 9/11 Commission, in investigating the aviation environment just prior to the attacks, stated that "As of September 11, 2001, the FAA was mandated by law to regulate the safety and security of civil aviation" (Kean et al., 2004, p. 14)

Further, the commission noted that, while the FAA had a security mission to protect the users of commercial air transportation against terrorism and other criminal acts, the agency perceived sabotage as a greater threat to aviation than hijacking, and believed that aircraft were more vulnerable to explosives than to weapons such as firearms.

The FAA standards for entering flight training for persons living in the United States have been noted previously. For international students, flight training in 2001 could be commenced while they were in the United States, even if on a tourist visa (see Appendix J, re the 9/11 terrorists' training in the United States). Flight schools (and other schools, such as those that taught English as a second language: ESL) often offered assistance to international students by petitioning the United States government for a student visa for them. International students then were taught to fly to the FAA standards, usually (Kean et al., 2004).

In 1993, in a report regarding factors that affected the supply of pilots (and aviation maintenance technicians), the FAA's Pilot and Aviation Maintenance Technician Blue Ribbon Panel noted that

> . . . most persons seeking a career in aviation receive training and initial certification through schools that meet the requirements of FAR 141, Pilot Schools, or FAR 147, Aviation Maintenance Technician Schools. These schools meet specific curriculum requirements, have a definite structure, and are certificated and regularly reviewed by the FAA (FAA, 1993, p. 34).

At that time, the report stated, there were approximately 600 pilot schools in operation in the United States, and that it was reasonable to estimate that more than half of the 49,580 individuals in 1991 who received private pilot certificates did so through a Part 141 school. Further, the panel found that an even higher percentage of those receiving advanced certificates (commercial, instrument, flight instructor and airline transport) received their training from Part 141 certificated schools. The study stated that there had been "few" civilian ab initio flight training programs in the United States until shortly before the study. It then highlighted examples of four schools that offered a complete curriculum from beginning pilot training through airline transport pilot, to meet the increased demand anticipated for both domestic and foreign needs: 1993 costs shown ranged from $10,000 to $80,000, with some of the schools combining the training with a four-year degree. Only one school listed, the Airline Training Center Arizona (ATCA) required that prospective ab initio students meet certain age, education, and physical requirements, as well as meeting a

certain psychological profile that included an assessment of intelligence, crisis management skills, decision-making ability, and leadership qualities (FAA, 1993).

The same 1993 FAA report noted that "(The) FAA regulatory structure governing the certification and training of professional pilots is adequate to qualify pilots for commercial pilot occupations to a minimum standard" (FAA, 1993, p. 51), but expressed concern that

> FAA certification requirements are not designed to ensure that 'entry-level' pilots have all the experience and skills required to safely operate air carrier aircraft. Therefore, beyond the next 3 to 5 years, employers may experience a shortage of pilots who meet the *qualification and experience* standards currently accepted (FAA, 1993, p. 51).

Thomas McSweeny, Associate Administrator for Regulation and Certification, FAA, speaking before the House Committee on Transportation and Infrastructure, Subcommittee on Aviation, regarding the crash of Egypt Air 990 in 1999, testified that the medical examinations required by the FAA are given by FAA-designated aviation medical examiners (AMEs) at 6-month intervals for ATPs, annually for commercial pilots, and every two or three years for private pilots, depending upon the private pilot's age. The medical examinations are designed to ascertain the applicant's mental state, he reported, and said that the AMEs are trained to be sensitive to indications of emotional problems and are " . . . instructed to make observations regarding the applicant's appearance, behavior, mood, communication skills, memory and cognition . . . (but) the FAA does not mandate a mental health screening" (McSweeny, 2000, p. 2).

In 2001, as during preceding years, the FAA set and enforced aviation security rules, which airlines and airports were required to implement. The intent of the FAA was to produce a multi-layered system of defense, so that the failure of any one layer would not amount to absolute failure. The 9/11 commission report says, however, "But each layer relevant to hijackings – intelligence, passenger prescreening, checkpoint screening, and onboard security – was seriously flawed prior to 9/11" (Kean et al., 2004, p. 83).

The first layer was use of intelligence. The FAA policy was to use intelligence to identify both specific plots and general threats to civil aviation security so that the agency could develop and deploy appropriate countermeasures. The FAA had a 40-person intelligence unit that was tasked to receive a broad range of intelligence data from the FBI, CIA and other agencies so that it could assess the threat to aviation.

The FAA's intelligence unit, however, didn't get much attention from the agency's leadership. According to the 9/11 Commission Report, neither FAA Administrator (Jane) Garvey nor her deputies reviewed daily intelligence – and what they did see had been screened for them, so Garvey was unaware of " . . . a great amount of hijacking threat information from her own intelligence unit, which in turn, was not deeply involved in the agency's policymaking process. Historically, decisive security action took place only after a disaster had occurred or a specific plot had been discovered" (Kean et al., 2004, p. 83).

The second layer of defense for civil aviation was passenger prescreening. As of September 11, 2001, however, the FAA's 'no-fly' list contained the names of only 12 terrorist suspects even though government watchlists contained the names of many thousands of known and suspected terrorists.

The third layer utilized checkpoint screening with walk-through metal detectors and X-ray machines to stop prohibited items. Although screeners were trained, many reports showed that checkpoints performed poorly, including the detection of " . . . obvious FAA test items. Many deadly and dangerous items did not set off metal detectors, or were hard to distinguish in an X-ray machine. Reportedly, the 9/11 hijackers were instructed to use items that would be undetectable by airport checkpoints" (Kean et al., 2004, p. 84).

The fourth layer was security on board commercial aircraft – but it was not designed to counter suicide hijackings. The FAA-approved "Common Strategy" developed through scores of experiences with hijackings, beginning in the 1960s taught crews that the best way to deal with hijackers was through compliance to their demands, in order to get the plane landed safely so that law enforcement or the military could handle the situation at that point. However, "FAA training material provided no guidance for flight crews should violence occur" (Kean et al., 2004, p. 85).

Further, the FAA regulations prior to the attacks, " . . . mandated that cockpit doors permit ready access into and out of the cockpit in the event of an emergency" (Kean et al., 2004, p. 85). With this said, rules implemented in the 1960s did require that aircrews keep the cockpit door closed and locked in flight, but that requirement was not always observed or vigorously enforced. A key factor, as well, was that, since there had been no domestic hijacking of any United States commercial aircraft anywhere in the world since 1986, there were only 33 armed and trained federal air marshals as of September 11, 2001, – and they were not deployed on United States domestic flights, except when in transit to provide security on international

departures. At the time of the attacks, Congress' focus was on a "passenger bill of rights," to improve capacity, efficiency, and customer satisfaction in the aviation system, with no focus on suicide terrorism (Kean et al., 2004, p. 86).

Once again, the familiar pattern noted by Kent and others, emerged. Kent's words, written over two decades before the attacks, are, "FAA's response followed a predictable pattern: a quick and furious effort once the threat had been spotlighted . . . " (Kent, 1980, p. 131).

Ten days after the attacks, FAA Administrator, Garvey, speaking before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, on aviation security, said,

> The nature of the threat facing America has changed. What we faced on September 11th was a new phenomenon – hijackers taking over commercial flights for the sole purpose of turning them into human-guided terrorist bombs of massive explosive power. Given the events of last week, assumptions underlying aviation security have fundamentally changed" (Garvey, 2001, p. 1).

In the intervening four years from that day to this, many precautions have been taken to avoid a repeat, including training some airline pilots in the use of guns (Elias, 2004). On November 3, 2003, news anchor Tracy Rowlett of channel 11 news in Dallas, Texas, said, "One new law of the sky is that pilots must never again allow their planes to become weapons of mass destruction" (Rowlett, 2003). Homeland Security was the watchword.

In considering the FAA's actions, and the aviator response, Kent (1980) sums up the swings in the aviation community toward safer skies with these words,

> A somewhat surprising constant in the saga of Federal air regulation is the continuing hostility that the general aviation community has shown towards regulatory efforts, especially toward programs for airway and air navigation modernization. The tradition of the gypsy fliers and barnstormers has lived on among those who fly for the sheer enjoyment of it. This tradition has resisted most attempts to transform flying from a romantic, if risky, adventure into a safer means of getting from one place to another. While the general aviation community has often argued its case on the costs of new equipment to meet higher standards, which it claims would force many to give up flying, few have given up the thrill of flying once they have been bitten by the bug. As a result there have been periods of truce between FAA (and its predecessor agencies) and the general aviation

> community, but never a lasting peace. Nor does there seem much chance for one in the future. (Nevertheless, the FAA) … could be proud of their performance in keeping American aviation safe, separated, and soaring (Kent, 1980, pp. 356-7).

Clearly, the FAA developed a safety first attitude as events occurred and as the science and industry of flying became more and more complex. By the 1990s, the FAA was funding research into all areas involving aviation safety, establishing committees to investigate all means of meeting their mandates, and seeking to integrate all aspects of the extremely complex and intricate world of aviation. The events of September 11, 2001, and subsequent days do show that the agency still often reacts to events, rather than taking proactive steps to prevent disastrous events.

Aviation Industry Standards and Programs

Over time, airlines developed a system of scrutinizing pilot applicants, including background checks, psychological profiles, extensive interviews, and a detailed analysis of their logbooks to insure integrity and that minimum (FARs) standards of experience were met.

The Federal Aviation Reauthorization Act of 1996, passed on October 3, 1996 as Public Law No. 104-264, amended 49 U.S.C. to reauthorize programs of the FAA and to effect certain changes including pilot records. Primarily, this Pilot Records Improvement Act (PRIA), in Section 501, resulted from certain airline accidents attributable to pilot error, where it was later found that, although the pilot(s) had a history of poor performance, the current employer had not investigated each pilot's background (Public Law 104-264, 1996).

Public Law 107-71, enacted November 19, 2001, established the Transportation Security Administration and amended the PRIA, requiring, among other things, that before an air carrier can allow a pilot to begin service, it must request and receive certain information concerning that individual, including FAA records, records from other air carriers or persons and from the National Driver Registry (49 U.S.C. § 44703(h)(1)) (FAA AC 120-68B).

In early 1997, The Aviation Rulemaking Advisory Committee (ARAC) convened its first meeting of the working group that was tasked to study pre-employment screening. The scope of the group's task was

not to devise any regulatory solutions but only to conduct a 2-part study as directed by Congress. The ARAC Task Statement, 1997, states that the FAA asked the

> . . . group to review current pre-employment practices and procedures among the air carriers; the knowledges [sic], skills, and abilities required for pilots to maintain safe operations; suggested approaches to enhancing pilot selection; and data available both on-line and in the literature on human factors as well as the knowledge base of industry experts (Federal Register, 1997).

The thrust of that task was directed towards pilot selection for airlines – not ab initio training. The summary draft of the committee's work noted that the task was particularly complex, and that the group would approach this particularly complex task systematically, critically and with consideration for the corporate structures involved and affected. Stating the obvious, the statement observed that pilot hiring had become increasingly more complex than even five years ago, and that it would likely become even more so in years to come.

As part of the group's work they reviewed the hiring practices of various companies and determined that companies generally establish minimum standards for their operations. These standards require only minimum time as specified by the FAA for the rating, as well as minimum time spent in interviews, flight simulator assessments, and, only on occasion, general mental abilities. Still, these are the screening devices used to eliminate a number of potential pilot applicants.

In the fifth meeting of the group, March 3, 1998, they summarized the standards/testing needed for the airline industry. Included in that summary was the statement that psychological and cognitive testing is important and that the screening tool, 'CogScreen,' should be used. Also they noted that a broad-based standard was not needed but that there should be some form of a basic test, some form of a simulator test and some form of a psychological test. The contrary position that the group took, however, noted that the certification process in place establishes the framework and is adequate; that there is more to being a pilot that meeting some type of standard, and that because of the fact that the airline cultures are very different, that hard-and-fast standards would not work. In particular, the group worried that creating a "cookie-cutter" pilot would adversely serve the industry (FAA, 1999, p. 19).

In 1996, the FAA and ARAC, working with the Joint Aviation Authorities (JAA) of Europe, investigated the feasibility of pursuing a harmonization of training and experience requirements that would

aid pilots to transition easily between United States and European professional positions (FAA, 1996). Again, the work of this group focused only on the professional level, not ab initio training. The Air Line Pilots Association (ALPA) in a discussion of the group's work that was to work toward equalizing the FAA's ATP certificate with its equivalent JAA certificate, noted that, "(The) current FAA standards for an ATP certificate do not represent the experience or qualifications of even the most junior airline captain (i.e., the current FAA standards are far below the industry hiring norms)" (ALPA, 1998).

McSweeny, speaking before the House Committee on Transportation and Infrastructure in 2000, referred to work, citing the considerable variability among the major and regional air carriers " . . . in the use of psychological tests (cognitive, aptitude, personality, and psychopathology) . . ." (McSweeny, 2000, p. 2), and noted that only one carrier made reference to using a personality inventory.

The United States military has long been interested in pilot training, and has devoted research efforts to developing tools for predicting success in the pilots it selects and trains. An example of this type of research can be found in Kantor's work, studying the various aspects of the pilot's makeup and the measure of success for military pilots. In every sense, however, military pilots equate to professional pilots, rather than to individuals who simply seek flight training (Kantor, 1985). The standard of performance for military pilots far exceeds the standard for private pilots in the civilian world.

In March of 1999, Congressman Bud Shuster, then-chair of the National Transportation Policy Commission, speaking at the 24th Annual Commercial Aviation Forecast Conference Proceedings, described The Aviation Investment and Reform Act for the 21st Century (AIR-21). Key points that he made focused on increasing the safety of commercial aviation with provisions to replace and improve air traffic control facilities, increase funding to allow continued investments in explosive detection system, and funding to create a short-term program that would address critical problems of (and caused by) air congestion and traffic delays. AIR-21 would also require enhanced safety at small airports, and authorize funding to help reduce the growing number of runway incursions. The final tenet of AIR-21 – much as the Kelly Act of 1926 – was to encourage competition in the airline industry by, among other things, providing aid to airlines that would serve underserved cities. Shuster's address did not mention concerns about pilot training (24th Annual Commercial Aviation Forecast Conference Proceedings, 1999).

Should ab initio students be subjected to the same prescreening procedures that the airlines – or military – use?

Significant Changes in Aviation Regulations Regarding Pilot Training Since September 11, 2001

In an addition to the FARs in early 2003, and adopted without prior notice and without the period of public comment normally used by the FAA in its usual NPRM procedures, a "security disqualification" was added, pertaining to the certification of airmen. Affecting Parts 61, 63, and 65, " . . . the new regulations provide that the FAA will automatically suspend the privileges of an airman upon receiving an Initial Notification of Threat Assessment from the newly created Transportation Security Administration (TSA) in response to the September 11, 2001, attacks" (Hahn, 2003). Under the provisions of the regulations, the airman's privileges remain suspended unless the TSA issues a Withdrawal of Initial Notification. If TSA issues a Final Notification of Threat Assessment, however, the airman's certificates are revoked. The airman may respond in writing, according to attorney Derrick Hahn, but there is no appeal process (Hahn, 2003).

What did not happen immediately was a change in the FARs regarding eligibility for flight instruction: Would-be pilots could still commence flight instruction without scrutiny from the FAA. Before a student can solo, he or she must have a medical examination from an AME. The medical then acts as the student pilot's certificate, or "license," until the training is completed and the written, oral and practical exams passed, resulting in an FAA-issued private pilot certificate.

Subpart C of Part 61 of the FARs, dealing with student pilots, still states, in paragraph 61.83 under the heading Eligibility requirements for student pilots.

To be eligible for a student pilot certificate, an applicant must:

(d) Be at least 16 years of age for other than the operation of a glider or balloon.

(e) Be at least 14 years of age for the operation of a glider or balloon.

(f) Be able to read, speak, write, and understand the English language. If the applicant is unable to meet one of these requirements due to medical reasons, then the Administrator

> may place such operating limitation on that applicant's pilot certificate as are necessary for the safe operation of the aircraft (FAR AIM, 2005, p. 76).

The FAA is charged with aviation safety, first. What is to be its final position in this matter?

Significant Changes Regarding Foreign Students' Admission into Flight Training since September 11, 2001

Prior to the catastrophic events of September 11, 2001, in which foreign flight student/terrorists massacred their way into airline cockpits and flew into targets, effectively making bombs out of the airliners, many flight students from abroad came to the United States for training, for the best training in the world could be obtained here. Coming into the United States for flight training was straightforward and simple. Many flight schools worked almost exclusively with foreign students, and kept the procedures as uncomplicated as possible, for entry into the United States, making living arrangements, and taking care of many details for the trainee pilot/client.

In a news report for ABC news on September 13, 2001, aviation analyst John Nance explained that the FAA does not regulate to whom flight schools give training. Hank Price, speaking for the FAA in the broadcast, said that, although the FAA asks for extensive background information, it " . . . only cross-checks the applications when there is reason to believe there might be a problem" (Thomson, 2001).

Screening applicants, prior to September 11, 2001, was left to the flight schools and the simulator companies that taught jet training through use of full-motion simulators. Although expensive, simulators cut down on the expense of jet training to the students and provide around-the-clock access to the hands-on training, which improves the proficiency of the pilot trainee (Thomson, 2001). Foreign students were often required to pay for their entire course before beginning training, however, so the flight schools' cash flow was improved considerably.

So, what has changed? The eligibility requirements for flight training remain unchanged in the FARs. September 11, 2001, events did, however, set off a series of changes that made entering the United States much more difficult.

According to Naples Air Center in Florida, the Immigration and Naturalization Service (INS)

acted quickly to make it much more difficult to enter the country, to insure that students arrive with the correct training visas (Naples, 2003). Officials determined that two of the hijackers entered the country as students, but nine came as visitors (tourists) and the other eight were in some other nonimmigrant category. Law-enforcement officials believe that a more stringent border policy might have resulted in a denial of access for some, or closer monitoring of their activities (Murthy, 2001).

As a result of changes in the Department of Justice's scrutiny, the United States Citizenship & Immigration Services requires a multi-step process that still starts with a foreign student's selecting a flight training school approved for foreign students (USCIS, 2003), and making application and gaining admission. The school then sends the student the proper paperwork, which must be presented to the United States Embassy for documentation before the student will be allowed to enter the United States on a M-1 category visa, which allows vocational training. Even after successful entry, additional procedures are in place to track students, according to the U.S. Citizenship and Immigration Services website (USCIS, 2003). The INS requires, still, that foreign students must give evidence of the ability to pay for their training before beginning (Naples, 2003).

The U. S. Department of Justice (DOJ) plays a key role in scrutinizing foreign students, as part of the Foreign Terrorist Tracking Task Force (FTTTF) put into place in 2002. Participants in the FTTTF include the Department of Defense, the Department of Homeland Security's Bureaus of Immigration and Customs Enforcement and the Customs and Border Protection, the State Department, the Social Security Administration, the Office of Personnel Management, the Department of Energy, and the Central Intelligence Agency. The liaisons with Canada, Australia and the United Kingdom expand the databases that provide information to help keep terrorists and their supporters out of the United States (Tanner, 2003).

According to Charlene Porter (2002), the INS implemented a new system for tracking and monitoring foreign students who had been issued visas to enter the United States, which would be fully operational by January 2003.

Prospective students sign an authorization for the release of information form, which the DOJ accepts or rejects at the time of application. Even if the student gains an initial clearance through the Department of Justice (DOJ) Flight Training Candidate Checks Program (FTCCP), however, the DOJ has

the right to suspend training at any time, if any derogatory information concerning the student should surface during the training, and so informs the student through an e-mail memorandum (DOJ, 2003).

Foreign students can be removed from training at any time. In an interview, Charles Sullivan, a Learjet instructor for Bombardier Aerospace Training Center at DFW Airport, noted that, occasionally, the DOJ will remove a student from the Part 142 classroom, even well after training has started (personal communication, October 23, 2003).

Although the FARs retain the same wording as prior to September 11, 2001, on September 21, 2004, the Transportation Security Administration (TSA) issued an "interim final rule" on flight training for aliens and other designated individuals, pertaining to flight training in an aircraft weighing 12,500 pounds or less. The primary provisions of the rule require that all students prove citizenship status before beginning flight training. Further, foreign nationals must complete a background check with TSA and receive TSA clearance to begin training. They must be in possession of proper (not visitor) visa, must submit fingerprints to TSA and a photo taken on first day of flight training. Flight schools' employees in direct contact with students and active instructors must complete annual security awareness training. The rule also specifies proper application procedures and record-keeping requirements, including the necessity of a flight instructor's registering with the TSA before giving flight instruction to a foreign national (TSA, 2004).

CHAPTER III

PROCEDURES

Introduction

On September 11, 2001, when terrorist hijackers transformed airliners into " . . .highly explosive kinetic weapons . . ." (Der Derian, 2002, p. 177) and flew them into targets selected, apparently, for maximum damage, American life changed. To determine a proper course of action that would lessen the possibility of a repeat occurrence, there is a clear mandate to again examine the standards for gaining the knowledge, skills and abilities necessary to fly an aircraft.

Since all flight training for powered aircraft in the United States is done under the Department of Transportation's Title 14 of the Code of Federal Regulations, under the regulatory authority of the Federal Aviation Administration (FAA), a study of the FAA's standards for eligibility for flight training was clearly mandated. The FAA is charged with aviation safety, first

Design of the Study

The primary purpose of this research was to seek to understand and to frame new hypotheses regarding the standards for entry into flight training. Utilizing selected participants from diverse perspectives within aviation, the basic research question, "In light of the events of September 11, 2001, what do you judge to be adequate standards for entry into pilot training?" was considered in the format of a Policy Delphi technique, with four iterations, using ten participants selected and invited for their expertise in aviation.

Because the study was inductive – that is, having no hypothesis – the design was emergent, as the research progressed, within the framework of the question and the techniques involved in a Policy Delphi.

Delphi Respondent Panel

Since a Policy Delphi study requires expertise in diverse areas of the subject at issue in order to expose the elements of the research question, with the corresponding subtleties, respondents were selected because of their advanced knowledge or experience in some or all of the following:

1. Aviation training institutions
    a. Part 141 schools
    b. Part 61 instructors
1. Aviation industry
    a. Aircraft manufacture (such as Cessna, Raytheon, or Cirrus Aircraft companies)
    b. Aviation support industry
2. Federal Aviation Administration (FAA) representatives
    a. Administration
    b. Legal
    c. Inspection
    d. Air Traffic Control
    e. Aeromedical
    f. Training
3. Pilot organizations
    a. Administration
    b. Professional pilot
    c. General aviation pilot

A list of names for potential respondents was generated by surveying known experts, seeking recommendations. Delbecq says that the size of the respondent panel is variable but suggests that with a homogenous group of people, ten to fifteen participants is adequate, and further recommends that " . . . the number of participants in the Delphi study (be) held to a minimally sufficient number of respondents . . ." (Delbecq, Van de Ven & Gustafson, 1986, p. 89).

Ten respondents were selected, representing different subspecialty areas within aviation, demonstrating the three desirable categories of " . . . diversity of expertise, diversity of experience, and diversity of interests" (Bjil, 1992, p. 241).

TABLE I

A SUMMARY OF RESPONDENTS' QUALIFICATIONS

Categories of Qualifications	Frequency n = 10 respondents	Percent
Pilot ratings: (Some respondents hold combinations of fixed wing, rotary wing and glider ratings.)		
Airline Transport Pilot (ATP)	6	60
Commercial	2	20
Private, with instrument rating	1	10
Rotary wing	3	30
Glider	1	10
Type rated	6	60
Pilot activity:		
Active pilot	9	90
Time in aviation:		
Over 40 years	3	30
25 to 40 years	4	40
10 to 25 years	3	30
Instructor experience: (Some respondents have combinations of experiences, under several Parts.)		
Part 61	4	40
Part 121	1	10
Part 125	1	10
Part 135	3	30
Part 141	2	20
Part 142	3	30
Military	1	10
Aviation classroom instruction: college	3	30
FAA experience: (Some respondents have experiences in more than one category.)		
FAA-designated pilot evaluator	3	30
FAA Aviation Education Counselor	2	20
FAA Rulemaking Committee	1	10
FAA Safety Inspector	1	10
Expert witness: pilots' records	1	10
Aviation attorney	1	10
Aviation Medical Examiner	1	10
Industry experience: (Some respondents have experiences in more than one category.)		
Aviation management	4	40
Aviation consultant	2	20
Developed/supervised training	5	50

(table continues)

Categories of Qualifications	Frequency n = 10 respondents	Percent
FBO owner/manager	4	40
Pilot selection/hiring	4	40
Published in field	3	30
International experience	4	40
Currently supervising other pilots	3	30
Other significant aviation experiences:		
Experience in building aircraft	2	20
Aviation experience with military	3	30
Pilot organizations:		
Held national office	2	20
Presented seminars/training	5	50
Education – highest level:		
Doctorate	2	20
Working toward doctorate	1	10
Masters	2	10
Bachelors	3	30
High school + training	3	30

Respondents' Demographic Information

In this narrative that expands the information shown in Table 1, respondents' credentials are presented in no particular order. Efforts have been made to preserve confidentiality: Identities are not divulged. All respondents are currently active in aviation careers. All respondents have been in the field of aviation for more than ten years. All but one hold pilot certificates and are active pilots.

Respondent 1. Respondent 1 has been in aviation, as a career, for over 25 years, and has achieved acclaim as an expert witness, particularly as relates to pilots' logbooks and aviation accidents. Respondent 1 was involved in pilot selection and hiring for two decades for a major airline, currently consults pilots seeking airline employment, is published in the field, has served on aviation committees both in the United States and internationally, has credentials as an FAA Aviation Education Counselor, served on the FAA Aviation Rulemaking Committee for two years and has held national office in a professional aviation organization. Respondent 1 has two years of formal education beyond high school.

Respondent 2. Respondent 2 has been in an active aviation career for over 40 years, has been an instructor for over 31 years, with time as a Part 61 instructor, a military instructor, a Part 141 instructor, and

a Part 142 instructor. Respondent 2 lists over 16,000 hours of logbook time, has had international experience in aviation, including holding a foreign pilot's license, is an FAA-designated Pilot Evaluator and an FAA Aviation Counselor, has been involved in aviation management and has developed and overseen aviation training in several capacities. Respondent 2 served in the military for almost three decades, managed a fixed base operation (FBO) for a time, and served as an aviation classroom instructor for a major United States university. Respondent 2 has experience building aircraft, is an active pilot, holds the ATP rating, and is type-rated. Respondent 2 holds a master's degree and has completed all classwork for a doctorate in aviation education.

Respondent 3. Respondent 3 has been in aviation for over twenty-five years, is an active private pilot with an instrument rating, and is an aviation medical examiner (AME).

Respondent 4. Respondent 4 has been in aviation for over twenty-five years, and is an active pilot in fixed- and rotary-winged aircraft and gliders, as well as a Part 61 and Part 135 instructor. Respondent 4 has developed and overseen aviation training, was a military aviator and served in the military for almost a decade, is an FAA Aviation Safety Inspector, currently supervises other pilots, has experience building aircraft, is type rated, and holds an ATP. Respondent 4 has taught aviation in the classroom, served as a corporate pilot and an air taxi pilot, and served as an FAA operations field inspector as well as in the Regulatory Standards Division at the FAA Academy. Respondent 4 has a master's in business administration (MBA).

Respondent 5. Respondent 5 is another of the three respondents who hold the rotary-wing rating, as well as the fixed-wing. This respondent has been in aviation, as a career, for over 40 years, has more than 11,000 logged hours, has been a CFII for more than 30 years, holds the ATP rating for multi-engine aircraft, is type-rated and currently is employed as chief pilot in a Part 142 operation. Respondent 5 served in the military for eight years in electronics and in operations management, has taught aviation on the college level, is an FAA-designated Pilot Evaluator, commissioned the first Global Positioning System (GPS) Standard Instrument Approach Procedure (SIAP), and holds a bachelor's and two associate's degrees.

Respondent 6. Respondent 6 is another of the three respondents who hold the rotary-wing rating, and is an instructor with time in Part 121, Part 135, and Part 141 operations. Respondent 6 is published in

the field, has worked in (or currently works in) the following: aviation management, aviation consulting, developing and overseeing aviation training, and providing training. Respondent 6 is type-rated and has certified expertise in, and is a seminar speaker in: CRM (Cockpit Resource Management), human factors, and accident prevention. Respondent 6 holds an associate's degree, is certified as an instructor and counselor, and has served on multiple aviation boards.

Respondent 7. Respondent 7 has been an aviator for about 25 years but has had a career in aviation for 15 years, including over 1500 hours as a flight instructor in a Part 141 operation. Respondent 7 is type-rated, holds the ATP, has been an FBO manager, has held elected office in an aviation organization committed to advancement of aviation careers, and is currently a captain for a major airline. This respondent holds a bachelor's degree and has started classwork for a master's degree.

Respondent 8. Respondent 8 holds the commercial rating with about 1500 logged hours, has been in aviation as a career for 30 years, is an instructor, and has owned an FBO. Respondent 8 holds an associate's degree in Aircraft Maintenance Technology, a bachelor's in aviation management, the MBA in International Business, holds the juris doctor (JD) – specializing in aviation, has international experience, and is published in the field.

Respondent 9. Respondent 9 has been actively in an aviation career for over 40 years, and has been an instructor for more than 35 years with experience in Part 61, Part 125, and Part 142 operations, currently managing a Part 142 operation, with responsibilities for developing and overseeing pilot training. Respondent 9 holds the ATP, has over 9000 logged hours, is an FAA-Designated Pilot Evaluator, has been responsible for pilot selection and hiring, has FBO management experience, has international experience, and has worked in aviation management. Respondent 9 served as a fighter pilot, Squadron Commander of a Fighter Squadron, and as a Vice Wing Commander of a Fighter Wing, while serving in the military for 30 years. Respondent 9 is type-rated, served as a board member of NBAA Advisory Council, and holds a bachelor's degree plus seminar training.

Respondent 10. Respondent 10 has been in aviation as a career for almost 20 years, as flight instructor, check-airman, commercial pilot carrying freight, and corporate pilot in a Part 135 fixed wing air ambulance operation, with current responsibilities as flight department manager of the operation and

supervising all flight and maintenance personnel. Respondent 10 has over 5000 hours of logged time, including over 1000 hours as flight instructor.

Method

The Institutional Review Board (IRB) gave approval for the study (see Appendix A), which expired between rounds three and four, requiring a second approval for the continuation (see Appendix B). The first contact with potential participants was by telephone, using a script that explained the process, and requesting participation (see Appendix C). Assenting respondents were e-mailed a consent form (see Appendix D). Subsequent contacts were by e-mail, except on four occasions when it was necessary to contact respondents by telephone, when they did not initially respond, and did not respond to reminder e-mails. Response participation was by e-mail. Demographic data was collected on each participant (Table 1, p. 47).

In an e-mailed notification to expect the Delphi question on the next day, respondents were given initial instructions and suggestions regarding the format for responding (see Appendix E). The purpose of round one was discovery of the elements in the Delphi question, "What do you judge to be adequate standards for entry into pilot training, in light of the events of September 11, 2001?" The first round was pivotal in identifying the issue and soliciting ideas (Dunham, 1998). This identified the essential components of the problem (Jeffrey and Hache, 1995). Feedback was correlated and condensed, using a frequency distribution, into a second round of concerns proposed by the first round.

Second round responses, were, likewise, grouped and condensed into a third round in an attempt to understand the issues involved in the research question. The third round invited further discussion of the identified elements and concerns and solicited respondents' final thoughts. Respondents' comments appeared to stabilize between the second and third round.

Although it is not necessary to reach consensus on the question in a Policy Delphi, a fourth round was sent to respondents asking them to rate their findings with regard to each finding's potential for dealing with the question. The rating used a Likert-like scale with 0 having no potential and 7 having great potential for dealing with the question (Dunham, 1996). Space was provided for additional, optional comments regarding strengths and weaknesses, or further thoughts. Each of the first three rounds

attempted to determine the position and thinking of each member with regard to elements, subtleties, and ramifications of the problem, with feasible solutions. Every round referred respondents back to the original question, in order to keep the study focused. Responses were cross-referenced to search for common concerns and themes, with great effort being made to retain the intent of respondent's comments. Round four was analyzed to seek a ranked list according to means.

The research was inductive in that it moved from the specific event to a general conclusion, and applied, for it sought to solve an immediate and real problem, and descriptive, in that the conclusion(-s) were given with words, primarily, requiring synthesis (Gay, 1996).

Rationale and Cautions Associated with Using the Policy Delphi Method

William Wiersma (2000) says that (all) research demands a systematic process. Gall, Borg and Gall (1996) point out that qualitative research typically deals with complex social phenomena as they occur in a real-life context, and caution that researchers may have to deal with findings that are contrary to their own. James Key (1996) points out that the Delphi Technique is used in the planning process, especially " . . . with appraising the future political, economic, and social environment, (and) ascertaining the role of the organization in this environment . . ." (p. 108). He points out that one of the disadvantages of the Delphi is the difficulty in interpreting particpants' responses. Author Lynn Stuter warns that the Delphi Technique can be used to sway participants' judgments to a central group position (Stuter, 1996, Focus, 1998).

The Policy Delphi technique is a process that systematically searches for public wisdom using area specialists as a substitute for hard data; as such, it is particularly useful in finding that deliberative judgment that many complex issues require for resolution (Linstone & Turoff, 1975).

The Delphi technique was an innovation of the Rand Corporation of Santa Monica, California, with roots in an experiment carried out in 1948 in the hope of improving betting scores at horse races (Lang, 1995). The technique was named for the greatest of all Greek oracles, Apollo's Delphic oracle, whom the Greeks visited for information about their futures, according to H. J. Strauss and L. H. Zeigler (1975). Created by Olaf Helmer and Norman Dalkey around 1953 as a part of RAND's studies of the decision-making process, it was first used in about 1955 as a way to estimate the probable effects of a

massive atomic bombing in the United States. The Delphi Technique became popular about a decade later, when it began to be applied to technological forecasting and corporate planning (Lang, 1995). Kenneth Corey says, "The Delphi Technique . . . is helpful in generating the expert knowledge required to explore planning solutions" (Delbecq, Van de Ven, Gustafson, 1986, p. iii). Randall B. Dunham states that the Delphi technique's purpose is to elicit information and judgments from participants to facilitate problem-solving, planning, and decision-making (Dunham, 1996).

From its beginnings with RAND, uses of the Delphi technique proliferated into private corporations, think tanks, government, education and academia. Essentially, Delphi is the name given to a set of procedures for eliciting and refining the opinions of a group. Further, it satisfies the need to obtain the opinion of experts without the necessity of bringing them together face to face (Dalkey, 1969). Generally, the Delphi is used to explore, to seek information that may generate a consensus of judgment, to correlate informed judgments on a topic, and (or) to educate the respondent group, and can encompass any one or a combination of these objectives (Strauss & Ziegler, 1975, MSUE, 1994).

Joseph P. Martino (1972) outlines a classic Delphi Sequence as originally developed at Rand as a means of forecasting future events, using a four-round format. The round one questionnaire is completely unstructured and open-ended, and asks panelists to make a forecast in the subject under consideration. When returned to the director of the project, that person identifies, then consolidates events, eliminates unimportant events, prepares a list in clear terms and returns that list to the panel as the second questionnaire. The panel, in round two, considers the consolidated list, then makes predictions and gives reasons for their answers. The director then prepares a consolidated summary, mentioning their arguments and reasons, including a statistical summary of the dates of their forecasts, which is returned to the panel as round three. In round three, panelists are asked to review the arguments, and formulate new estimates. Their revision involves their comparing their estimates against the statistical summary provided, for compliance within the interquartile range – and their justifying their views and commenting upon the views of those with whom they are in disagreement, if their new forecast dates fall later than the upper quartile, or earlier than the lower quartile. Upon receiving round three, the director again summarizes the arguments on both sides, computes new quartiles and medians. In round four, the panelists receive the consolidated list of events, the statistical description, and the arguments on both sides. Panelists are asked to consider

the arguments and critiques, and to make a new forecast (Martino, 1972, pp. 21-23). Although convergence is not forced, because panelists may retain their positions outside statistical summaries, he says, "This tendency for the outliers to move toward the median has been corroborated in a number of experiments . . ." (Martino, 1972, p. 26).

Ian Mitroff and Harold Linstone (1993) point out that the Delphi (now) has many variations, but consists of putting a question to a panel of experts who are typically dispersed in different geographical and time zones. They say that "(the) three main characteristics of the Delphi are: (1) group participation, (2), the iteration of responses over several rounds, and (3) the anonymity of responses" (Mitroff & Linstone, 1993, p. 22). While minimizing the adverse qualities of interacting groups, the Delphi " . . . has four basic features: structured questioning, iteration, controlled feedback and anonymity of responses" (Lang, 1995).

Of crucial importance is the makeup of the respondent group. D. Sam Scheele suggests that a successful mix will have three kinds of panelists: " . . . stakeholders, those who are or will be directly affected; experts, those who have an applicable specialty or relevant experience; and facilitators, those who have skills in clarifying, organizing, synthesizing, stimulating . . ." (Linstone & Turoff, 1975, p. 68). Scheele goes on to say that the very process of acquiring understanding that occurs as part of the Delphi carries an impetus for action – and he believes that most panelists " . . . intend to influence the formulation of policy or the making of decisions" (Linstone & Turoff, 1975, p. 70).

The Delphi is one of the best known qualitative methods and is an important opinion capturing technique, according to Trudi Lang (1995). In 1975, Strauss and Ziegler said that the three types of Delphis are numeric, policy and historic, and that, " . . . (the) goal of the numeric Delphi is to specify a single or a minimum range of numeric estimates or forecasts on a problem. The goal of the policy Delphi is to define a range of answers or alternatives to a current or anticipated policy problem. And, the goal of the historic Delphi is to explain the range of issues that fostered a specific decision . . ." (Strauss & Ziegler, 1975, p. 253). Over time, the technique came to be modified to the point, today, where we now have a family of Delphi-inspired techniques – the Conventional Delphi, the Policy Delphi, the Decision Delphi – in a broad range of applications, according to Jan van Dijk (1990). Lang (1995) says, " . . . we no longer use (the Delphi) in the same way we did in the 60's and 70's. This is to be expected, with more prolific use

and continual discussion on improvements" (Lang, 1995). Of these evolved techniques, it is the Policy Delphi that holds the most potential for this research.

The Policy Delphi is " . . . a forum for ideas" (Linstone & Turoff, 1975, p. 10). Murray Turoff states that the Policy Delphi, while not a replacement for the committee process, can operate as a precursor to committee activity, using anywhere from ten to fifty people to explore the issues. He says that the goal, then, is " . . . not so much to obtain a consensus as to expose all the differing positions advocated and the principal pro and con arguments for those positions" (Linstone & Turoff, 1975, p. 86). The Policy Delphi is information-conserving, as opposed to information-reducing. James Davis says, in speaking of an information-conserving format, that although a member's opinions may change as a result of participating in the discussion, there " . . . is no final group-mediated combination that 'loses' the individual contribution . . ." (Davis, 1969, p. 32). Indeed, that respondents change their positions during the course of the exercise is noted by many other authors, as well.

Because the Policy Delphi produces verbal, rather than numeric data, Turoff says that it is a very demanding exercise, for both respondents and researchers. The Policy Delphi, he says, primarily deals with statements, arguments, comments, and discussion. He lists six phases that take place during the exercise. The phases include formulation of the issues, exposing the options, determining initial positions on the issues, exploring the reasons for disagreements, evaluating the underlying reasons and reevaluating the options. Turoff cautions the importance of choosing informed people as respondents, who will bring out the subtleties of the problem, but he further notes that "(the) respondents must gain the feeling that the monitors of the exercise understand the subject well enough to recognize the implications of their abbreviated comments" (Linstone & Turoff, 1975, p. 88). Along this line, Lang, too, calls for carefully keeping the intent of the respondents' answers intact, and repeats the advice from Linstone and Turoff's 1975 list of procedural suggestions to keep statements in the questionnaires to no more than 25 words (Lang, 1995). Open-ended questions are extremely valuable for demonstrating logical reasoning, according to Rob Bjil (Bjil, 1992).

According to tradition, the Delphi is accomplished through a series of questionnaires (Dalkey, Brown & Cochran, 1969). The first questionnaire asks panelists to respond to a broad question, then each subsequent questionnaire is built upon responses to the preceding one, with the process' stopping when

consensus has been approached, or when sufficient information exchange has occurred (Delbecq, Van de Ven, & Gustafson, 1986). Mitroff and Linstone, as an example of old thinking about the Delphi, caution that, because the desire for agreement is normal, the techniques sometimes used pressure participants toward the group mean, producing an artificial consensus. Mitroff & Linstone (1993, p. 29) said,

> If tight agreement or consensus is required before we can act on important social issues, then we seem doomed to perpetual inaction or widespread dissatisfaction no matter which course is taken, a condition in which we have found ourselves too readily in recent years.

They say, in calling for application of a new way of thinking about complex problems and social systems, that new methods are needed for " . . . systematically uncovering important stakeholders and their associated (assumptions), on which every organization's plans and actions depend" (Mitroff & Linstone, 1993, p. 148). They conclude by saying that it is critical with today's problems to examine them systematically from different perspectives.

Lang says that the coordinating team pulls the responses together into a final report (Lang, 1995). Jan van Dijk states that the Policy Delphi is the second step (of five) in applied social research: i.e., the Policy Delphi is the goal of learning, in getting to know and understand the complex issues involved in the broad question (van Dijk, 1990). Dunham, in another of the many adaptations of the basic iterative process, says that the process continues until no new ideas are emerging and "that all strengths, weakness, and opinions have been identified" (Dunham, 1996). Dunham says that the final resolution may occur in one of two ways:

> If dominant, highly evaluated ideas emerge via consensus, the exercise is declared finished. The end product is a list of ideas with their concomitant strengths and weaknesses.
>
> The Coordinator conducts a formal assessment of the group's opinions of the merits of the ideas. There are a number of ways to conduct a formal evaluation. In one method, the Coordinator prepares a questionnaire that lists all the ideas and asks participants to rate each one on a scale. For example, a 7-point scale could be used that ranges from 0 (no potential for dealing with the issue) through 7 (very high potential for dealing with the issue). If this approach is used, participants send the rating forms to the Coordinator, who compiles the results and rank-orders the ideas based on the evaluations.

A second approach for evaluating the ideas is that which is used in the Nominal Group Technique for 'voting.' With this approach, the Coordinator asks each member to identify the top five ideas and assign five points to the most promising idea, 4 points to the next most promising, and 3, 2, and 1 points to the third, fourth, and fifth-best ideas. These votes are returned to the Coordinator, who tallies the results and prepares a report. The report notes the rank order of the ideas based on the total number of points received and indicates the number of people who voted for each idea (Dunham, 1996, p. 2).

Bjil, speaking of technique and resolution, says that the Policy Delphi does not aim for consensus but seeks, instead " . . . to generate the strongest possible opposing views on the resolution of an issue and to table as many opinions as possible . . . to expose the range of positions advocated and the pros and cons of each position" (Bjil, 1992, p. 241). Lang concurs that it is important that the study strives for stability rather than consensus, so that divergent opinions can be acknowledged and included in the findings (Lang, 1995). Scheele quotes Henry James' statement: "Many things have to be said obscurely before they can be said clearly" (Linstone & Turoff, 1975, p. 71).

Application of the Policy Delphi Technique to this Research

In this study, then, the Policy Delphi was used as a method for structuring a group communication process so that the process was effective in allowing a group of geographically separated individuals, as a whole, to deal with a complex problem. Respondents were presumed to have an intuitive feel for the complexities of the issues, achieved through training, education and experience. Due to their expertise, it was further presumed that they would, then, intuitively agree that the "obvious" questions and subissues were equally understood by all so that they would be able to " . . . ferret out the subtle aspects" (Linstone & Turoff, 1975, p. 88). The process included procedures for feedback of individual contributions of information and knowledge, some assessment of the group's judgment or view, some opportunity for individuals to revise their views, and some degree of anonymity for the individual responses (Linstone & Turoff, 1975).

The opportunity for individual respondents to modify or refine views differentiated the exercise from an ordinary polling of experts. The refinements were made through subsequent rounds in which a

summary of the previous round's responses was sent back to the respondents. In responding to the other respondents' views with anonymity, each respondent was able to speak with candor, and without risk of power struggles.

The phases of the exercise started with the first-round initial exploration of the subject under discussion, during which each individual added information that was pertinent to the issue from the vantage point of his or her expertise and experience (see Appendix F).

The second round, in considering the first-round input from all respondents, refined how the group viewed the issue, and added further areas of consideration based on the items that surfaced during the first round (see Appendix G).

Disagreements which surfaced were further explored in round three to discover the reasons for the disagreements and, perhaps, to evaluate them. Round three also called for respondents' final comments (see Appendix H).

After the third round, when all previously gathered information had been analyzed into a list of 25 findings, a fourth round called for respondents to rank the list with regard to each finding's potential to deal with the problem. This procedure reflected areas of high agreement, and of disagreement. Turoff warns that ignoring disagreements may produce an artificial consensus (Linstone & Turoff, 1975).

The additional advantages of using the Policy Delphi technique included minimizing feelings and nonverbal communications, and allowing the greatest degree of freedom of expression of knowledge and opinions for each respondent based on his or her expertise. Turoff points out that reflection and imagination are stimulated by the committee-free environment and the anonymity of the Delphi (Linstone & Turoff, 1975). Researcher Miriam Raskin found that participants appreciate the dialogue that the Delphi permits between geographically separated experts, as well as the personal learning that occurs (Raskin, M. S., 1994).

Validity and Reliability

While no one mode of inquiry perfectly satisfies every requirement for truth content, the Delphi technique of data-gathering fosters validity (Linstone & Turoff, 1975). Wiersma states that increasing the size of the sample (panel) does not counter bias, but only increases the quantity of data. He adds that it is

the perceptions of those involved in the study that must be captured in order to obtain the accurate measure of reality that the research seeks (Wiersma, 2000).

In actuality, Turoff notes that the objective of the study may not be consensus, but to elicit many diverse points of view and potential aspects of the issue given that the respondents are “informed” individuals in different specialties related to the problem area, which is much broader in scope than the knowledge that any one individual respondent possesses (Linstone & Turoff, 1975).

The premise of reliability of the Delphi study lies in the inference that a larger group, using consistent methods with other experts, would develop the same results, according to Linstone & Turoff (1975).

CHAPTER IV

FINDINGS

Introduction and Rationale

Because terrorists had been taking pilot training (see Appendix J) in the United States prior to September 11, 2001, then used their training on that infamous day to hijack four airborne jetliners heavily loaded with fuel, and then flew them into targets selected, apparently, for maximum damage, they created a clear and present need to examine the standards for entry into flight training in the United States.

Thousands of innocent lives were lost, and billions of dollars of damage were done, including the total destruction of the two World Trade Centers in New York City and extensive damage to one wing of The Pentagon, in Washington, DC.

Since all flight, and all flight training for powered aircraft in the United States was done under the Department of Transportation's Title 14 of the Code of Federal Regulations under the regulatory authority of the Federal Aviation Administration, a study of the FAA's standards for eligibility for flight training was clearly mandated.

The Policy Delphi technique, evolved from the classic Delphi technique developed by The Rand Corporation for the United States Air Force in the 1950s, provided a vehicle for an emergent study, which sought insights from aviation experts through four iterations of the question, "What do you judge to be adequate standards for flight training, in the light of the events of September 11, 2001?" The three rounds of discovery and comments were followed by a fourth round that asked respondents to rate their findings, and gave them the opportunity for additional comments, if they so desired. Consensus was not sought as the primary outcome, although Paul Leedy (1997) says that convergence provides a measure of construct validity (p. 34). The study was designed to remain emergent throughout all iterations, and with respondents unaware of the identities of others on the panel. Martino's 1972 model, modified from the original Rand technique, was adapted for this study (Martino, 1972).

Since the Delphi study required expertise in diverse areas of the subject at issue in order to seek clarification, respondents were selected because of their own advanced knowledge and specialties in aviation, and because, together, they provided a wide range of experiences and skills. This combination of knowledge, skills, and experiences was intended to generate depth and breadth in the study.

As the study progressed, clarifying statements from each respondent were categorized and returned to all respondents, via email, inviting more comments, in an effort to elicit greater insights as they built on each other's views. The final ratings from round four came after the study had stabilized between rounds two and three, and reflected, in part, the respondents' own emergent understanding.

The Question

The Delphi question sent to respondents was, "What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?"

Qualifications of respondents and rates of responses

Because the classic Delphi study requires expertise in diverse areas of the subject at issue in order to seek clarification of the elements of the research question, respondents were selected because of their advanced knowledge or experience that would enable them to consider the question, "What do you judge to be adequate standards for flight training, in the light of the events of September 11, 2001?" Respondents were selected as known experts, or because they were recommended by other known experts. Advanced knowledge or experiences in some or all of the following areas were sought:

1. Aviation training institutions
    a. Part 141 schools
    b. Part 142 training institutions
    c. Part 61 instructors
2. Aviation industry
    a. Aircraft manufacture
    a. Aircraft support industry
3. FAA representatives

a. Administration

b. Legal

c. Inspection

d. Air traffic control

e. Aeromedical

4. Pilot organizations

a. Administration

b. Professional pilot

i. Part 121

ii. Part 125

iii. Part 135

iv. Part 141

v. Part 142

c. General aviation pilot

From the database of potential respondents, ten (of fifteen) were selected, in accordance with Rand recommendations of ideal respondent panel size and committee agreement.

Respondents were, then, selected for consideration for the Delphi panel because of their individual and combined expertise in aviation, representing different specialty areas within aviation, their years of being involved in aviation and in being decision-makers, and because their combined aviation experience provided a broad range for developing insights into the question. In addition, to be considered, an individual had to be earning his/her primary income in aviation. Ten respondents were selected. All were still active in aviation as a career, at the time of the study, with no immediate plans among them to retire. They lived and worked in different parts of the United States. Some worked abroad, but not regularly at the time of the study.

Six of the respondents held the ATP rating, two held the commercial license, and one held a private pilot license with instrument rating. Three had been actively involved in aviation for over 40 years, four had been active in aviation for over 25 years, and three for over 10 years; therefore, their combined

experience totaled 220 years in aviation. Six respondents were type-rated. Three respondents held rotary-wing ratings, and one held a glider rating.

Eight of the respondents were instructors (CFIs). Two of the eight had been instructing for over 30 years. They had experience in Part 61 operations, as well as Part 121, Part 125, Part 135, Part 141, and Part 142 operations. Only five respondents listed actual logbook hours, but their combined total was over 42,500 hours of logged time. Three respondents mentioned military service, totaling 66 years.

Three respondents were FAA-designated pilot evaluators, and one was an active journalist and expert witness, including the area of pilots' logbooks and records, and had formerly been responsible for hiring thousands of pilots for a major airline, over a period of years.

Three were published in their field, and four had had extensive international experience, including serving on international decision-making bodies.

One respondent was an AME, one was an aviation attorney, two were FAA Aviation Education Counselors, one was an FAA Safety Inspector, three had spent time in aviation management (or were still in aviation management), and three were professional aviation consultants. Four had been FBO owners or managers at some point in their careers. One was currently working directly for the FAA.

Two respondents had held a national office in an aviation organization, and three had had college classroom experience as an instructor. Three were supervising other pilots at the time of the study. Two respondents had had experience in building their own aircraft. Nine of the ten were active pilots at the time of the study.

Two respondents held doctorate degrees, and a third was working on a dissertation at the time of the study. Two held the master's degree and three held bachelor's degrees. The others held certificates of training, and had partially completed the bachelor's degree.

The response rate was consistently ninety percent for each of the first three rounds; i.e., the same nine panelists of the ten responded each round. Round four had a response rate of one hundred percent.

Iterations and Response Rates

Round One

One day prior to e-mailing the Delphi question, a notification to expect the question the next day (see Appendix E) was sent. The purposes of this notification were to alert the respondents to expect Round One's Delphi question, and to give the respondents some guidance concerning their responses, as well as some encouragement to participate fully.

Specifically, these points were included:

- Respondents were asked to take a minute as soon as possible to look at the question and give their thoughts about the issues involved in the question, from the perspective of their experiences/expertise. They were asked to send their thoughts back as a reply, or as new mail.
- They were instructed to make their responses as long or short as they liked, using any format, including bullet points, phrases, sentences, and paragraphs. The important thing, for round one, was to get started. **"**What do you think, when you consider the question?" was to be their guide.
- They were reminded that they would not be identified – so they could say anything that they wished. For round two (around mid-July), they could expect to receive a composite of all the respondents' answers to round one, for their further consideration.
- They were reminded that they would not hear from me again for at least two weeks, and thanked for participating.

Because of the researcher's professional experiences in the field, all efforts were made to avoid biasing the question with the researcher's opinion. Round one, then, consisted of only the question: "What do you judge to be adequate standards for flight training, in the light of the events of September 11, 2001?" Although round one was sent to ten respondents, only nine returned the questionnaire, even after reminders were sent. Linstone and Turoff state that an eighty percent return is adequate for analysis (Linstone & Turoff, 1975). The responses identified eighteen areas of concern (see Table II).

TABLE II

ROUND ONE RESPONSES AND FREQUENCY OF COMMENTS

Discovery or concern	Frequency of comment
Primary training/ab initio mention	8
Do background checks on persons entering flight training	5
Register and track international students	4
Regulations are training regulations and are inadequate to stop or prevent an attack	4
Regulations are adequate and are not the issue	3
Require positive identification of flight students	2

(table continues)

Discovery or concern	Frequency of comment
Consider the negative effect on General Aviation of more stringent regulations	2
Be aware that terrorists would use other modes for future attacks	2
Do psychological test prior to commencing flight training	2
Interview candidates for flight training prior to primary training	2
National security issue – not training issue	2
INS needs to standardize and control immigration issues	1
Require US citizenship prior to training	1
Require airman's medical exam prior to commencing training	1
Develop situational awareness	1
Proceed cautiously to protect the extraordinary liberties of flight in US	1
Consider the negative effect on flight schools of more stringent regulations	1
Pass TOEFL, as a condition for flight training	1

Synopsis of Round One: Discovery of the Issues Embedded in the Question.

In response to the question, "What do you judge to be adequate standards for entry into flight training in the light of the events of September 11, 2001?" the Delphi respondents answered with insights into the issues embedded in the question:

1. Regarding the Adequacy of Title 14 CFR: Part 61. Three respondents said, outright, that the current (entry into flight training) regulations are adequate as they are, in answer to the question.

2. **A**dditions to Existing Regulations. Some of the respondents proposed a total of five additions to existing regulations.

First, one respondent suggested that a United States airmen's medical certificate could be required, prior to commencing flight training.

Second, psychological testing should be required, prior to commencing flight training according to two respondents. One specifically said that the test should be specific to pilots and validated by the FAA. The other respondent who spoke to psychological testing said that it should be part of the airmen's medical.

Third, passing the Test of English as a Foreign Language (TOEFL), if not proficient in English should be required of persons who speak English as a second language, according to one respondent.

Fourth, two respondents suggested that the flight candidate should submit to a formal interview conducted by a responsible person, or the training organization, to " … validate the candidate's goals and perceptions regarding the training that will be undertaken."

Fifth, admitting to the difficulty in implementing the suggestion, because of its adverse effect on flight training institutions that depend upon foreign flight students, one respondent suggested that a measure that could be taken would be to make United States citizenship mandatory, prior to commencing flight training.

3. **P**reventative Measures. Background checks were recommended by five respondents, ranging from just checking against the TSA's "no-fly" list to full FBI security checks " . . . like the military and civil government does for certain sensitive positions." One respondent specifically included United States, as well as foreign, flight students.

Registration and tracking were recommended for international students by four respondents. Positive identification – some acceptable form of documentation – was suggested by two respondents, however, one respondent strongly felt that entry level students should not be subjected to background checks.

Situational awareness is a key preventative measure, according to one respondent.

4. Other Concerns and Comments. Regarding "aircraft as weapons:" terrorists would choose other modes (than aircraft) for future attacks, partly because screening measures at airports and barring cockpit doors, is "adequate" now according to two respondents.

Three respondents stated that Part 61 regulations were inadequate to prevent a "9/11 type" attack. As a corollary to that, one respondent specifically said, "My perception is that the events of 9/11 should not be an issue when considering adequate standards for entry into flight training (because) the inadequacies that led to the events of September 11 could be found in the lack of standardization and control in the Immigration and Naturalization Service. To put it simply, the barn door was left open." Continuing, that respondent went on to say that the immigration issues should not be regulated at the flight training entry level, but by appropriate governmental agencies.

In apparently parallel thinking, another respondent pointed out that the training regulations are meant to be prerequisites for certification and " . . . were never designed to prevent a 9/11 type incident and they are grossly inadequate in that regard."

The negative effect of more stringent entry regulations on General Aviation was brought out by one respondent.

The negative effect of restricting foreigners from training in this country, on flight schools that draw the bulk of their student population from other countries, was stated by one respondent.

The potential loss – and need to proceed cautiously, therefore – of the " . . . extraordinary liberties of flight that we enjoy in this country . . ." was discussed by one respondent.

In addition, two respondents expressed concern, although not embedded directly in the question, over advanced training issues as being pertinent to the security and safety issues in this age.

5. Summative Quotes. " . . .the definition of entry into flight training has changed."

"Interesting question, for a short sentence it has a few areas that are very large."

"My major concern with regards to your specific question is national security."

" . . . adequate standards should include: A standard psychological test specific to pilots and validated by the FAA."

" . . . foreign flight students (don't) pose as great a security threat as they did prior to 9/11. I'm sure that if there is another attack on this country the terrorists will use another method."

"My perception is that many of the inadequacies that led to the events of September 11 can be found in the lack of standardization and control in the Immigration and Naturalization Service. To put it simply the barn door was left open."

"Do we question the standards for entering a drivers education course because someone drove a van with a bomb into a Federal Building?"

"So whenever we move to place barriers upon flight students entering training here, we must be mindful of the rights of citizens and foreign nationals alike, to freely participate in flight training in this country."

" . . . a formal interview should be conducted with the flight candidate (prior to commencing

training) by the training organization to validate the candidate's goals and perceptions regarding the training that will be undertaken."

"Have the candidate have a discussion with a responsible person on 'why' they want to get into flight training."

"The current FAA requirements are adequate."

"I do not believe that for student starts a background investigation should be initiated."

"I believe we have the large airliner crash into the building almost under control via the security at the airport and secure doors to the flight deck. Any other airplane is unsecured. Large trucks hide a lot of potential."

Round Two

The e-mail sent to respondents provided them with a narrative compilation of the concerns and comments from the first round, including frequencies of comments, and the quotes detailed above. The accompanying letter thanked respondents for their participation and their insightful comments, and asked them to read the discoveries from the first round, then to, " . . . consider, pounce, refute, agree/disagree, revise your own opinion(-s), add new thoughts, etc." Ten e-mails were sent, but only nine respondents participated in round two, even after reminders were sent and extra time allotted, to accommodate summer travel schedules.

In response to round two, twenty areas received most of the respondents' attention. As invited, some of the comments refuted ideas advanced in round one. Several new areas were brought out, as well.

TABLE III

ROUND TWO RESPONSES AND FREQUENCY OF COMMENTS

Discovery or concern	Frequency of comment
Background screening	8
Interviews as screening techniques	6
Terrorists' weapons: aircraft and other modes	6
Adequacy of Part 61	5

(table continues)

Discovery or concern	Frequency of comment
Changing the standards	5
National security issue – not training issue	5
Work loads and effects: FBI, TSA, FAA, flight schools	4
Registration/tracking international students	3
Psychological testing as screening technique	3
Medical, as screening device	3
US citizenship as requirement	3
Positive identification	3
INS responsibilities	2
Inadequacy of Part 61	2
Cockpit security adequacy	2
Civil liberties: change or loss	2
Training regulations: other industries	2
Part 61 language requirements vs. TOEFL	2
Call for no background check for entry level	1
Airport screening (inadequacy of)	1

Synopsis Of Round Two: Further Discovery Of Issues,

Discussion, And Quotes From Respondents

There were 20 areas that received most of the respondents' attention during round 2, with some overlap of topics.

1. Issues and concerns, proposed actions, discovery, or suggestions of no actions needed. Eight respondents commented on the topic of background screening. Seven of the eight advocated screening by the FBI or TSA for foreign students, but one added that US students should be screened, as well. One respondent noted that lengthy and expensive background screening is already being done for non-citizens seeking a type rating.

Each of the six panelists who responded to the idea of using interviews as screening techniques expressed negativity to the idea, with comments ranging from ridicule to sarcasm to outright rejection because of the inherent difficulty in devising an effective interview and finding an acceptable interviewer. The six respondents who referred to terrorists' future methods agreed that there were many modes that could be used, other than just aircraft, including trucks packed with explosives, convening on a target, as well as boats, trains, and subways.

Five respondents affirmed their position that the training regulations as stated in Part 61 were adequate. Specifically, five respondents also stated outright that the events of September 11, 2001, were a national security issue, and not a training issue.

Although five respondents spoke to the idea of changing the entry standard(-s), two specifically disagreed that there was a need to change it. One respondent said, "I could support an addition to Part 61 that requires the CFI or school to advise the system of any student showing abnormal tendencies or interest in training." Along the same line, another respondent noted that the U.S. has become a "service country", and that " . . . we should be working at better quality . . . not quantity (of students)." Four respondents expressed concern over adding to the workloads of the FBI, the TSA, the FAA, and/or flight schools if entry standards were made more stringent, but one noted that background checks of prospective students are already in place at his/her place of employment. Some comments reflected concern over loss of Bill of Rights privacy that would accompany the FBI or TSA's inquiries into entrants' personal lives.

Registering and tracking international students was specifically commented on by three respondents. The majority opinion stated was that the tracking should continue at regular intervals throughout training. One respondent tied registering and tracking to the background checks and said that if we do them, then we will know where they (international students) are, and what training they are taking.

Psychological testing as a screening tool drew comments from three respondents, but ranged from total disagreement to musings about the questionable effectiveness and the added burden testing would place on already struggling general aviation flight training. One respondent wondered if representatives of the FAA could pass a psychological test.

Three respondents weighed in on the airman's medical issue, with positions ranging from requiring the medical prior to any training, to keeping it as it is: i.e., requiring the exam prior to solo, allowing students to experience a few lessons before committing to training, including the expense of the medical.

Requiring US citizenship before permitting training was rejected by three respondents. One respondent noted that " . . . applicants may not receive a type rating in an aircraft with a weight greater than 12,500 pounds without proof of citizenship or a background check and fingerprinting. We don't really

want to turn away non citizens, so a background check for all aircraft training for non citizens is a possibility."

Three respondents spoke to the issue of an applicant's presenting positive identification before being allowed to begin flight training. One respondent, especially, pointed out the difficulty in determining the authenticity of identification papers, and the need for training in this area.

Two respondents commented that the events of September 11, 200l, were the result of the INS' failures, and, specifically, that the INS had not been responsible enough, thus allowing the events to develop.

Addressing the concept of the inadequacy of Part 61, two respondents answered with arguments that stated the counter position. One stated that the regulations " . . . did not take into account that . . . people would hijack an airplane and run it into a building killing themselves and many others. How do we make the regulation stronger is probably the exercise (the Delphi) we are in the middle of right now." The other respondent commented that "Part 61 regulations were not meant to prevent a terrorist (attack.) Terrorists do not acknowledge regulations."

Regarding cockpit security, one respondent made mention of the difference between commercial and corporate requirements for security and barred cockpit doors, by stating that, " . . .(C)ommercial aircraft do have security and barred doors, but large corporate aircraft do not." Another respondent agreed with the round 1 statement, however, that cockpit security is now adequate. Both of these respondents felt that other security measures were still lacking: to wit, the general security around smaller airports, and security around other venues that might provide opportunity to terrorists, such as the aforementioned trucks. A third respondent, although not addressing cockpit security spoke to an unsatisfactory level of security within the cabin and cited that most flight attendants had not received additional training in self-defense, to date.

In this round, only two respondents spoke directly to the loss of civil liberties in the field of aviation that the events of September 11, 2001, had caused. One of the respondents stated that " . . . we must accept the fact that some of our freedoms are going to be taken from us." Another respondent stated that we must recall that, "It is not a right to participate in flight training, but a privilege . . ." and noted that

the system already restricts entrance with its attention to " . . . alcohol/drug convictions, (and) excessive traffic violations."

Two respondents referenced training regulations in other industries, by comparing those industries to aviation. Specifically, one respondent suggested that, "If automobiles . . . were regulated and tested to standards as (in aviation), we would certainly have fewer automobile fatalities and far fewer 'un driveworthy' vehicles on our roads."

One respondent felt that the English language requirements were adequate as they are because Part 61 requires proficiency in English already. Another respondent felt that passing the TOEFL was a necessity in the global environment, since English is the language of aviation.

Again, one respondent called for no background check for entry level training, to allow potential students the opportunity to experience some training before making a final commitment to training. Finally, one respondent felt that airport screening was not yet adequate, citing the ease with which one could carry small implements through the security checks.

1. Quotes From Respondents, To Further Clarify The Issues. To retain the intent of respondents' comments, again, quotes were included as fodder.

A. Background screening:

"Yes – (by) some official government agency. (This is) already in place at some training centers. (With no offer of training without background check's being completed.)"

"By whom? Does the FBI or TSA have the personnel?"

"Current regulations: applicants may not receive type rating in aircraft of greater than 12,500 lbs without proof of citizenship and background check and fingerprinting. (A) background heck for all aircraft training for non-citizens is a possibility."

" . . . already being done for non-citizens in aircraft requiring a new type rating. (But) it is a lengthy and expensive process."

" . . . good background check is in order along with stricter standards and a medical prior to flight training."

" . . . background check, with ground school only, until approvals come back. Set time limit for intervals between flight training. If exceeded, rerun background check."

A. Interviews as screening techniques:

"(I, respondent) withdraw the recommendation and move (my) support to background screening."

"W ho is 'responsible' person who would judge another . . . Terrorists might be quite capable of passing an interview."

"'Responsible' is just too broad. Was President Clinton responsible?"

"A terrorist would tell the truth?"

"A formal interview by trained (personnel) presents an obstacle for the legitimate pilot candidate already facing immense costs. (Also) adds costs to flight school . . ."

"Who? Someone from the FAA?"

C. Terrorists' weapons: aircraft and other modes:

"(A) terrorist will choose (any) available mode. If aircraft, then not because of training regulations. Large corporate aircraft do not have the security and barred doors of commercial aircraft. (Also) security is not as strict at smaller airports. Security training is now a requirement for all operators – however, many don't know how or what to train."

"(There will be) other modes in the future. (Consider) truck rental – (bomb-laden) trucks converging on the White House."

"Trucks, boats, trains, subways – all … potential threat."

"Have you heard the latest aviation threat? Terrorists have been observed practicing smuggling explosive parts onto an aircraft (using several participants) then assembling the device in the aircraft lavatory. No flight training necessary for this threat!"

"In the interim, the FAA has approved the "Sport Pilot" designation allowing pilots to self-certify their medical status and fly aircraft limited to 1800 pounds maximum gross weight. While that weight aircraft do not have the mass to cause much damage to a structure; it could be used to disperse a chemical or biological agent. This doesn't change the basic question as these pilots must still receive their initial training from a CFI before obtaining their pilot certificate. . . ."

D. Part 61: adequacy:

"Current regulations are adequate – interesting comments notwithstanding."

" . . . not meant to prevent a terrorist attack. Terrorists do not acknowledge regulations."

" . . . sufficient. However, TSA background checks of foreign flight students is a good idea."

A. Changing the standards:

"Do we question the standards for entering a drivers education course because someone drove a van with a bomb into a Federal Building?"

"Okay … Excellent point! This one really made me think."

"Any regulation (causing additional investigation) will have an adverse impact on individuals and flight schools."

"I could support an addition to Part 61 that requires the CFI (or school) to advise the system (FAA/TSA/FBI?) of any student showing abnormal tendencies or interests in training. Call it profiling if you wish, but the unusual interest in flight control only and no interest in learning to safely land – (shown by the 9/11 hijackers) could possibly have pointed out a trend and been investigated by the school officials involved. Perhaps there was more interest in cash flow than student progress."

"Training regulations to operate trucks, boats, trains, subways would never be considered as it is with aviation."

B. National Security issue – not training issue:

"(This is not an aviation training issue. This is a national security issue. Every person in the US should become situationally aware for all types of unusual activity. Not paranoid – just aware."

"One security inspector may have 200+ operators to work with."

G. Workloads and effects: FBI, TSA, FAA, schools:

"Are FBI or TSA personnel available to do screenings?"

H. Registration/tracking international students:

"Yes, by INS for all international students – not just flight training. All training."

"Know where they are and what training they are taking through background checks."

"What needs improvement is immigration control. Our country is still at risk to terrorist attack by persons crossing our southern borders."

I. Psychological testing as screening technique:

"No."

"I totally disagree. What kind of test would work? Who would give it? Who would be the judge? Would the Wright Brothers have passed? …stringent rules/policies would need to be in place before a psychological test should determine my career path!"

"Good idea, but my concerns are two-fold: there is no guarantee that pre-training testing in security or psychology would prevent a 9/11 incident, and GA (general aviation) is already struggling. The added burden of additional testing would add barriers to new student entrants, lowering their numbers and increasing the strain on flight schools."

A. Medical:

"Prior to solo is adequate, allowing a person to take a few lessons to see if they like it."

"I agree with a medical before commencing flight training."

"A medical is already required, before (solo) flight."

B. US citizenship as requirement:

"No. (Allow) anyone, according to Part 61, but limit to ground school until approvals from background checks."

"Requiring citizenship would put some schools out of business."

C. Positive identification:

"… done at time person applies for medical."

"Since many persons wouldn't know the difference between a real and a fake ID, training would be required for anyone checking the ID. There is an entire book on many acceptable forms of IDs for persons not carrying a passport."

D. INS responsibilities:

Re ' *open barn door'* comment: Respondent: "Well said. Bravo!"

[Other comments overlapped into several categories.]

E. Part 61: inadequacy:

"How do we make the regulations stronger? This Delphi is part of that exercise …"

F. Cockpit security adequacy:

"Yes."

"Did they legalize marijuana usage in the US?"

G. Civil liberties: change or loss:

[See Summative Quotes in section 3.]

H. Training regulations in other industries:

[Comments overlapped.]

I. Part 61 language requirements vs. TOEFL:

"English proficiency is already required…"

"Terrorists … are often proficient …(in English) …"

J. Call for no background check for entry level students:

"Agreed. If a background check is required, it should be done prior to solo."

"Wrong. Everyone . . . "

"Really. Should we wait until they have full working knowledge of all aircraft systems, ATC (air traffic control) systems, etc.?"

K. Airport screening: inadequate

[See 'Summation' comments.]

Summative Quotes. These quotes are to highlight the passion with which respondents spoke.

"It is not a right to participate in flight training, but a privilege. This can, and already is, restricted by the system. (Alcohol, drug convictions, excessive traffic violations.)"

"Even if 9/11 is taken out of the scenario, standards should be more strict. Besides, you can't take 9/11 out of the picture – it happened and security is an issue."

" Does it matter how many people are killed to make it relevant? Regardless of 9/11, I don't believe the system sufficiently screens out potential hazards to the pilot and to others. If you look at the statistics, in 2004 alone, there were 890 accidents, 737 of them were GA, 22% of those were fatal. None were Part 121 carriers and only 11 were Part 135. With foreign students, the risk factor increases because of language problems. Terrorists can find a way to turn a Cessna 152 into a killing machine if they want."

"We must improve the TSA program and improve some of the training and then accept the fact that some of our freedoms are going to be taken from us. [(Respondent) inadvertently carried small implement in carry-on through security over 50 times before screening caught them – and asked, "Still feel safe?"]

"We must find a way to better screen new entrants into flight training without reducing individual liberties, and without placing undue financial burdens on existing flight schools. Any options we suggest should be validated with regard to their potential to avert a 9/11 type disaster."

Round Three

As for the second round, the e-mail sent to respondents provided them with a narrative compilation of the concerns and comments from the previous round, including frequencies of comments, and the quotes detailed above. The accompanying letter thanked respondents for their gracious participation and their insightful comments. In the third round of discovery, they were asked to read the synopsis of round two with its twenty areas of concern, and then to crystallize their own thoughts into their "final" positions and to comment on the issues.

Respondents were reminded that they had identified and developed issues, and, in some cases had discarded some. They were complimented again for the complexity of their thoughts, the very fine lines they had drawn in discussing some of the issues, both their musings and their provocative questions, and for their effective use of language, including sarcasm, to make their points. They were reminded that they had done an outstanding job of identifying issues and concerns, and offering or considering possible actions. Finally, the range of their observations was noted – from fiery passion to deliberately thoughtful – as they had well demonstrated their expertise and deep concerns for aviation.

Again, ten e-mails were sent, but only nine respondents participated in round two, even after reminders were again sent and extra time allotted, as in previous rounds.

In response to round three, twenty-one areas received most of their attention.

TABLE IV

ROUND THREE RESPONSES AND FREQUENCY OF COMMENTS

Discovery or concern	Frequency of comment
Part 61 training regulations adequate, but will not defeat a hideous plan	7
INS' responsibility to eliminate weaknesses in immigration systems	4
Aviation community must unify to protect rights and freedoms left	4
Danger still exists from terrorists	4
INS' responsibility to round up threats	3
National security issue – not training issue	3
Develop situational awareness	3
Security screening necessary for any person entering flight training	3
Keep in mind that it is a privilege to fly, not a right	3
Periodic rescreening necessary for persons throughout flight training	2
Flight schools should focus on quality of training, without distractions of paranoia	2
Terrorists will find other modes – not flight student threat	2
Accept additional costs as necessary because of additional measures necessary	2
Remember that a danger still exists for another attack using aviation	1
Allow ground school only, until approvals come back from screening agency	1
Do background screening for foreign students	1
Do terrorist profiling	1
Interview CFI applicants	1
Develop pilot psychological test	1
Require better language skills	1
Require no background check for entry level	1

Synopsis of Round Three**:** Respondents' Final Positions on the Issues

There were twenty-one areas that respondents selected for their final consideration, as they considered the question, "What do you judge to be adequate standards for entry into flight training in the light of the events of September 11, 2001?"

Rather than merely ranking their responses, the respondents continued to work on problem solving, even stating, in one case, that this Delphi was a part of the process of problem-solving that would " . . . avoid future 9/11-like events."

1. Final Positions. The strongest agreement came from seven respondents who spoke directly, in their final comments, to the issue of the adequacy of the existing regulations governing entry standards. With their specific agreement that the regulations were adequate for entry into flight training, and would not defeat a hideous plan to use aircraft as weapons in a terrorist attack, they said that the regulations were never meant to address any issue other than flight training standards. Along this line, two respondents emphasized that the flight schools should focus on the quality of training, not on the paranoia associated with screening students.

A total of six respondents spoke to the recurring theme of the INS' responsibility regarding the events of September 11, 2001. Four of these respondents repeated that the INS had the responsibility to eliminate weaknesses in immigration systems that allowed the September 11, 2001, terrorists into the country and into flight training. Two other respondents again stated that they believed that there exists an ongoing need for the INS to "round up" threats who might act in a second terrorist attack. (One respondent addressed both issues.) However, two respondents believed that the terrorists would use other modes, and were not a flight student threat.

Four respondents took a specific position that the aviation community must unify to protect the rights and freedoms left, but agreed that there still exists a danger for further attacks. Only one respondent believed that there was a continuing danger of another attack using aircraft.

Three respondents specifically took the position that the events of September 11, 2001, were a national security issue and not a training issue. These respondents were among the seven who emphatically stated that the regulations were adequate as they were at the time.

Three respondents pointed out that situational awareness must be further developed, by all citizens, not just flight instructors who might question why a student would be interested only in learning to handle an airborne aircraft, but not in learning to land it.

Three respondents, two of whom were among the seven who thought it necessary to affirm their position on the adequacy of the existing regulations, said that there should be security screening for any person entering flight training, to be done by the FBI or TSA or some other agency capable of managing the workload. Two of those three went on to state that there should be periodic rescreening throughout

training. One other respondent specified that foreign students should be subjected to background screening, and one other respondent stated a position that there should be "terrorist profiling" done. Two respondents pointed out the need to accept the additional costs made necessary because of the "additional measures" necessary to protect the public.

One respondent stated that a student should be allowed to take ground school, only, until background checks came back.

One respondent continued to support the development of a pilot physiological test, a requirement for better language skills, and an interview for CFI candidates to determine their motivation and ability to be situationally aware enough to act as a shield against foreign threats.

Finally, three respondents mused that pilots should remember that it is a privilege to fly, not a right.

1. Quotes From Respondents, Selected To Further Clarify Their Positions.

A. The regulations:

"Part 61 is a training regulation. It should cover the training requirements necessary for certification. Issues such as knowledge, age, previous certifications, experience levels and such. It should not be encumbered with immigration issues such as visa requirements, travel histories and the like. Those are issues for other Agencies and Departments to deal with. The regulation can say that after all the other National Agency requirements are met, and the requirements of Part 61 are satisfied, training can begin. All the 'close the barn door' requirements that have been piggybacked onto the FARs belong elsewhere. There is a real need for quick communications between US national agencies and their foreign counterparts. The lack of this capability has created problems within the training industry that will have an eventual negative impact on US training capabilities unless addressed and remedied. Various trade and industry working groups are currently working on the problems with varying degrees of success. However, it is not the job of the FAA to certify foreign pilot candidates for entry into the US."

"I'm still an advocate of Part 61 entry requirements into pilot training. The requirements are sensible and well thought-out. Don't change them. . . . "

"Part 61 deals with minimum requirements for certification. A person can participate in flight training and acquire a good bit of knowledge and skill before achieving any of the Part 61 certification requirements. . . . I have concluded that Part 61 is inadequate for preventing a person from using flight training in a 9/11 type attack."

"For ab-initio student entry, I believe the regulations are adequate as they stand. The regulations are broad enough to allow an individual to explore the realm (and thrill) of flight to determine the feasibility of pursuing the goal of certification without excessive regulatory interference and at a reasonable cost – in both financial and time expenditures.

"I agree (that) ' . . . (the regulations) are not meant to prevent a terrorist attack. Terrorists do not acknowledge regulations.'"

"Part 61 should be kept as is – it addresses all the necessary issues for flight training. Get the INS, DOJ and TRA into the picture and we might stand a chance of success. Keep the ACLU lawyers out of the picture for the moment – maybe even longer than a moment."

B. INS' responsibility, and other modes of attack:

"Change the current INS procedures and keep the current regulations."

"If foreign students are to be accepted, the burden of security should be placed on the government agencies permitting them to enter the US."

"I agree (with) 'What needs improvement is immigration control. Our country is still at risk to terrorist attack by persons crossing our southern borders.'"

"I still do not feel that there is a big threat from foreign student pilots. If there is another attack on US soil I think the terrorists will use a different method, as they did in Spain. The US government must have come to the same conclusion or there would have been more restrictions on foreign student pilots . . . . (The "barn door") is still open mostly and there are people roaming our country who wish to do us harm and they must be caught at all costs. I would like to see the US government do something more proactive about rounding up some of these persons and the persons who may be assisting them. I know there are some very dedicated people working on this and I hope they are successful before there is another attack on US soil."

C. Aviation community must unify, and situational awareness:

"One outstanding attribute that most pilots have is a desire to share this privilege with others. There will always be the possibility that one aviation lover will at some point be discovered by an entity and used to obtain whatever information is needed to complete some hideous plan. No amount of regulation will defeat this. We only need to look around us as others have learned to do and raise the alarm when we detect a threat. Pilots as a lot are a passive group who only want to pursue their passion. We can no longer sit quietly holding on to our precious licenses while others take advantage of our largess. We as a group must assume our part in making our occupation (or passion, in most cases) a safer, more respected pursuit. Any one who truly loves and enjoys flying knows when they encounter someone who is asking the right questions for the right reasons."

"I wonder how closely the events of September 11 emotionally affected some of the respondents. I saw Ground Zero smoking on Thursday, September 13 and met so many individuals in DCA and NYC that were affected by this event. I guess I am prejudiced and need to consider that in my responses. However, I still feel strongly that our culture needs to be changed before we will stop another event like September 11. We need to be a unified force within our nation to protect the rights and freedoms we have ... . At least those rights and freedoms that are left."

"… There is a 'new' awareness in the industry and common sense 'should' prevail."

"Give the instructor the ability to go directly to a hot line and be anonymous when (s)he suspects something is going on that shouldn't be happening."

D. Security and background screening and periodic re-screening, and additional costs**:**

"Any person who does not have a US passport or Green Card should have a comprehensive background screen by the FBI prior to obtaining flight training. All persons starting flight training should get finger printed and information submitted to FBI. All pilots going to work for an airline are fingerprinted, everyone else should be."

"I believe the best we can do is promote the promulgation of national legislation that requires successful completion of a security screening for any person (foreign or domestic) prior to that person entering flight training. The scope and breadth of this screening should be defined by the national agency charged with conduct of said screenings. I believe the FBI of the Dept. of Homeland Security is capable of

conducting such screenings, if sufficient dollars are made available for them to staff for the task. Periodic re-screenings should be conducted if a person stays in aviation."

"Background screening for all flight training has to take place for foreign individuals (those who are not US citizens). Let the government figure out how they will handle that issue."

"There is a minimum background check accomplished now on anyone requiring a medical examination for certification. The same NCIC check could become a requirement for the Sport certification with little problem. A major change in internal FAA policy will be required however, requiring mandatory communication between the Medical Branch and the Certification Branch on the results of these checks. I can support an increased background check for those pilots training for advanced certification to the Commercial and ATP levels. I do not, however have a workable plan on how or who should conduct these checks. Our society is too fluid to have the police department of your home town certify as to your good character as is done in Belgium and Germany. . . . Since it is a Federal Certificate, the investigation should logically be done at the federal level, but by whom? A new Department of Aviation Background Investigation? Increase the size of the FBI to accomplish the task? Some branch of the TSA – after they can sort out the wiring diagram of who reports to who following the amalgamation of however many Departments and Agencies were merged into one with its creation. I support the idea of the expanded background check more to protect the public from the occasional fruitcake than the dedicated political assassin who will have a prepared 'clean' background."

"Priorities must be set. Terrorism has cost the nation. These costs are mandatory to protect our nation, rights and liberties. Times have changed. Not everyone will be able to continue financially the same as prior to September 11. Just to be clear . . . thousands of lives were lost and the possibility for this to occur again remains . . . and we are still worried about undue financial burdens on flight schools and individual liberties. What really is our priority?"

A. Psychological tests, language skill requirements and interviews for potential CFIs:

"I believe there are characteristics that are inherent in pilots that can be quantified . . . . I have worked closely with entities that develop pilot psychological testing and have administered them in the past and believe they are valid and useful."

"Better background screening from the beginning, investigate psychological profiling, fluent (really fluent) language skills. Yes, some terrorists are proficient, but again, the more screening tools you use, the lower the risk."

"Maybe as part of the CFI training, the flight instructor could be taught to spot the profile of a potential terrorist."

B. The privilege – not right – to fly:

"As I look each day at people in training, I realize more and more what a wonderful privilege it is to be able to fly. One outstanding attribute that most pilots have is a desire to share this privilege with others."

" . . . Exactly. It is a privilege to those who worked very hard to maintain this status."

"Whatever is done, I hope that we remain mindful of the inherent civil liberties we enjoy with respect to flying in this country and we work to prevent future 9/11 type incidents without reducing our freedom to fly. I feel (my) proposals mentioned above should have a minimum impact on our flying freedoms."

Round Four

On September 21, 2004, fortuitously a few days after the last response to the round three inquiry was received, the Transportation Security Administration (TSA) issued an "interim final rule" on flight training for aliens and other designated individuals, pertaining to flight training in an aircraft weighing 12,500 pounds or less. Since this ruling concerned the areas under discussion with the Delphi, it would have been considered to be a significant source of bias had the discovery phase still been in process. The results of round three, compiled with the repeated areas of concerns from rounds one and two, comprised a list of twenty-five dominant thoughts generated from the exercise. This list was sent back to the respondents to be rated, in the classic Delphi tradition. In addition to the ratings, respondents were invited to add comments regarding each statement's strengths or weaknesses, if they wished to do so. All ten respondents participated in rating the list: Some added comments.

Using a scale of 0 to 7, with 0 having no potential for dealing with the problem and 7 having very high potential for dealing with the problem, respondents were asked to consider each item, keeping in mind the original question "What do you judge to be adequate standards for entry into flight training, in the light

of the events of September 11, 2001?" Table V lists the items, shows the actual scores from the respondents, posted in the order received, and the mean for each item. Table VI again shows the mean scores for each item, and the items in rank-order. Calculating the means without the outliers made no significant difference. Calculating the means without the non-participant's scores made no significant difference.

TABLE V

ROUND FOUR RANKING OF DOMINANT THEMES GENERATED BY THE DELPHI EXERCISE

Statement to evaluate	Scores received	Mean
1. Require security screening for all persons entering flight training	6,1,4,3,7,3,4,4,7,1	4.0
2. Allow ground school only, until approvals come back from screening agency, for all students.	3,4,7,2,7,3,4,7,6,2	4.5
3. Require no background screening for entry level training.	0,1,4,0,0,0,3,0,0,6	1.4
4. Register and track international students.	6,5,7,7,7,7,6,4,6,7	6.2
5. Conduct periodic rescreening throughout flight training.	5,1,6,2,7,1,1,0,4,2	2.6
6. Have FBI, TSA, or other tasked federal agency do background screening for foreign students	7,7,7,7,7,7,5,7,5,6	6.5
7. Require positive identification from all flight students.	6,5,7,6,7,7,2,7,7,7	6.1
8. Keep the Part 61 regulations as adequate training regulations only -- not intended to prevent an attack.	6,7,4,2,2,7,2,3,7,7	4.7
9. Change the Part 61 regulations to include anti-terrorist provisions.	3,0,7,2,5,2,3,3,2,0	2.7
10. Do psychological testing, developed for pilots, prior to commencing flight training.	2,1,6,3,1,0,1,1,5,1	2.1
11. Interview candidates for flight training prior to commencing primary training.	4,1,7,5,0,0,1,5,6,5	3.4
12. Require the airman's medical exam prior to commencing training.	2,6,7,1,0,0,3,0,4,6	2.9
13. Require US citizenship prior to training.	6,0,7,6,6,3,2,0,4,4	3.8
14. Pass TOEFL, as a condition for flight training.	4,5,7,3,5,0,3,0,4,4	3.5
15. Require better language skills in Part 61.	1,5,6,6,3,7,3,3,4,5	4.3
16. Interview CFI applicants.	1,6,7,5,0,0,2,4,5,6	3.6
17. Accept that this is a National Security issue and not an aviation training issue.	6,5,7,3,0,7,2,4,2,7	4.3
18. Accept that INS needs to standardize and control immigration issues, and to round up threats.	5,5,7,6,4,7,4,5,3,7	5.3
19. Do terrorist profiling.	5,5,7,6,0,7,4,7,4,6	5.1
20. Accept that commercial airline cockpits are now adequately secured to prevent similar attacks.	1,5,6,2,1,5,4,6,5,6	4.1
21. Unify the aviation community to protect rights and freedoms left.	1,5,6,4,0,7,5,2,5,7	4.2
22. Encourage all citizens to develop situational awareness.	2,2,7,3,7,7,5,7,6,7	5.3
23. Accept additional costs as necessary because of additional preventive measures necessary.	0,2,6,3,5,4,3,6,3,6	3.8
24. Be prepared to accept that more stringent regulations will have an adverse effect on General Aviation, in form of greater costs.	0,3,6,1,7,4,2,5,3,4	3.5
25. Require that flight schools focus on quality of training, without the distractions of screening applicants	0,6,6,0,0,3,4,1,1,7	2.8

TABLE VI

RESULTS OF RESPONDENTS' RATINGS OF FINDINGS

Finding Item number:	Mean	Rank order
6. Have FBI, TSA, or other tasked federal agency do background screening for foreign students	6.5	1
4. Register and track international students.	6.2	2
7. Require positive identification from all flight students.	6.1	3
18. Accept that INS needs to standardize and control immigration issues, and to round up threats.	5.3	4,5
22. Encourage all citizens to develop situational awareness.	5.3	4,5
19. Do terrorist profiling.	5.1	6
8. Keep the Part 61 regulations as adequate training regulations only -- not intended to prevent an attack.	4.7	7
2. Allow ground school only, until approvals come back from screening agency, for all students.	4.5	8
15. Require better language skills in Part 61.	4.3	9,10
17. Accept that this is a National Security issue and not an aviation training issue.	4.3	9,10
21. Unify the aviation community to protect rights and freedoms left.	4.2	11
20. Accept that commercial airline cockpits are now adequately secured to prevent similar attacks.	4.1	12
1. Require security screening for all persons entering flight training	4.0	13
13. Require US citizenship prior to training.	3.8	14,15
23. Accept additional costs as necessary because of additional preventive measures necessary.	3.8	14,15
16. Interview CFI applicants.	3.6	16
14. Pass TOEFL, as a condition for flight training.	3.5	17,18
24. Be prepared to accept that more stringent regulations will have an adverse effect on General Aviation, in form of greater costs.	3.5	17,18
11. Interview candidates for flight training prior to commencing primary training.	3.4	19
5. Conduct periodic rescreening throughout flight training.	2.9	20,21
12. Require the airman's medical exam prior to commencing training.	2.9	20,21
25. Require that flight schools focus on quality of training, without the distractions of screening applicants.	2.8	22
9. Change the Part 61 regulations to include anti-terrorist provisions.	2.7	23
10. Do psychological testing, developed for pilots, prior to commencing flight training.	2.1	24
3. Require no background screening for entry level training.	1.4	25

Respondents considered and discussed 14CFR (the regulations that govern flight training) and their carry-over into the daily life of a pilot. They concerned themselves with the aviation environment and safety, showed profound sorrow over the losses of life on September 11, 2001, and worried about further erosion of the privilege to fly. They debated relinquishing more freedom by submitting to more regulations and screening processes.

The rank-ordering is presumed to show respondents' final positions on the question, quantitatively. Statistician Richard Shavelson (1996) says that the mean is the most basic and frequently used measure of central tendency (p. 92). Since only one ranking was done, there is no need to weight the mean scores obtained. The four highest ranked items – those, then, that the respondents viewed as having the most potential for answering the Delphi question–dealt with the foreign threat, primarily, and the need to screen for the elements that would harm the country, through their knowledge as flight students. Item number seven addressed the regulations that govern flight training (Part 61), calling for them to be kept as training regulations, only, with a mean score of 4.7, compared to a maximum (unachieved, in this study) mean of 7.0. The proposal to change those regulations to include ant-terrorist provisions was rank-ordered as item twenty-three, with a mean score of 2.7. The first twelve items were viewed as having some potential for relief, by having a mean score above 4. Item thirteen was in the neutral position (4). The remaining twelve items were ranked increasingly low on the scale of potential for addressing the Delphi question.

Chapter V will make conclusions and consider recommendations, based on the study.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to investigate the need to impose more stringent entry standards, ab initio, on flight students, in the light of the events of September 11, 2001, when terrorists who had been international flight students in the United States hijacked four fuel-laden jetliners and flew them into buildings, as airborne bombs (Kean et al., 2004). The attack cost thousands of innocent lives, billions of dollars, disrupted–and forever altered–air travel around the world, but especially in the United States.

Summary of Findings

This study sought to answer the following research question: What do experts judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?

Findings of the Review of Literature

The review of literature indicated that the struggle to determine a reasonable stance, following an aviation-related event, is not new. The review of literature traced the history of aviation from its inception with the first flight in 1903, in a world of no regulations, to the complex environment of 2001, through the creation of a regulatory structure charged with safety and promoting aviation.

Through the laborious process of reacting to aviation events, but sometimes foreseeing them and acting proactively, 2001's FAA, charged by 14CFR, regulates all flight training in the United States. Tracing the process was central to the review of literature, to understand how changes in the aviation environment come about.

The review of literature showed how, as aircraft became more sophisticated and economically vital, the regulatory structure adapted to meld the new concerns with the FAA's overarching mandates of safety and to promote aviation.

As aviation developed and the industry became increasingly complex, crossover regulations were put into place, to promote safety. As the industry developed in the United States, flight training schools proliferated, attracting foreign nationals to come to the United States for flight training, where it was possible for anyone with funding and reasonable health, vision and intelligence to commence flight training — without making application, submitting to background checks, or even having the ability to communicate in English at the beginning of training. In 2001, flight training could commence, even for persons in the country on a tourist visa.

Findings of the Delphi Component

To achieve the purpose, aviation experts were asked what they judged to be adequate standards of entry into flight training, in the light of the events of September 11, 2001. This took the form of a four iteration Delphi study, to seek clarification of the issue (Dalkey et al., 1953). Three iterations were for discovery, and the fourth called for a Likert-type rating scale to gain the perceptions of each expert respondent with regard to how the expert viewed the potential of each of the dominant items generated by the first three rounds for its merit in dealing with the problem. The actual Delphi question asked was, "What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?"

Ten experts were selected and agreed to participate in the study. All ten respondents completed the study, although not all of them participated in every round.

Round One Findings. In the first round of the study, participants identified eighteen areas of concern to consider. Nine respondents participated in generating the discussion points for round two.

Round Two Findings. In round two of the study, nine respondents voiced their agreements and disagreements and added new elements to consider based on the original eighteen items. Some withdrew some of their round one observations, based on insights drawn from the other respondents. At the

conclusion of round two, respondents had generated a list of twenty concerns that garnered most of their attention.

Round Three Findings. In round three of the study, nine respondents voiced their positions on items that had been discussed. They were asked to refine their comments, add new thoughts if they chose to, and to carefully consider and state their final positions on the question. By the end of the interactions, a list of twenty-five dominant items had emerged.

Round Four Findings. In round four of the study, respondents were asked to rate each of the twenty-five items, using a Likert-type rating scale. This was necessary to gain the perceptions of each expert respondent with regard to how the expert assessed the merit of each of the dominant items generated by the first three rounds, for dealing with the problem. With a maximum mean of 7.0, twelve of the items were rated as having at least some potential for addressing the problem, according to the means generated by the exercise; one item had a neutral mean of 4.0; twelve items were rated as having no potential for dealing with the problem, with means less than the neutral point. The following are the twelve items that the panel of experts found to have some, or high, potential for dealing with the problem:

First statement: Have FBI, TSA, or other tasked federal agency do background screening for foreign students (M=6.5).

Second statement: Register and track international students (M=6.2).

Third statement: Require positive identification from all flight students (M=6.1).

Fourth statement: Accept that INS needs to standardize and control immigration issues, and to round up threats (M=5.3).

Fifth statement: Encourage all citizens to develop situational awareness (M=5.3).

Sixth statement: Do terrorist profiling (M=5.1).

Seventh statement: Keep the Part 61 regulations as adequate training regulations only–not intended to prevent an attack (M=4.7).

Eighth statement: Allow ground school only, until approvals come back from screening agency, for all students (M=4.5).

Ninth statement: Require better language skills in Part 61 (M=4.3).

Tenth statement: Accept that this is a national security issue and not an aviation training issue (M=4.3).

Eleventh statement: Unify the aviation community to protect rights and freedoms left (M=4.2).

Twelfth statement: Accept that commercial airline cockpits are now adequately secured to prevent similar attacks (M=4.1).

Conclusions

The conclusions divide into three areas of concentration.

Although 14CFR regulates all flight training in the United States, the experts chose tools outside the training regulations, per se, to deal with the problem of entry standards for flight training. These tools include screening, profiling, registering and tracking international students, positively identifying all students, mandating a higher standard of entry into the country from the INS, and educating all citizens to remain situationally aware.

In regard to actual training, they agreed that the Part 61 regulations remain adequate as training regulations, but were never intended to prevent an attack. Showing weak agreement, the experts felt, however, that all flight students, regardless of country of origin, should be denied access to flight training until approvals come back from the appropriate agency doing background checks – limiting them, then, to ground school, only – and that better English skills should be required.

In their weakest areas of agreement, they indicated a call to the nation to accept that the attacks were a matter of national security and not aviation training, that the aviation community should unify to maintain the liberties of flight, and that the industry had now secured cockpit doors, making the cockpit secure from hijackings.

Conclusions Relating to Background Screening, Security Screening, and Recurring Screening

The need to scrutinize persons' backgrounds and activities to uncover motivations to create harm has long been acknowledged for sensitive positions. With the current anti-Americanism that is encouraged in some parts of the world, the compelling need to investigate the backgrounds of any international student is apparent and realistic. The problem is more complex than could be resolved by a single background

check, however, for a dedicated terrorist could, indeed, have a prepared 'clean' background. The need to track international students thus seems obvious, regardless of their course of study, to determine their activities and connections while in this country.

The majority of respondents supported background checks for international students entering flight training. Some respondents advocated background checks for all flight students. Although periodic rescreening for persons remaining in training was rejected in round four, tracking international students was strongly advocated.

Conclusions Relating toTraining Regulations, Access to Training, and English Language Skills

Although consensus is not an expected result of a Policy Delphi study, the majority of respondents strongly supported their belief that the regulations, issued by the Department of Transportation's FAA as 14 CFR, Part 61, (AIM, 2000), governing entry into flight training, were adequate for their purpose: setting the standard for training. During the three discovery iterations, respondents acknowledged and discussed that the regulations were written as training regulations and not intended for the purpose of preventing terrorist attacks.

The implications of rewriting the training regulations to remove the threat of terrorists' using aviation extend far beyond the scope of training. The abuse of aviation by a terrorist cell does not necessitate the revision of training standards.

Regarding access to training, terrorist profiling should be accomplished prior to student visa issuance for international students, to prevent unnecessary and expensive delays in training.

Since English is the international language of the airways, requiring proficiency before training commences is reasonable and prudent.

Conclusions Relating to National Security Issues, the Aviation Community's Response, and the Industry Standard of Cockpit Security

The majority of panelists, at the time of the study, believed that further terrorist attacks were possible, but that the mode of major attacks was unlikely to be through aviation because of precautions initiated across organizational lines by the TSA, DOJ, and INS, mandated by Congress (TSA, 2004). In

their discussions, almost half of the respondents conceded that, while aviation could be used as the mode in future attacks, such an attack was not likely to be of the scope of 9/11. Clearly, respondents felt that the attacks were a national security issue, and not the responsibility of the aviation community to solely shoulder.

The respondents agreed that the aviation community must aggressively work to educate the citizens and decision-makers, to preserve the liberty to fly, through the means available to them. As an example, AOPA (Aircraft Owners and Pilots Association) is a powerful advocate for aviation, offering pilot services and advice, and listening to pilots through forums around the country. In addition, AOPA frequently calls for pilots' voices to be heard on important issues, then implements the process by providing links on the AOPA website to appropriate agencies, such as during the FAA's rulemaking, comment-gathering phase. The respondents concluded that pilots must speak out.

In the weakest agreement in the study, the respondents concluded that the aviation industry has now secured cockpit doors against future hijackings.

Recommendations

On the basis of the information gleaned from this study, the following recommendations are offered as related to the findings. In an odd confluence of events, eight days after the discovery portion of the Delphi was concluded, TSA issued their "interim final rule," also known as the Alien Flight Training/Citizenship Validation Rule on September 21, 2004 (AOPA, 2004), which addressed several of the recommendations that would have been made, thus making them moot.

Recommendations Pertaining to Background Screening, Security Screening, and Recurring Screening

This study recommends tasking an appropriate agency to track the movements and associations of foreign nationals while in this country, with a review of the efficacy of the policies after a suitable period of time. With TSA's recent actions requiring proof of citizenship status from all students, complete background checks with TSA for foreign nationals, security awareness training for all active CFIs, fingerprinting foreign nationals, and submitting a photo of the foreign national student taken on the first day of training, many primary concerns uncovered by this study have been addressed.

Recommendations Regarding the Purpose and Adequacy of the Regulations and English Language Proficiency

This study recommends that the training regulations be retained as training regulations, and that additional research be initiated on the efficacy of different training methods.

The implications of rewriting the training regulations to remove the threat of terrorists' using aviation extend far beyond the scope of training. Traditionally, the regulations have been written to reflect occurrences in aviation – as advancements or calamities in the field have dictated; however, the abuse of aviation by a terrorist cell does not necessitate the revision of training standards. The need to retain a division of responsibility seems obvious. Flight instructors should be allowed to focus on flight training: Immigration authorities should make the decisions regarding entry into this country for the purpose of flight training. Terrorist profiling should be accomplished prior to student visa issuance.

Because English is the international language of the airways, this study also recommends that proficiency be required for the beginning of training. On the other hand, while the regulations state that a person must be able to " . . . read, write, and understand English . . ." (AIM, 2005, p. 76) before soloing, training is often begun before an international student's language skills reach proficiency. This practice poses a safety hazard more than a terrorist threat, but in the post 9/11 training environment should certainly be cause for concern.

Recommendations Regarding National security and Situational Awareness

This study recommends that security awareness training be offered to the general populace. Additional research should be undertaken to ascertain the most effective means of offering the training.

The precautions that have been taken in the backwash of September 11, 2001, to secure cockpit doors, to screen passengers more thoroughly for possible weapons, to forbid the carrying of certain types of objects on board commercial aircraft, and to scrutinize passenger lists have all greatly reduced the potential for a repeat attack using aircraft as bombs – although nothing will completely eliminate the possibility of an attack using aviation, or other, means. Remaining vigilant about worldwide threats and realizing the

constant need to cultivate the ability to train those authorities charged with protection to "think like a terrorist" will further reduce the likelihood of large-scale attacks. Training private citizens will increase vigilance, without creating paranoia. In that sense, all citizens are members of the intelligence community, when it pertains to national security.

In the aftermath of the attack, there have been many pages of analysis written regarding the performance of the intelligence community, in which blame has been laid, as well as excuses made for the difficulty in properly analyzing all of the information received prior to the attack. Using words such as "While many dedicated officers worked day and night for years to piece together the growing body of evidence on al Qaeda and to understand the threats, in the end it was not enough to gain the advantage before the 9/11 attacks" (The performance of the intelligence community, 2002, p. 12). The recommendation in this area answers the last question in that report: " . . . Who is in charge of intelligence?" Everyone has a role to play.

Situational awareness – i.e., reporting the odd interest in only flying a heavy aircraft and not in learning to land it – was effective in the pre-9/11 environment. In the post 9/11 world, more attention would certainly be paid to such a report. It is the recommendation of this section that ordinary citizens be trained to be vigilant.

Recommendations Regarding the Unification of the Aviation Community

This study recommends that all pilots be given security awareness training, and that further research be done to find effective ways to teach activism to pilots.

Research shows that aviation leaders are not always pilots (Kutz, 1998), so will not always understand all of the nuances involved in aviation training. Many aviation organizations exist which must be proactive in speaking out and sharing their expertise. From the early days of aviation, when there were no restrictions, until now, there has been a slow eroding of the individual's freedom to pursue the passion to fly.

While it is now necessary to protect the unsuspecting public with regulations that prescribe the actions of pilots, it is incumbent upon the aviation community to self-police. Situational awareness within the community would offer protection to the public for the actions of the "occasional fruitcake" (as one

respondent said, referring to any pilot who sees aviation as a means of self-destructing or of "making a statement . . .") who would endanger many. Pilots already have the mechanism in place by which they can report unsafe behavior among their own to the FAA for scrutiny: They must do so.

The majority of the respondents felt that the INS had neglected its responsibility to "control and standardize" immigration into this country, even for limited periods, as for students. A minority of respondents strongly felt that the INS was not doing enough to "round up" persons who still pose a threat who are moving around the United States. Along that line, some respondents pointed out that the events of September 11, 2001, were a national security issue, and not a flight training issue. In the last round of responses, three respondents repeated that situational awareness should be developed by all citizens, and not just flight instructors who questioned why a student wished to learn only to handle an airborne aircraft, and showed no interest in learning to land it. As a corollary, one respondent recommended an interview for CFI candidates to assess their motivation, and their situational awareness as a shield against foreign threats.

Recommendations Regarding the Responsibility of the INS and Other Government Agencies

This study recommends that further research be done in communication pathways among federal agencies mandated to protect and serve the populace, and between individuals, whose trained awareness would act as a shield against some foreign threats, and government agencies.

Recommendations Pertaining to 'Character'

Finally, this study recommends that further research be done regarding the efficacy of scrutinizing the character of pilot applicants before training begins.

At this time, the regulations make no mention of a person's character until that person seeks the airline transport pilot rating, although a private pilot can carry passengers, and a commercial pilot can carry passengers for hire. It is not until one seeks the airline transport pilot certificate and rating that any mention is made in the training regulations of the person's character. FAR 61.153 (c) states only that " . . . a person must . . . be of good moral character" (FAR/AIM, 2005, p. 101).

As disciplines, aviation has one major commonality with medicine and law: All deal with the public's trust. An unsuspecting, untrained public must be able to place their trust in professionals. A review of entry requirements into randomly selected schools of law and medicine revealed, without exception, that prospective students of those disciplines are subjected to intense scrutiny from several vantages, before being admitted into the study. Although those who practice medicine take the additional active step of taking the Hippocratic oath to be harmless (Remen, 1996), the scrutiny occurs before their admission into formal study.

Almost all the American Bar Association-approved law schools and 116 medical schools utilize centralized professional application services (Law School Data Assembly Service and American Medical College Application Service) to receive a prospective student's first application. Part of that application is the professional exam (LSAT and MCAT, respectively) required of the professional standards boards of the disciplines (College Source online, 2003; AMCAS, 2003; LSDAS, 2003). If the student passes that first round, he or she may then make application to the admissions committee of the selected school, providing additional transcripts, letters of recommendation, autobiographical information, and anything else the school desires. Foreign students are admitted to most, although residence requirements provide effective obstacles for many. The intense scrutiny examines every aspect of the prospective student's life, to determine the appropriateness of his or her request to enter formal study of the discipline.

Since the practice of aviation, too, requires trust from those who put their lives into a pilot's hands, would scrutinizing a prospective pilot in some of the same areas as prospective doctors and attorneys before allowing training to enter the profession have blocked the attacks of September 11, 2001?

Concluding Remarks

Changing the standards for entry into flight training in any major way seems ill advised in the light of this study. The study asked aviation experts what they thought should be adequate standards for admission into flight training, in the light of the events of September 11, 2001. They developed some suggestions for increasing security, as it affects aviation, but through means other than changing the training regulations. They resoundingly answered that the regulations govern training, and are adequate in

that regard, with minor changes to them possible, but not advisable. Further research on developing entry and training standards for foreign nationals might be merited.

The subject of flight training is laced with emotional overtones for the passion that it represents to pilots, as well as nuances of personal freedoms guaranteed by the United States' Bill of Rights. To discuss the subject with clarity and insights that explore the breadth of the subject required being immersed in it for many years. Each active panelist responded to the challenge of delving into the Delphi question, referring, at times, to the significance of such a study on their livelihoods and passions.

As the literature on the educational effects of the Delphi on participants indicates, respondents sometimes reversed previously stated positions after reading the other respondents' refutations. Often, a respondent would remark that (s-)he "… should have thought of that, . . ." then would go on to develop the thought further. According to some of their own comments, they recognized that an exploratory process like this Delphi would be the means to resolving the problem to the extent that it could be resolved.

In the end, several panelists issued statements of thanks for having been asked to participate, indicative of their desire to influence the outcome of the current turmoil in the industry due to September 11. Again, the literature predicts that stance from some participants. Several contacted the investigator after the termination of the study with additional comments or relevant news from the aviation community, as the problem is continually being probed for salient solutions. Some remarked about the anonymity promised them and the consequent freedom they enjoyed in making their comments, and their unfettered comments reflected their knowledge that they could, indeed, say anything without fear of their identities becoming known – again, as the literature predicts from a classic Delphi study.

Their candor, their knowledge, and their independent willingness to thoughtfully consider others' views, then to express their views from the perspective of their diverse areas of experience and expertise added immensely to the forum of ideas gained, to which some researchers refer in the literature. Although some Policy Delphi studies have fewer rounds, it seemed apparent that most respondents in this study had worked through to their own final positions by the end of the third round, as might be expected from the literature. They were asked to state their own positions in their own words. The fourth round, rating their discoveries, reduced many words to a succinct few.

The broad question posed a complex problem of multiple layers. The findings indicate a need for thoughtfully pondered action that clearly delineates the true issues, then selects from the possibilities from many quarters that would embrace the greater good. The wisdom comes from deselecting suggestions that would be ineffective or harmful.

All flight training is still done under the auspices of the FAA – and the FAA's mandates are yet dominated by the dual aspects of promoting aviation and safety.

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APPENDIXES

APPENDIX A

INSTITUTIONAL REVIEW BOARD

APPROVAL LETTER (1)

Oklahoma State University
Institutional Review Board

Protocol Expires: 6/2/2005

Date: Thursday, June 03, 2004 IRB Application No ED04108

Proposal Title: Post September 11,2001 Flight Training Entry Standards: A Delphi Study

Principal Investigator(s):

Sharon Sullivan
1733 Vinewood Street
Fort Worth, TX 76112

Robert Nolan
210 Willard
Stillwater, OK 74078

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact me in 415 Whitehurst (phone: 405-744-5700, colson@okstate.edu).

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

APPENDIX B

INSTITUTIONAL REVIEW BOARD

APPROVAL LETTER (2)

Oklahoma State University Institutional Review Board

Date:	Wednesday, September 21, 2005
IRB Application No	ED0628
Proposal Title:	Post September 11, 2001 Flight Training Entry Standards: A Delphi Study (Additional input)
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved **Protocol Expires: 9/20/2006**

Principal Investigator(s

Sharon Sullivan
1733 Vinewood Street
Fort Worth, TX 76112

Robert Nolan
204 Willard
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

[X] The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Sue C. Jacobs, Chair
Institutional Review Board

APPENDIX C

SOLICITATION SCRIPT

DELPHI STUDY: PARTICIPATION SOLICITATION SCRIPT (VERBAL)

(Greeting) I am a doctoral candidate through Oklahoma State University, the College of Education in Aviation and Space Education.

Because of your expertise in aviation, I am requesting your voluntary participation as a Delphi panel respondent in my research study. Your participation will be completely anonymous — i.e., your name and identifying characteristics will never be used — and there is no benefit to you, other than the satisfaction of speaking freely from your area of expertise in an interesting, and important, study. Your participation will be enormously appreciated, and entirely voluntary, with no consequences for withdrawal before the study is completed.

My research study will be conducted as a classic Delphi study, of three rounds.

- In the first round, I will send a single question to respondents, and ask them to respond, through email, with their interpretations of the essential components in the question. Responses will be separated from the senders' identities upon receipt.
- For the second round, I will correlate, rank, and condense the first-round responses of all participants into common themes and new issues to be considered. Second-round responses will, again, be separated from respondents' identities, and correlated, ranked and condensed.
- Third-round responses will seek clarification, from each respondent, of the identified issues.

Consensus is not a goal of the Delphi technique process.

Again, every precaution to maintain confidentiality and privacy will be taken. The Delphi format encourages complete freedom to discuss the issues, because of the anonymity of panel respondents.

Your time involvement will be whatever you choose to put into any round in which you participate. Prompt responses are encouraged, because there will be only 10 days between rounds, once the question is released to the respondents. The question will be sent to all respondents on the same day.

If you verbally agree to participate, I will email you an implied, informed consent form, before sending you the research question. An email reply to the form will constitute your consent to participate.

May I count on you to be one of the respondents?

Thank you!

(Sharon Sullivan, PI)

APPENDIX D

CONSENT FORM

CONSENT FORM for Delphi Study

Dear Delphi panel respondent: To consent to participate, please read this document, then click on reply. Your reply will give me your implied, informed consent. Thank you. Sharon Sullivan

AUTHORIZATION

I, ____(respondent)____, hereby authorize Sharon Sullivan to include my input in her research study.

DESCRIPTION OF RESEARCH AND ASSOCIATED RISKS/BENEFITS.

- ***Name of research project***: POST SEPTEMBER 11, 2001, FLIGHT TRAINING ENTRY STANDARDS: A DELPHI STUDY
- ***Statement of affiliation:*** The study involves participating in research conducted by **Principal Investigator (PI) Sharon Sullivan**, a doctoral candidate through Oklahoma State University, Stillwater, OK.
- ***Explanation of the purposes of the research and expected duration:*** The purpose of the research is to ask aviation experts what they judge to be adequate standards for admission into flight training, in the light of the events of September 11, 2001. Respondents' participation is expected to occur on three occasions spanning less than 45 days, total.
- ***Description of the procedures to be utilized:*** The research will be conducted as a three-round Delphi technique in which respondents will be asked to respond to a single question in the first round, then to comment on issues brought out by all respondents in the second and third rounds.
- ***Description of any benefits to the respondents …:*** None, to the respondent, other than the satisfaction of speaking freely on the subject. By defining the issues, there will be some benefits to the industry and to society.
- ***Statement describing the extent …to which confidentiality will be maintained:*** Respondents' identifying information will be separated from their responses upon receipt (except for consent form). Respondents' names and other identifying information will not be used. PI is only person having access to the email account being used.
- ***Explanation of how and whom to contact about:***

The research: PI, Sharon Sullivan; 817 492-8060; sharonsullivan@att.net
Research respondents' rights: the IRB office at 405 744-5700
Additional contact: Dr. Carol Olson, IRB Chair, Oklahoma State University, 415 Whitehurst, Stillwater, Oklahoma 74078; or Robert Nolan, Dissertation Chair, (405) 744-9190 or bob.nolan@okstate.edu

VOLUNTARY PARTICIPATION

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I also understand that I am free to withdraw my consent and end my participation in this project at any time without penalty after I notify the project director, Sharon Sullivan at 817 492-8060 or sharonsullivan@att.net

CONSENT DOCUMENTATION

I have read and fully understand this consent form. I consent freely and voluntarily. My reply to this document constitutes my consent.

(Consent by clicking "REPLY")

PI'S STATEMENT

I certify that this document explains all required elements of the research study to the respondent, and that I am available to answer any additional questions that may arise through email (sharonsullivan@att.net) or by phone (817 492-8060). Asking the respondent to click on "REPLY" is equivalent to asking the respondent to sign the form.

Sharon Sullivan, PI /s/

APPENDIX E

NOTIFICATION TO EXPECT DELPHI QUESTION

Notification to expect Round One the next day (sent June 29, 2004).

Hi --
Again, thanks for agreeing to participate. This study tackles an important issue in the United States.

On Wednesday, June 30, I will start the Delphi process by sending the question to each respondent for round one (of three) of your comments and thoughts.

Please take a minute as soon as possible to look at the question and **give your thoughts about the issues involved in the question**, from the perspective of your experiences/expertise. Send them to me as a reply to the question itself, or as new mail to sharonsullivan@att.net.

Make your responses as long or short as you like. You may use any format you like, including bullet points, phrases, sentences, paragraphs. **The important thing, for round one, is to get started.** ***What do you think, when you consider the question?***

Remember that you will not be identified -- so you may say anything that you wish!
For round two (around mid-July), you will receive a composite of all the respondents/ answers to round one, for your further consideration.

You won't hear from me again for at least two weeks. **Thank you so much for participating!**

Sharon Sullivan, PI

817 492-8060

APPENDIX F

DELPHI QUESTION: ROUND 1

ROUND ONE E-MAIL: THE DELPHI QUESTION

"What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?"

APPENDIX G

DELPHI QUESTION: ROUND 2

ROUND TWO (E-MAIL)

Thanks to all of you for your responses to Round 1 (of 3). Your answers to the question were **thoughtful, insightful** from the perspective of your own area of expertise, and **ranged** from a terse pronouncement that the regulations are adequate as they are, to expressions of deep concern with carefully stated options that might be used to improve the industry -- but offered with some reservations. They varied from six words to about 300 words (just in case you are curious about that ...)

There are ten respondents, each carefully chosen for a unique perspective that person would have, based on experiences and qualifications. Your experience(-s) in aviation are presenting a deeply insightful composite view of the question.

In this round, you are asked to comment on the discoveries from Round 1. Please feel free to consider, pounce, refute, agree/disagree, revise your own opinion(-s), add new thoughts, etc.

Again, you have the advantage of being transparent to each other (and your identity will never be divulged), so you can say whatever you think.

INSTRUCTIONS: Please make your responses as long, or as short, as you like. **Please use "reply" and make your comments by the areas that you wish to respond to -- then, make additional comments in the "COMMENTS" space.**

The question is still the same:

What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?

Synopsis of round 1:

1. Regarding 14 CFR: Part 61, three respondents said that the current regulations are adequate as they are.

As a corollary to that, one respondent said that the events of 9/11 should not be an issue when considering adequate standards for entry into flight training.

2. Some of you proposed **additions to existing regulations**:

A. US medical certificate required, prior to commencing flight training (one respondent)

B. Psychological testing should be required, prior to commencing flight training (two respondents)

C. Passing the Test of English as a Foreign Language (TOEFL), if not proficient in English (one respondent)

D. Interview with responsible person, prior to commencing flight training (two respondents)

US citizenship should, perhaps, be mandatory, prior to commencing flight training (one respondent)

3. As **preventative measures**, you said there should be:

A. Background screening checks (by FBI or TSA) (five respondents)
Specifically, *for US, as well as foreign,* students (one respondent)

B. Registration/tracking for international students (four respondents)

C. Positive identification -- documentation (two respondents), **however**,

D. Entry level students should **not** be subjected to background checks (one respondent)

4. Other concerns and comments:

A. re "aircraft as weapons" – terrorists would choose other modes (than aircraft) for future attacks, partly because screening measures at airports and barring cockpit doors, is adequate now (two respondents)

B. Part 61 regulations were inadequate to prevent a 9/11 type attack (three respondents)

A. Measures should not be regulated at the flight training entry level, but by government agencies' placing emphasis on security, in their own departments. Cited as an example: the INS' failure to standardize and control foreign students' entry into the US (one respondent)

B. The negative effect of more stringent entry regulations on General Aviation (one respondent)

C. The negative effect on flight schools, of restricting foreigners from training in this country, when they draw the bulk of their student population from other countries (one respondent)

D. The potential loss -- and need to proceed cautiously, therefore -- of the " ... extraordinary liberties of flight that we enjoy in this country ..."

G. In addition, two respondents expressed concern over advanced training issues as being pertinent to the security and safety issues in this age.

5. Quotable quotes:

" ... the definition of entry into flight training has changed."

"Interesting question, for a short sentence it has a few areas that are very large."

"My major concern with regards to your specific question is national security."

" ... adequate standards should include: A standard psychological test specific to pilots and validated by the FAA."

"... foreign flight students (don't) pose as great a security threat as they did prior to 9/11. I'm sure that if there is another attack on this country the terrorists will use another method."

"My perception is that many of the inadequacies that led to the events of September 11 can be found in the lack of standardization and control in the Immigration and Naturalization Service. To put it simply the barn door was left open."

"Do we question the standards for entering a drivers education course because someone drove a van with a bomb into a Federal Building?"

"So whenever we move to place barriers upon flight students entering training here, we must be mindful of the rights of citizens and foreign nationals alike, to freely participate in flight training in this country."

" ... a formal interview should be conducted with the flight candidate (prior to commencing training) by the training organization to validate the candidate's goals and perceptions regarding the training that will be undertaken."

" ... have the candidate have a discussion with a responsible person on 'why' they want to get into flight training."

" ... the current faa requirements are adequate."

"I do not believe that for student starts a background investigation should be initiated."

" ... I believe we have the large airliner crash into the building almost under control via the security at the airport and secure doors to the flight deck. Any other airplane is unsecured. ... large trucks hide a lot of potential."

COMMENTS:

APPENDIX H

DELPHI QUESTION: ROUND 3

ROUND THREE (E-MAIL)

Rounds 1 & 2: **Your thoughts are complex, wide-ranging and insightful.** In putting your thoughts out for group review and comments, issues have been identified, developed, and (in some cases) discarded. Some answers have been musings, while some have been posed as provocative questions. You have drawn a few very fine lines. Some of you effectively used sarcasm at times as a tool to make a colorful point. (I've left some of that language in its original form for its succinct flair.)
You have done an outstanding job of identifying issues and concerns, and offering or considering possible actions. In exhibiting everything from fiery passion to deliberate thoughtful observations, you have well demonstrated your expertise and deep concerns for aviation – and have been a terrific team!

Delphi Study: Round 3 -- **final call for responses**. Round 3 seeks to crystallize your thoughts into your "final" positions. First, however, **please read through** this analysis and synopsis of Round 2, in sections I, II, and III.. **Comment on anything** you wish, as you read**. At the end, please include, as part of your comments, what you think your current position on the question would be, based on your experiences and this exercise.**

I.

ISSUES & CONCERNS; PROPOSED ACTIONS or SUGGESTIONS of NO ACTIONS NEEDED

Listed below are the 20 areas that received most of your attention during round 2. Some topics overlap. The number in parentheses beside each listing indicates the **number of you who commented** on the topic. (The comments did not always agree: section II will look at some of your specific comments.)

ISSUE or CONCERN, etc.	**Number of respondents who commented**
Background screening ……..	(9)
Interviews as screening techniques ……..	(6)
Terrorists' weapons: aircraft and other modes……..	(6)
Adequacy of Part 61……..	(5)
Changing the standards ……	(5)
National security issue – not training issue ……..	(5)
Work loads and effects: FBI, TSA, FAA, schools ……..	(4)
Registration/tracking international students ……	(3)
Psychological testing as screening technique ……..	(3)
Medical ……	(3)
US citizenship as requirement ……..	(3)
Positive identification ……..	(3)
INS responsibilities ……..	(2)
Inadequacy of Part 61 ……	(2)
Cockpit security adequacy ……	(2)
Civil liberties: change or loss ……..	(2)
Training regulations: other industries ……..	(2)
Part 61 language requirements vs. TOEFL ……..	(2)
Call for no background check for entry level ……..	(1)
Airport screening (inadequacy of) ……..	(1)

II. SPECIFIC COMMENTS to read, review

Re:

A. Background screening:

1. "Yes – (by) some official government agency. (This is) already in place at some training centers. (with no offer of training without background check's being completed.)"
2. "By whom? Does the FBI or TSA have the personnel?"
3. "Current regs: applicants may not receive type rating in aircraft of greater than 12, 500 lbs without proof of citizenship and background check and fingerprinting. (A) background check for all aircraft training for non-citizens is a possibility."
4. "… already being done for non-citizens in a/c requiring a new type rating. (… a lengthy and expensive process.)"
5. "… good background check is in order along with stricter standards and a medical prior to flight training."
6. "… background check, with ground school only, until approvals come back. Set time limit for intervals between flight training. If exceeded, rerun background check."

B. Interviews as screening techniques:

1. "(I, respondent) withdraw the recommendation and move (my) support to background screening."
2. "Who is 'responsible' person who would judge another … Terrorists might be quite capable of passing an interview."
3. "'Responsible' is just too broad. Was President Clinton responsible?"
4. "A terrorist would tell the truth?"
5. "A formal interview by trained (personnel) presents an obstacle for the legitimate pilot candidate already facing immense costs. (Also) adds costs to flight school …"
6. "Who? Someone from the FAA?"

C. Terrorists' weapons: aircraft and other modes:

2. "(A) terrorist will choose (any) available mode. If a/c, then not because of training regulations. Large corporate a/c do not have the security and barred doors of commercial a/c. (Also) security is not as strict at smaller airports. Security training is now a requirement for all operators – however, many don't know how or what to train.
3. "(There will be) other modes in the future. (Consider) truck rental – (bomb-laden) trucks converging on the White House."
4. "Trucks, boats, trains, subways – all … potential threat."
5. "Have you heard the latest aviation threat? Terrorists have been observed practicing smuggling explosive parts onto an a/c (using several participants) then assembling the device in the a/c lavatory. No flight training necessary for this threat!"
6. "In the interim, the FAA has approved the "Sport Pilot" designation allowing pilots to elf-certify their medical status and fly aircraft limited to 1800 pounds max gross weight. While that weight a/c do not have the mass to cause much damage to a structure; it could be used to disperse a chemical or biological agent. This doesn't change the basic question as these pilots must still receive their initial training from a CFI before obtaining their pilot certificate. …"

D. Part 61: adequacy

1. "Current regulations are adequate – interesting comments notwithstanding."

1. "… not meant to prevent a terrorist attack. Terrorists do not acknowledge regulations."
2. "… sufficient. However, TSA background checks of foreign flight students is a good idea."

B. Changing the standards

1. Re: *"Do we question the standards for entering a drivers education course because someone drove a van with a bomb into a Federal Building?"* Response from Round 2: "Okay … Excellent point! This one really made me think."
2. "Any regulation (causing additional investigation) will have an adverse impact on individuals and flight schools."
3. "I could support an addition to Part 61 that requires the CFI (or school) to advise the system (FAA/TSA/FBI?) of any student showing abnormal tendencies or interests in training. Call it profiling if you wish, but the unusual interest in flight control only and no interest in learning to safely land – (9/11 hijackers) could possibly have pointed out a trend and … been investigated by the school officials involved. Perhaps there was more interest in cash flow than student progress.
4. "Training regulations to operate trucks, boats, trains, subways would never be considered as it is with aviation."

F. National Security issue – not training issue:

1. "(This is not an aviation training issue. This is a national security issue. Every person in the US should become situationally aware for all types o unusual activity. Not paranoid – just aware."
2. "One security inspector may have 200+ operators to work with."

G. Workloads and effects: FBI, TSA, FAA, schools:

8. "Are FBI or TSA personnel available to do screenings?"
9. [Note: other comments for this category overlap other categories.]

A. Registration/tracking international students:

1. "Yes, by INS for all international students – not just flight training. All training."
2. "Know where they are and what training they are taking through background checks."
3. "What needs improvement is immigration control. Our country is still at risk to terrorist attack by persons crossing our southern borders."

B. Psychological testing as screening technique:

1. "No."
2. "I totally disagree. What kind of test would work? Who would give it? Who would be the judge? Would the Wright Brothers have passed? …Stringent rules/policies would need to be in place before a psychological test should determine my career path!"
3. "Good idea, but my concerns are two-fold: there is no guarantee that pre-training testing in security or psychology would prevent a 9/11 incident, and GA is already struggling. The added burden of additional testing would add barriers to new student entrants, lowering their numbers and increasing the strain on flight schools."

C. Medical:

1. "Prior to solo is adequate, allowing a person to take a few lessons to see if they like it …"
2. "I agree with a medical before commencing flight training."
3. "A medical is already required, before (solo) flight."

D. US citizenship as requirement:

1. "No. (Allow) anyone, according to Part 61, but limit to ground school until approvals from background checks."
2. "Requiring citizenship would put some schools out of business."

E. Positive identification:

1. "… done at time person applies for medical."
2. "Since many persons wouldn't know the difference between a real and a fake ID, training would be required for anyone checking the ID. There is an entire book on many acceptable forms of Ids for persons not carrying a passport."

F. INS responsibilities:

1. Re ' *open barn door'* comment: Respondent: "Well said. Bravo!"
2. [Other comments overlapped into several categories.]

G. Part 61: inadequacy:

1. "How do we make the regulations stronger? This Delphi is part of that exercise …"

H. Cockpit security adequacy:

1. "Yes."
2. "Did they legalize marijuana usage in the US?"

I. Civil liberties: change or loss:

1. [See 'summation' comments in section III.]

J. Training regulations in other industries:

1. [Comments overlapped.]

K. Part 61 language requirements vs. TOEFL:

1. "English proficiency is already required…"
2. "Terrorists … are often proficient …"

L. Call for no background check for entry level students:

1. "Agreed. If a background check is required, it should be done prior to solo."
2. "Wrong. Everyone …"
3. "Really. Should we wait until they have full working knowledge of all a/c systems, ATC systems, etc.?"

M. Airport screening: inadequate

3. [See 'Summation' comments.]

I. Several 'Summation' comments:

5. "It is not a right to participate in flight training, but a privilege. This can, and already is, restricted by the system. (Alcohol, drug convictions, excessive traffic violations.)"
6. "Even if 9/11 is taken out of the scenario, standards should be more strict. Besides, you can't take 9/11 out of the picture – it happened and security is an issue."
7. " Does it matter how many people are killed to make it relevant? Regardless of 9/11, I don't believe the system sufficiently screens out potential hazards to the pilot and to others. If you look at the statistics, in 2004 alone, there were 890 accidents, 737 of them were GA, 22% of those were fatal. None were Part 121 carriers and only 11 were Part 135. With foreign students, the risk factor increases because of language problems. Terrorists can find a way to turn a Cessna 152 into a killing machine if they want."
8. "We must improve the TSA program and improve some of the training and then accept the fact that some of our freedoms are going to be taken from us. [(Respondent) inadvertently carried scissors in carry-on through security over 50 times before screening caught them – and asks, "Still feel safe?"]
9. "… must find a way to better screen new entrants into flight training without reducing individual liberties, and without placing undue financial burdens on existing flight schools. Any options we suggest should be validated with regard to their potential to avert a 9/11 type disaster."

IV. CALL FOR YOUR FINAL COMMENTS AND THOUGHTS:
COMMENTS:

QUESTION: "What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?"

Thank you for your thoughtful participation in this exercise to carefully consider the direction of changes in aviation. I deeply appreciate your time and gracious willingness to apply yourselves to this effort.

APPENDIX I

DELPHI QUESTION: ROUND 4

ROUND FOUR (E-MAIL)

Formal Ranking of the issues or concerns generated by the panel

Please keep in mind the original question when making your selections: **"In light of the events of September 11, 2001, what do you judge to be adequate standards for entry into pilot training?"**

Instructions: Below is a list of the dominant thoughts generated during the three rounds of the Delphi study which sought to **identify adequate standards for entry into flight training**. By (your) ranking each item, I will be able to determine which items you view as having the most merit for dealing with the problem. After reading through the entire list, click on 'Reply' then rank each abbreviated action statement, using a scale of 0 to 7, **with 0 having no potential for dealing with the question and 7 having very high potential for dealing with the question**. (Optional: Please add comments regarding each statement's strengths or weaknesses, if you wish to do so.)

Ranking:

Please put your ranking – from 0 to 7 – in the blank beside each item.

_____1. Require security screening for all persons entering flight training.

Comments:

_____2. Allow ground school only, until approvals come back from screening agency, for all students.

Comments:

_____3. Require no background check for entry level training.

Comments:

_____4. Register and track international students.

Comments:

_____5. Conduct periodic rescreening throughout flight training.

Comments:

_____6. Have FBI, TSA, or other tasked federal agency do background screening for foreign students.

Comments:

_____7. Require positive identification from all flight students.

Comments:

_____8. Keep the Part 61 regulations as adequate training regulations only -- not intended to prevent an attack.

Comments:

_____9. Change the Part 61 regulations to include anti-terrorist provisions.

Comments:

_____10. Do psychological testing, developed for pilots, prior to commencing flight training.

Comments:

_____11. Interview candidates for flight training prior to commencing primary training.

Comments:

_____12. Require the airman's medical exam prior to commencing training.

Comments:

_____13. Require US citizenship prior to training.

Comments:

_____14. Pass TOEFL, as a condition for flight training.

Comments:

_____15. Require better language skills in Part 61.

Comments:

_____16. Interview CFI applicants.

Comments:

_____17. Accept that this is a National Security issue and not an aviation training issue.

Comments:

_____18. Accept that INS needs to standardize and control immigration issues, and to round up threats.

Comments:

_____19. Do terrorist profiling.

Comments:

_____20. Accept that commercial airline cockpits are now adequately secured to prevent similar attacks.

Comments:

_____21. Unify the aviation community to protect rights and freedoms left.

Comments:

_____22. Encourage all citizens to develop situational awareness.

Comments:

_____23. Accept additional costs as necessary because of additional preventive measures necessary.

Comments:

_____24. Be prepared to accept that more stringent regulations will have an adverse effect on General Aviation, in form of greater costs.

Comments:

_____25. Require that flight schools focus on quality of training, without the distractions of screening applicants.

Comments:

Again, your participation is greatly appreciated. This final ranking will strengthen the results.

Sharon Sullivan

APPENDIX J

OVERVIEW OF TERRORISTS' FLIGHT TRAINING

OVERVIEW OF TERRORISTS' FLIGHT TRAINING

Pilot/Hijacker

Mohamed Atta: pilot/hijacker on American Airlines Flight 11, out of Boston.

Marwan al Shehhi: pilot/hijacker on United Airlines Flight 175, out of Boston.

Hani Hanjour: pilot/hijacker on American Airlines Flight 77, out of Dulles International in Washington, DC.

Ziad Jarrah: pilot/hijacker on United Airlines Flight 93, out of Newark, NJ.

Overview of Flight Training

Atta entered the United States in June 2000, and entered Huffman Aviation in Venice, Florida in their Accelerated Pilot Program. He soloed in July, 2000 and had his private pilot certificate by mid-August 2000. He had his instrument rating by November 2000 and his commercial pilot certificate by December 2000. Then he began training on flight simulators to fly large jets. . After leaving the United States briefly, he was readmitted to the United States in January 2001 by persuading INS inspectors to let him in to continue flight training. In six months from his entry into the United States, he was training on large jets (Kean et al, 2004, p. 227).

Atta unsuccessfully sought a loan to buy a twin-engine, six-passenger plane to convert to a crop duster, in mid-2000 (Miller, Stone & Mitchell, 2002).

al Shehhi came into the United States in May 2000, to Huffman Aviation in Venice, FL, accepted into the Accelerated Pilot Program. He soloed in July 2000, and got his private pilot certificate by mid-August 2000. He applied with INS to change his immigration status from tourist to student, stating his intention to study at Huffman until September 1, 2001. In September 2000, he enrolled in instrument training at Jones Aviation in Sarasota, FL, and " . . . sometimes fought (with the instructor) to take over the

controls during their training flights . . ." (Kean et al, 2004, p. 227). He failed his first stage check for instruments, so went back to Huffman. He got his instrument rating in November 2000 and his commercial pilot certification in December 2000. Then he began training on flight simulators to fly large jets. After leaving the United States briefly, he, too, was readmitted to the United States in January 2001 by persuading INS inspectors to let him in to continue flight training. In six months from his entry into the United States, he was training on large jets (Kean et al, 2004, p. 227).

Hanjour first came to the United States for flight training in 1997 and began flight training in earnest in Arizona (Arizona Aviation). He got his private pilot certificate in 3 months, and got his commercial certificate in April 1999. He got a student visa in September 2000. He arrived in San Diego in December 2000, but left with Hazmi and, " . . . headed for San Jose to take flying lessons" (Kean et al, 2004, p. 223). In reality, he went back to Arizona. In early 2001, he started training on a Boeing 737 simulator at Pan Am International Flight Academy in Mesa, AZ. Although he did poorly, he completed his initial training in March 2001. During the summer of 2001, he flew the low-altitude route (Hudson Corridor) along the Hudson River that passes NewYork landmarks like the World Trade Centers with an instructor at Air Fleet Training Systems in Teterboro, NJ. (The instructor declined a second flight due to Hanjour's poor skills.) He then switched to Caldwell Flight Academy in Fairfield, NJ where he rented small aircraft and took practice flights along the route that would have taken him near Washington, DC. Also, he may have returned to Arizona for flight simulator training in early June 2001(Kean et al, 2004, p. 242).

Jarrah entered the United States in June of 2000, and had already arranged to take flight training at Florida Flight Training Center in Venice, FL. He got his private pilot certificate in August 2000, and began simulator training in December 2000 at a different (from the one training Shehhi and Atta) center in Florida. During the summer of 2001, he, too, went to Hortman Aviation in Philadelphia and flew the low-altitude route (Hudson Corridor) along the Hudson River that passes NewYork landmarks like the World Trade Centers with an instructor, because his skills were too poor to fly it solo (Kean et al, 2004, p. 242).

Other Terrorist Team Members Who Attempted Flight Training:

N. Hazmi and al Mihdhar entered the United States at Los Angeles to enter pilot training in January 2000. They said that they " . . . came to the United States to learn English, take flying lessons, and become pilots as quickly as possible" (Kean et al, 2004, p. 216).

To their instructors, Hazmi and al Mihdhar emphasized their interest in learning to fly jets. Instructors (San Diego Sorbi Flying Club) remember them as poor students who focused on learning to control the aircraft in flight but took no interest in takeoffs or landings. Their lack of language skills became an insurmountable barrier to learning how to fly. Instructor Rick Garza, of the San Diego Sorbi Flying Club concluded that neither Al-Midhar nor Al-Hamzi knew English well enough to operate a small plane, let alone the big jets they dreamed of flying, so he showed them the stipulation in the FAA regulations " . . .requiring English fluency for pilots and told them he wouldn't take them up a third time" (Miller, Stone & Mitchell, 2002, p. 273). By the end of May 2000, Hazmi and Mihdhar had, " . . . given up on learning how to fly" (Kean et al, 2004, pp. 221-222). Hazmi, however, then "headed for San Jose to take flying lessons" (Kean et al, 2004, p. 223). Hazmi told his housemate that he and a friend were going to Arizona to take flying lessons, in January 2001.

Zacarias Moussaoui was a flight student with Airman Flight School in Norman, Oklahoma, for a time. He was a student at Eagan Flight School , Minneapolis, Minnesota when he aroused suspicions and was arrested in August of 2001 because " . . . he wanted instruction in flying but not in taking off or landing. It is widely suspected that Moussaoui would have been among the hijackers on September 11 if he had not been arrested earlier" (Calhoun, Price & Timmer, 2002, p. 275).

VITA

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Candidate for the Degree of

Doctor of Education

Thesis: POST SEPTEMBER 11, 2001, FLIGHT TRAINING ENTRY STANDARDS: A MODIFIED POLICY DELPHI STUDY

Major Field: Applied Educational Studies

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Personal Data: Born in Fordyce, Arkansas, July 26, 1943, the daughter of Sebern J. and Mary Louise Smith.

Education: Graduated from Pine Bluff High School, Pine Bluff, Arkansas, in May 1961. Received Bachelor of Arts in Chemistry degree from Southern Nazarene University, May 1965; received Associate in Applied Science degree in Aviation with Professional Pilot option from Rose State College, December 1993; received Master of Science degree in Natural and Applied Sciences from Oklahoma State University, December 1997; completed requirements for the Doctor of Education degree from Oklahoma State University in December 2005.

Experience: Classroom teacher in Oklahoma and Hawaii, 1965 – 1970. Community, church, and school volunteer: developed programs in adult education, parenting forums, and a public schools/university connection, 1970 – 1984. Held part-time and interim positions, obtained flight certificates, earned AAS, flew as mission pilot for Civil Air Patrol, 1984 – 1994. Program Development Specialist for Oklahoma University's Oklahoma Aerospace Academy, 1994 - 1995. Raised great kids, 1970 – 1996. Licensed insurance agent, earned flight instructor certificate, gave flight instruction for private students and at Delta State University, newspaper columnist, 1995 – 1999. Adjunct instructor in Airways Science at Langston University, taught skills development classes for US Navy, newspaper reporter, small business owner, 1999 – 2001. Free-lance work, gave presentations in schools, substitute teacher, 2001 – 2004. Classroom teacher in Texas, 2004 – 2005.

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Scope and Method of Study: The purpose of this study was to investigate the possible need to impose more stringent entry standards on flight students. A respondent panel of ten aviation experts was selected to participate in a four-round Policy Delphi study to explore the question, "What do you judge to be adequate standards for entry into flight training, in the light of the events of September 11, 2001?" The experts selected had differing areas of expertise within the career field of aviation.

Findings and Conclusions: This study concluded that the events of September 11, 2001, were a national security issue, not an aviation training issue. The respondents found a pressing need to task a federal agency to conduct background checks on international students prior to their beginning flight training, and cited a strong need for international flight students to be registered and tracked. They agreed that profiling should be accomplished prior to visa-issuance. Respondents saw a need to positively identify students prior to training, and felt that students should be held to a higher standard of English proficiency. They believed that students should have access to ground school only, until approved by the federal agency. They concluded that it was the INS' responsibility to standardize and to control immigration issues, but identified a need for all citizens to develop situational awareness as a deterrent against future attacks, which they believed would use a mode other than aviation to accomplish. Respondents concluded that the regulations were adequate for their purpose of training, but were never intended to avert a terrorist attack. They identified a need for the aviation community to unify to preserve the privilege to fly. Last, they concluded that the industry had adequately secured cockpit doors, which would avert a similar attack.

ADVISER'S APPROVAL: Dr. Robert E. Nolan