

University of Montana

ScholarWorks at University of Montana

Graduate Student Theses, Dissertations, &
Professional Papers

Graduate School

2002

Committed to the sky: How Delta Air Lines reacted to the worst day in the history of commercial aviation

Michael Crocker

The University of Montana

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

Let us know how access to this document benefits you.

Recommended Citation

Crocker, Michael, "Committed to the sky: How Delta Air Lines reacted to the worst day in the history of commercial aviation" (2002). *Graduate Student Theses, Dissertations, & Professional Papers*. 7983.
<https://scholarworks.umt.edu/etd/7983>

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.



Maureen and Mike
MANSFIELD LIBRARY

The University of

Montana

Permission is granted by the author to reproduce this material in its entirety,
provided that this material is used for scholarly purposes and is properly cited in
published works and reports.

****Please check "Yes" or "No" and provide signature****

Yes, I grant permission

No, I do not grant permission

Author's Signature: Michael R. Cook

Date: 5-17-02

Any copying for commercial purposes or financial gain may be undertaken only with
the author's explicit consent.

COMMITTED TO THE SKY

*How Delta Air Lines' reacted to the worst day in the history of
commercial aviation.*

By

Michael Crocker

B.A. Bates College, 1998

Presented in partial fulfillment of the requirements

for the degree of

Master of Arts

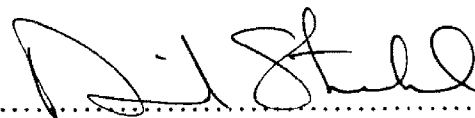
The University of Montana

May 2002

Approved by:



.....
Chairperson



.....
Dean, Graduate School

5-21-02

.....
Date

UMI Number: EP38784

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI EP38784

Published by ProQuest LLC (2013). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code



ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

For Dad, my navigator and co-pilot.

CONTENTS

PREFACE.....	iii
I. DELTA HEADQUARTERS.....	1
II. THE ATTACKS.....	5
III. NEW THREATS.....	9
IV. THE VIEW FROM THE COCKPIT.....	16
V. THE VIEW FROM THE GROUND.....	22
VI. THE WEAKEST LINK: AIRPORT SECURITY.....	34
SOURCES.....	39

PREFACE

At 6:57 a.m. in Missoula, Montana on September 11, 2001, I awoke to a phone call from my mother. I remember the exact time because the tone of her voice was so urgent, her message so horrifying: “Turn on the television, quick. An airplane just hit the World Trade Center.” She was in shock. I scrambled for the remote control. Unable to find it, I stretched from bed and pressed the power-button with my finger. The image, as so many have described it, was surreal: New York’s twin towers standing side by side, black smoke billowing from one. I watched, frozen. Suddenly an object streaked across the screen and exploded into the other building. “What airline?” I screamed. “What airline?”

It is a strange question to ask at such a moment, I know. But when your father is an airline pilot it is the only question after learning of a crash. My father is a captain for the Delta Shuttle. In a typical day he might fly in and out of New York’s LaGuardia Airport, across the East River from the World Trade Center, four or five times, so for a few terrifying moments on Sept.11 I didn’t know where he was or if he was even alive. Fortunately, I found out later that he was not working at the time but I knew his life would never be the same.

The World Trade Center was perhaps the most prominent landmark on a pilot’s flight into New York City. Approaching LaGuardia from Boston’s Logan Airport on a clear day my dad, said he could see the two towers scraping the sky from 20 miles out. Then he would turn toward the mouth of the Hudson River, dropping down near the Statue of Liberty and circling around the World Trade Center’s 110-story towers once before setting his plane down on runway 4. The pattern he flies into New York City since

Sept. 11 is the same as it was before but now when he lands he always looks down on the void in lower Manhattan, unable to forget what happened there.

In the weeks after the attacks, I remained glued to the 24-hour news networks and read hundreds of column inches about the airline industry's violent transformation: U.S. military fighters patrolled the skies over American cities prepared to shoot down a hijacked airliner that threatened lives and property on the ground; there was talk of arming pilots with handguns; and the industry was bleeding millions of dollars a day, putting the jobs of hundreds of thousands of airline employees in jeopardy. Obviously, for me, the attacks struck pretty close to home. For a professional project for my Master's degree in journalism I was compelled to write about the sudden change in my father's profession.

Originally, I intended to do kind of pop-psychology account of how pilots were dealing with post-Sept. 11 pressures in a career already known for its high level of stress. But in a conversation with my father last fall he deflected the story from himself. He said, "If you want to know how some of Delta's employees handle pressure, you should talk to the people who were working at the OCC that day; they did an incredible job."

The OCC is Delta's central command center. Dad explained that although his airline had escaped the horrors of United and American on Sept. 11, it still faced a logistical nightmare. After the second plane hit the south tower Delta's chief flight controller shut down the airline, several minutes before the government closed U.S. airspace nationwide. All of a sudden, flight dispatchers and pilots had to coordinate the landing of no fewer than 400 planes carrying at least 30,000 passengers. Some landed in places as remote as Santa Maria in the Azores, stranding passengers and crews; and, after

the government opened airspace 5 days later, Delta had to restart the massive operations it had ground to a virtual instant halt. But before the airline could recover a single plane, engineers and security analysts had to develop new security procedures and technology to prevent another catastrophe. Clearly the OCC's response was vital to the story, but I knew there was more.

In the weeks following Sept. 11, I talked to Delta pilots, flight attendants and engineers to get their reaction to the day that changed their profession forever; and in March I went to Delta's headquarters in Atlanta for four days to see the OCC and its support resources function in person. Delta's experience is part of the larger story of the aviation industry's triumphs and mistakes, and it offers a rare glimpse into the minds of an extraordinary team of professionals—by no means all of them pilots—whose jobs depend on cool confidence and quick thinking.

My father's job and my status as a student allowed me a level of access at Delta that would have otherwise been impossible. When a reporter from the *Washington Post* or the *Wall Street Journal*, for example, visits Delta he is accompanied by a public relations manager I was not. Nor did I surrender any editorial privileges. On the contrary, most of the people I talked to recognized that for better or worse they are part of a new world order, and asked only that I tell their stories fairly.

A journalist's role as a "watchdog" for abuses of power in our democracy requires vigorous skepticism, but another role of journalism is to record the experiences of people as they cope with change. The instant American Airlines Flight 11 sliced into the World Trade Center's north tower at 8:45 a.m. on Sept. 11, one world ended and a new more dangerous one began, a struggle in which the people of the airline industry are on the

front lines of and one where life for all Americans will never be the same. Whatever the airlines' past failings, the responsibilities of the men and women I observed at Delta—and of those who do their jobs at every airline—are enormous and they deserve to have their stories told.

I. DELTA HEADQUARTERS

Outside the headquarters of Delta Air Lines Inc., near Atlanta's Hartsfield International Airport, almost six months to the day after the Sept. 11 terrorist attacks, a guard inspected my father's and my credentials and looked us up and down. We cleared the first security perimeter but just a few steps inside another guard asked us to prove we were supposed to be there. My father is a pilot for Delta and we had come to see Capt. Dan Yates, an old family friend and a special project manager in the airline's flight operations department, to find out how Delta was coping with the aftermath of the attacks. Although I'd only been at headquarters a few minutes I'd begun to appreciate that flying in this country will never be quite the same.

The headquarters consist of three five-story brick buildings connected by two pedestrian bridges on the outside and a maze of hallways on the inside. Operation Control-3 houses multi-million dollar flight simulators capable of challenging a novice pilot with just about any scenario his instructor can dream up. Operation Control-2 is filled with classrooms and Hollywood-style airplane sets used to train flight crews for emergencies in as realistic an environment as possible, right up to the air-sickness bags stuffed in pretend seat-back pockets. Operation Control-1 is home to the Operation Control Center (OCC), the cerebrum of the nation's third largest airline. The OCC is divided into 17 departments each with a distinct area of expertise but all inextricably connected. Here, mathematicians, meteorologists, pilots, engineers, economists, flight dispatchers and security analysts, to name just a few of the positions, determine the safest and most cost-effective way to operate 2,200 flights to over 500 cities worldwide, 24-hours a day, seven days a week.

While the long-term effects of Sept. 11 on the country remain largely uncertain, the attacks have already transformed the airline industry: flights had to be reduced; cockpit doors were strengthened against attackers trying to get at the controls inside; airport security was heightened; and the cost of it all has left the future of some airlines hanging in the balance. With Yates' guidance (and his security clearance) I would observe several key features of Delta's operations over the next four days—from security briefings at the Flight Operations department to the floor of the OCC to a ride in a Boeing 767-400 flight simulator—to see how these changes are being felt at Delta. The airline's experience is part of the larger story of the industry's triumphs and mistakes, and it offers a rare glimpse into the minds of a team now charged with keeping the skies safe.

On the surface, the flight operations department could have been any other office space in Atlanta: A sea of wall-to-wall carpet filled with cubicles and surrounded by offices and conference rooms on every side save one left open to let in the Georgia sun. But the employees at "Flight Ops" are hardly typical. Most are pilots, many with advanced degrees in business or engineering and many are also retired military officers with strong leadership skills and a knack for order. Flight Ops is a liaison between management and Delta's 9,800 or so pilots on issues ranging from the operational safety of aircraft to contract negotiations. However, since Sept. 11, it has been focused primarily on security.

When I arrived at Yates' half-opened office door, an assistant was inside briefing him about a forthcoming meeting with federal air marshals. I could hear his calm, articulate voice: "I'll have to move some things around but we need to discuss our operations at National." My father met Yates about 10 years ago in Boston when they

were both flying 727s. He also holds a Master's degree in electrical engineering from the Massachusetts Institute of Technology. After a stint as chief pilot for the Delta Shuttle in New York City Yates was asked to come to Atlanta as something of a utility infielder for Flight Ops. He has published numerous articles in Delta's aviation safety journal *Up Front* on issues such as windshear (a violent meteorological phenomena that has resulted in several commercial airline crashes over the years) and jet engine fuel efficiency.

His office is Spartan in appearance. The first thing I noticed was that the computer monitor on top of his steel desk was draped with green camouflage netting "just in case of an air-raid," he said sarcastically. Unopened cardboard boxes were stacked in corners. On the wall behind his desk were steel cabinets with three die cast model jetliners on top; and on the wall in front of his desk a dry-erase board sported a quote from Shakespeare's *Julius Caesar*:

Cry Havoc! And
let loose the dogs of war. That this
foul deed should
smell above the
earth with carrion men
groaning for burial.

-Marc Anthony

Early last September Yates had put aside his managerial responsibilities to return to training so he could remain proficient as a pilot even as his career brought him further away from the cockpit. But after the attacks, Delta pulled the brainy 43-year-old out of the classroom and put him back in his office. Except for weekend trips to see his wife and two small children in Duxbury, Mass., he has been living out of a hotel room ever since. Suddenly, Delta needed one of its best problem solvers to help fix a security system that

nobody knew was so terribly broken. I'm jumping ahead, however, to the world that began after American Airlines Flight 11 exploded into the World Trade Center at 8:45a.m. Delta's story begins earlier on Sept. 11, inside a hanger at Boston's Logan airport.

II. THE ATTACKS

It was a perfect day, 70 degrees and clear blue skies, perfect for a leisurely “ferry” flight to Cincinnati. Mike James, a Delta 737-800 co-pilot met Capt. Pat O’Connor at 7:30a.m, inside a hanger adjacent to Logan’s international terminal E. After a pre-flight inspection the two pilots settled into the cockpit and ground crew workers kicked chocks, holding the plane in place, out from behind its giant wheels. James and O’Connor were supposed to have left Boston the day before but a mechanical problem delayed the flight by 24 hours, so they had received a new flight plan to fly the repaired plane, given the flight number 9930, empty of passengers to Cincinnati. At 7:45a.m. O’Connor maneuvered the 737 into the long line of aircraft forming on taxiways for Logan’s morning departures. Several planes ahead, on American Airlines Flight 11, Mohamed Atta and four other passengers in rows 2, 8 and 10—two in pairs and one alone were making final preparations to hijack the plane shortly after takeoff.

At 7:59a.m. Flight 11, a 767 with 81 passengers and 11 crew, departed runway 9, climbing out into an offshore breeze before turning west for Los Angeles. James and O’Connor were close behind. They had flown the route dozens of times before and the two pilots had over 40 years of flying experience between them, but nothing could have prepared them for what was about to happen. As they climbed to a cruising altitude of 35,000 feet, over western Massachusetts, James looked down on the Adirondacks and saw that the leaves were just beginning to change color. It was the kind of morning that reminded him of why he became a pilot. But soon a bizarre call from Boston’s control center would change his mood: *Delta 9930, I don’t know how to tell you this so I’m just*

going to tell you. There's an American 767 we're not talking to with its transponder shut off. Its last altitude was 29,000 feet, and we think its headed right at you.

A transponder sends a radio signal reporting a plane's altitude, airspeed and heading to air traffic control. So after Atta, who authorities believe was flying the plane, turned the transponder off, Flight 11's exact location was unknown. Moments later near Albany, N.Y, James saw the silver 767 about 5,000 or 6,000 feet beneath him racing east. James was probably the first person to see Flight 11 after it was hijacked. He reported its altitude and heading to Boston Center. At first, James thought the plane may have lost electrical power and was headed back for an emergency landing. But immediately O'Connor knew something more sinister was afoot. He reminded James that the 767 had a wind driven generator fan that pops out in case of total electrical failure. Even if the plane had lost both its engines it still would have had enough power to run the transponder. James and O'Connor continued west, listening closely to the radio.

At 8:45a.m. James heard Boston Center erupt into commotion: "You can hear the background noise at the center on the radio. After Flight 11 hit the World Trade Center I could hear yelling and screaming every time a controller keyed his mike." Controllers announced that a plane had flown into the World Trade Center and put aircraft near New York City in a holding pattern. "I thought, my God, I bet it was that American 767," James said. Fifteen minutes later United Flight 175 ripped into the south tower.

Immediately after the second plane hit, Joe Turner, Delta's chief flight dispatcher, gave the order to shut down the airline. Several minutes later, the government grounded all civil aircraft nationwide. Initially there was no way to know if Delta had lost a plane or if more attacks were planned on flights already in progress. Turner's order sent Delta's

flight dispatchers into action, scanning their screens to account for every single Delta plane and then to land it quickly, wherever it happened to be. At that time in the morning Delta had more planes aloft than any other airline—some 400 aircraft carrying no fewer than 30,000 passengers scattered in the skies around the world.

O'Connor and James were ordered to continue to Cincinnati, full throttle. But when O'Connor began to slow the plane for landing, about 20 miles from the airport, the flaps wouldn't budge. The 737-400 is equipped with a device that prevents one flap from lowering farther than the other. So if both flaps aren't working precisely, pilots have to configure the plane for a special emergency landing. James pulled out a quick-reference guide and immediately flipped to the section covering asymmetrical flap landings. Cincinnati's air traffic control noticed 9930 was a little slow on its approach, and fearing the worst, asked James to confirm that he was not being hijacked. "It took a little convincing on my part but I explained that we had a flap problem and would be landing shortly," James said.

Flap asymmetry is pretty rare. Most pilots only practice for the problem in a simulator, but James had just returned from training and the procedure was still fresh in his mind. He quickly ran through the emergency checklist for O'Connor, who landed the plane safely at 10:11 a.m. James and O'Connor were fortunate to get a place at one of the airport's gates, which were quickly filling up with the dozens of unscheduled flights landing in Cincinnati. Still reeling from what had just happened, James and O'Connor walked through the airport to the crew lounge, where a television was on. They watched the World Trade Center's two towers crumble to the ground.

Hundreds of other Delta flights headed west from the East Coast also made impromptu landings in places like Cleveland and Des Moines. At first Delta Flight 1989, a 767 departing Boston for Los Angeles at approximately 8 a.m., came under particular scrutiny from law enforcement because it closely resembled two of the hijacked planes. (American Airlines Flight 11 and United Airlines Flight 175 were both 767s departing Boston for Los Angeles at around 8:00 a.m.) But Flight 1989 landed safely in Cleveland at approximately 9:50 a.m. No evidence has been found to suggest terrorists were on board or that any attacks were planned on the flight.

With U.S. airspace closed, dozens more Delta aircraft bound from Europe that were east of 30 degrees latitude returned to the continent; aircraft west of 30 degrees latitude continued on to the Azores, Bermuda and the Canadian Maritimes. Delta landed all of its planes on Sept. 11 without any major incidents, but for Yates and many at the airline, the hard work was just beginning. "In many ways getting our planes down was the easy part," Yates said. "Far more complicated was getting them back in the air."

III. NEW THREATS

The terrorist attacks had made it clear that the industry's old strategy for dealing with terrorists was obsolete. While the FAA's pre-Sept. 11 "common strategy" for hijackings remains classified, it is clear pilots were instructed to cooperate with hijackers to avoid an incident that could result in damage to flight control or injury to passengers. It was assumed that a terrorist would allow the aircraft to be landed where he would make demands and law enforcement could take over—a tragic misconception that will haunt many in the industry for the rest of their lives.¹

By the afternoon of Sept. 11 Yates had assembled a security task force to address the new threats. The task force attacked the problem on two fronts: a procedural group, responsible for developing new strategies and communicating the information to flight crews, and a technical group, responsible for investigating structural modifications of aircraft. On Sept 12, Yates and the procedural team made up of pilots, flight attendants, engineers and security experts worked almost 24 hours nonstop drafting a memorandum that outlined new procedures needed before a single plane could again rise to the sky. With its passengers and crews stranded at airports around the world, and the company bleeding millions of dollars a day, Delta couldn't wait to act.

The memo addressed many new security procedures that would make national headlines in the weeks to follow: security access at airports; verification of employee credentials; restricted access to the cockpit during flight; and air defense maneuvers that

¹It is inconceivable to the employees I spoke to that the pilots of the hijacked planes willingly allowed the terrorists to get behind the controls. In cell phone calls from United Flight 93 (the hijacked plane that crashed in a Pennsylvania farm field) passengers reported seeing their pilots' bodies lying in the aisle, lifeless. One pilot said the terrorists probably knew a commercial airline pilot would only surrender a plane's controls over his dead body. The new procedure is also classified but it is safe to say never again will flight crews acquiesce to a hijacker's demands.

could be used by pilots to subdue a hijacker. However, Flight Ops still needed to get the new procedures to flight crews, some of who were staying at private homes in places Delta normally doesn't even fly to. The terrorist attacks made reaching their pilots in secrecy a paramount concern. "We didn't want to send our brand new security strategy to a public fax machine in a general aviation terminal or hotel lobby," Yates said. When possible, Yates sent the memo to secure control rooms at airports, but keeping it secret in remote locations required more ingenuity.

In Gander, Newfoundland, for example, Yates enlisted the help of the Royal Canadian Mounted police to deliver the memo. Delta set down 26 trans-Atlantic jets at Gander's airport that usually only sees a handful of flights per day. On Sept. 11 its taxiways were crammed with aircraft sitting wing-to-wing, filled with thousands of weary passengers. The small fishing community simply did not have the infrastructure to handle thousands of visitors. Accommodations was needed by passengers and crew, customs officials were needed to process hundreds of foreign nationals and law enforcement was needed to address the possibility that so-called sleeper terrorists were on board some of the flights.

Law enforcement and customs officials were brought in from other parts of Canada and the United States to assist with the legal situation. And the people of Gander opened their homes and public buildings to the stranded travelers for five days. Some of the captains took on the roles of leaders and ambassadors, staying in contact by radio and cell phone with the OCC and disseminating information to Canadian officials and passengers as it became available. The generosity shown by the people of Gander "stood

in sharp contrast to the inhumanity of the terrorist attacks that had brought so many to their shores,” Yates remarked.

Capt. Michael Quiello, a calm, meticulous man headed the technical group created after the attacks. On the morning of Sept. 11 the former A-6 Intruder flyer in the Marine Corps was in his office when his son called from Washington, D.C., to ask him what he thought was going on at the World Trade Center. His son is a congressional aide on Capitol Hill and in the middle of their conversation American Airlines Flight 77 hit the Pentagon at 9:40a.m. Immediately, the Capitol building was evacuated and Quiello didn't talk to his son again until later that afternoon. But the pilot had to put his concerns as a father aside for the time being because suddenly every single cockpit door in the nation was obsolete.

As soon as reports that terrorists had burst into cockpits on the hijacked flights emerged, Quiello began designing a strengthened cockpit door. The work involved in retrofitting an aircraft with even the smallest part, he well knew, would be extensive. One problem was that there simply is not enough real estate in a modern cockpit to make significant alterations. Another problem was that the new door would still have to allow pilots to escape in the event of a crash. But the most serious obstacle involved the complex issue of cabin pressurization.

A commercial airliner gradually pressurizes its fuselage as it climbs, so at high altitudes passengers and crew can breathe comfortably in the thin air; valves release pressure as the plane descends. At 37,000 feet above sea level the atmospheric pressure inside a standard airliner is kept approximately equal to the pressure at 6,300 feet above sea level or 8.6 pounds per square inch. While this air pressure is perfectly comfortable

for passengers and crew to breathe, held inside a sealed tube soaring at the fringes of the troposphere, it creates the potential for a rapid decompression accident.

In the weeks after Sept. 11 it was not widely reported that airliners' old cabin doors were designed to be frangible for a good reason. If a cockpit sealed with an airtight door were to experience a cracked windscreen, the force of the greater air pressure in the cabin equalizing with the suddenly lower air pressure in the cockpit could cause a violent decompression.

An incident aboard a British Airways BAC-111 out of Birmingham, England, in 1990 well illustrates the danger. Shortly after take-off the plane's windscreen—later discovered to have been fastened with the wrong bolts by mechanics two days earlier—shook loose and fell away. The explosive rush of air sucked the captain out from under his seatbelt, but a flight attendant in the cockpit was able to grab and hold onto his legs, eventually pulling him back inside. The co-pilot, who was fully restrained at the time of the decompression, landed the plane safely in Southampton, England. Remarkably, the captain suffered only frostbite and a few broken bones.

The new cockpit door would thus have to simultaneously keep intruders intent on crashing the plane out while letting air pass without difficulty between the cabin and flight deck. After the government opened U.S. airspace, five days after the attacks, Quiello led a team of Delta engineers and test pilots to a meeting at the Boeing aircraft manufacturing company near Seattle. During the flight they feverishly scribbled ideas for a stronger cockpit door into notebooks to share with federal aviation officials, major airline representatives and manufacturers.

I looked at a binder filled with some of the designs generated at the Boeing meeting. One placed a Kevlar cargo net in front of the cockpit—allowing air to flow effortlessly while preventing unauthorized entry. Another zigzagged steel wire across the opening to the flight deck, but both designs left pilots susceptible if a terrorist somehow smuggled a firearm on board and both required tremendous time and money to install on the nation's entire commercial fleet.

The Boeing meeting settled on a simple device that, in retrospect, probably should have been present all along: a steel security bar that could be installed on pre-existing cockpit doors. The engineers were concerned the bar might interfere with cabin air trying to equalize with air in the cockpit, so they performed a risk analysis. In the previous 50 years of commercial aviation, they discovered, only two aircraft had been lost to a decompression accident.² Compared with the sobering number of planes lost in the previous week—four—to forced cockpit entries the engineers reasoned a greater risk existed with an unlocked cockpit door. With the nation's entire commercial fleet sitting idle at airports around the world and the airlines losing millions of dollars a day the FAA approved the cockpit security bar as a temporary fix.

Currently Delta is designing, in conjunction with the industry and government agencies like NASA, a permanent cockpit door capable of resisting a hijacker determined to get at the controls while still remaining permeable to air. Quiello said aeronautical engineers are uniquely detail oriented and have been concerned with every imaginable

²Since the 1950s there have been about 50 rapid decompression incidents on commercial airliners, two resulted in the loss of the aircraft: On March 3, 1974, 347 passengers were killed when a Turkish DC-10 crashed after an explosive decompression severed control cables; and on August 12, 1985 520 passengers were killed after a pressure bulkhead failed on a Japan Air Lines 747, the worst single aviation accident in history. In 1989 an electrical short caused the forward cargo to open on a United Airlines 747 en route from

particular of the design: "If you ask an engineer to design a secure cockpit door he'll say, 'Okay, how many Newtons does the door need to resist?' And, 'What are we designing against, a blunt object, ballistics or battering?' If you say a blunt object, he'll say, 'What about ballistics?' And, if you say okay we want to protect against ballistics, he'll ask, 'What kind of gun, at what range and at what caliber?'" The deadline for installation set by the FAA is April 2003.

Additionally, Quiello headed a study by the Air Transport Association that investigated the use of rapid turns, descent and depressurization as a way for pilots to subdue a hijacker. After experimenting with test aircraft and in simulators the ATA advised that the techniques only be used with extreme caution. Tests showed performing the defensive maneuvers improperly could result in structural failure and loss of control. They also warned they could potentially injure passengers trying to prevent a hijacker from reaching the pilots.

Another strategy, currently being debated in Congress, is whether or not to arm pilots in order to defend cockpits. United Airlines recently trained its pilots in the use of "stun-guns" and the Air Line Pilots Association, the union that represents Delta's aviators, came out in favor of arming pilots with lethal weapons after appropriate training and certification. Delta has yet to take a corporate position, but Quiello expressed concern about introducing firearms to "a gun free environment." He noted that the guns-in-the-cockpit issue is "overwhelmed with emotion." And that "we [the industry] need to think long and hard before putting deadly force in the hands of a pilot." A pilot in favor of the move said "If the U.S. Air Force is prepared to shoot down a jet full of passengers

Honolulu to Sydney, nine passengers were sucked out and lost at sea but somehow the pilots managed to land safely.

to prevent another plane from flying into a building it doesn't seem so drastic, to me, to first give pilots a chance to protect their passengers and themselves.”

The job of a commercial airline pilots changed dramatically on Sept. 11. Overnight, the planes they love to fly became potential targets for terrorists planning to use them as guided missiles. Quiello said that pilots spend their lives preparing for the unexpected and the new threats will be taken in stride. But I wanted to see for myself so Yates arranged for me to observe a flight simulator lesson in a 767-400, one of Delta's most sophisticated airframes.

IV. THE VIEW FROM THE COCKPIT

The flight simulator is the backbone of Delta's training regimen. The company owns 30 simulators representing each type of aircraft in its fleet and they run around the clock.³

The newest simulators cost \$5 million each and require a special team of mechanics and computer engineers to be on call 24-hours a day in case one breaks. But they allow Delta to train pilots with a frequency and in kinds of situations that would be too costly or dangerous in a real plane.

I met two instructors and one student co-pilot for a pre-flight briefing in one of the small rooms adjacent to the eight 767 and 757 simulators in OC-3. The co-pilot was training for his transition from the 767 "Classic" to the "Dash 400," a bigger and more sophisticated version of its predecessor. One of the instructors was there to play the role of captain in the simulator or "box," as the initiated call it. Capt. Mark Bradley was there to assess the co-pilot's performance. The co-pilot looked a little nervous, but Bradley had the confident strut of a naval aviator that I had come to recognize growing up around my father and his friends. And, when I looked down at his left hand, I saw the big gold ring worn by Naval Academy graduates.

Training is the central feature of a commercial airline pilots' career. Young aviators must have attained at least 2,500 flight hours (7-10 years experience) in a branch of military aviation or at a smaller carrier before even being considered for a job at a major airline like Delta. Pilots are selected based on their experience, airmanship and leadership skills. If a pilot lasts Delta's extensive interview process he must then undergo a six-week initial training program in Atlanta. Then he will return at least once a year for

a week of recurrent training and on average, once every three years for another six-week program as he advances in aircraft sophistication and rank. On any given day about 400 Delta pilots will be participating in classroom, simulator and “line-operating experience” training, when a certified captain assesses a pilot during a flight with passengers.⁴

Bradley began a PowerPoint presentation outlining one of the day’s lessons: “Non-Normal Landings.” A non-normal or emergency landing is something pilots rehearse over and over, until it becomes second nature. This is because an emergency landing may be the most critical moment of a pilot’s career. If a plane loses an engine at takeoff, for example, the pilot flying has only fractions of a second to react.⁵ The 767-400 blasts down a runway with more than 30,000 pounds of combined thrust from its two engines. When it attains a speed of approximately 150mph (what pilots call V-1 speed or “the point of no return”) its wings begin to lift off the ground. At this point there is not enough runway left to abort the takeoff and the aircraft is thus committed to the sky. Immediately, the pilot must compensate for 15,000 pounds of thrust imbalance by steering the giant rudder on the plane’s tail with foot pedals and maintain airspeed by holding up the throttle for the one remaining engine. Simultaneously, he begins to recite

³ Delta’s fleet consists of about 600 aircraft, representing 12 different airframes: the Boeing 777, 767-400, 767-300, 767-200, 757, 737-800, 737-300, 737-200 and 727-200, and McDonnell Douglas’ MD-11, MD-88 and MD-90.

⁴ Line operating checks occur every two years. Delta’s pilot training and standards department consists of 148 program instructors like Bradley, 14 crew resource management instructors and 450 line-operating check pilots.

⁵ If the captain is not flying during an engine failure at take-off, the traditional cockpit hierarchy is abandoned because there is no time to allow the more experienced pilot to take over the controls from the first officer. Therefore, all captains and first officers must be equally proficient in engine failure and emergency landing procedures and instruction manuals describe the flight crew, in this situation, as either “the pilot flying” or “the pilot not flying.”

an emergency landing procedure that he has memorized.⁶ Bradley said at moments like these a pilot's training must become instinct to avoid disaster.

First, the pilot flying climbs to 400 feet to buy one or two seconds while telling the pilot not flying to "shut down auto-throttles," "notify tower" and to "start the auxiliary power unit." Then he continues to climb to 1000 feet where he re-configures his instruments and maneuvers the plane for immediate landing. Most modern commercial aircraft only have two engines so if one fails it's serious business, and every pilot understands his career depends on how effectively he executes a V-1 engine failure procedure in the simulator. The student pilot is assessed on how quickly and accurately he maintains the appropriate altitude, airspeed and heading. Even slight variations from the strict parameters means a failing grade and that he will have to repeat the exercise again and again, until he gets it right.

After the briefing, we walked outside the room to a balcony that overlooked the plane we would be "flying." The simulator, a square white box about the size of a large passenger van, stood a story tall on top of four hydraulic arms that sway back and forth and move up and down mimicking the motion of flight, making the box look something like the lunar Lander.

Bradley lowered a steel gangplank to the cockpit door and we all filed in. The captain sat down in the left seat, the co-pilot in the right and they both put on radio headsets. Bradley sat at a small desk behind the co-pilot with a touch screen computer on

⁶Bradley said that, in an emergency, checklist discipline is the most important element of good airmanship. I learned this lesson as a young driver. When my father taught me to drive he insisted that I run through a safety procedure before leaving the driveway, checking fuel and oil levels, seatbelt security and the tires' air pressure. In September of 1998 he warned me that the rear tire of my jeep was low on air. but in a hurry I ignored the safety checklist and drove off. I awoke from a coma a week later to discover that the low tire caused me to spin out of control and roll at least three times on Route 1 South in Massachusetts.

top that controlled the simulator. I sat in a chair to the left of the instructor's position. In almost every way the simulator's cockpit is identical to a real one. The controls are the same, the instruments are the same, even the seats adjust in the same way. The windscreen is a liquid crystal display, the material used in laptop computers and it wraps around the front of the cockpit on three sides for optimal realism.

Bradley entered data into his computer for the lesson. We would take-off from runway 15 Right at Boston's Logan Airport and climb to 19,000 feet where we would divert back to Logan for an emergency landing on runway 4 Right. At this early stage in the student's training, Bradley was letting him get used to flying the simulator before he threw anything too intense at him.

All of a sudden the scene at Logan's Terminal C appeared. The tarmac, the gate and the fuel trucks were covered with early morning light and looked identical to the ones actually used at Logan. Bradley called the pilots on his microphone as though he were an air traffic controller with a Boston accent: "Deltah Flight Numbah One you're ready for push-back. Thanks for pahkin in Bahston." The cockpit rocked a little when the co-pilot started to back up. He taxied the plane to a sign that read 15R, pointed us down the runway and waited for the okay from the controller. "Deltah Numbah One you are cleared for takeoff; have a nice flight," Bradley said. I slid back in my seat when the student pushed up the throttles, blasting us down the runway.

The simulator's software uses highly detailed information, gathered by special mapping satellites, to recreate the little cracks, bumps and dips on every runway in Delta's system. In fact, the sound and motion as we roared down 15 Right was so real I had to clutch onto the arm of my seat. Then, the vibrations slowed and finally stopped

when the plane lifted off the ground, climbing in a high arch over Boston Harbor. The co-pilot retracted the landing gear and banked the plane north toward Marblehead, Mass. When we reached our cruising altitude Bradley began to fiddle with his computer to show me what the simulator could do. With the push of a button he turned dawn to dusk and said he could simulate “a bird flying into the windscreen, an engine fire and all types of weather, just about anything.”

After a few minutes of practicing steep turns high above the North Shore of Massachusetts, the co-pilot called air traffic control to announce that he had an engine warning light and needed to land as soon as possible. A list of the nearest suitable diversion airports, their distance and the estimated amount of fuel required to get there popped up on a computer screen between the captain and co-pilot: Providence, R.I., Hartford, Conn., Portsmouth, N.H., Portland, Maine as well as Boston. He entered the appropriate data for Logan on a keypad and turned the plane around. We quickly made our way south at 350mph descending about 4,000 feet every minute. Soon Boston’s skyline and airport came into view.

As we closed in on the runway a pleasant female voice announced the plane’s altitude from a speaker in the cockpit every ten feet: “60 feet, 50 feet, 40 feet, 30 feet...” Now the co-pilot intuited his heading and closing speed, making fine adjustments with the yoke and throttles, 4R painted at the front of the approach side of the runway growing below us. Then his training became entirely instinct and in the final seconds he gently raised the nose, landing 1000 feet down 4 Right and we roared to a stop. Perfect.

At the beginning of the 2002 Delta introduced a new element to its pilot simulator-training syllabus: they are now asked to respond to a bomb-scare during a

practice flight. Pilots are graded on how quickly they get from 35,000 feet to the safety of a runway. “We can never totally simulate reality—the fear, the pressure—but we try to make our training as close to reality as possible so pilots are as ready as they can be for the unexpected,” Bradley said. But preparing for the unexpected at a major airline, as I would discover, requires yet another group of highly trained professionals, who toil almost perfectly invisible to the passengers they guide in the skies above and help land safely on every corner of the earth.

V. THE VIEW FROM THE GROUND

The bustling floor of the OCC has aptly been described as a cross between NASA's mission control and the floor of the New York Stock Exchange. "Of Delta's 10,000 type A personalities, 9800 are pilots and the other 200 work in here," said Hank Echols, Delta's unflappable director of flight control, as we stepped out onto the floor.

The facility was dimly lit by the glow of hundreds of computer monitors and seven movie theatre-style screens: two of the screens were broadcasting the Weather Channel, one had on CNN, another the FOX news network and the remaining three displayed Delta's vital statistics for the day—mechanical, weather and safety concerns and the number of flights on time, delayed and cancelled. At the rear of the floor, Delta's 17 on-duty aviation meteorologists were busy scribbling on poster-size maps, forecasting weather for nearly every region of the globe. And, adjacent to the meteorology department is Atlanta Radio, Delta's central communications system. Through the use of satellite technology and strategically placed VHF transmitters, Atlanta Radio can talk to pilots anywhere on earth.

The philosophy behind the OCC is to have decision-makers from each of the company's departments and the most advanced aviation support technology together in the same room.⁷ The facility was completed in 1995 at a cost of \$30 million and requires additional millions annually to keep running around the clock. But it is an investment that has paid Delta back in spades, mostly because the OCC helps the airline efficiently handle weather delays.

⁷ The operation control center consists of 130 positions, 23 business processes, 18 software applications and 17 distinct departments: Flight Control; Meteorology; Radio; Air Logistics; Crew Tracking; Aircraft Routing; Airport Customer Service; Reservations; Flight Operations; In-flight Coordination; Material

Storms cost Delta money, a lot of money. Every time a weather event cripples a major airport the repercussions can be felt throughout the airlines' entire system. If, for example, Boston's Logan Airport is closed because of a surprise winter storm off the Massachusetts coast, air-traffic gets jammed up and down the eastern seaboard. All of a sudden planes flying into Logan have to divert to other airports or circle at high altitude until it is safe to land. Flights that were supposed to connect in Boston to other cities are now stuck on the ground or in the air as far away as Atlanta and beyond. This means the airline loses money on jet fuel,⁸ revenue, hotel rooms for passengers and crews even on the phone-cards it provides to stranded customers. By having flight dispatchers, meteorologists, economists and so on together in the same room Delta can predict storms, move planes around and make necessary cancellations in one fell swoop. The savings after the OCC handled its first major storm: approximately \$30 million. The center paid for itself in 48 hours.

The central players at the OCC are flight dispatchers. "At Delta we call flight dispatchers flight superintendents because, frankly, we expect a little more out of them than your average dispatcher," said Echols who speaks with ill-concealed affection for his employees. The airline maintains a staff of 191 flight superintendents who perform a wide range of tasks that are critical to the safety of thousands of flights every day. During peak operating hours, a superintendent might be responsible for as many as 50 aircraft.

Services; System Reroute; Maintenance Coordination Center; Structural Engineering; Navigation Data Base; Revenue Management; and Corporate Security.

⁸Aircraft fuel is Delta's second biggest operating expense after employee salaries. The cost of fuel is dramatic because of the enormous economies of scale involved: At a presumed cost of \$1.00 per gallon and assuming 2,200 flight segments per day, conserving just one gallon of fuel per flight segment translates into \$803,000 in savings annually.

They make certain planes have enough reserve fuel,⁹ they forward changes in weather, wind and airport conditions to pilots and they ensure flights operate in compliance with a laundry list of company and federal regulations.

In the early days of the aviation industry, before the advent of the flight dispatcher, flying was a precarious activity at best. Pilots would take off from dirt airstrips carrying mail, passengers and cargo on little more than a wing and a prayer. Few pilots used flight plans, little if any weather information was available and if conditions changed en route it was up to the pilot to improvise, which often meant setting his plane down in a remote field. Many pilots took off never to be heard from again. A. Scott Berg, Charles Lindberg's biographer, writes of Lindberg's perilous beginnings as an airmail carrier in St. Louis:

Navigation was rudimentary at best, with pilots relying on visual contact with the ground—following railroad tracks, rivers or at night, the glow of the town below. 'During the summer months most of our route was covered during daylight,' Lindberg would write, 'but as winter approached the hours of night flying increased until darkness set in a few hours after we left St. Louis.' DeHavilland planes had neither landing lights nor navigation lights. 'Our total lighting equipment,' Lindberg remembered, 'consisted of a pocket flashlight (pilot furnished) and a compass light attached to a button on the end of the stick.' Lindberg later recounted how he 'arranged with the mail truck driver to hang four kerosene lanterns on fence posts on the leeward side of the cow pasture we used as an airmail field at Springfield, as a precaution; and I once had to return and land by the light of the two of them that were still burning.' As a rule, Lindberg recalled, 'We went as far as we could, and if the visibility became too bad we landed and entrained the mail.'

As the industry continued to grow so too did its accidents. Eventually, Congress grew tired of the increasing loss of life, equipment and cargo and passed the Civil

⁹Since the cost of fuel for jets varies regionally, just as gas does for automobiles, airlines save money by purchasing fuel at airports where it is least expensive. Delta has a software program that calculates the cost of buying cheaper fuel at one airport and carrying it to an airport where fuel is more expensive. If it is cheaper to transport the fuel (it costs fuel to carry fuel because of its weight) then the dispatcher will take on extra fuel at airports with bargain prices.

Aeronautics Act in 1938. The act established a system of checks and balances which sought to make flying safer; and one of its key features was the creation of a new licensed profession: the aircraft dispatcher. Today, the government requires all U.S. airlines operating planes with more than nine seats to maintain flight control centers staffed by FAA accredited dispatchers around the world. By federal law, every time a passenger plane takes to the skies both the captain in its cockpit and a dispatcher on the ground share equal responsibility for the safe completion of the flight. Delta has built on this foundation.

When my tour of the OCC was snaking past scores of flight superintendent positions spread across the floor, I heard a sound that had been noticeably absent since my arrival at headquarters: a woman's voice. Frances Queenan, one of Delta's most experienced flight superintendents, noticed me as I walked by with my tape recorder and asked if I would like to listen in on a conference call with the nation's 24 air traffic control centers.

Not to be confused with flight dispatchers, air traffic controllers are a dedicated team of 15,000 federal employees who manage the flow of aircraft through a vast network of glassed-in towers, radar installations and control centers. Tower controllers give pilots taxiing and takeoff instructions and are responsible for planes inside a 30-mile radius of an airport. Outside the tower's airspace, terminal radar approach controllers (TRACON) direct planes until they climb through 18,000 feet where control centers, or what Queenan called "fiefdoms" pick up the aircraft.

Every two hours at quarter past the hour controllers update each other on weather changes, security issues and the general condition of the nation's airports. I picked up a

phone at the position adjacent to Queenan's and listened to each of the country's centers give its region's status. The reports moved fast one after the other except for Chicago. A winter storm had passed through the central-Midwest the night before, closing O'Hare Airport's runway 22 so flights in Chicago were getting a little backed up. But blue skies prevailed over most of the rest of the country and operations were running smoothly. "On a busy weather day you can be on that call for 45 minutes, but it was short and sweet today because of the fact there isn't much going on," Queenan said. My tour continued but I asked Queenan if I could come back the next day to watch her work. She agreed.

Queenan grew up in a New York City home filled with talk of planes and radios. "Aviation to me is not just something I do for a living; it's something I've lived my entire life," she said. Her father was a pilot for American Overseas Air Lines beginning in 1947. In those days aviation was largely the province of young daredevils without wives or children, so when Queenan's dad started a family he moved from the cockpit to the control tower where he worked until Pan American Airways bought out AOA in 1952. He then joined the airline's management, and helped consolidate Pan American's international divisions into one of the world largest corporations. The 1950s were boom years for the airline and Queenan's father often brought home aviators to discuss the burgeoning industry.

Queenan tells the story of the Friday afternoon she came home from school to find Charles Lindberg eating tuna and noodle casserole at her kitchen table. Lindberg was a pathfinder for Pan American in the early 1950s as it expanded into unexplored territories around the world and later joined the airline's board of directors. That night Lindberg came to discuss developments in radio communications with Queenan's dad,

but after dinner he sat her on his knee and quizzed the schoolgirl about geography. "You think you're an airline brat," Queenan told me. "I'm a bigger airline brat."

Of Delta's 191 flight superintendents only 11 are women, but even in a world dominated by type A personalities and testosterone Queenan's air of confidence and extensive experience commands respect. She followed in her father's footsteps, beginning her career at Pan American in 1967 and climbed the company's ranks. "I was a crew scheduler, an aircraft scheduler, I boarded airplanes, I worked system operation control, I ordered parts, you name it, I did it at Pan Am." Eventually, Queenan earned her dispatcher's license and worked in flight control until Delta bought out the company in 1991.

The average dispatcher at Delta proved himself with 15 years of supervising experience at the company or another major airline (United or American) before even being considered for flight superintendent training. A 200-hour dispatcher's program covering all aspects of aviation from meteorology to radio communications at a selective aeronautical school followed. And only after passing a grueling exam, administered by the FAA, were they awarded their coveted airman's certificate. Then they are required to pass written and oral proficiency examinations at least six times annually. At Delta, a dispatcher's recurrent training is spread out over the calendar and includes a ride in a plane's cockpit to give them first-hand knowledge of life on the other side of their radio.

Additionally, dispatchers are responsible for learning the frequent advances in aviation technology, safety and security procedures discussed at workshops and published by the government and in professional journals every month.¹⁰ On a moment's

¹⁰ In May the Aircraft Dispatchers Federation will hold a workshop discussing the peculiar problem volcanic ash poses to aircraft safety. Sometimes when a volcano erupts it sends an enormous cloud of fine

notice, FAA officials have been known to drop in on a dispatcher to administer a pop-quiz and have the authority to pull his license on the spot. Not surprisingly, dispatchers are well compensated for their efforts and at the major airlines earn salaries up to \$150,000.

Queenan's position near the front of the floor reflects her extensive experience. As the Atlanta sector manager she was responsible for the most critical hub in the Delta system. Virtually every one of the airlines' flights has either a direct or indirect connection to Atlanta so if planes get backed up in Atlanta Delta gets backed up everywhere.

Her workspace consisted of three monitors and a touch-screen computer displaying a mind-boggling amount of data. In addition to the Atlanta sector she was responsible for Delta's fleet of aging 727s, about 50 aircraft in all. One monitor had a digital map of her region filled with dozens of little gray dots, each representing a Delta plane in real time. The other screens listed weather conditions, her planes' arrival and departure times, the altitude airspeed, heading and remaining fuel of the aircraft aloft, how much fuel was needed for the planes yet to depart, all her planes' mechanical information and service history, and how many more hours their crews were permitted to fly under FAA and contractual guidelines. Flight superintendents communicate updated information to pilots via Atlanta Radio, which is channeled through their position phone. They can also use the Automated Communication and Report System (ACARS), a coded message typed into their keyboard then transmitted to a plane's onboard computer.

dust into the atmosphere. And, if the ash is sucked into a hot jet engine, it can melt and then re-harden on the turbine's blades. In 1985 a British Airways 747 flew into the invisible plume blown from Mount Galunggung at 37,000 feet over the Pacific Ocean, stalling all four engines. In a remarkable display of

After the terrorist attacks a flight superintendent's job became even more complicated. When I arrived at Queenan's position for the second time her phone was buzzing urgently and an orange light was flashing on top of her desk. Because it can get so hectic on the floor, superintendents need a way to know with a measure of certainty when they have an important phone call. "OCC, Frances Queenan," she answered.

The call was from a reservations agent in Birmingham, Ala., who was desperately trying to reschedule a group of passengers through National Reagan Airport in Washington, D.C. But because the airport's flight paths are only seconds away from so many government buildings the airport operates under strict FAA guidelines: every flight in and out of National-Reagan has two or more sky marshals—armed federal agents trained in close-quarters marksmanship—on board; passengers on National flights are not permitted to stand up at the beginning or end portions of the trip; and Washington's airspace is closely regulated and patrolled by military fighters around the clock.

"We simply can't do that," Queenan told the agent. "No, since Sept. 11 we are only allowed to operate into Washington-Reagan to and from certain locations for security reasons. I'm sorry, the FAA is not going to change that rule for a group of 38 or 39 or however many this is." And that was that.

Although no one ever imagined a catastrophe of such magnitude was possible, Delta was not entirely unprepared for Sept. 11, in part because all of the resources at the company's disposal were right there in the OCC. Indeed, from a logistical point of view, Sept. 11 was in many ways like the unpredictable weather events the facility was designed for, only much bigger and more intense.

airmanship the pilots were able to re-start an engine after plummeting 25,000 feet and landed safely in Jakarta, Indonesia.

Suddenly the airline's operating system, which thrives on forecasting as many variables as possible—weather, mechanical problems and cost—was faced with the unpredictable. Planes, passengers and crews were stranded at the wrong airports, connecting flights were disrupted, accommodations were needed, critical information had to be relayed to pilots and financial losses began to mount almost immediately.

Employees said the atmosphere inside the OCC after the second plane hit the World Trade Center was indescribable. "I don't know if words are capable of capturing the feeling here that day," said Frank Crowell, a pilot with the Flight Ops department who drove to work right after the attacks. Like so many Americans, Crowell had watched United Flight 175 slice into the south tower on television at 9:06a.m. "Not only did I think that it might have been a Delta plane, I thought there was a good chance I just watched someone I knew well die." he said. The workers at the OCC had little time for emotion as they scanned their screens to account for every Delta plane and then to land them immediately.

Crowell, who has a special understanding of both the OCC and a cockpit, explained that the emergency landing of even a single flight is no small matter. Pilots and dispatchers have to choose from a list of diversion airports and have to make sophisticated calculations comparing aircraft weight to runway length. Unscheduled landings in the middle of a flight are particularly challenging for a pilot because he must contend with thousands of tons of unburned fuel. He can either dump it, delaying the landing or touch down "heavy" requiring more runway length to stop and a complete structural inspection before the plane is put back into service.

At the time of the attacks, hundreds of Delta planes, loaded with jet fuel for long flights to Salt Lake City and the West Coast, were barely an hour into their journeys; and many other flights over the Atlantic were running low on fuel after the previous night's passage. Flight superintendents had to work fast and the OCC provided the perfect platform to do it.

Critical information about every airport in the world was available at their fingertips as well the technology to communicate with flight crews. When possible, flight superintendents directed pilots to on-line airports—which had been meticulously inspected by Delta's own engineers and were equipped with support equipment. Turner Delta's chief flight dispatcher who retired after Sept. 11, decided to inform pilots of the attacks after they landed so they could focus on getting their planes down safely, a judgment call that would later spur the criticism of many pilots.

After a *Washington Post* article ("The View from the Ground: Delta's Reaction to Sept. 11 Illustrates the Airline Industry's Violent Change Dec. 30, 2001) implied Turner was "worried about potential panic in the cockpit," the OCC was bombarded with heated calls and letters from pilots who felt they were kept in the dark about the catastrophic security breach. Flight superintendents insisted the quote was taken out of context and that they merely wanted to limit the tasks of pilots to an already complex list of procedures during emergency landings. While most pilots said knowledge of the attacks was precisely the kind of information they needed in order to land safely that day. Whoever is right, the small controversy illustrates what happens when the trust between a pilot and dispatcher is called into question, on either side of the radio.

By 12:00a.m, pilots, dispatchers and air traffic control had coordinated the safe landing of Delta's entire fleet—all but two at on-line airports—a logistical feat unequaled in the history of aviation. But later that afternoon, when Queenan began her shift, the OCC was still buzzing. She was immediately bombarded with frantic calls, even as she noted that for the first time in her career her screens were blank, with no civil aircraft aloft. She spent the afternoon answering questions from family and co-workers trying to get information about the safety of Delta's planes, reservations agents who needed updates for bewildered passengers and from pilots, some stranded in places like Gander, who needed to know when it was safe to come home. All the while she was fearing for the lives of close childhood friends in New York City, one of whom she later discovered was of the firemen killed at the World Trade Center.

From the morning of Sept. 11 until Delta's last aircraft was recovered from the Canadian Maritimes five days later nearly 1,000 employees manned Flight Ops and the OCC. Flight superintendent's spent the next three weeks re-positioning Delta's aircraft, scheduling in-service inspections for the hundreds of jets that landed heavy on Sept.11, implementing new security procedures and bringing balance back to the airline's operating system. "Dispatchers are selected because they think well inside the box but also because, when they have to, they do just as good a job thinking outside the box," Queenan said.

After the attacks, new technology and training were put in place at the OCC. A position for a corporate security representative was added to coordinate the many security regulations handed down by the company and the newly created Transportation Safety Administration. Also, the flight control director runs frequent drills to rehearse for an

emergency response; and new software allows flight superintendents to simultaneously send an emergency message on ACARS to every Delta cockpit. On Sept. 11, superintendents had to type out a code specific to each aircraft separately.

None of the employees I spoke to at Delta have any illusions that their company did something special to avoid a hijacking on Sept. 11. It may have simply been chance that a Delta airliner wasn't attacked. It may have been that the terrorists felt Delta, a name that reflects the airline's origins as a crop dusting outfit on the Mississippi Delta, didn't pack the same symbolic punch as United or American. But like the industry leaders, Delta is left trying to close the security holes that led to the Sept. 11 attacks.

VI. THE WEAKEST LINK: AIRPORT SECURITY

Logistically a fail-safe security system is probably impossible. The airlines spent the past few years attracting customers with cheap tickets and improved traveling convenience. A new security procedure that adds thirty seconds to the screening time of every passenger would delay the boarding of a full 767-400 by nearly three hours. Reforms that overwhelm the already overstressed air travel system would drive passengers away by the millions. And Israeli terrorism expert Ariel Merari reminds us, in the recent book “Aviation Terrorism and Security,” airport security can only go so far:

The security system was caught by surprise when an airliner was first hijacked for political extortion; it was unprepared when an airliner was attacked on the tarmac by a terrorist team firing automatic weapons; when terrorists, who arrived as passengers collected their luggage from the conveyer belt, took out weapons from their suitcases, and strafed the crowd in the arrivals hall; when a parcel bomb sent by mail exploded in an airliner’s cargo hold mid-flight; when a bomb was brought on board by an unwitting passenger...The history of attacks on aviation is the chronicle of a cat-and-mouse game, where the cat is busy blocking old holes and the mouse always succeeds in finding new ones.

And no whole was bigger than the one the terrorists found on Sept. 11.

First, they well understood the weakness of security checkpoint screening. Before the attacks, airport screening nationwide was contracted to private companies with poorly trained and paid workers. It was later revealed, however, that nine of the 19 hijackers on Sept. 11 were brought back for additional inspection before being finally being allowed to board planes with small knives and box-cutters hidden in their hand luggage. So the problem was not just a lack of expertise, but the difficulty of detecting something small weapons. Even under close scrutiny an X-ray picture of a knife blade turned edge-side forward looks like a thin line and a box-cutter—jumbled together with pens, pencils, rulers and calculators—seems similarly innocuous.

Second, the terrorists knew if they got weapons through security there was another loophole—in the psychology of passengers and crew. They gambled that passengers would think their plane was being hijacked for money or political ransom. They may have also known that in hijacking situations pilots had been instructed by the FAA to cooperate with the attackers in order to get their plane on the ground as soon as possible, where law enforcement can negotiate. Only the Sept. 11 terrorists had no intention of bargaining for money, political ransom or anything else.

Cockpit voice recordings and cell phone calls from the hijacked planes illustrate the calculated nature of the attacks. On some of the flights terrorists rushed the cockpits, probably overcoming pilots by knocking them unconscious or slitting their throats. On other flights, terrorists lured the cockpit door open by savagely cutting flight attendants and passengers in the cabin then they attacked the cockpit. On all of the flights a group of terrorists played crowd control, herding passengers to the rear of the planes to prevent them from assisting the crew.

Passengers on United Flight 175 and American Airlines Flights 11 and 77, although terrified probably thought they would eventually land and be released. After the passengers on United Flight 93 learned that the three planes had flown into the World Trade Center and Pentagon on cell phone calls they rushed the terrorists. Flight 93 crashed in Shanksville, Pennsylvania at 10:37a.m, short of its intended target, which very well may have been the White House. Flight 93 marked a turning point in the psychology of American aviation: never again will flight crews and passengers acquiesce to hijackers, now that they know their own lives and the lives of thousands on the ground may be at stake. That's why tragedy was avoided several months after Sept. 11 when the

so-called shoe-bomber Richard Reid tried to light explosives on a trans-Atlantic flight and was subdued by a flight attendant and several passengers. But we are still left with the challenge of screening millions of passengers and pieces of luggage every day for weapons and explosives.

After Sept. 11 the government created the Transportation Safety Administration to handle airport security with a 60,000-strong force of well trained and paid federal employees. The airlines are now also required to “match” every bag put in the belly of a plane with a passenger on board, eliminating the possibility a terrorist will check a bag full of explosives and make a run for it. Additionally, bomb-sniffing dogs and machines scour luggage, passengers and airports for explosives.

The airlines also have in place a system that efficiently determines the risk posed by passengers. When a ticket is purchased the CAPPS—Computer-Assisted Passenger Prescreening System—assesses the customer on a variety of criteria. The exact information used is classified but probably includes the passenger’s address, credit and travel history, whether the ticket was paid for in cash, if it is one way, if the passenger is traveling alone and so on. A recent review by the Department of Justice acknowledged that the approximately 50 pieces of data used by CAPPS do not discriminate on the bases of ethnicity. A 50-year-old stockbroker from New York City, for example, who has traveled on my fathers’ shuttle flight from LaGuardia to National-Reagan twice a week for the past decade will breeze through security. But a few passengers deemed high-risk will have their bags examined again and may be asked to undergo individual screening.

And there is another effective strategy used by the airlines today that most passengers will never see but provides an important defense against an attack—sudden

changes in security levels, procedures and routines that respond to information about heightened threats gathered by intelligence services and deny a would-be hijacker a measure of certainty.

Can the airlines close the holes that led to the Sept. 11 attack? Historically, the industry has done a very good job preventing mechanical and weather related accidents. It is also very good at training individuals to execute those procedures under the most stressful situations imaginable. That's why the odds of being involved in a fatal aviation at an airline with a safety record like Delta are around 1 in 12.4 million. It is clear that the new training and technology has made airport security better today than ever before. But screening hundreds of thousands of bags and passengers every day places enormous psychological demands on the airport security system. The success security operators have in preventing another tragedy thus may rely on something more difficult to implement than better technology and training.

Before I left the OCC to board a Delta 767-400 to Salt Lake City on my way home I asked Queenan how she performs so well under pressure day after day without cracking. She credited success in her profession to the attitude of flight superintendents, one we often trust in but rarely see and that allows ordinary people do extraordinary things: "What is it those astronauts said... Yes, that's it. In this business failure is not an option." Aviation was founded by that attitude. And, after Sept. 11, it can advance *only* by that attitude.

Such an attitude does come from security workshops or sophisticated computer systems. It is not handed down by the federal government or bolstered by new uniforms and bigger paychecks. It comes from a commitment that is socially established over

lifetimes of experience and challenges—a commitment to excellence and order that is handed down to young people by older people whom they respect and trust. It might be by that measure of character, rather than economics or technology, through which we make our skies safe again.

SOURCES

Because this is meant as a magazine piece, not a newspaper or scholarly article, I have avoided using citations and mentioning, in the body of the text, some of the names of the people I have interviewed or the books and articles I have read and relied on for my information. I owe them all many thanks. Additionally, I am confident I was able to reconstruct an accurate chronology of the events of Sept. 11, as they unfolded at Delta, by interviewing employees from many of the company's departments who were working independently of each other that day and by pulling up the company's records of flights. Interviews also allowed me to cross-reference accounts for inaccuracies, and many articles from major news outlets allowed me another way of verifying exact times and facts. So many people so generously gave of their time and knowledge to help me with this project it is hard to believe there would be any mistakes, if there are, they have been furnished exclusively by me.

Interviews

Jon Agne, a Delta co-pilot who flew into LaGuardia minutes before Flight 11 hit the first tower on Sept. 11; Mark Bradley, a 767 instructor for Delta; Capt. Ken Crocker, my father and a 737-800 captain for Delta; Frank Crowell, OCC Duty Pilot; Hank Echols, Delta's director of flight Control; Jerry Elder, OCC sector manager; Capt. Craig Gottschang, Delta's director of pilot training and standards department; Carlos Fernandez, Delta flight operations manager; Mike James, a Delta co-pilot who saw American Airlines Flight 11 on Sept. 11; Dave Oden, flight operations manager of domestic operations; Bill Palmer, flight superintendent for Delta Shuttle operations;

Frances Queenan, OCC sector manager; Capt. Michael Quiello, chief technical pilot at flight operations; Capt. Dan Yates, special projects manager at flight operations.

Articles

“School for Security: ALPA’s National Security Committee launches a prototype school for MEC security,” Jan W. Steelback *Airline Pilot*, April 1999.

“A Visit With Ideal Airline’s Flight Safety Department: How a fictional airline might work to ensure flight safety in the best of all possible worlds,” Capt. Tom Duke, *Airline Pilot*, April 2000.

“New Visions for Pilot Training and Standards,” Capt. Craig Gottschang, *Plane Talk* (a Delta Publication), June 2001.

“Maintain Altitude, Heading and Airspeed (Attitude, Aptitude, and Corporate Airspeed), Dave Slade, *Up Front*, (a Delta Publication), summer 2001.

“How Delta’s Pilots Mobilized in the Battle Against Management,” Martha Brannigan, *The Wall Street Journal*, April 24, 2001.

“Five Planes May Have Escaped,” Ben Fenton, *The Daily Telegraph* (London). September 20, 2001.

“America Prepares Retracing Hijackers Steps,” Mitchell Zuckoff and Michael Rezendes, *The Boston Globe*, September 23, 2001.

“If You Want to Humble an Empire,” *Time*, special issue, September 2001.

“Twin Terrors,” *Time*, September 26, 2001.

“Safety in the Skies: How far can airline security go?” Malcolm Gladwell, *The New Yorker*, October 1, 2001.

“A Nation Challenged: The First Day—The impact of Grounding Jets is Still Unclear,” Matthew L. Wald and Don Van Natta Jr. *The New York Times*, October 18, 2001.

“Fighting Terror: the Hijackings/ In the cockpits probe Reconstructs Horror, Calculated Attacks on Planes,” Glen Johnson, *The Boston Globe*, November 23, 2001.

“The View From the Ground: Delta’s Reaction to Sept. 11 Illustrates the Airline Industry’s Violent Change,” Keith Alexander, *The Washington Post*. Dec. 30, 2001.

“U.S. Tackling Terrorists, But Slow to Explore their Roots,” David M. Shibman, *The Boston Globe*, January 15, 2002

“Air Security? Doubts Linger,” Scott Lehigh, *The Boston Globe*, January 18, 2002.

“The Beat Goes On: In the battle to ensure the security of air travel,” Leo Mullin, *Sky: A Traveling Magazine*, March 2002.

“Race to Overhaul Airline Security; Industry Pressure May Slow Reform, Critics Fear,” Alan Gathright, *The Boston Globe*, March 24, 2002.

Books

Lindberg, A. Scott Berg. Putnam: 1999.

Hard Landing: The Epic Contest for Power and Profits that Plunged the Airlines into Chaos, Thomas Petzinger, Times Books: 1997.

Websites

<http://www.dot.gov/affairs/aircraftsec.htm>, for updated information about government changes to cockpit security.

<http://www.dot.gov/affairs/airportsec.htm>, for updated information about government changes to airport security.

www.dispatcher.org, the Aircraft Dispatcher Federation’s Website for a brief but good overview of the profession’s responsibilities and history.

www.planecrashinfo.com, a database of virtually every aviation accident in the past 70 years.