THE AFTERMATH OF TRAGEDY: REGULATION OF HUMAN FACTORS IN AVIATION

By: Chris Livas

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INTRODUCTION

On February 12, 2009, at approximately 9:20 p.m. EST, a Bombardier Dash-8 Q400 began a typical and unremarkable route between Newark International Airport in New Jersey and Buffalo Niagara International Airport in New York. Less than an hour later the aircraft, Colgan Air operating as Continental Connection Flight 3407 (“Flight 3407”), crashed into a private residence roughly 5 nautical miles from the Buffalo airport killing all 49 people on board, and 1 person on the ground. While air travel remains one of the safest modes of transportation available, few events receive more public interest than air traffic disasters. Unfortunately, the international news cycle lately has been dominated by air traffic disasters, much to the chagrin of the organizations striving to prevent them. On the heels of Colgan Air Flight 3407, the Federal Aviation Administration (“FAA”) implemented controversial regulations, greatly increasing the training and experience requirements for pilots. The controversy stems from the National Transportation Safety Board (“NTSB”) recommendations issued after Flight 3407. These recommendations evolved into heightened FAA training and experience requirements for pilots despite the pilot of Flight 3407 having had significant experience. The FAA regulations have little safety benefit. Instead, these regulations pose high barriers to entry for aspiring pilots, high implementation costs to air carriers, and the threat of higher prices to consumers. This paper explores the lifecycle of NTSB recommendations through their implementation as FAA regulations. Part I of this paper gives a brief overview of the NTSB and the FAA and their respective roles in US air travel. Part II of this paper examines the facts and circumstances surrounding Colgan Air Flight 3407 and the

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1 The author wrote this article in fulfillment of a graduation requirement for the Chicago-Kent College of Law Spring 2015 Aviation law seminar course taught by Professor Henry H. Perritt, Jr.
2 NTSB Report NTSB/AAR-10/01 p.X.
3 Id.
5 Dating back to March 2014, notable events, amongst others, include the disappearance of Malaysia Air Flight 370, the shoot-down of Malaysia Air Flight 17, the crash of Indonesia AirAsia Flight 8501, and the allegedly deliberate crash of Germanwings Flight 9525.
involvement of human factors in the accident. Part III surveys the timeline of the NTSB recommendations following Flight 3408, from the NTSB’s final report, through the legislative process, and all the way to the implementation of new FAA regulations. Part IV investigates the impact of the NTSB’s recommendations on FAA regulations and explores the benefits and drawbacks of the process.

I. THE NTSB & THE FAA: A BRIEF OVERVIEW
Fortunately, the United States has not been the location of air travel’s most recent tragedies—though it is clear the United States is certainly not immune to such tragedies. Safety in American air travel is not a coincidence. Congress has long recognized the importance of safety in air travel.\(^6\) The National Transportation Safety Board (“NTSB”), formally established in 1967, is tasked with investigating all aviation accidents within the United States.\(^7\) Additional NTSB tasks include developing factual records, and producing safety recommendations to ensure such accidents are not repeated.\(^8\) The NTSB typically issues a preliminary report within weeks of an accident, and a final report within 12-18 months of the accident.\(^9\) NTSB final accident reports are often long and detailed reports, which include the NTSB’s findings of fact (conclusions), probable cause of the accident, and proposed safety recommendations to prevent re-occurrence of the accident. The NTSB safety recommendations are submitted to the Federal Aviation Administration (“FAA”), which regulates air travel within the United States.\(^{10}\) The NTSB has no regulatory authority; it can only propose recommendations to the FAA.\(^{11}\) The FAA retains all regulatory and enforcement authority in United States air travel.\(^{12}\) While their duties may differ, their goals are the same. That is, both agencies operate for the

\(^6\) Despite the FAA’s formal establishment in 1958, the Air Commerce Act of 1926 began the federal government’s regulation of US air travel. See https://www.faa.gov/about/history/brief_history/

\(^7\) The NTSB may also be tasked with investigations into aircraft incidents abroad involving US carriers, US manufactured aircraft, and/or upon request from foreign governments. See 49 U.S.C. §1111 - §1119

\(^8\) Id.

\(^9\) Id.

\(^{10}\) Consistent with the Administrative Procedures Act, the FAA has rulemaking power and final rules are documented in the Federal Register. See 49 U.S.C. §106(f)(3)(a).


\(^{12}\) Id.
furtherance of safety in United States air travel. To understand this relationship between the NTSB recommendations following Flight 3407 and corresponding FAA regulations, it is important to understand the facts and circumstances surrounding Flight 3407.

II. COLGAN AIR FLIGHT 3407

The airline industry must deal with many problems. A core problem is balancing consumers’ insistence on 100% safety against affordability and convenience. The worst-case scenario for a passenger is a flight delay or cancellation due to inclement weather – in the grand scheme of things, a minor inconvenience. The unfortunate reality however is the worst-case scenario for a passenger is loss of life. Aircraft crew members, namely pilots (or captains) and co-pilots (first officers) have the burden of safely transporting large quantities of people 35,000 feet above and around the world. There are countless variables of which the flight crew must both be aware and competent to handle.

A. Circumstances Surrounding Flight 3407

Inherent in aviation is the danger posed by circumstances outside the control of the flight crew. These include factors such as weather, airplane maintenance, passenger interference, air traffic control problems and/or communication issues.

Weather is a major consideration in any flight, and Flight 3407 was no different. The forecast for the Buffalo area, as reported to the aircraft, was not particularly poor. The conditions that night were typical of a February night on the eastern seaboard with wind gusts of 15-22 knots, 3 miles of visibility, light snow, light cloud cover, and temperatures around 33 degrees Fahrenheit.

The primary weather consideration on Flight 3407 was ice. Throughout the day, multiple pilots flying in to Buffalo reported ice forming on their aircraft. Ice formation on an aircraft is problematic, especially on the wings. The build up of ice on the wing alters the aerodynamics of the wing and, if enough ice builds up, air can no longer flow over the wing causing an aerodynamic stall. The build up of ice was significant enough

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14 Id.
15 Id. at 22.
16 See interview of Thomas Ratvasky, Engineer in the icing branch of NASA Glenn Research Center available at http://www.scientificamerican.com/article/ice-flight-3407/
17 Id.
that both the first officer and the pilot made comments on such accumulation. At one point, the cockpit voice recorder captured the first officer saying:

“I’ve never seen icing conditions. I’ve never deiced. I’ve never seen any – I’ve never experienced any of that. I don’t want to have to experience that and make those kinds of calls. You know I’dve freaked out. . I’dve have like seen this much ice and thought oh my gosh we were going to crash,”

Roughly four minutes later, Flight 3407 crashed. A review of the full transcript shows the mention of ice in the cockpit on eleven different occasions by both the first officer and the captain. All but one of those mentions of ice were within the last six minutes before the crash. Of course the discussion of ice on the aircraft just before and during the fatal approach is by no means an indication of causation. The ice discussions may be an indication of the flight crew’s mindset or a pre-occupation with the ice build up as opposed to other pressing issues, such as the aircraft’s air speed.

Other factors, such as those particular to the aircraft itself, may have an effect on the flight. Flight 3407 was aboard a Bombardier DHC-8-400, a medium range aircraft powered by two turboprop engines, capable of carrying up to 74 passengers. The NTSB investigation found the aircraft was properly certified, equipped, and maintained in accordance with Federal Regulations. All of the aircraft’s systems and mechanical implements appeared to be functioning properly as well. The air-traffic controllers responsible for the flight during its approach in to Buffalo performed properly and appropriately. As nearly all other circumstances surrounding the flight were routine, the NTSB’s investigation turned to the flight crew.

B. Human Factors

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18 NTSB Report NTSB/AAR-10/01 Cockpit Transcript p. 275.
19 Id. at 278
20 The captain was in control of the aircraft when it crashed not the first officer.
22 Id.
23 As discussed in the next section, the NTSB found only minimal effects of icing on the airplane. The investigation did reveal that Colgan’s inadequate procedures for airspeed selection and management during approaches in icing conditions were a contributing cause of the accident.
24 NTSB Report at p.15.
25 Id. at 80.
26 The systems on this particular aircraft included a stall protection system, a de-icing and ice detection system.
27 Id.
28 NTSB Report at 151.
Aircraft technology has improved by leaps and bounds over the lifetime of aviation. Many aircraft produced today have completely electronic cockpits outfitted with fly by wire controls as opposed to manual flight controls. The aircraft was in experienced hands when it crashed on the fateful night of February 12, 2009 but experience is not synonymous with perfection. With a significant amount of flying time between them, both the captain and the first officer should have been able to competently land the aircraft despite the conditions. The 47-year-old captain held an airline transport pilot (ATP) certificate and an FAA first-class medical certificate. The captain had accumulated 3,379 hours of flying time, 1,030 hours as pilot-in-command, and 111 hours on the Bombardier Q-400.

While his experience was unquestioned, the captain’s record was not perfect. The NTSB report notes seven (7) instances wherein the captain received either FAA disapprovals or Colgan Air required the captain undergo additional training. Of note, these incidents include:

10/1/1991 – disapproved for instrument airplane rating;
5/14/2002 – disapproved for commercial single-engine land airplane certificate;
10/15/2007 – disapproved for ATP certificate based on approach and landing.

The same rationale regarding ice accumulation and the flight crew’s conversation about such accumulation also apply to the blemished record of the captain. That is, just because the captain received a number of disapprovals and required additional training in some areas, doesn’t mean he was an incompetent captain. This captain’s particular troubles are also not indicators of causation. To wit: the captain later passed those tests

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29 This is especially true in aircraft produced by manufacturing giant Airbus, where a completely electronic interface replaces manual flight controls. The Q400 used for Flight 3407 had manual flight controls. Fly by wire aircraft replace cables and pulleys with hydraulics and electronics in flight control.
30 At the time of the crash, an ATP certificate required at least 1500 hours as a pilot, holding a commercial pilot certificate with instrument rating, and passing both a knowledge and a physical test. See 78 FR p.42324-25 (2013).
31 NTSB Report NTSB/AAR-10/01 pp.6-7
32 Id.
33 Id. at pp 9-10. In these instances, the pilot failed portions of a practical test but later passed in compliance with FAA and Colgan Air requirements.
34 This disapproval was not reported to Colgan on his application for employment.
35 This disapproval was not reported to Colgan on his application for employment.
as he had an ATP certification at the time of the occurrence. While the captain’s disapprovals are not mentioned specifically in the NTSB’s probable cause or contributing causes, such disapprovals did not go unnoticed by the Board.\(^{36}\)

The 24-year-old first officer held a commercial pilot certificate and an FAA medical certificate.\(^ {37}\) She had accumulated 2,244 hours of total flying time, including 774 hours in turbine airplanes including some on the Q400.\(^ {38}\) The NTSB investigation revealed she was disapproved on her initial flight instructor certificate in May 2006\(^ {39}\) but subsequently passed the test and received her certificate later that same month\(^ {40}\).

Inquiries into the flight crew’s experience and training are commonplace in NTSB investigations regardless of the circumstances of the accident. A natural conclusion to draw from this particular accident is that despite experience, there will always be certain scenarios presenting new problems for flight crews. Making split-second decisions with the lives of almost 50 people at stake is undoubtedly a stressful, high-pressure situation. Such a situation would only be more difficult given other possible factors such as fatigue.

Fatigue is an inhibiting factor in any activity. Despite the technological advances in auto-pilot and the common adage that planes basically fly themselves, fatigue is a particularly dangerous and prevalent factor in commercial aviation.\(^ {41}\) Flight 3407 was no different.

The NTSB issued safety recommendations regarding fatigue in 2006\(^ {42}\) and again in 2009 attempting to simplify flight crew hours-of-service regulations and consequently increase crew alertness.\(^ {43}\) The NTSB has a clear standard for fatigue to be considered a factor in the flight crew’s performance: deficiencies need to be clearly discernible and consistent

\(^{36}\) The captain’s established pattern of first-attempt failures might have indicated he was slow to absorb information, develop skills, or that he had difficulty performing required skills under the stress conditions. NTSB Report at 115.

\(^{37}\) Id. at p.11

\(^{38}\) Id.

\(^{39}\) The FAA noted, *inter alia*, her take-offs, landings, and performance maneuvers required re-examination. *Id.*

\(^{40}\) Id.


\(^{42}\) The fatigue recommendations were in response to Corporate Airlines flight 5966 accident

\(^{43}\) NTSB Report at 60
with the known effects of fatigue, and any evidence supporting alternative explanations for such deficiencies needs to be considered.\textsuperscript{44}

Both the captain and the first officer had flown during the week before the accident, but their schedules were within duty-time limitations.\textsuperscript{45} Despite the flight crew’s adherence to flight and duty time requirements, both the captain and the first officer inappropriately used an airport crew room to rest before the flight.\textsuperscript{46} The NTSB ultimately decided that fatigue was not a probable cause of the accident. Although the crew’s failure to detect the stick shaker\textsuperscript{47} could be consistent with effects of fatigue but the extent of impairment and degree to which it contributed could not be conclusively determined.\textsuperscript{48} There was also some inquiry into the possible sickness\textsuperscript{49} of the first officer but the NTSB was unable to determine what, if any, impact that may have had on her performance.\textsuperscript{50} Between the experience, the training, and possible fatigue of the pilots there were a number of human factors involved in Flight 3407’s demise. The NTSB is tasked with making sense of each factor and each piece of evidence and establishing a probable cause of the accident.

\textit{C. NTSB Probable Cause and Conclusions}

On February 2, 2010, roughly a year after Flight 3407 crashed into suburban Buffalo, the NTSB published its final report including probable cause, recommendations, and conclusions.\textsuperscript{51} According to the NTSB, the probable cause of the accident was the captain’s inappropriate response to the activation of the stick shaker, which led to an aerodynamic stall\textsuperscript{52} from which the airplane did not recover.\textsuperscript{53} The reason the captain did not recognize the stick shaker or properly react could not be determined from the

\textsuperscript{44}Id. at 106
\textsuperscript{45}Id. at 104. The NTSB also includes a timeline for both the captain and the first officer of the 72 hours prior to the accident, to help identify rest patterns.
\textsuperscript{46}NTSB Report at 104.
\textsuperscript{47}The stick shaker shakes the control yoke of an airplane to warn the pilot of an impending stall.
\textsuperscript{48}NTSB Report at 107, 153.
\textsuperscript{49}Throughout the flight, the cockpit voice recorder picked up sniffling, coughing, sneezing and commentary from the first officer regarding how she feels and whether she may call in sick for work the following day.
\textsuperscript{50}Id. at 113
\textsuperscript{51}Id. at pp. 151-60. It is also important to note that NTSB findings of probable cause are inadmissible at any civil trial. They are solely relied upon to inform the public and inform the FAA for future remedial action.
\textsuperscript{52}An aerodynamic stall occurs when the angle of attack of the wings increases to a point where the air does not flow over the top of the wings smoothly and they stop generating lift.
\textsuperscript{53}NTSB Report at 155.
evidence. In other words, after extended inquiries into the flight crew’s training, experience, fatigue, sickness, and ice accumulation on the wings, the accident’s root cause was the pilot’s failure to respond when notified of the impending stall. Other cockpit systems designed to inform the pilot of a stall were functioning and alerts were presented on the flight instruments with adequate time for either pilot to take corrective action, but neither responded.

In addition to the captain’s failure to respond to the stick shaker, there were four (4) contributing causes to the accident. Those contributing causes to the accident were:

1) the flight crew’s failure to monitor airspeed in relation to the rising position of the low-speed cue;
2) the flight crew’s failure to adhere to sterile cockpit procedures;
3) the captain’s failure to effectively manage the flight; and
4) Colgan Air’s inadequate procedures for airspeed selection and management during approaches in icing conditions.

The NTSB report explicitly notes in its conclusions that the captain’s response to the stick shaker activation should have been automatic, his actions were inconsistent with his training, and his actions instead were consistent with startle and confusion. By reaching such a conclusion, the NTSB implies that his training was inadequate. If the captain’s response is supposed to be automatic, and his actions were inconsistent with his training, it reads as more of an indictment of this particular captain’s skills as opposed to the amount of training required. This was one instance of failure amongst thousands of pilots and tens of thousands of pilots flying each day. It is difficult to assign systematic

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54 Id. at 151.
55 These other systems include decreasing margin between airspeed and low-speed cue, airspeed trend vector point down, and the changing color of numbers on airspeed display.
56 Id.
57 Id.
58 Had the flight crew been aware of the low airspeed it may have recognized the stall. Id. at 152.
59 Cockpit conversations between the captain and first officer delayed approach checklist completion and created an environment that prevented timely error detection. Id.
60 The NTSB issued 46 conclusory findings. Only those findings relevant to the human factors outlined in the previous section are discussed in this paper.
61 The improper actions of the flightcrew included failure to consider reference speed switch when stick shaker activated, the captain’s attempt to override the stick shaker which exacerbated the stall, and the first officer’s retraction of the flaps. NTSB Report p.151-52.
62 Id.
blame on training inadequacies when such a miniscule percentage of pilots make the same mistake. The NTSB report also explicitly notes that the first officer’s retraction of the flaps and suggestion to raise the landing gear during the stall were inconsistent with stall recovery procedures and training.\textsuperscript{63} By reaching such a conclusion, the NTSB implies to imply the training the first officer received was adequate. Finding the first officer’s actions inconsistent with her training illustrates her own shortcomings rather than an industry-wide lack of training. The training procedure for any task cannot be rendered inadequate simply by the failure in one instance to abide by such procedure. Perhaps the system failed the first officer in allowing her to pass through her training. Perhaps the first officer passed through training with flying colors but later regressed after becoming more comfortable in her position. In any case, it would be easier to make an argument in favor of more training requirements if failures like Flight 3407 were commonplace, but that is not the case.

Few lines of work exist where one can reasonably believe that each employee will be 100\% compliant with all training, rules, and regulations. There are far too many variables and scenarios for which training cannot adequately prepare an individual. In aviation, a flight simulator or small training aircraft cannot accurately simulate the pressure of a real world scenario with the lives of others on the line. An argument could be made that pilots, more than other professionals, need to be constantly trained until they are perfect or as close to perfect as possible and fully compliant with all practices and procedures. Ideally, all pilots would receive training until they were perfect in every aspect of their jobs. Ideals do not always prevail when they are pitted against financial constraints. Training hours and flight hours cost money. In a job market that already faces shortages, airlines don’t have the luxury of waiting for perfect pilots. While some may believe that ‘the planes basically fly themselves’ it is human beings in control of the aircraft. As long as humans are in control, human factors will always play a role in aviation.

\textbf{III. LIFECYCLE: FROM NTSB RECOMMENDATIONS TO FAA REGULATIONS}

\textsuperscript{63} \textit{Id}. at 152.
There is plenty of blame to assign for the tragic end to Flight 3407. The NTSB is charged with assigning the blame and preventing such tragedy in the future. Perhaps the safety recommendations, if recommended earlier or implemented sooner, would have prevented this outcome – perhaps, not. The FAA adopted the position that a significant increase in training and experience requirements for pilots will prevent such an accident from occurring. A prevailing opposing argument is that Flight 3407 was a result of human error by an experienced crew with adequate training. The argument logically follows that it was not the training or experience requirements that failed the flight crew of Flight 3407; rather, it was the flight crew that failed to act on their training which, if followed, would have avoided the disaster. The latter is the adopted view of many pilots and aspiring pilots who consider the new FAA regulations unnecessary and excessive for a labor market that already faces shortages. Indeed, it is difficult to form a logical connection between the initial NTSB recommendations and the new FAA regulations.

A. NTSB Recommendations

It is important to keep in mind the probable cause, contributing causes, and conclusions outlined by the NTSB when contemplating safety recommendations arising out of the same accident. The NTSB introduced over twenty (20) new recommendations, reiterated its stance on three (3) previously issued recommendations, and reclassified their stance on five (5) others. The new recommendations, in relevant part, include the following:

A-10-13 – Issue advisory on guidance on leadership training and standards of conduct for upgrading captains;
A-10-14 – Require operators to provide specific course on leadership training to upgrading captains;
A-10-15 – Develop and distributed to all pilots guidance on professionalism and techniques for sterile cockpit\textsuperscript{67} adherence;
A-10-16 – Require all operators to address fatigue risks;
A-10-17 – Require operators to document and retain copies of all pilot training to fully assess pilot’s entire training performance;

\textsuperscript{64} See \textit{Aman v. F.A.A.}, 856 F.2d 946, 955 (7th Cir. 1988); See also 57 J. Air L. & Com. 755. \textit{From the Cockpit to the Nursing Home: A Look At the Recent Developments in the Law Concerning the Age-60 Rule}. Journal of Air Law and Commerce. Spring 1992.

\textsuperscript{65} With the numerous safety recommendations addressed in the NTSB Report, this paper will only discuss those relevant to human factors.

\textsuperscript{66} The following recommendations have been simplified. See http://www.ntsb.gov/investigations/AccidentReports/Reports/AAR1001.pdf pp. 156-60.

\textsuperscript{67} A sterile cockpit means no extraneous conversation below 10,000 feet.
A-10-20 – Develop processes to audit and validate accuracy of training records;
A-10-21 – For airplanes with reference speed switches, implement specific training to ensure pilots are proficient in this area;
A-10-22 – Require operators and training centers to develop and conduct training incorporating fully developed stalls in all circumstances;
A-10-23 – Require operators of stick pusher aircraft to provide pilots familiarization simulator training;
A-10-24 – Define and codify minimum simulator requirements to support expanded stall training recovery;
A-10-25 – Require operators to provide airplane specific stall recovery procedures

The one relevant previously issued recommendation is as follows:

A-05-14\textsuperscript{68} - Require Operators to establish training programs for flight crewmember who have demonstrated performance deficiencies.

There are numerous recommendations revolving around training and new training requirements. The FAA’s final rule only addresses two of these recommendations.\textsuperscript{69} The NTSB recommendations seem well aligned with the findings of the investigation. That is, the probable cause was a stall resulting from the captain’s disregard of the stick-pusher. Therefore a major point addressed by the subsequent safety recommendations is additional training in stall recovery, and airplane specific stall recovery training. Additionally, these recommendations reasonably address the conclusions and contributing causes to the accident by implementing training and procedures to keep a sterile cockpit, and improving flight management skills through leadership courses. It is not these recommendations which are overly burdensome or which draw the ire of many in the aviation industry. The source of controversy is the final FAA regulations\textsuperscript{70}.

Between the NTSB’s report released on February 2, 2010 and the FAA’s final rule on July 15, 2013, the reasonably appropriate safety recommendations from Flight 3407 transformed into burdensome FAA regulations. To understand the evolution from these recommendations to FAA regulations, it is easiest first to explore the final FAA regulations in comparison with the original NTSB recommendations.

\textsuperscript{68} NTSB Report p. 159
\textsuperscript{69} 78 FR 42324, 42329 (The NTSB investigated these accidents and the changed enacted in this rule address, at least in part, the following NTSB recommendations (A-10-22 and A-10-23) amongst 22 total recommendations from various other occurrences.
\textsuperscript{70} 78 FR 42324-01 (2013)
disconnect is clear, a review of the legislative process in between start and finish illustrates gradual change from recommendation to regulation.

B. FAA Final Rule
The post-Colgan regulations include a number of significant changes for certification and qualification requirements for pilots.\textsuperscript{71} The changes primarily affect pilots seeking an Airline Transport Pilot (“ATP”) certificate\textsuperscript{72} with an airplane category multiengine class rating or an ATP certificate obtained concurrently with an airplane type rating.\textsuperscript{73} In the final rule, the FAA specifically acknowledged Flight 3407 under the heading ‘Statement of the Problem’.\textsuperscript{74} In response to the Colgan Air accident, the FAA published an Advance Notice of Proposed Rule Making (“ANPRM) to gauge public opinion on the topic.\textsuperscript{75} The new FAA regulations, in comparison with the old, clearly illustrate the changes.\textsuperscript{76} First, the new regulations provide additional requirements for obtaining an ATP. The previous requirements for an ATP were:

1) Be at least 23 years of age;
2) Hold a commercial pilot certificate with instrument rating;
3) Pass the ATP knowledge and practical test; and
4) Have at least 1500 hours total time as a pilot.\textsuperscript{77}

Under the new regulations, those same requirements still exist plus the following additional requirements\textsuperscript{78}:

1) Prior to taking ATP knowledge test, successfully complete an ATP CTP;\textsuperscript{79} and
2) Have a minimum of 50 hours in class of airplane.\textsuperscript{80}

In addition to the heightened requirements for obtaining an ATP certificate, there are two other significant ways the FAA altered pilot requirements. First, the new regulations require all first officers to hold an ATP.\textsuperscript{81} Previous requirements mandated only:

\textsuperscript{71} The meaning of “all pilots” or “pilots” in this paper refers to those pilots in Part 121 and part 135 Air Carrier operations, including pilots for commercial airlines.
\textsuperscript{72} In order to be a pilot in command of an aircraft, an ATP is required under both the post-Colgan regulations and the previous regulations.
\textsuperscript{73} 78 FR at 42325.
\textsuperscript{74} Id.
\textsuperscript{75} ANPRM is the first step in an agency’s proposal of a regulation. An ANPRM advises the public of potential regulations and invites feedback on such regulation.
\textsuperscript{76} See Appendix 2 for complete chart of requirements before and after FAA regulations.
\textsuperscript{77} Id.
\textsuperscript{78} Id.
\textsuperscript{79} ATP CTP is an Airline Transport Pilot Certificate Training Program. Based on preliminary research these classes cost anywhere form $4500 to $8500.
\textsuperscript{80} The new ATP requirements are in effect for both captains (Pilots in Command) and first officers (Second in Command).
1) A commercial pilot certificate; and
2) A second-class medical certificate.

The new requirements require the first officer to hold:

1) An ATP\textsuperscript{82} with appropriate aircraft type rating - OR - an ATP with restricted privileges\textsuperscript{83} and an appropriate aircraft type rating.
2) At least a second-class medical certificate.

This is a significant increase in flight-hour experience. The new requirements here equate to an increase from 250 hours before, to 1500 hours under the new regulations. Finally, and perhaps most controversial, are the new requirements to serve as a captain.

Prior to the new regulations the requirements for a captain were:

1) Have at least 1500 hours of total time as a pilot;
2) Hold an ATP certificate with appropriate aircraft type rating; and
3) Hold a first class medical certificate;

The new regulations\textsuperscript{84} include all of the previous requirements as well as:

1) Have a minimum of 1,000 flight hours in air carrier operations as second in command or as a captain in other types of air carrier operations.

In particular, the new 1,000 flight hour requirement for captains seems incongruent with the NTSB safety recommendations. Those recommendations consisted, in relevant part, of additional training programs in varying circumstances of a stall, especially for operators aware of aircraft-specific stall characteristics. Not one of the NTSB recommendations suggested an increase in flight hour requirements or experience. It seems the requirement for all pilots to hold an ATP certificate is a direct result of the first officer’s actions on Flight 3407. Yet it was not the actions of the first officer that doomed the flight. In fact in the NTSB’s conclusions, the first officer is mentioned in only four (4) of their findings. Of those mentions, only one (1)\textsuperscript{85} suggests that the first officer acted improperly.

Both the NTSB Report and a common sense reading of the events of Flight 3407 indicate the captain was at fault. In such a situation, it would be fruitful for the NTSB and the FAA to take steps to correct those pilot errors. The NTSB was on the right track, with the recommendations for stall training, leadership training, and fatigue awareness. Those recommendations were rationally related to the causes of Flight 3407’s demise. The FAA

\textsuperscript{81} Id.
\textsuperscript{82} In accordance with the new regulations discussed supra.
\textsuperscript{83} There are additional methods of obtaining restricted privileges as a first officer under the new requirements that include education at either a 2-year or 4-year aeronautical university. These methods are outside the scope of this paper, however.
\textsuperscript{84} Id.
\textsuperscript{85} NTSB Report at p.151-52 (first officers retraction of flaps and suggestion to raise the landing gear were inconsistent with stall recovery procedures)
regulations are quite the opposite. Even if the new regulations had been in place at the time of the accident, the captain of Flight 3407 would have met all of the new requirements. He had over 3300 hours of flying time, an ATP with the appropriate aircraft type rating, a first class medical certificate, and over 1,000 as a pilot in command. This fact underscores the argument that this crash was not a matter of the training or experience; it was a matter of pilot error.

The FAA’s final rule makes specific mention to human error, the NTSB safety recommendations, and the apparent influence the recommendations had on these FAA regulations. The final rule claims the FAA identified 31 accidents between 2001-2010 that could have been prevented if the enhanced ATP qualification standards had been in effect. The rationale behind such findings as to how these new qualification standards would have prevented the occurrences is not clear. Equally unclear is whether Flight 3407 is one of those accidents the FAA considers as “would have been prevented” when, as previously discussed, the captain of Flight 3407 met all of the new ATP heightened qualifications. It is an overstatement to suggest these standards would have prevented these previous accidents. A fair characterization is to say the new ATP qualifications would have provided more training and preparation for the pilots involved. The very nature of human factors suggest that no amount of training or experience guarantees the exact same, perfectly accurate performance in every instance.

All of these requirements were implemented despite studies showing that added time in the cockpit does not automatically lead to pilots with more knowledge and flight skills. Intervening processes between the NTSB recommendations and the FAA Final Rule played a crucial role in shaping the regulations. The first of those processes is the first phase of the FAA regulatory process: The Advanced Notice of Proposed Rule Making.

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86 NTSB Report at pp. 6-7
87 78 FR at 42329 (“Human error, as evidenced in the Colgan Air accident, has been a major factor in many of the commercial accidents over the past 10 years”).
88 Id.
C. The ANPRM, the Rule Making Committee

The FAA published an ANPRM on February 8, 2010 titled “New Pilot Certification Requirements for Air Carrier Operations”\(^{90}\) which, the FAA Final Rule indicates, was published “in response to the Colgan Air Accident\(^{91}\)”. Clearly, the new requirements were a direct response to the Flight 3407 tragedy. Notably, the ANPRM came less than one week after the NTSB final accident report.

The ANPRM explicitly mentions\(^{92}\), just as the Final rule does, Colgan Flight 3407. As previously noted however, the FAA rule explicitly states which NTSB recommendations are addressed by the rule, but only two of the relevant human factor recommendations from Flight 3407 make the cut\(^{93}\). Those two recommendations addressed stall training and stick pusher familiarization for pilots of stick pusher equipped aircraft. As many in the aviation industry would attest, stall prevention, training, and recovery is something pilots undergo from the beginning of their aviation careers\(^{94}\). The consideration of so many other recommendations unrelated to Flight 3407 and the timing between the NTSB report and the ANPRM indicate Flight 3407 was just the straw that broke camel’s back in human factor related accidents. Perhaps these human factors regulations, heightened experience and training requirements were a long time coming. Perhaps Flight 3407 finally provided the devastating, and incredibly public, springboard for new regulations.

If the FAA truly believed the heightened standard could have prevented some 31 accidents\(^{95}\) it seems illogical, almost inhumane, to wait for such a tragedy to implement change. Another possible reasoning for the quick work on the ANPRM is the pressure felt by the FAA from families of loved ones on Flight 3407. Feeling pressure after such a large loss of life would also somewhat explain the implementation of such regulations despite the numerous and well-documented negative effects which the regulations carry.

\(^{90}\) 75 FR 6164-01 (February 8, 2010).
\(^{91}\) 78 FR at 42327.
\(^{92}\) 75 FR 6164 (“The FAA is initiating this rulemaking project to request recommendations from the public to improve pilot performance and professionalism, issues which were also highlighted in the Colgan Air accident”)
\(^{93}\) See note 75, above.
\(^{94}\) 14 C.F.R. 61
\(^{95}\) 75 FR at 42329 (FAA has identified 31 accidents, which resulted in 99 fatalities, 29 serious injuries, and 44 minor injuries). See also Docket # FAA-2010-0100
The nature of an ANPRM makes proposed regulations transparent and allows feedback from anyone interested in potential regulations including consumers, trade groups, and professionals alike.

Among the relevant issues outlined in the ANPRM’s general discussion and request for information, the very first issue on which the FAA requests feedback is whether to require an ATP certificate for all pilots.\textsuperscript{96} The primary discussion of flight hours within the ANPRM\textsuperscript{97} concerned the number of hours required for ATP certification at the time. It also notes that the FAA expects that a new endorsement, if one were adopted for second in command pilots, would include additional flight hour requirements in addition to those requirements in effect at the time. At this point there is no indication of what those requirements might be, simply a solicitation of feedback. There is no mention of any stall training or stick pusher training in the ANPRM despite being the sole probable cause of Flight 3407’s demise. The only other potential regulations of relevant human factors include the discussion\textsuperscript{98} of requiring operating experience in a crew environment including icing and high altitude operations.

The ANPRM received comments from approximately 1,300 commenters including flight schools, flight school associations, pilot associations, major and regional carriers, and individuals.\textsuperscript{99} Due to the overwhelming number of comments from both sides, and the wide spectrum of comments in both support and opposition of the proposed rules, the FAA established the First Officer Qualifications Aviation Rulemaking Committee (FOQ ARC) in July of 2010\textsuperscript{100}. According to the FAA, his was a cross section of aviation industry experts that provided a forum to discuss flight experience and training.

\textsuperscript{96} 75 FR 6164.
\textsuperscript{97} Id. at §2A-2C
\textsuperscript{98} Id. at §3.
\textsuperscript{99} 77 FR 12377. (approximately 1300 commenters in 60 day period from 2/8/2010 – 4/9/2010). Available at http://www.regulations.gov/#!docketBrowser;rpp=100;so=ASC;sb=commentDueDate;po=500;dc t=PS;D=FAA-2010-0100
requirements to fly as second in command.\textsuperscript{101} This is another seemingly direct connection to Flight 3407. While Flight 3407 was caused by pilot error, the second in command experience and training came under some scrutiny for failure to recognize the pilots’ improper actions. This scrutiny is misguided. It was the improper actions of the pilot which caused the crash of Flight 3407 yet it is the first officer’s actions and experience which necessitate contemplation by a specific committee? It should have been the pilot’s training and experience at the forefront of these regulations, especially given the FAA’s insistence on linking the regulations to the accident.

It certainly seems from the makeup of the FOQ ARC that both supporters and detractors of these heightened requirements were represented. Before the FOQ ARC submitted its final recommendations however, President Obama signed into law the Airline Safety and Federal Aviation Administration Extension Act of 2010\textsuperscript{102} which essentially tied the FAA’s hands.

\textit{D. The Airline Safety and FAA Extension Act of 2010}

The Airline Safety and Federal Aviation Administrations Extension Act of 2010 (“The Act”) was signed into law on August 1, 2010 and included multiple provisions for improving airline safety\textsuperscript{103}. Section 216 of the Act is the most relevant of those section and requires all flight crew members, both pilots in command and second in command, to hold an ATP certificate. The Act provided an August 2, 2013 deadline for second in commands to acquire the ATP Certificate. The Act did not however require any additional flight hours for becoming a pilot in command, as the final rule did. The Act did require air carriers to implement training programs and/or mentorship-type leadership programs pairing experienced and young pilots, and mandated FAA establish regulations for strict adherence to sterile cockpit rules, and rules to protect against pilot fatigue.\textsuperscript{104} It also mandated the FAA to establish a rule requiring flight training or simulator training in stall avoidance, recognition, and recovery, and required a rule mandating stick pusher

\textsuperscript{101} 77 FR 12374, 12379 (FOQ ARC included participation from, inter alia, Air Line Pilots Association, Aviation Accreditation Board International, Pilot Career Initiative, National Air Disaster Alliance Foundation, National Business Aviation)

\textsuperscript{102} Airline Safety and FAA Extension Act of 2010. PL 111-216 (August 1, 2010)

\textsuperscript{103} Id. at II. §201-217

\textsuperscript{104} Id. at II. §206, 212
training. Few would argue against adherence to sterile cockpit rules, protecting against pilot fatigue, leadership programs, and stall-related training. These rules are related to specific concerns and are not excessive for pilots. Requiring pilots in command to acquire another 1,000 flight hours, and requiring all seconds in command to acquire ATP certifications puts a significant burden on pilots. The FAA had no choice but to implement the ATP requirement for all flight crewmembers because of a congressional mandate, but the 1,000 additional flight hours before becoming a pilot in command was not explicitly addressed in the Act.

E. The NPRM

On February 29, 2012 the FAA published its Notice of Proposed Rule Making (“the NPRM”) after public feedback on the ANPRM, recommendations from the FOQ ARC, and congressional mandates outlined in the Act. The NPRM is the first instance where the 1,000 hour flight hour requirement for Pilots in Command is proposed. The NPRM is also the last step before the final rule is published. The FAA explicitly explains its reasoning for this aeronautical experience requirement within the NPRM. The FAA cites the Act, which references “sufficient flight hours” and notes the additional benefits a second in command derives from observing a pilot in command. The Act does not make mention of whether the previous total-hours requirements’ were sufficient or not. Here, the FAA’s reasoning necessarily fails given the regulations relationship to Flight 3407. Clearly the second in command of Flight 3407 could not have derived much benefit from following the captain’s improper activities. The NTSB report is littered with references to improper actions by the pilot in command. Furthermore, the captain would have already met the additional 1,000 hour requirement. This shows that the new requirements could not have prevented the Flight 3407 crash. In other words, even those who meet the new requirements will still be susceptible to error. Without a doubt, the stick pusher and stall training were necessary regulations, given the cause of Flight 3407’s accident. There is no debate that some action had to be taken given what transpired on Flight 3407. There also should be a reasonable balance between

105 Id. II. §208
106 §217 of the Act does require an FAA rule regarding “sufficient flight hours to enable a pilot to function effectively in an air carrier environment”.
107 77 FR 12374-01.
all the competing interests including those of the air carriers, the pilots, and the consumers. In this case it does not seem

Just as the ANPRM did earlier, the NPRM\textsuperscript{108} elicited hundreds of comments of varying opinions. Among those commenters were regional airlines, most notably American Eagle\textsuperscript{109} which submitted a 16 page comment arguing, inter alia, that the certain pilots should be grandfathered in to the new ATP certificate requirement if they have at least 1,000 hours on the given airplane. The American Eagle comment also included reference to the 2010 Pilot Source Study.\textsuperscript{110} Within the study was the case of one regional airline\textsuperscript{111} which had hired 600 pilots over the previous 18 month. Of those approximately half, 300 pilots, would be ineligible to fly under the proposed regulations. The disqualification of 300 pilots (150 flight crews) to one airline would result in the regional airline either taking 30 aircraft out of service, or withholding of 30 aircraft to the travelling public. The FAA final rule, published in July of 2013, explicitly mentions the consideration of American Eagle’s comment, but rejects American Eagle’s proposal. This comment, amongst dozens of other which outlined the harm of these regulations on airline operations, is just a small piece of evidence showing the potential harm of the FAA Regulations.

IV. THE IMPACT OF FAA REGULATIONS

Roughly three years have passed since the implementation of the heightened FAA regulations. While that is not nearly enough time to assess the full effect of such regulations, it is sufficient for examining emergent trends. Primarily, these regulations have an impact on the air travel industry, consumers, and pilots.

\textit{A. Air Travel Industry}

Given the FAA’s regulatory authority over the air travel industry, it logically follows that all FAA regulations have some effect on the industry. The regulations issued in this instance are no different. Despite several recent aviation disasters, air travel remains quite safe. A study by the International Air Transport Association (IATA) revealed that

\textsuperscript{108} The NPRM garnered approximately 600 comments including comments from major air carriers, industry groups, colleges and universities, flight schools, pilots.
\textsuperscript{109} American Eagle is a regional carrier under American Airlines.
\textsuperscript{110} FAA-2010-0100-1824. Comment posted May 2, 2012.
\textsuperscript{111} Id.
for the year 2013, there was 1 accident for every 2.4 million flights\textsuperscript{112}. A more recent study published in the Wall Street Journal\textsuperscript{113}, which incorporated the recent accidents, found 2.8 accidents per 1 million flights. These are worldwide numbers. Even traveling on an airline with one of the worst safety records the odds of dying in an aircraft accident are still 1 in 2,000,000\textsuperscript{114}. This means the chances of dying from accidental poisoning, choking, or heat exposure are greater than the chances of an individual dying in an air transport safety incident\textsuperscript{115}. Even considering the recent number of high profile disasters, air travel continues to be quite safe\textsuperscript{116}. According to the International Civil Aviation Organization, a total of 90 commercial flights crashed worldwide in 2013, meaning an accident rate of 2.8 per 1,000,000\textsuperscript{117}. Given that these numbers include worldwide commercial flights in places such as Africa and the Middle East, United States air travel has an even lower accident rate\textsuperscript{118}. Moreover, not all accidents are fatal accidents, lowering the likelihood of death in United States air travel even further\textsuperscript{119}. To put these numbers in perspective, Aviation accidents in the US have claimed 10,505 lives since 1945\textsuperscript{120}. In 2012 alone, over 815,000,000 passengers traveled on US airlines and foreign airlines serving the US. Even if all of those fatalities occurred in 2012, that would mean approximately .0000012 percent of air passengers were in a fatal US air accident. Extrapolating that data over the roughly 70 years from 1945-2015 and

\textsuperscript{112} IATA Study
\textsuperscript{113} Pasztor, Andy. Data Show Safety of Flying Despite Spate of Crashes. Wall Street Journal. (2.8 accidents per 1,000,000 departures worldwide; Even lower in USA considering Africa only accounts for 2% of global passenger traffic but accounts for 10% of accidents).
\textsuperscript{114} http://www.cnbc.com/id/101865037 (By comparison, if traveling on one of the worlds major airlines, the odds of a fatal accident are 1 in 4,700,000).
\textsuperscript{115} Id. (Odds of dying from choking 1:3,649; Unintentional poisoning 1:119, Heat Exposure 1:8,321.)
\textsuperscript{116} Pasztor, Andy. Data Show Safety of Flying Despite Spate of Crashes. Wall Street Journal. (2.8 accidents per 1,000,000 departures worldwide; Even lower in USA considering Africa only accounts for 2% of global passenger traffic but accounts for 10% of accidents).
\textsuperscript{117} Id.
\textsuperscript{118} Id.
\textsuperscript{119} Africa, for example, makes up only about 2% of air traffic around the world but 11% of the world’s fatal accidents occur there. International Civil Aviation Organization. 2014 Safety Report. http://www.icao.int/safety/Documents/ICAO_2014%20Safety%20Report_final_02042014_web.pdf
\textsuperscript{120} http://blogs.marketwatch.com/thetell/2013/07/08/u-s-has-the-most-fatal-plane-crashes-by-country-but-then-we-fly-a-lot-more/ (According to data obtained from the Aviation Safety Network)
incorporating that hundreds of millions of passengers travel US airlines each year, the percent of passengers involved in fatal US air accidents is exponentially low. While the preceding is by no means a 100% accurate mathematical formula, it underscores the likelihood of dying in an air traffic accident in the US is low. Considering the relationship to other effected groups discussed below, there has to be a balance between regulations and feasibility and productivity. At some point, the FAA’s regulations are too burdensome compared to their safety benefits at the margin. Simply put, the aviation industry is so safe that costs of new restrictions outweigh any potential benefit. Safety is always a priority, and having the FAA constantly monitor and implement new safety regulations is necessary. But heightened training requirements with no tangible evidence of improved safety are infeasible for regional airlines. This infeasibility of the new regulations was outlined by American Eagle in its NPRM comment\textsuperscript{121}. American Eagle noted that the new regulations would lead to the suspension of 30 aircraft from their fleet due to lack of crews. The requisite training implement of these new regulations would cost, conservatively estimated by American Eagle, roughly $2,440,000\textsuperscript{122}. Costs that high might be reasonable if they were guaranteed to increase the safety of air travel. That is simply not the case here\textsuperscript{123}. Anytime an airline faces higher costs, the unfortunate result is those costs get passed on to consumers. With many airlines already charging fees for things like checked bags, early boarding, and fuel surcharges, it seems inevitable that consumers will foot the bill for the costs associated with these regulations. Furthermore, American Eagle’s comment argues that enhancements to their own, and to all airlines, training programs are not the byproduct of overly restrictive legislation, but as a result of desire to have the highest quality pilots in the industry. The airlines have a vested interest in having the most qualified pilots and in having those pilots receive adequate training. As evidenced after the attacks of September 11, 2001 it became

\textsuperscript{121} See Note 118 on page 21.  
\textsuperscript{122} These costs include pilot training, reserve pilots, instructors, check airmen, simulator rentals, hotels, and pilot per diem costs for the 1,251 American Eagle pilots without ATP certificates and 1337 pilots without PIC type rating.  
\textsuperscript{123} See note 94 on page 15.
abundantly clear that an airline’s financial well-being is directly and negatively affected by air traffic disasters\textsuperscript{124}. While financial incentive will not always inspire companies to go above and beyond federal regulations, it does encourage companies to weigh the benefits in adopting new safety procedures with the overall harm they inflict. Unfortunately, air carriers were not allowed to balance the pros and cons as the FAA made the decision for them. At some point these costs will inevitably lead to less availability and less affordability in air travel. While declaring the aviation industry completely safe is absurd, it may have reached a point where careful analysis of additional safety regulations need to be weighed against other interests. The post-Colgan regulations demonstrate the costs outweighing potential benefits. When costs outweigh the benefits, individuals pay the price. In this case, Pilots are negatively affected by the new regulations.

\textit{B. Pilots}

While many pilots of the major carriers such as American Airlines and United Airlines will not be affected by new regulations, regional air carriers will undoubtedly feel a squeeze. The president of the Regional Airline Association, Roger Cohen\textsuperscript{125}, believes the new regulations requiring 1500 hours as part of the ATP requirement will adversely affect the future supply of pilots and could imperil service to over 500 communities in the United States. With fewer pilots at their disposal, regional air carriers are faced with decisions about cutting service or cutting aircraft. While regional carriers would feel the effects of such cuts in lower profits, so too would consumers faced with fewer options in air travel, especially from smaller cities. With fewer options to utilize in air travel, the demand for such options will increase, and regional carriers may surge their prices higher to recover lost profits and respond to increased demand. Basic economic principles of supply and demand support this theory. When demand increases and the supply either decreases or remains the same, the price will increase to account for the shortage in supply.


The new requirements serve as a barrier to entry for future pilots. The cost of obtaining ATP certification and the acquisition of thousands of flight hours comes at a high cost. ATP Certificate Training Programs range from $4,000 to $8,000 alone; not to mention those costs associated with flight hours and instructional training. To further complicate the pilot situation, many regional airline pilots are paid just over minimum wage\textsuperscript{126}. It is also problematic for pilots to achieve 1,500 hours because most commercial jobs require at least that much experience as a pre-requisite for employment. The new requirements, if not obtained through educational alternatives provided by the final rule, may shut the door on career opportunities for some low-time pilots and make it harder for airlines to find qualified applicants\textsuperscript{127}. At some point, would-be pilots must consider the cost of becoming a pilot against their potential earnings as a pilot. Such a comparison will not yield much optimism. The heightened requirements, if met, would also mean the pilots that are employed by these carriers are now more qualified and experienced than ever before. It goes without saying that more qualified and more experienced pilots require a higher salary, but this is another unwanted cost for regional carriers. Overall, the new requirements ask a lot of regional carriers and their pilots. But the aviation industry and their pilots will not be the only ones affected by the regulations. Ultimately, the burden imposed by the FAA will be felt by consumers and their pocket books despite no credible evidence that safety has improved.

V. Conclusion

Colgan Air Flight 3407 was a tragedy. What followed was a thorough investigation and competent final report issued by the NTSB. The safety recommendations the NTSB put forward were logical, and reasonably related to their findings of probable cause in the crash of Flight 3407. Unfortunately, those recommendations transformed into burdensome new pilot requirements. In the aftermath of Flight 3407, perhaps it was the public outcry or lobbying of Congress from families of those involved in the crash that led to such drastic implementations. While their devastation and public outcry are understandable, Congress misconstrued their complaints. The FAA Extension Act of 2010 laid out many of the requirements and directed the FAA to implement certain

\textsuperscript{126} See note 94, p.15.
regulations. Congress bound the FAA into requiring ATP certificates for all pilots, consequently mandating rules that are unlikely to benefit airline safety. Those same rules are sure to impact regional airlines negatively and their pilots, resulting in service cuts, and the inability for pilots to meet expensive new requirements. Unfortunately, as many Congressional acts do, these regulations will burden consumers with higher prices and less availability.