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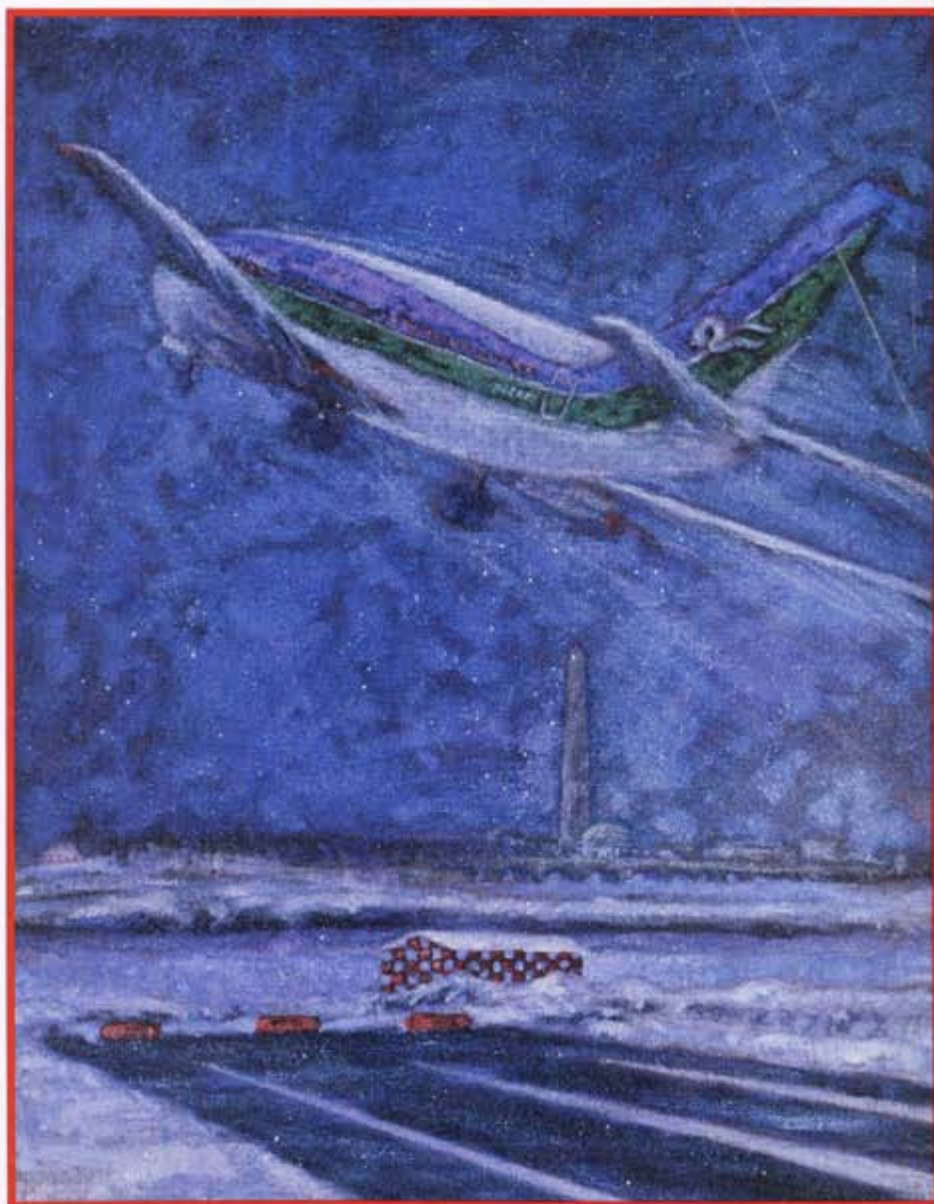
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“A False Feeling of Security”*

The Inside Story of the Crash of Air Florida's Flight 90

How Mistakes by Young Pilots Combined with a Snowstorm to Cause Washington's Worst Air Disaster

*The co-pilot was worried about the snow on his plane. “Boy, this is a losing battle trying to de-ice these things. It gives you a false feeling of security. That’s all it does.”



The Inside Story of the Crash of Air Florida's Flight 90

A False Feeling of Security

With Snow Falling, the Air Florida Plane Took Off from National Airport. . . . Seconds Later It Dropped from the Sky, Hitting the 14th Street Bridge and Falling into the Potomac River. The Crash Was Full of Terror, and the Rescue Full of Drama, But What Does Such a Crash Tell Us About Where and When It Is Safe to Fly?

We board jet airliners today as routinely as our grandparents hitched horses to a buckboard or cranked up a Model T Ford. We casually surrender our bags at the airport counter, convince the security guards we are respectable characters, and then saunter onto the plane. Minutes later we are glancing down from 30,000 feet at exhilarating landscapes, speeding along at 500 miles per hour.

We often take for granted the possibilities that high-speed aviation has created. The Orioles can finish a night game in Anaheim and be home to Baltimore for another game the following evening. Oysters from a market in France can be on the table at a K Street restaurant within hours. A wife in Boston and a husband in Annapolis, separated by the demands of their careers, can be back together making love on weekends. And a presidential candidate can now inflict speeches on the residents of three or four states in a single day.

Such trips involve some blind faith. We trust that thousands of pieces of riveted metal and little-understood instruments will work to perfection, and that the people who control this sophisticated technology will take us up and bring us down with care. We assume that engineers have designed our plane without flaw, that maintenance crews have kept it

in good condition, that pilots and air-traffic controllers are skillful and cautious, that the Federal Aviation Administration's regulations are adequate, that all will go well through weather both clear and stormy. Most of us ignore as superfluous those airport vending machines that sell flight insurance.

There are statistical reasons for this feeling of security. In 1981, the country's major airlines flew 286 million passengers without a crash fatality. In 1980, they carried 299 million people with the same result. By contrast, 100,295 persons were killed in highway accidents in that same period—a figure that the FAA, the airlines, and the aircraft manufacturers like to quote to illustrate the relative safety of flight.

And yet we know that flying has a dark side, too. Imbedded somewhere in our subconscious is a fear that the essential absurdity of flying—the defiance of both gravity and human capacity for error—will catch up with us. We have all seen televised pictures of jet crashes—with smoking fragments of wreckage and scattered pieces of bodies—that are nothing like Hollywood's airplane-disaster movies. The fact is that 3,461 people have been killed in crashes of major US airlines since the beginning of the commercial jet age in 1959. Over 10,000 more have been killed worldwide.

**By Larry Van Dyne with
John Pekkanen and Daniel Rapoport**



These crashes suggest a set of questions that the airline advertisements never ask, let alone answer: Are pilots, air-traffic controllers, and mechanics as competent and experienced as they should be? Are the federal administrators and company executives who manage the \$38-billion-a-year airline industry as safety-conscious as we have a right to expect? Are storms and foggy weather safe for flying? Are certain airlines, planes, and airports more dangerous than others? Is there any chance at all for survival in a jet crash? Is there anything people can do—in choosing a seat, for instance—that can improve their chances? Do those generally good statistics about the safety of flying represent a triumph of technology and human skill or just plain luck?

In a crash, the victims have no time to ask such questions. For the rest of us, the questions come up infrequently—perhaps at times like that cold, snowy day last January 13, when Air Florida Flight 90 lifted off a runway at National Airport and a few seconds later crashed into a bridge over the Potomac River.

“Is It Safe?” His Wife Asked. “I Sure Hope So, Hon. But They Should Know What They’re Doing!”

Marilyn Nichols would be flying that day, so her husband, Larry, planned a surprise for her—he would install metal steps on the side of her light-blue Jeep to make it easier to get into. It was sitting in front of their Miami townhouse that morning, as she slipped on her blue Air Florida flight attendant’s uniform, kissed him goodbye, and headed toward the airport.

It was a good day to be working outdoors, crawling around under the Jeep with an electric drill and a handful of bolts. The midwinter sun was pushing the temperature into the seventies. Out

back, on their deck overlooking the Miami River, the purple and white irises were blooming. And Sam, their black woolly spaniel, was happily romping around.

Marilyn had always had trouble climbing into the Jeep in her skirts, and Larry knew she would need the new side-steps more than ever in a few months. They’d learned just a month before that she was pregnant with their first child.

They’d delivered the news to her parents, who lived in Orlando, on Christmas Eve, and Marilyn had given them a doll to commemorate the event. Already Larry had taken some silly pregnant-lady pic-

Marilyn and Larry Nichols were married in 1980, and they enjoyed Miami’s sun and water when they had time off from her Air Florida flight attendant’s job and his real-estate development business. They were ecstatic, a month before the crash of Flight 90, when they learned she was pregnant with their first child.



tures of her, including one with a big ball stuffed under the front of her blouse. They hadn't decided when she should report the pregnancy to Air Florida and go off duty. But she'd been in for her first obstetrics exam on the previous day, January 12, and it seemed safe to take at least one more series of flights.

With the baby on the way, Larry thought of them as a young couple riding the crest of happiness. Only two and a half years before, he had been a carefree, successful Miami real-estate developer prone to womanizing. But then he'd met Marilyn—a vivacious, brown-eyed brunette, attractive enough to have done a little modeling—and been swept into a relationship such as he'd never known. They were together constantly, always leaving affectionate little notes around the house for each other. Marilyn made a point to bid as often as possible on Air Florida's shorter routes so she could be home to him for dinner.

Her schedule this day was longer and more complicated than usual. But she had chosen it so she could fly with Donna Adams, a flight attendant who was one of her closest friends. She'd left the trip number jotted on the big Ziggy calendar by their refrigerator—"Trip #58 with night layover at LaGuardia." She had promised to call Larry just after 6 PM, when she would be back in Fort Lauderdale for a brief stop. He couldn't decide whether to tell her about the Jeep on the phone, or let her discover the surprise when she got home the next day.

The Air Florida crew destined for Washington checked in at the sun-drenched Miami International Airport around 10:15 to wait for their plane, a Boeing 737 that was still in the air. It had departed Tallahassee at 7 AM, flown to Tampa, to Miami, to Key West, and was heading back to Miami. By happenstance, an FAA inspector was aboard on a routine ride to observe the pilots, and he noticed nothing wrong with the 737's performance. Even though it was thirteen years old and had logged nearly three years—or 23,600 hours—in the air, it was well maintained. There seemed to be no reason why it could not fly on safely for many hours more. With the new crew, it was scheduled to depart from Miami for Washington just before noon, come back south in mid-afternoon to Tampa and Fort Lauderdale, lay over for a little more than an hour, and then go back to LaGuardia Airport in New York City before stopping for the night.

In an Air Florida check-in room, Marilyn Nichols and her friend Donna Adams were joined by a third attendant, Kelly Duncan. All three were used to long days of serving drinks and food aboard 737s, and they were ready to go—

dressed in nicely tailored new uniforms the company had introduced only a few months before. Adams had three and a half years of experience, which made her the senior person in charge.

In the flight-operations room nearby, Captain Larry Wheaton and his co-pilot, Roger Pettit, were picking up flight plans and weather reports. They projected a normal flight up the East Coast—routine except for a winter storm that was covering some of the route. But they could easily fly above it most of the way, and would have to confront it only during the landing and takeoff at National Airport.

Both men were relatively young pilots—Wheaton was 34 and Pettit was 31, compared to the industry-wide average of 42. Neither had long experience flying 737s—Wheaton about two and a half years, and Pettit just over a year. And

Both men were relatively young pilots—Wheaton was 34 and Pettit was 31. And neither man had landed or taken off in a 737 very much in snow and ice.

neither man had landed or taken off in a 737 very much in snow and ice like that they would encounter in Washington—Wheaton eight times as a captain and Pettit only twice. Still they both met the standards of the FAA and Air Florida for their responsibilities: proper certifications, good vision and hearing, many hours of training.

Neither man appeared worried. Although they later told someone that they didn't much like the subfreezing temperatures up North and would be glad to get back to Florida, they seemed relaxed and unhurried. Both of them lived in south Florida, where the airline was based. Wheaton had a wife and two sons waiting at home in Miami, and Pettit's wife and two sons were in Fort Lauderdale.

At 11:15, the pilots lifted the twin-engine jet off the Miami runway, climbed to their assigned altitude, and cruised up the coast. They arrived in National at 1:29 in the afternoon amid a heavy snow, taxied to Gate 12, and shut down their engines. They were one of the last jets into the airport before it was closed to allow time to plow and sand the runways.

The 74 passengers waiting in Washington for Flight 90 were no different from

those that board thousands of flights each year. Like Chaucer's pilgrims on the way to Canterbury, they were drawn together only by a common destination.

They were a cross-section of ordinary airline passengers—mostly middle-class white suburbanites, wives and husbands, fathers and mothers, bosses and employees. Forty-two of them lived in the Washington area or distant parts of Virginia and Maryland, 21 in Florida, and 11 in other states or abroad. Most were under 50 years of age, including three infants.

Some were traveling in family groups. Jose Tirado, a Spaniard who was on his way to a new construction job in the Tampa area, was accompanied by his wife, Priscilla, and their nine-week-old baby, Jason. The Piontek party from Tampa included three generations: Barbara, the grandmother; Mary, the mother; and Brian, the five-month-old grandson. Naval doctor Edward Krzanowski of Lexington Park, Maryland, and his wife, Karen, were going to Florida with their two children—David, four, and Christine, eighteen months—where he was planning to attend a medical conference and take the children to Walt Disney World. Dr. William Liddle Jr. and medical secretary Jo Ann Blake, both from Fredericksburg, were also headed to a medical conference.

Other passengers were business people, some of whom flew regularly as part of their jobs. Herman Haven was president of a District company that bound paperback books. George Graham owned a tropical plant and nursery business in suburban Vienna. Edward Horton Jr. was president of his own biological testing laboratory in Clearwater; William Zondler was president of a Dallas company that marketed telephone-answering devices; and Gordon Calvin was an executive with George Steinbrenner's shipbuilding company in Ohio. Eight of them—Joseph Carluccio, Robert Essary, Bert Hamilton, Eric Kauffman, Robert Laudani, Benson Levinson, Theodore Smolen, and Robert Trexler—were employees of Fairchild Industries' Space and Electronics Division in Germantown and were on their way to a meeting. Rex Ellis, whose construction company in Luray, Virginia, was shut down by winter weather, was taking a vacation.

The modern professions represented at Gate 12 would have amazed Chaucer and his band of monks and millers. Robert Shubinski of Annandale and Eugene Soune of Alexandria were engineers; Terrence Klasky of Arlington and Donald Gilmore Jr. of Alexandria were lawyers; Francis Pipes of Washington was a public-relations man; Jack Viehman Jr. of Arlington was a management consultant; Sharon Wood of Rockville worked

in marketing; Walter Sutton of Rockville was a salesman; Thomas Fisher of Clarksburg, Maryland, was an expert on the retarded; James Fako of Pittsburgh was an accountant; and Arland Williams of Atlanta was a bank examiner. Six military officers and two civilian Defense Department employees were waiting to go to MacDill Air Force Base in Tampa, including Lieutenant Colonel Herbert Hiller of Fairfax, Arnold Ivener of Springfield, and Richard Miller of Burke. Hiller and Ivener carried classified documents in their briefcases.

Other Flight 90 passengers were retired. Leon and Harriet Murek were Jews who had survived the Holocaust and emigrated to the United States, where they had built a grocery business in DC; they were going to inspect a new condominium in Fort Lauderdale that they had bought for their final years. Stanley Woodard of Silver Spring had the same idea, going alone to Florida to shop for a condominium where he and his wife hoped to move to get away from cold and snow. Two women passengers from New England, Beth Hanson and Sophie Davis, were in their eighties and had been born before Orville and Wilbur Wright made their flight at Kitty Hawk.

Several people were on pilgrimages to visit relatives. Robert Silberglied, an entomologist who had attended a conference in Washington, was planning to spend a couple of days with his parents in Florida before returning to Panama, where he studied butterflies at the Smithsonian's Institute for Tropical Research. Cathleen Delmonte of Dale City was going to see her sick grandmother. Judith Foer of Potomac wanted to be with her mother while her father went into surgery. Jane Burka, the wife of Bethesda real-estate developer David Burka, would be visiting her sick mother.

Many of them had struggled to get to the airport through the snow that was paralyzing Washington traffic. Some had left early to make sure they arrived in plenty of time for the 2:15 departure. Joseph Stiley, an executive with a GTE division in McLean, and his administrative assistant, Patricia Felch, got to the airport about noon, early enough to have lunch before checking their bags. Stiley kept his briefcase, which contained his checkbook and some bills he planned to pay that night in his hotel room. It had taken Bert Hamilton much longer than usual to drive from his home in Gaithersburg and he had had trouble parking his car, so he arrived later than most of his colleagues from Fairchild.

Some were reluctant flyers. Susan Fusco, a schoolteacher from Bowie, was apprehensive enough about the weather that she had called Air Florida and asked if she could change her reservation or

cash in her ticket. Impossible, the reservation agent said, because her cut-rate fare prohibited refunds—a policy the airline used to combat its “no-show” problem. Robert Essary, one of the Fairchild employees, had talked with his wife the night before about what she should do if he died or were killed—a subject she encouraged him to forget. John Ventura, a businessman from Florida, had started flying again only because his job required it. He hated flying—he had been a machine gunner on a plane shot down in the Far East during World War II.

Others who had planned to be on Flight 90 missed it. John Bush, a former chairman of the Interstate Commerce Commission, switched to an earlier flight home to Florida. Jane Dodge, a school counselor from St. Petersburg, missed Flight 90 because her connecting flight from Charlottesville was grounded by ice. She took a train north instead, arriving after the crash, by way of the railroad bridge across the Potomac.

As the band of travelers waited at Gate 12, word came that the airport was closed for snow removal and that Flight 90 would be delayed. Trucks mounted with snowplows moved up and down the runways, pushing away two inches of fresh snow and laying sand across the asphalt.

The passengers sat killing time. They smoked or read or made sure their carry-on bags were secure, and they watched the snow falling outside. A cute little girl in a green dress romped among the seats. And Chalmers McIlwaine, a vice president of a Denver-based company, called his wife Bonnie at their home in Great Falls.

“It’s one hell of a mess here. Sand trucks are everywhere,” he said. “They’re gonna board us, so once they get the runways cleared, we can go.”

“Chalmers,” his wife said, “is it safe?”

“I sure hope so, Hon. But they should know what they’re doing.”

Finally, at about 2 PM, Air Florida began loading the passengers. Each had an assigned seat, although the airline’s sticker check-in system left no record of who was sitting where. The families went first. The Pionteks took seats in the first row on the right, and the Krzanowskis settled farther back on the left. The Tirasos sat near the back on the right side behind the wing, so Priscilla could indulge her fascination with the workings of the flaps. Michael Lauderdale, an Air Florida employee riding on a free pass, took a seat near the left wing. Most of the Fairchild party sat near the back, including Bert Hamilton, who took a seat in the last row. The plane, which could have held 125, was just over half full.

Meanwhile, the Air Florida crew and ground personnel had been getting the

plane ready to depart. Larry Wheaton, the captain, had received weather and dispatch papers teletyped from the airline’s control center in Miami. He had crawled out of the cockpit to discuss refueling with a maintenance crew from American Airlines, which serviced Air Florida planes at National under a contract between the larger, established carrier and the smaller airline, which had been expanding rapidly since the deregulation of the industry in 1978. Some 1,567 gallons of jet fuel had been hosed into tanks on the plane’s wings. The passengers’ luggage had been conveyed into the belly of the plane. And a red-and-silver Marriott truck had pulled up and filled the galleys with food trays.

One of the flight attendants, Kelly Duncan, had stayed aboard the plane ever since it arrived in Washington, but Marilyn Nichols and Donna Adams had taken advantage of the delay to have a little fun. Both had seldom seen so much snow. It was beautiful to the eye and rare to the touch. They slipped off the plane to play in it.

How Dangerous Is It to Fly in Bad Weather?

Anyone who sets out to determine the risks involved in jet travel discovers trends that are both unassailable and encouraging:

■ Airline travel in America has been growing safer since jets began taking over from the old props. In 1959, the first full year of jet service, crashes claimed one jet for every 100,000 hours in the air; by 1981, the cumulative losses had been cut to about one per 900,000 hours.

■ American carriers have one of the best safety records in the world. Their loss ratio is bested only by that of Australian carriers, which have lost one plane for every 1.7 million hours aloft. Airlines in Canada rank third (743,000 hours per loss), followed by those based in Europe (419,000), Africa (277,000), Asia (263,000), and South America (210,000).

■ The country’s 29 major airlines, which carry about 94 percent of all passengers on the longer routes, have a better combined safety record than the 61 commuter lines.

■ Commercial airlines, including commuters, are safer than the light planes that fall into the catchall category of “general aviation.” Will Rogers, Rocky Marciano, Thurman Munson, Patsy Cline, Buddy Holly, Walter Reuther, and many other celebrities have been killed in crashes of light planes, which statistics say are 27 times deadlier than airliners.

Beyond these generalizations, judg-

ments about air safety are subject to statistical quirks. Fatal airliner crashes are so relatively infrequent—the recent high was seven crashes in 1972 and 1974, and there were none in 1980 or 1981—that trends tend to be ambiguous. A second problem is that many accidents are so random—sabotage, freak weather, bizarre lapses by pilots—that they don't tell much about the overall safety of an aircraft or airline. An occasional crash of a Boeing 727 or a Pan American jet doesn't mean that all 727s and Pan Am flights are hazardous.

There is further confusion because of the complex and sometimes controversial nature of crashes. There are often multiple causes—perhaps some error by a pilot, controller, or maintenance crew combined with bad weather or a flawed plane. And the National Transportation Safety Board's conclusions are sometimes bitterly contested, in courts and elsewhere, by airlines, aircraft manufacturers, and the pilots' union—all of which have their interests to protect.

Despite these subtleties, the NTSB has compiled enough evidence about crash causes to develop a rough worry list for the airline passenger. Errors by the pilot are at the top of the list, cited by the NTSB in 62 percent of fatal crashes in the 1970s. Bad weather is second, blamable 46 percent of the time. (The total adds up to more than 100 percent because of multiple causes.) Smaller factors are flaws in the air-traffic-control system, maintenance procedures, and the design and manufacture of engines and airframes. Airport problems rank at the very bottom.

First consider bad weather, the one risk that you can factor into your flying plans. Immensely powerful, capable of varied guises, gentle at one moment, fierce and unpredictable the next, the weather has to be respected. It sometimes seems to taunt airline pilots, allowing them to fly safely in bad conditions often enough that they become overconfident. Then weather will cause a series of disasters. This year has been one of those when nature reasserted its power. All three fatal crashes on major US airlines in 1982 occurred during bad weather—the Air Florida crash last winter, another one a few days later involving a World Airways jet landing on an icy runway in Boston (two presumed dead), and the July crash of a Pan Am jet just after takeoff in high winds from the airport in New Orleans (153 killed).

The airlines continue to take off and land in weather conditions that seem potentially hazardous to a passenger's eye. Planes take off in the rain and fog, rise through gray soup, then pop through the storm into a sunny sky. But is it safe?

Of all bad weather, the type most haz-

ardous to airliners is the thunderstorm containing wild and erratic headwinds, tailwinds, and downdrafts known collectively as "wind shear." Only recently discovered by meteorologists and still little understood, wind shear is difficult to detect and can sweep around a plane during takeoff or landing and destroy its aerodynamic stability with fatal results.

Since mid-1973, the FAA says, nine US airliner crashes have been largely attributable to low-level wind shear. It was probably a factor in 25 others, some of which were first thought to have been caused by pilot error. Most notable were the July Pan Am accident in New Orleans and the 1975 crash of an Eastern jet landing at New York's Kennedy Airport (113 killed). Research on wind-shear detection devices is continuing, and about 60 major American airports—including all three Washington-area airports—have devices to signal the potential for such conditions.

Other bad-weather conditions are of less concern to airline pilots, largely because technology has been developed to deal with them—often after fatal crashes pointed out vulnerabilities. An airline pilot always carries weather predictions alerting him to fog, storms, and other problems. Planes have many protective devices. Controllers on the ground help route a pilot above and around storms. And ultimately, during marginal conditions, a pilot can always refuse to leave the gate.

Snow like that confronting Air Florida's Flight 90 is worrisome to pilots, but many planes at National on January 13 were taking off without incident. The dangers are real enough—snow on a plane's wings can affect its ability to develop the "lift" needed for a safe climb, ice inside its engines can give pilots incorrect instrument readings, and slippery runways can make it hard to react to emergencies. But the safeguards are real, too—applications of deicing fluid at the gate can get rid of the snow on the wings, anti-ice mechanisms in the engines can keep them thawed out, and snow removal and sanding can keep runways in decent shape.

Fog is no longer of much serious concern to airline pilots, although it does occasionally close an airport when visibility approaches zero. Even very low visibility is considered safe for takeoffs and landings using autopilots and other instruments. A pilot simply turns on these trusty aids and flies through soupy conditions he would drive an automobile through only with extreme caution.

The danger of lightning knocking down a big jet is very low. The most famous case occurred nearly twenty years ago, when a lightning bolt blew up the fuel tanks of a Pan American 707 over Elk-

ton, Maryland, killing 81 persons. Since then jet fuels have become less volatile, new metals in hulls are better able to dissipate electricity, and radar makes it easier to stay out of lightning's way.

Ordinary rain is also considered safe, although in 1977 hail and water flooded the engines of a Southern Airways jet, which then crashed during an approach to a field in New Hope, Georgia, killing 70 persons. The only real concern with rain is on landings, when it is possible that a "hydroplane" effect can diminish the effectiveness of braking. The solution has been to cut grooves in runways, keep landing speeds somewhat lower than usual, and bring jets down extra hard.

That may give passengers a momentary scare, but it illustrates one of the ironies of flying in bad weather: Conditions that look most hazardous—fog, rain, snow, lightning—are usually less dangerous than the potential killer you can't see—wind shear.

Kelly Duncan Assured Passengers That Deicing Was a Routine Precaution

With the temperature at National in the mid-twenties and the storm dumping snow on the fuselage and wings of the Air Florida jet, there was no question that it would need to be deiced. An American Airlines service crew wheeled a deicing tank truck into place beside Flight 90 at about 2:20. From the rig's elevated "cherry-picker," a maintenance man with a hose began shooting a high-pressure stream of hot, pinkish liquid—part water, part ethylene glycol—against the metal skin of the jet to knock loose the snow and ice.

He worked his way along the left side of the fuselage. But before he had made much headway, Captain Larry Wheaton decided it was useless to continue. With the airport still closed, with several planes due to leave ahead of Flight 90, and with the snow still falling, it made more sense to postpone deicing until nearer departure. The maintenance man was ordered down out of his rig to wait.

The passengers were waiting too, relaxing inside the warm cabin. The three flight attendants, after making sure carry-on luggage was properly stowed, were moving up and down the aisle taking drink orders. Joseph Stiley was getting warm, so he took off his jacket and tried to sleep. At the rear of the cabin, several businessmen kidded Kelly Duncan about

the delay, asking for free drinks and joking that the pilots were holding up the flight so they could collect overtime. Other passengers reached into the seat pockets and glanced through the in-flight magazine, *Sunshine*, at its stories on John Travolta and Florida fishing. Or they looked at the redemption catalog for S&H Green Stamps, which Air Florida had just begun offering on some of its routes.

Although it was difficult to see through the fogged-up windows, several passengers had noticed the deicing crew at work. They heard the stream of liquid hitting the side of the jet, and watched slush slide down over the portholes. A couple of people asked Duncan what was happening, and she assured them that deicing was a routine precaution.

About 25 minutes after the first deicing was called off, word came that the airport was ready to reopen. An American Airlines crewman crawled back into the deicing rig amid the falling snow and started the process again, pouring on 30 gallons a minute of the water-glycol mix. Unknown to anyone, two errors were occurring. The maintenance crew used a non-standard hose nozzle instead of the manufacturer's model, and they thought the atmosphere was about four degrees warmer than it actually was. These two lapses combined to produce a deicing mix that was potentially less effective than normal—too much water, too little glycol. Thirty percent glycol was appropriate, but the mix used on the plane was about 18 percent glycol and 82 percent water.

Cautious airline captains, who have ultimate responsibility to make sure their planes are free of snow and ice, frequently get out of the cockpit and walk around outside to make a visual check. Instead, Wheaton asked Air Florida's station manager, who was standing at the end of the enclosed walkway onto the plane, to glance out the window at the plane. The station manager reported a "light dusting" of snow on the left wing from the engine to the wing tip, but otherwise clear. That, apparently, was the extent of Wheaton's inspection.

At about 3:25, an hour and ten minutes behind schedule, Flight 90 was given permission by a ground controller to leave its slot and head toward the runway. Inside the cabin, the flight attendants had already given passengers the usual departure announcement—oxygen masks here, emergency exits there, plastic cards with more information in the seat pockets. They noted that life vests were under the seats, but did not demonstrate their use. That was not required under FAA rules, because the plane was not scheduled to fly at any length over water.

Outside, maintenance crewmen attached a self-propelled tug to the nose-

wheel of the jet to push it out of the gate area. But snow, ice, and spilled deicing fluid made the concrete apron so slippery that the tug spun its wheels helplessly. The plane, which weighed just over 102,000 pounds, would not budge. Here another mistake was made, this time by the pilots. Despite a warning from maintenance people that it was against American Airline procedures, they started their engines and applied about 30 to 90 seconds of "reverse thrust" in an attempt to back the plane away from the gate. That maneuver blew snow and slush up around the plane. Still, the plane did not move, so the pilots shut off the engines.

Another tug, this one equipped with chains, was driven under the nose of the 737, and a tow bar was attached to the wheel. The tug operator established radio contact with the cockpit.

"Ready to roll?" he asked.

"Ready to roll," came the reply from Wheaton.

"Brakes off?"

"Brakes are off."

The tug's chains dug into the snow and ice. The plane—its engines shut down this time—broke loose. It started to roll slowly backward away from the gate.

"You can start your engines if you want," said the tug operator.

"I'll tell you what," said Wheaton.

"I'm gonna wait 'til you disconnect before I start them up."

"Okay," said the man on the tug.

"Parking brakes?"

"Brakes are set," said Wheaton, as the maintenance men leaned underneath the plane to detach the tug.

"Stand by for salute. We'll see ya later," said the tug operator, as he gave the final gesture that meant the plane could move out of his jurisdiction.

"Right-O," said Wheaton. "Thanks a lot."

Jet Airliners Are Almost Perfect Machines Until...

Jet airliners are now so common that it is easy to forget that they have been flying for only about 25 years. The first jet passenger flight by a US airline was a New York-to-Paris run by a Pan American Boeing 707 on October 26, 1958—eight years after the first flight tried by the British (which crashed) and two years after the first flight by the Soviets. Since then McDonnell Douglas, Lockheed, and Boeing (the only US manufacturer still designing new passenger jets) have sold thousands of jets worldwide, relegating piston-driven props

to commuter and cargo flights.

These jets not only have made airline travel faster, but also have greatly reduced mechanical problems. Homer Mouden of the Flight Safety Foundation is a pilot who remembers the old days, and is amazed by the improved reliability of jet planes. In 1945, flying props during his first year as an airline captain, Mouden had seven engine failures, luckily none of them leading to an accident. During his last seven years, mostly flying jets over the Pacific Ocean, the closest he came to trouble was when he once shut down an engine as a precaution.

This improved airworthiness is based partly on advances in aircraft design. The jet engine is a rare example of a new machine that is simpler than its predecessor—fewer moving parts than a piston engine, hence less to go wrong. Jets also develop power more efficiently, allowing planes to fly high over bad weather, and improvements in metallurgy have strengthened hulls. The biggest disadvantage of jet planes is that they cannot glide as easily as prop planes into emergency landings.

Modern planes also go through a lengthy certification process under the eye of the FAA. Boeing's new 767 produced a 35-foot shelf full of documents outlining five years of designs and redesigns as well as hundreds of tests on the ground and in the air. A plane must demonstrate that it can fly and land with all but one of its engines shut down. And its primary instruments and control systems must be accompanied by backups.

Regular preventive maintenance, using computerized record-keeping, affords jets a durability that would make a car owner envious. It is not unusual for a jet to fly thousands of miles each day for a couple of months, be pulled off line for an inspection and overhaul with new parts, then fly several months more. The thirteen-year-old 737 used on Flight 90, for instance, had relatively new engines.

All this means that aircraft flaws now rank well below pilot error and bad weather as a cause of airline crashes. But there is room for improvement in aircraft design. Manufacturers operate in an economic environment with pressures to trade safety precautions off against airline demands for lower prices; and some critics believe that the FAA does not demand enough of either the manufacturers or airlines. Higher costs have slowed down the installation of better-anchored seats and fire-retardant cabin materials.

Over the years there have been suspicions about a few planes. The Lockheed Electra had faulty wings, which were blamed for two crashes in 1959 and 1960. That was followed in 1965 by three crashes in quick succession of early-edition



A few minutes after Flight 90 was deiced at Gate 12, it looked like this through the camera of a Georgia businessman who happened to be shooting Washington's snowy weather from an Eastern jet near the terminal. Snow is already beginning to build up on the Air Florida jet's fuselage.

Boeing 727s—accidents that eventually were attributed to insufficient pilot training rather than to the plane itself. During the 1970s the 727 became the airline industry's safest and busiest jet, logging more than twice as many hours in the air as its nearest rival, the McDonnell Douglas DC-9.

The most recent example of a flawed jet is the McDonnell Douglas DC-10. It was involved in two major crashes in the 1970s, resulting from lapses in design, manufacturing, and maintenance.

In the first accident, a rear cargo door on a Turkish Airlines DC-10 blew out a few minutes after it took off from Paris in 1974. That caused an explosive decompression, which collapsed the cabin floor and in turn severed cables that left the pilots helpless to control the jet. It crashed into a forest northeast of Paris, with 346 killed. An investigation revealed a series of foul-ups prior to the crash. Two years before, the same door on an American Airlines DC-10 had blown out over Windsor, Ontario, but the captain's extraordinary flying prowess brought the plane to a safe landing in Detroit. The FAA, rather than require modifications to the door, allowed McDonnell Douglas to send out a "service bulletin" to airlines that were already flying the plane; the company was

supposed to correct the problem on all new planes during assembly. The new Turkish jet slipped through the manufacturer's quality-control system without the correction.

The second accident with the DC-10 occurred in 1979 on an American Airlines flight taking off from O'Hare Airport in Chicago. As the plane roared down the runway, its left engine ripped off, severing flight-control cables inside the wing. The jet lifted about 300 feet into the air, rolled sharply to the left, and came down near a trailer park a mile from the runway. The flight lasted only 31 seconds—the last word on the cockpit voice recorder was "Damn"—and it killed 273 persons, the highest toll in US history.

An investigation placed primary blame on a money-saving, management-ordered shortcut by American's maintenance personnel. They had been servicing the plane by removing the engine and the pylon that held it in place in one step rather than the two recommended by McDonnell Douglas. This hurried procedure produced a crack in a critical joining collar, which grew large enough over the next few weeks to cause the loss of the engine.

The investigation also raised questions about the DC-10's design. Had the con-

trol cables been placed farther back in the plane's wing—as they are in the Boeing 747 and Lockheed L-1011—they probably would not have been destroyed when the engine ripped off. With adequate controls the pilots very likely could have made a safe takeoff, even with the one engine gone.

A less publicized problem with a jet involves Boeing's 737, the plane Air Florida used on Flight 90. Since the early 1970s, pilots reported at least twenty incidents in which 737s pitched up their noses and began to roll sideways when they took off with snow on the leading edges of their wings. Because deicing prior to takeoff is supposed to take care of such a problem, the FAA did not require Boeing to prove that the jet could react safely. The manufacturer, whose own test pilots discovered the problem not long after the plane was first sold, contended that it was correctible by adding extra power on takeoff. The company sent the airlines three advisories to that effect.

Faulty maintenance, one of the causes of the Chicago DC-10 crash, also has figured in other accidents. One of the most famous took place in 1960, when a four-engine Lockheed Electra crashed into Winthrop Bay upon takeoff from Logan Airport in Boston, killing 62 per-



sons. Federal investigators said the jet had run into a flock of starlings, which were sucked into its turboprops, shutting down one completely and reducing power to two others. During the litigation that followed, it was discovered that more than birds had been involved. A few weeks before the crash, a maintenance man had rigged a wire around a faulty cockpit seat to hold it in place. The court concluded that the wire probably tore loose at a critical moment in the flight, the pilot's seat slid back, and he was unable to control the plane.

Another maintenance lapse occurred last year. While a jet was racing down the runway at Miami International, one of its engines began to break up. The pilot aborted the takeoff without injury to passengers, but bits of metal were strewn along the runway. Investigators examined the fragments and discovered an alloy that is never used in jet engines. The conclusion: A maintenance man from another airline, which serviced the plane under contract, had left a tool inside the engine. The victim of the error: Air Florida.

"Anti-Ice?" Asked Pettit. "Off," Wheaton Replied. Then They Began to Taxi.

Just after Larry Wheaton and Roger Pettit were given their farewell salute at Gate 12, they failed to take a critical step necessary to protect



their plane against the dangers of bad weather. Running through the start-up checklist, they neglected to turn on an "anti-ice" mechanism to thaw the engines. "Anti-ice?" asked Pettit. "Off," Wheaton replied.

Then they began to taxi toward the runway, sixteenth in line for takeoff. Under instructions from a controller, they pulled in behind a New York Air DC-9 and stopped. Sitting there in the falling snow, with its green-and-blue stripes suggesting tropical water and sky, the Air Florida jet stood out from the gray-

and-white landscape.

In the cockpit, the conversation of the pilots about the weather was being fed into a tape recorder in the tail section of the plane. "Boy, this is shitty," said Pettit. "It's probably the shittiest snow I've seen."

In the cabin, the 74 passengers and three flight attendants had little to do. Priscilla Tirado, her baby in her lap, tried to see out of her foggy window. And Donna Adams chatted over the intercom with Pettit in the cockpit. She was still excited by the snow building up on the taxiway.

"I love it out here," Adams said. "I love . . . the neat way the tire tracks."

"See that Citation over there?" asked Pettit. "Looks like he's up to his knees."

Wheaton and Pettit talked about the snow accumulating on their plane. It had been about 30 minutes since they were deiced, and they had picked up enough new snow for them to joke about it as they sat behind the New York Air DC-9, letting the jet exhaust melt and blow some of it off. This was not accepted practice. Water from the melted snow could easily turn to ice on such a cold day, contaminating the front edge of the wings and reducing the 737's aerodynamic capabilities.

"Did [the exhaust] get your [wing]?" Pettit asked.

"I got a little on mine," Wheaton said, looking out the window on the left.

Pettit had some snow on his side, too: "This one's got about a quarter to half an inch on it all the way."

Pettit noticed another plane on the taxiway that had ice hanging from it, and for a moment he marveled at the power of modern jets to overcome such obstacles. "It's impressive that these big old planes get in here with weather this bad," he said. "It never ceases to amaze me when we break out of the clouds [on landing], and there's the runway."

They were still behind the New York Air jet, and they were disappointed when it pulled up too far ahead for its exhaust to reach them. "Don't do that, Apple," Wheaton said, using New York Air's code. "I need to get the other wing done." Then there was the sound of laughter.

A second later, an air-traffic controller contacted Wheaton and Pettit from the tower—using Air Florida's "Palm 90" code—to make sure they knew their takeoff clearance would be coming soon. "Now for Palm 90," he said. "You'll be going out after the red DC-9 Apple type."

As they waited, the pilots chattered, telling tales they had heard from other pilots about flying in snow. Wheaton told about a pilot who accidentally landed on "a closed runway" in Chicago with a Boeing 727 in about "sixteen inches"

of snow. They laughed about that. "I'll bet it did smooth deceleration," said Pettit.

But Pettit was worried about the snow on his plane. "Boy, this is a losing battle trying to deice these things. It gives you a false feeling of security. That's all it does."

"[It] satisfies the Feds," said Wheaton.

Wheaton went on to suggest a new way to deice planes that wouldn't run the risk of so much snow piling up on them after leaving the gate. They ought to have a couple of deicing trucks out on the runway, he said, so a pilot could pull between them and get a last shot of glycol right before takeoff.

Not a bad idea, Pettit allowed: "You taxi through kinda like a car wash."

"Yeah," said Wheaton. "Hit [the plane] with about eight billion gallons of glycol."

Wheaton gave the impression that he didn't have much faith in current deicing procedures. One of the few times he'd ever been deiced was in the airport at Minneapolis-St. Paul, and that had turned out to be useless. "The heater on the truck didn't work," he said. "The glycol was freezing the moment it hit."

Air Florida's takeoff was getting closer, and the pilots settled down to prepare. But not before Pettit commented again on the snow: "Boy, I'll bet the school kids are just shitting in their pants here. It's fun for them. No school tomorrow. Yahoooooooo!"

At 3:59—nearly 50 minutes since the deicing—the pilots made a turn to face north on Runway 36, the longest strip at National.

Airline Crashes in the Jet Age

Year	Location	Airline	Killed	Type
1982	New Orleans	Pan American	153	Takeoff
	Washington, DC	Air Florida	78	Takeoff
1979	Chicago	American	273	Takeoff
	Mexico City	Western	71	Landing
1978	Over San Diego	Pacific Southwest/light plane	144	Midair collision
1977	Canary Islands	Pan American/KLM-Royal Dutch (both charters)	574	Ground collision
	New Hope, Ga.	Southern	70	During flight
1975	Kennedy Airport, NY	Eastern	112	Landing
1974	Pago Pago, Samoa	Pan American	96	Landing
	Bali Islands	Pan American	107	Landing
	Over Ionian Sea	TWA	88	Sabotage during flight
	Charlotte, NC	Eastern	71	Landing
1973	Berryville, Va.	TWA	92	Approach
	Papeete, Tahiti	Pan American	78	Takeoff
1972	Boston	Delta	88	Landing
	Miami	Eastern	99	Approach
1971	Over Duarte, Cal.	Hughes Air West/military jet	50	Midair collision
	Juneau, Ala.	Alaska Airlines	111	Approach
1970	Huntington, W. Va.	Southern (charter with Marshall U. football team)	75	Approach
1969	Over Fairland, Ind.	Allegheny/light plane	82	Midair collision
1968	Dawson, Texas	Braniff*	85	During flight
	Caracas, Venezuela	Pan American	51	During flight
1967	Over Hendersonville, NC	Piedmont/light plane	79	Midair collision
	Constance, Ky.	TWA	69	Approach
1965	Atlantic Ocean near Jones Beach, NY	Eastern	84	Takeoff
	Constance, Ky.	American	58	Approach
1964	New Orleans	Eastern	58	Takeoff
1963	Elkton, Md.	Pan American	81	During flight
1962	Idlewild Airport, NY	American	95	Takeoff
1961	Hinsdale, Ill.	TWA	78	Takeoff
	Shannon, Ireland	President (charter)*	83	Takeoff
	Richmond, Va.	Imperial (charter)*	77	Approach
1960	Holdercroft, Va.	Capital*	50	During flight
	Cannelton, Ind.	Northwest*	63	During flight
	Boston	Eastern*	62	Takeoff
	Over New York City	TWA*/United	134	Midair collision
1959	LaGuardia Airport, NY	American*	65	Landing
	Milan, Italy	TWA*	68	During flight

This includes all crashes of US civilian passenger planes with 50 or more fatalities since jet service started.

*Propeller plane



This is the view from the cockpit of an airplane after it takes off from the long north-south runway at National Airport. Planes then head up the Potomac River toward the 14th Street bridges. The first bridge is for railroad traffic; the second bridge is for Metro trains; the third span—the one Flight 90 hit—is the 14th Street Bridge from Virginia into the District. If the plane had cleared that bridge and had still been losing altitude, it would have hit the fourth span, which carries traffic from the District into Virginia.

The Plane Started to Roll Down the Runway: 1,000, 2,000 Feet... Past 3,500 Feet Where the Plane Should Be Airborne...

Roger Pettit, the co-pilot, was going to fly the plane on this takeoff rather than Larry Wheaton, the captain. This sharing of work load is common in commercial aviation, although all co-pilots have it drummed into them that the captain alone has authority to abort a takeoff or make other crucial decisions.

That was the burden of responsibility resting on Wheaton as he and Pettit sat in the cockpit surrounded by crowded panels of gauges and the sound of safety beepers and radio transmissions. Both were small men—Wheaton was five feet nine inches and 130 pounds, Pettit was five feet seven and 137 pounds—strapped

into harness that stretched across their white shirts.

As they neared the moment of takeoff, the extraneous chatter in the cockpit ceased, and the two pilots began to concentrate on flying. Pettit asked his captain if he had any special instructions on handling the slushy runway ahead of them.

No, Wheaton said, unless Pettit himself had something in mind.

Pettit did. "I'll take the nosewheel off, and then we'll let it fly off," he said. "We'll be climbing to [5,000 feet]. I'll pull [the throttle] back to [reach an airspeed of about 170 miles per hour] . . . depending on how scared we are." (Sound of laughter.)

Over the radio came clearance from the control tower: "Palm 90 cleared for takeoff."

Pettit acknowledged the clearance, and then alerted the flight attendants and passengers that they were ready to go: "Ladies and gentlemen, we have just been cleared on the runway for takeoff. Flight attendants please be seated." Kelly Dun-

The Eastern plane was on a descent from the south, and it was coming in fast behind Flight 90.

can sat in a jumpseat at the rear of the cabin, strapped in by shoulder harness. Donna Adams sat in a similar seat on the front wall of the cabin, just behind the lavatory. Marilyn Nichols, who might have taken the potentially safer seat next to Duncan, stayed up front next to Adams. They were such good friends.

Seconds later, controller Stanley Gromelski in the tower made a final contact with Wheaton and Pettit that may have put some pressure on them to get moving quickly and not stop. The controller already had cleared another jet—Eastern Flight 1451—to land on the same runway where the Air Florida jet sat facing north. The Eastern plane was on a descent from the south, somewhat closer than FAA's "separation" rules allow, and it was coming in fast behind Wheaton and Pettit. There was no panic in the controller's voice, but his message to the Air Florida pilots was unmistakable: "No delay on departure, if you will, traffic two and a half [miles] out for [your] runway."

"Okay," Pettit replied.

The 737's Pratt & Whitney engines, one hanging under each wing, revved up as Pettit released the brakes and put on

the power. The plane started to roll down the runway: 100, 200, 300 feet . . . 1,000, 1,500, 2,000 . . . past the point at 3,500 feet where the plane should have been airborne . . . 4,000, 4,500, 5,000 . . . still on the ground.

Pettit, with his hands on the controls, was beginning to develop a sense that they didn't have enough power. He conveyed his anxiety to Wheaton, who was monitoring various instruments.

"God, look at that thing," Pettit said, apparently referring to a needle gauge that displayed the power being developed by the engines. "That don't seem right, does it?"

"Yes it is," said Wheaton.

"Naw, I don't think that's right," Pettit said. "Maybe it is, I don't know."

With the remaining runway ahead of the plane ebbing away, Captain Wheaton had the authority to order an emergency "abort" and try to get it stopped before sliding off the end of the snowy strip. No one can know why he ignored that option, but his inaction would later be officially considered a major error in judgment. Nor can anyone know why co-pilot Pettit, who seemed to be subliminally begging for an abort order, didn't come right out and demand it. Perhaps it was the normal deference a co-pilot shows toward his captain, perhaps he convinced himself that his engines were actually getting enough power for a safe flight, perhaps both he and Wheaton were overconfident that the plane would somehow overcome any problem.

Pettit's instinct that something was wrong with the "engine thrust" reading was correct. Because he and Wheaton had failed to turn on the anti-icer in the engines back at the gate, tiny pressure tubes that monitor engine thrust were clogged by ice. This blockage meant that the "engine pressure ratio" gauge was incorrect. Although it showed Pettit and Wheaton that they were using enough power for a normal flight, the engines were actually running at only about 80 percent of that.

Back in the cabin, uneasiness was spreading among some of the passengers as the runway roll became longer and longer. Joseph Stiley, himself a certified pilot, knew it was abnormal. The 737s he'd flown on had been scooters, which shot down the runway and took off quickly. But this one wasn't even developing enough force to push him back in his seat. He was convinced that the pilots would abort when they realized they were using up too much runway, perhaps causing the plane to skid off the snowy asphalt into the river inlet.

Kelly Duncan was worried, too. On a normal takeoff she sat in the rear jumpseat with her hands over her ears to protect them from the noise of the engines.

But this time they weren't as loud as usual. She grew tense and silently urged the plane into the air: *Get this baby up! Get this baby up!*

Most Pilots Are Very Safety-Conscious. An Old Saying Goes: "Pilots Are the First to Arrive at a Crash."

When you board an airliner, you have no way to learn about the pilots into whose hands you are delivered. You rarely see them—at most a glimpse through an open cockpit door—and you usually hear them for just a few seconds on the public-address system. You can only trust that the FAA and the airline have insured that the pilots are well-trained, cautious professionals with sound judgment.

Pilots are well paid to assume life-or-death responsibility, especially on the major airlines, most of which operate under contracts negotiated by the Air Line Pilots Association. Captains earn \$80,000 to \$90,000 a year for flying 100 hours a month.

Not only do many pilots have experience flying military jets or light planes before joining airlines, but they also get intensive training on the passenger jets they will be flying and have to pass FAA certification tests. Beyond this technical competence, most pilots are extraordinarily safety-conscious, in part because they have as much to lose as their passengers if they make a mistake. "Pilots are the first to arrive at a crash," is an old saying.

But airline pilots do make mistakes. During the 1970s, according to the National Transportation Safety Board, pilot error was blamable in full or in part in 62 percent of fatal crashes of US airlines. The mistakes included cases like these:

- In 1974, while an Eastern DC-9 was heading toward the fog-shrouded airport in Charlotte, the pilots were rattling on about everything from politics to used cars. Because of this "poor cockpit discipline," they didn't realize they were descending too rapidly, and crashed into the ground about three miles short of the airport, killing 72 persons.

- In 1977, two Boeing 747s filled with charter passengers collided on the runway at an airport in the Canary Islands during bad weather. Both planes, one operated by KLM Royal Dutch Airlines and the other by Pan American, burst into flames and 583 persons perished—the largest death toll in aviation history.

Spanish authorities attributed the crash to mistakes by the KLM captain, including his emphatic insistence that the Pan Am plane had already taken off, starting his takeoff roll against the orders of the control tower, and failing to interrupt his takeoff when Pan Am reported that it was still on the runway.

■ In 1977, prior to the departure from Anchorage of a Japan Air Lines DC-8 cargo plane loaded with cattle, the captain (an American) arrived at the airport drunk. His taxi driver said he had staggered from the cab, appeared mentally confused, and slurred his speech. Taking command of the plane, he rolled to the wrong runway, had to be guided to the correct one by controllers, then took off and crashed. An autopsy revealed an alcohol level in his blood three times Alaska's legal maximum for driving a car.

■ In 1978, a United DC-8 had problems with its landing gear and was forced to circle the airport in Portland, Oregon, for about an hour. Preoccupied by this problem, the captain did not pay attention to warnings from his crew that he was running out of fuel. When the tanks ran dry, the plane crash-landed, killing eight persons.

■ In 1979, seventeen persons died when a twin-engine prop operated by Downeast Airlines crashed short of the runway while trying to land at the fogged-in airport in Rockland, Maine. Investigators concluded that the pilot had been suffering from job-related stress that resulted in enough "chronic fatigue" to curtail his flying skill and alertness. On the day of the crash, he had been on duty for nearly nine hours, three of them in the air.

The Downeast crash is an example of the pressure that can be put on pilots to meet schedules—a safety problem that is less serious for bigger airlines, where pilots have union protection. Fourteen former Downeast pilots told investigators that the company forced them to fly with known mechanical defects or in hazardous weather conditions and subjected them to verbal abuse, fines, layoffs, and firing if they didn't. The owner and some employees denied the charges, but the NTSB concluded that management was culpable.

Stanley Mohler, a former FAA official now conducting research on air safety at Wright State University in Ohio, tells of another example of management pressure on pilots in the early-1970s. Braniff was plagued by a reputation for being late, so its executives came up with a marketing plan called "Lucky Bucks." Clocks were installed in Braniff's planes, and each passenger was promised one dollar off his or her fare for each minute the airline was late in arriving. On an approach into the airport in Oklahoma

The Pilots



Larry Wheaton, the captain of Flight 90, was 34 years old and had made only eight takeoffs and landings in such snow while in command of a 737. No recent photo of Wheaton was available; this one was taken in 1965.



Roger Pettit, the co-pilot who actually was at the controls of Flight 90, was 31 and had operated a 737 in snow only twice. This photo was taken in 1971.

City, a Braniff pilot was told by the control tower that because of wind conditions he should circle around and come in from a different direction. He told his partner in the cockpit that they had only a few minutes to meet the Lucky Bucks deadline, so he ignored the controllers and came in the direction he had planned. With a tailwind pushing the plane at too high a speed, it skidded off the runway and was badly damaged. No one was hurt, and the FAA eventually forced Braniff to drop the Lucky Bucks promotion.

Busy airports put other pressures on pilots to cut safety corners. Once a jet has been cleared to leave the gate and has taken its place in line on the taxiway, it is a time-consuming nuisance to go back to check a potential problem.

Another pilot-related factor in airline crashes has to do with human relationships inside the cockpit. Airline captains have ultimate command authority, even when not at the controls, and co-pilots and flight engineers are trained to defer to them. In emergency situations, it can be important how the captain and his crew work together as a team. Does the

captain encourage warnings from his crewmembers and take them seriously? Are the crewmembers assertive enough when they smell danger?

Investigators have found cases in which co-pilots, aware that captains were making errors, sat silent or uttered only the faintest of warnings. A classic cockpit drama of this sort occurred in 1971 as an Allegheny jet approached the New Haven airport in fog. The captain, apparently something of an authoritarian, dropped the plane too low. The submissive co-pilot simply read out the altitude all the way down to twenty feet—just before impact. The co-pilot was one of only three survivors among the 31 people aboard as the plane hit three beach cottages nearly a mile short of the runway.

Enough other cases of such undue deference toward captains have been uncovered for the NTSB to recommend that the FAA urge airlines to put their subordinate crewmembers through "assertiveness training." Some have done so.

Although age and experience do not guarantee that a pilot will avoid mistakes, a little gray at the temple does not hurt. Airline policies and seniority rules

reinforce this notion. At United, the nation's largest carrier, a co-pilot customarily assumes the captain's seat after eighteen years of experience, at Eastern after seventeen years, and at American after twelve to fifteen years. During these long apprenticeships, co-pilots are likely to have seen how veterans handle various emergencies and the airlines have had a chance to weed out marginal performers. So critical is experience that many experts believe current rules requiring pilots to retire at age 60 are shortsighted.

Related to pilot experience is a controversial safety issue that has emerged since federal deregulation of the airline industry in 1978. One argument runs like this: Deregulation, which has encouraged the expansion of small regional airlines as well as the creation of new ones,

At United, a co-pilot customarily assumes the captain's seat after eighteen years of experience.

puts a premium on holding down costs to stay profitable. An obvious way for these "new entrant" lines to save money is to hire younger, less-experienced, non-union pilots. These pilots, even though certified under the FAA's minimal standards, are unlikely to have the judgment of a veteran if they encounter emergencies. The Air Line Pilots Association—whose constituency is mostly on larger, established carriers—has gone so far as to warn of a coming spate of pilot-related crashes among the new airlines. That has not happened thus far, and the newer companies, including Air Florida, hotly contest the warning.

Air Florida, which business reporters call "an ugly-duckling airline" that has become "the darling of deregulation," started only ten years ago with a handful of pilots, few planes, and routes confined to Florida. Unshackled by deregulation, it began to compete with more established airlines on routes between Florida and such cities as Washington and New York. With low fares and a vigorous anti-union policy, it quickly grew into the country's sixteenth-largest airline and became an economic success. It showed profits while older lines suffered big losses, and it attracted new investors, including Mandell J. Ourisman, the Washington auto magnate whose 2.4 percent share of the airline's common

stock is second only to that owned by the airline's founder. This growth meant that the airline had to add new planes and personnel rapidly throughout the late 1970s, including more than 250 new pilots. Among the new hires were Larry Wheaton and Roger Pettit.

Wheaton had grown up in the Miami area, and had been obsessed with flying from an early age. He took his first flying lessons at age eighteen. After high school he took more pilot training at Miami-Dade Community College, and in 1968 he joined the Army, where he flew light planes. He studied at Florida's Embry-Riddle Aeronautical University, flew a year with Gulfstream Airways, then caught on in 1976 with Air Sunshine, a Key West airline that used a fleet of old DC-3s on short runs inside Florida. Floridians used to joke about the airline—"Air Sometimes," they called it—and in 1978 it was bought out by Air Florida.

As part of the purchase, Air Florida sifted through Air Sunshine's 32 pilots to pick the ones it wanted to keep. Fourteen, including Wheaton, were asked to stay, landing their jobs without having to compete against the thousands of pilots in Air Florida's application files. The airline gave Wheaton more training and assigned him as a co-pilot on DC-9s. But because it needed pilots to handle its growing passenger load, the company promoted him much more rapidly than customary on a larger airline. Eight months after his first flights for Air Florida, he was switched to 737s as a co-pilot. Fourteen months after that he was promoted into the 737 captain's seat. By last January—at age 34, with roughly 32 months' experience on 737s, 18 of them as a captain—he reportedly was making between \$65,000 and \$70,000 a year.

Other Air Florida pilots considered Wheaton capable in the cockpit—a man who was quiet but diligent. His record, however, included some marginal performances during tests he was given by the FAA and the airline. On five FAA written exams taken between 1965 and 1977 to get various licenses before joining Air Florida, he scored only a few points above passing. He also flunked two flight tests on 737s administered by Air Florida in 1980 and 1981—a rare occurrence among the company's pilots. Both times, he was retested and passed.

Roger Pettit had graduated from high school in a small town in West Texas, then went on to earn a political-science degree in 1971 at Texas Tech University in Lubbock. He worked as a bank teller there for about a year during and after his schooling, then came to Washington for a few months as a clerk at the Federal Bureau of Investigation. Late in 1972 he joined the Air Force to become a pilot, and for eight years flew a variety of mil-

itary planes, including the F-15 jet fighter. Pettit was hired by Air Florida in 1980, making the transition to commercial airlines that is common among Air Force jet jockeys. After training, which he apparently handled with ease, he was assigned as a 737 co-pilot. Among other pilots he was known as a witty, talkative man with "good hands" at the controls—the kind of pilot who someday would make a good captain. By last January, he was 31 years old and had been flying 737s for about 14 months.

None of this, of course, was known to the passengers on Flight 90. Wheaton and Pettit were just voices up in the cockpit who were supposed to know what they were doing. None of the passengers could have known that they had taken off and landed 737s so few times in snow.

Pettit Was the First to Say It Out Loud. "Larry, We're Going Down, Larry."

Get this baby up! Get this baby up! At last the 737 responded to Kelly Duncan's anxious command. The nosewheel of the plane left the runway, and Flight 90 was airborne—1,900 feet farther down the runway and fifteen seconds later than on a normal takeoff.

Within a few seconds, the jet should be climbing over the Potomac. It would reach 1,000 feet and about 200 miles per hour as it passed over the 14th Street Bridge. The pilots would retract the landing gear, make a left-hand turn away from the prohibited air space around the White House, fly up the river to the Cabin John Bridge, then turn and head south toward Tampa. In the cabin, the NO SMOKING light would go off, the flight attendants would slip on their aprons, then begin moving up and down the aisle with drinks.

Instead, the plane began to lose airspeed and its nose pitched up in the same way that some other pilots had experienced while flying 737s into snow. The "stickstaker" on the control column in Pettit's hand began to shudder—they are designed that way to alert pilots to danger. The vibration became increasingly violent, a signal that they were beginning one of the most feared problems in aviation—a "stall" on takeoff.

Wheaton tried to verbally coax the plane into a steeper climb. "Forward, forward," he urged. "We only want 500 [feet rate of climb]. Come on! Just barely climb!"





"Stalling," one of them cried. "We're stalling."

In the cabin, the passengers' sense of relief that the plane had finally gotten into the air gave way to fear. The stalling plane—now shuddering and bouncing—was beginning to fall. Out the windows, passengers could see trees on the Virginia side of the river. Closer . . . closer . . . bigger . . . bigger . . . they seemed to be rushing up to meet the plane.

In Seat 17E, Priscilla Tirado at first had told herself that the shaking was due only to the turbulence that jets fly through all the time. She had flown more than her husband, Jose, and she hooked her

arm in his to reassure him. It's just turbulence, she seemed to say, just real bad turbulence. But it got worse, and she too became scared.

In Seat 21D, Bert Hamilton looked at Joe Carluccio, one of his colleagues from Fairchild. Carluccio shook his head and smiled nervously as if to say, "This is really a rough one, isn't it?" Hamilton reached down and tugged at his seatbelt, pulling it as tight as he could. And he exchanged a horrified glance with Kelly Duncan, just behind him to his left.

Across the aisle and three rows forward, Joseph Stiley turned to Patricia Felch and said: "We're not going to make

it! We're going in! Just do what I do." He put his arms up around his head, put his head down in his lap, and looked over to make sure she was doing the same.

By now the plane was buffeting like a twig in a windstorm. Food trays in the galleys rattled, coats and luggage shifted in the overhead bins, and people bounced in their seats, causing mothers to grip more tightly to their babies.

In the cockpit, Pettit was the first to say it out loud.

"Larry, we're going down, Larry," he cried.

"I know it," said Wheaton.



For Just a Moment, Before People Started Screaming, Everything Was Still

On the northbound span of the 14th Street Bridge, traffic into the District was at a bumper-to-bumper crawl. Though it was only 4 PM, commuters were heading home—hundreds of them released early from the Pentagon and other Virginia offices be-

cause of the snow that swirled across the bridge.

At one minute after 4, the green-blue-and-white Air Florida jet swooped down on the motorists with a roar. With its nose pitched up at a fifteen-degree angle, the engines, wings, and tail section of the jet pounded the bridge. Chunks of snow and ice fell off onto cars, and the plane struck six cars and a truck. Three Fords, a Pontiac, a Mercury, a Plymouth, and a Renault were spun around on the snow-covered bridge, some of their tops smashed down or ripped off to the top of the doors. A 40-foot metal section of the bridge's north banister exploded into pieces.

After hitting the bridge, the jet went into a dive and plunged nose-first into the ice-covered Potomac about 250 feet upstream and 150 feet from the Virginia bank. The three-inch ice in the river shattered under the impact, and the twisting plane broke into four large pieces and hundreds of smaller ones. Debris was scattered across an area the size of a football field—some of it under the water, some floating up on top of the water, some resting on the broken ice. As quickly as that, Wheaton and Pettit and most of their passengers were dead.

The crash was so unexpected, so violent, and so momentary that it was difficult for eyewitnesses to describe fully. Many could not remember whether the plane's landing gear had been up or down. (It was down.) And they struggled to find an analogy out of ordinary experience to convey what the crash had looked like. It hit the bridge "like a duck coming in for a landing." It hit the icy river "like a rock thrown into a giant piece of glass." It shattered "like an egg cracked on the side of a dish."

The eeriest phenomenon, some witnesses said, was the unexpected silence right after the impact. For just a moment, before people from the cars started screaming, everything was still. There was only the sound of the wind in the snow.

The disorientation of Flight 90's passengers—those that survived—was far greater. Bert Hamilton, although conscious all the time, was not aware that the plane had hit a bridge. Priscilla Tirado felt the plane hit something like "a brick wall" and then saw a great flash of white light. Joseph Stiley thought, "God help me," and then blacked out. Kelly Duncan had a sensation that she was dying, floating through white. Patricia Felch, looking down at an angle as the plane dove into the river, saw the tops of the seventeen rows of seats ahead of her.

In the control tower back at the airport, controller Stanley Gromelski was beginning to worry. Flight 90 had shown up

only briefly as a blip on the radar screen and then disappeared. Over the radio he and other controllers began trying to make contact: "Palm 90, how do you read? Palm 90, how do you read?" No answer.

On Runway 36, a USAir jet had just landed, and the controllers asked its pilot to roll to the end of the runway to see if he could find the missing plane. "I'm looking for a 737," said a controller, his own visibility reduced to only five-eighths of a mile by the falling snow.

The pilot radioed back that he saw a set of tire tracks in the snow that stopped just short of the end of the runway, apparently the mark of a plane that had taken off after an extraordinarily long roll. The 737 was not in sight.

A Zone of Terror: Some Freeze, Some Are Calm, Some Look Back

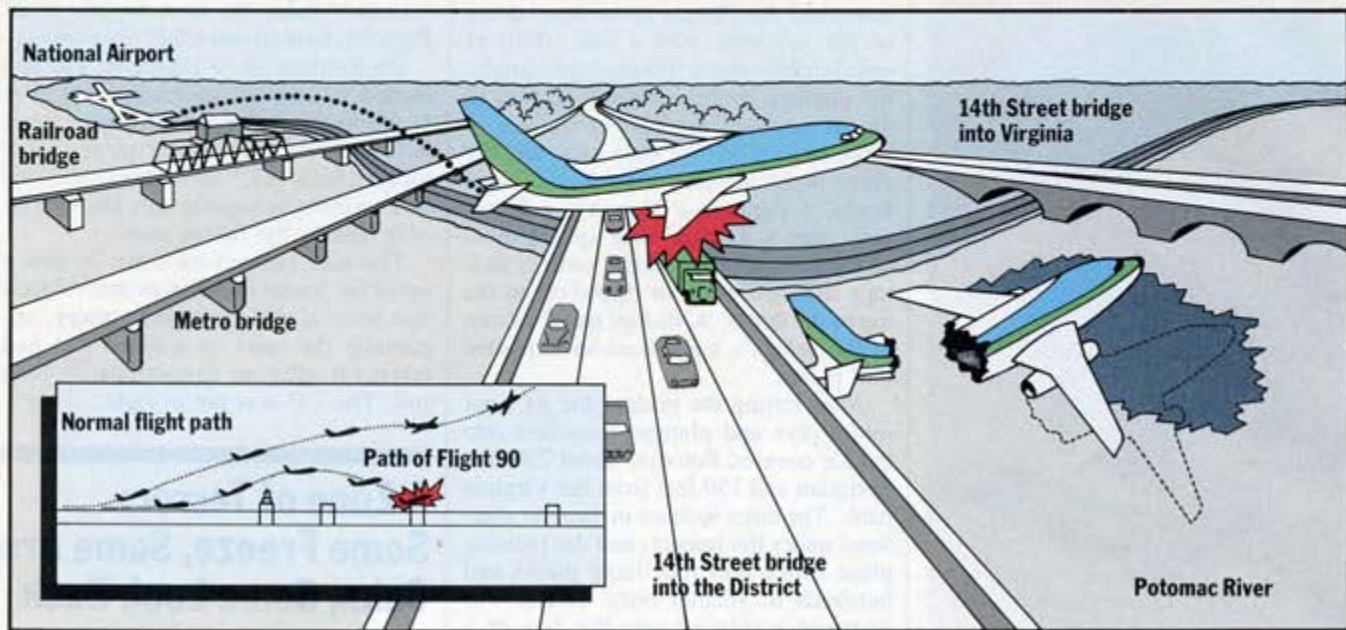
No one can know what ran through the minds of the victims of Flight 90 as they were swept to their deaths. So short a flight—about 30 seconds from lift-off to impact—and yet so universal and mysterious a set of questions: Were they filled with fear? For how long, if at all, did they live with the knowledge that they were doomed? Did their minds and bodies set up defenses for them? Did they feel any pain?

Psychologists have been intrigued with such questions, and they have sought answers by interviewing survivors of plane crashes and other life-threatening disasters. The memories of these people vary or are sometimes a bit sketchy, but enough has been learned to piece together a generalized but plausible scenario of what went on inside the cabin on Flight 90.

Passengers with lots of flying experience probably sensed, along with Joseph Stiley and Kelly Duncan, that the runway roll prior to flight was abnormally long, and very probably they began to feel the first tinges of fear. Those who had not flown very much were probably unaware of the abnormal roll, and their fear was postponed. Once in the air, as the plane entered the stall and began to shake, everyone was pulled into a zone of terror where they realized that danger was both imminent and profound. For some people, the fear was blended with wishful optimism that the shaking would stop and all would be well.

In a split second, their bodies responded to this fright, setting off as many as 79 discrete physiological reactions that combined to erect physical and psychological defenses. Their heartbeat, blood pressure, and level of perspiration all increased rapidly and dramatically. A cas-

The Path of Flight 90



cade of biochemicals and neurochemicals were released. Adrenaline, which gave them strength four to ten times normal, rushed through their bodies.

Their brains raced so fast that ordinary perceptions of reality were altered. Paradoxically, given the high speed at which events were occurring, some passengers probably saw them in slow motion and in extraordinary detail. The faces of other passengers, the backs of seats, the overhead bins and cabin ceiling—all would have been sharply focused. Some people also may have experienced the "flashback" phenomenon, seeing the face of a loved one or reliving some event from their past.

Perhaps some passengers were struck by what psychologists call behavioral inaction. Their bodies "froze," and they were simply unable to move. That has been reported before in similar situations. A woman who survived the ground collision of two jumbo jets in the Canary Islands in 1977 has said that as many as 100 of the victims could have escaped from one of the fiery planes if they had not been traumatized into inaction.

Another common reaction is "depersonalization." Here the mind would have detached from the body, in a sense, and victims would have watched the unfolding of events as bystanders rather than as participants. Two psychiatrists at the University of Iowa who documented this phenomenon tell of a truck driver who crested a hill and found himself heading at high speed toward an oncoming train. Suddenly, his mind flashed to a quick succession of scenes from unreal points of view. In one he was looking down on the train from 50 to 100 feet in the air,

in another he saw himself flying through his windshield, and in another he was behind the truck as it hit the train and blew up. In reality, he struck the train, but survived.

While some people on Flight 90 probably began to let out their fear with screams, crash studies suggest that others may have confronted death with remarkable composure. Religious belief—with its notion that death is God's will or that He will intervene—is soothing for some people. But even the non-religious sometimes experience a feeling of remarkable calm.

Technicians who listen to cockpit recordings of events preceding crashes often are amazed at the lack of hysteria that pilots display when they know they are doomed. Whether it's because they are so used to flying or because they are busy trying to save their plane, many pilots go down with professional cool. When a Pacific Southwest Airlines jet collided in midair with a light plane over San Diego in 1978, the last words from the cockpit were, "Ma, I love ya."

Among passengers, such composure may be related to whether a person has come close to death before. In the Canary Islands collision, there was a man aboard one of the jets who had been caught in a theater fire as a child. Forever after, in confined spaces, he noted the location of exits. When the collision occurred, he simply took hold of his wife's hand—she was frozen in her seat next to him—and led her to safety.

Just before Flight 90 hit the bridge, it seems likely that those who did not have their heads lowered into the brace position reflexively bolted upright in their

seats, gripping the armrests tightly. Their eyes were probably riveted straight ahead. Then, as the plane careened off the bridge into the river, they would have become totally disoriented.

The plane banged into the bridge at about 150 miles an hour with an impact estimated at four times greater than normal gravity. At the second impact, when the plane hit the icy river, the force was twelve times normal gravity. In that second or less, any items that were loose in the cabin—briefcases, for instance—became lethal projectiles as they flew through the air. The cabin floor collapsed and virtually all the seats were ripped from their moorings, hurling the strapped-in passengers into a jumble of death.

If generalizations about what happens to the human mind in a plane crash are speculative, that is not the case with what happens to the body. Here the facts are gruesomely certain. Sometimes, as in the crash last July of a Pan American jet in New Orleans, bodies are so dismembered that the cause of death is obvious. Other times, fire and smoke inhalation are the killers.

In less disfiguring crashes, the fatal injuries often fall into three major categories—all of them sudden enough to be largely painless. Some people die of head injuries when they are smashed into the seats in front of them. Others are killed as their heart is heaved with tremendous force into the chest wall, severing the aorta artery. Some suffer spinal-cord injuries that cut off breathing.

Many of the victims of Flight 90 died like this. Autopsies on 73 of the passengers and crewmembers—family permission for one victim was denied on reli-

The Rescue



CHARLES PERRINAU/S. PARK POLICE

The US Park Police helicopter, with pilot Don Usher and Gene Windsor aboard, dragged three survivors toward the safety of the Virginia bank of the Potomac. Patricia Felch was on the short rope, while her boss, Joseph Stiley, and Priscilla Tirado clung to the longer one. Stiley made it to shore, but Felch and Tirado lost their grip and fell back into the river.



CHARLES PERRINAU/S. PARK POLICE

Usher dipped the skids of the helicopter into the water, and Windsor pulled Patricia Felch aboard. She was the last one rescued.



WIDE WORLD

Priscilla Tirado, whose husband and baby perished, was later rescued by bystander Lenny Skutnik.



gious grounds—revealed that fatal head injuries were most common. That was the official cause of death in 38 cases, followed by 29 fatal injuries to chests, eleven to necks, four to abdomens, one to a thorax, and one to a pelvis. (This adds up to more than 73 because some people suffered multiple fatal injuries.) Despite numerous cuts, bruises, and broken arms and legs, there were only two instances of severed limbs.

Nineteen victims had some water in their lungs, which has led to speculation that they were still alive while strapped in their seats in the sinking plane. But experts believe these last gasps of water were only momentary post-death reflexes; all nineteen were so fatally injured that none could have been saved even with the promptest and most effi-

cient rescue effort. The death of only one person—Arland Williams, the bank examiner from Atlanta—was officially classified as a drowning.

The best judgment of the National Transportation Safety Board is that most of the survivors escaped only through sheer luck. It was conceivable that their bodies and those of other passengers might have tolerated the force of impact, but it was a fluke that they survived the subsequent disintegration of the fuselage and the breakup of seats. All the survivors were sitting near the rear of the cabin—the place that statistics prove is safest on airliners because the impact there is sometimes less than that absorbed by a plane's nose. Only Kelly Duncan's jumpseat, farthest to the rear of all, remained relatively undamaged.

"I Can't Find My Baby! Please Help Me Find My Baby!"

The cabin of the Air Florida jet—once warm and well lighted—had ripped apart from the wings, tail, and nose of the plane at impact and was settling into the cold, murky water of the Potomac. Through its ruptured walls, water poured into the darkened interior and its mass of tangled seats and bodies. For most passengers, it made little difference.

But for five passengers and one flight attendant—who had sustained only bro-



The falling jet hit six cars and a truck that had been headed into the District on the northbound span of the 14th Street Bridge, then ripped off a 40-foot section of the north banister. Four persons in the cars were killed.

the surface of the river.

Stiley, whose left leg and right ankle were broken, had been knocked unconscious by the impact, but the water revived him. He got his seatbelt loose, and fought to free his legs. He grabbed Felch—whose battered right side included a broken leg, arm, and wrist—and started to pull her out of the seat next to him. She was trapped, the seatbelt still taut around her waist. They managed to fumble in the darkness and get it unbuckled, but her legs were still pinned beneath the seat in front of her. She grabbed hold of her own armrests for leverage and pulled her legs free, leaving behind her right boot. Stiley grabbed her, and together they struggled toward the opening.

Tirado felt around in the darkness and water, trying to throw off the debris that covered her. Once she touched something that felt like her husband's arm. She tried to find her baby. Although suffering from a broken left leg, she managed to get herself uncovered and somehow pop to the surface of the river. It was covered by jagged chunks of ice and scattered debris—luggage, handbags, clothes, shoes, a tennis racket, bits of insulation, scraps of green-and-blue seat upholstery. The water smelled of jet fuel.

Kelly Duncan, whose left ankle was fractured, reached the surface too, but not before she saw one horrible image. Most of the passengers were still strapped in their seats under the water.

The survivors clung to the one part of the plane that was still afloat. This chunk of wreckage was slippery and seemed to be sinking too, but most of them bunched together and held on to it as their only chance. Tirado was stranded several feet away in deep water, but floundered toward them. Finally, she grabbed hold of Stiley's tie, almost pulling him under, and made it over to hang on too. Hamilton found a submerged section of taut cable to stand on so he could keep his head above water. Felch and Duncan, their hands already incapacitated by the cold, used their teeth to chew through a plastic container around a life jacket that had popped to the surface. They pulled it out, and got it around Felch.

Stiley talked to the sixth survivor. Apparently after tearing loose from the cabin floor, the man's seat had floated free with him still strapped in. Hard as he tried, he could not free himself. He was sitting there wedged into the wreckage with only his head above water.

"Are you all right?" Stiley yelled.

"I'm not gonna make it," the man said.

"Yeah, you will. Somebody'll be here.

Don't worry about it. We'll be all right."

"I'm strapped in," the man said. "I can't move."

While drowning was still possible, the biggest danger the survivors now faced was death from hypothermia. That involves a rapid loss of body heat when a person is exposed to cold air or water—water is much worse than air—and can reach the life-threatening stage in as little as ten to fifteen minutes, leading to heart failure. With the water temperature in the Potomac around 34 degrees, the injured, lightly dressed survivors had to be rescued quickly. Kelly Duncan looked at her blue hands, and had the impression that the blood in them was frozen. She held on to the icy wreckage with one and then the other, putting the fingers of the free hand in her mouth to thaw.

Stiley looked at his wristwatch. It was only a few minutes since they had been rolling down the runway. He tried to tell himself that it was only a matter of time before the rescue capabilities of the nation's capital would swing into action. Controllers at the airport, momentarily unaware of the crash, continued to clear traffic, sending a couple of planes over the site in the blinding snow.

As the survivors waited in the water, the air was filled with screaming. Tirado cried over and over: "I can't find my baby! I can't find my baby! Please help me find my baby!" Other survivors yelled at the crowd beginning to gather on the bridge and the Virginia shore: "We're going to die out here! Help us! We are going to die!"

Stiley and Hamilton saw a Metro bus pull up and stop on the undamaged southbound commuter span of the bridge and saw several people get off. Stiley thought it would make a great ambulance—warm and spacious. But after looking their way, the bus passengers reboarded, and it drove away. My God, Hamilton thought, they can't see us! Nobody knows we're here.

But some people on the bridge and river bank did see them, and tried to help. A few got ropes out of their cars to dangle off the bridge; one man came back with his jumper cables. But it was all useless. The ropes were too short or they came down too far away. Stiley was tempted to let go and dog-paddle toward them, but reconsidered and stayed with the others on the wreckage.

The bystanders also shouted assurances: "Hold on. Help is coming." They yelled that fire trucks were on the way, but Hamilton was not comforted much by that. Fire trucks couldn't get across the ice and water, he thought. "Boats," he yelled. "What we need are boats."

ken bones and cuts—the water presented the new danger of drowning. All these people—Joseph Stiley, Patricia Felch, Priscilla Tirado, Bert Hamilton, Kelly Duncan, and one other man—had been sitting near where the tail section had sheared off from the fuselage. That had created a gaping, jagged hole that offered them a chance to escape.

Hamilton, whose right wrist and arm were broken, felt the water rising around his seat to his waist. He saw daylight coming in the opening and reached down to unbuckle his seatbelt. He made no attempt to find a life preserver—that was the furthest thing from his mind. Strangely, he was worried most that he had lost his left shoe and that his foot would get cold. But he left it behind as he scrambled out of the broken cabin to

The northbound span of the bridge, where the plane had hit, was cluttered with grisly wreckage. A red flatbed truck lay on its side at the north edge of the bridge. Its twenty-foot crane swung at an angle over the water. Smashed cars were scattered across the roadway in the snow, and four of their occupants—Joe Pringle of Southeast DC, Mariella Spriggs of Northeast DC, Ray Bowles of Cockeysville, Maryland, and Michael Saunders of Oxon Hill—were dead or dying.

Ronald Williams, an Air Force first lieutenant who had been stuck in the traffic at the time of the crash, walked over to one of the cars where someone had laid a cloth over one of the bodies. He lifted the cloth for just a moment and saw the sickening sight. The man was wearing a military uniform with a single silver bar. He was an Air Force first lieutenant too.

Skutnik Yanked Off His Cowboy Boots and Coat, Plunged Into the River, and Swam Toward Tirado

Someone on the bridge with a citizen's-band radio sent out the first report of the crash at four minutes after 4—three minutes after the plane hit the bridge. That alarm, along with the reaction of controllers in the tower, set off a tumult of emergency radio and telephone calls alerting a scattered fleet of fire, rescue, and police units from Washington's local, state, and federal agencies. The federal city—famed for its slow-moving bureaucracies and orderly contingency plans—was suddenly thrown into a siren-filled scramble in which lives depended on a quick and coordinated response.

Fire units from the airport headed to the end of the runway and up the snow-covered, traffic-snarled George Washington Parkway. District policemen whipped their cars around, jumped sidewalks, and sped across the Mall. Fire and rescue units from Arlington and policemen from the National Park Service struggled through the snowy, crowded streets. More fire trucks responded from the District, using a commandeered dump truck to push aside heavy traffic barriers that were blocking access to the east end of the bridge. The Army dispatched five helicopters from Fort Belvoir.

One emergency call went to the US Park Police hangar in Anacostia Park, where Don Usher and Gene Windsor were beginning their evening shift. They put on their helmets and rolled out "Eagle

One," a blue-and-white Bell helicopter equipped for rescues. Windsor grabbed a rope, life vests, and other equipment, then crawled into the rear seat as Usher cranked up the copter. They lifted off at 4:15 and flew through the snowstorm over the traffic-clogged Southeast Expressway toward the Potomac.

On the Virginia bank of the Potomac, a husky young sheet-metal worker and Vietnam veteran named Roger Olian watched the freezing survivors cling to the wreckage and decided to attempt a rescue on his own. With a rope tied around his waist, he jumped into the water and began to swim. The survivors were about 150 feet away. Chunks of ice blocked his path, but he pushed them aside or tried to crawl over them. His rope ran out about halfway to the wreckage, and people on the bank tried to pull him in. But when they realized he wasn't going to give up, they tied more rope on their end and gave him slack. Olian was now perhaps five feet from the survivors, but his hands and feet were so numb he was beginning to give up hope for himself. Then he heard the sound of Eagle One and felt its downdraft—it reminded him of Vietnam—and the people on shore began reeling him in.

The downdraft whipped up cold water and wind around the survivors, making it difficult for them to see. They struggled to hang on to the slippery, icy metal. Usher, at the controls of the helicopter, edged down into a hover near them. Windsor, in a bright-blue flight suit, leaned from the back door and yelled instructions, but no one could hear.

Bert Hamilton, his face streaked with blood, let go of the wreckage and swam out a few feet until he was underneath the copter. He reached up and grabbed the copter's skids, but let go in pain when Windsor took hold of his broken arm in trying to pull him aboard. Windsor then threw out a looped rope, and Hamilton managed to get it around his chest. The copter lifted him out of the water and dropped him to rescue personnel waiting on the bank. One saved, five to go.

Back came the copter to the wreckage. This time Kelly Duncan got Windsor's rope around her. She looked up at him and nodded, and the copter lifted into the snowy atmosphere. She dangled beneath the copter—by now dramatically performing for television cameras—as it moved to the safety of the bank. Two saved, four to go.

Other helicopters, including those from the Army, were nearing the site, but Usher radioed the tower at the airport and asked controllers to keep them out of the area. The rescue site was so small that they would only get in the way and risk a collision. The Army copters lined up, at the ready, on a runway at the airport.

On the wreckage, Joseph Stiley was trying to reassure the man who was trapped in his seat. The man kept saying he was still pinned in by the seatbelt and that he wasn't going to make it. Priscilla Tirado had watched Hamilton and Duncan being lifted out of the water—unaware that the rope was looped around them—and began to fear she would never be able to hang on to it with her hands. She felt frozen, her energy was about spent, her glasses were gone, and her eyes burned from the jet fuel. I won't even be able to feel the rope, she thought. I'll fall.

The copter's third trip to the survivors was the most difficult. Windsor, who had picked up another rope from the people on the bank, threw two lines into the river this time. Patricia Felch grabbed

Windsor and Usher hovered over the wreckage, looking and hoping. But no one was there!

the short one, and Stiley took the long one. Stiley also grabbed Tirado with one arm. It was impossible to lift all three people completely out of the water, so Usher headed toward the river bank with them dragging through the open water where the copter's downdraft had pushed the ice out of the way. Stiley made it to the bank. But the two women lost their grip and were left stranded among ice floes offshore—Felch farthest out.

Several firemen and other rescue people were on the shore now, retrieving survivors from the copter's ropes. A 28-year-old bystander, Lenny Skutnik, stood watching, reminded of eccentrics he'd seen as a boy who cut holes in the ice to swim in Lake Superior. He felt helpless, knowing what Tirado and the others must be going through. Suddenly, he yanked off his cowboy boots and coat, plunged into the river, and started swimming toward Tirado. She was in bad shape—her eyes were rolled back in her head, and she was drifting away from the bank with the ice.

Moments before, Skutnik had been carpooling his way home to Lorton from his job as an errand-runner in the Congressional Budget Office on Capitol Hill, but he was about to become a hero. His selfless act was brief. He swam out about twenty feet, grabbed Tirado, and dragged and pushed her back to the bank, where a fireman was waiting to take her. Somewhere along the way he lost his



Lenny Skutnik became a national hero by completing the rescue of Priscilla Tirado. This photo was taken about 30 minutes after the crash, and only a few bystanders and rescue personnel had arrived, including airport fire units.

watch and got the mistaken impression that it was Kelly Duncan he had rescued. Four saved, two to go.

Seeing that Skutnik was taking care of Tirado, Usher and Windsor concentrated on making another try at rescuing Felch. Bleeding and cold, her wool clothes heavy from the water, she was unable to get a rope around herself. Usher dropped down farther, dipping the copter's skids into the water. Windsor stood on them, his back braced against the door opening, and held Felch in his grip until they got to the bank. Five saved, one to go.

On the shore, Stiley was trying to tell anyone who would listen that the last man out there was trapped in his seat. His rescue wouldn't be as easy as the others. Somebody ought to tell the copter pilots or get the rubber raft lying there into the water. But there was no direct radio link to the copter, and the boat lay there unused because it was considered worthless against the ice.

Usher turned back to the wreckage for this last survivor. On their other trips, he and Windsor had seen the man wedged into a part of the wreckage a few feet away from the others. Several times he had passed the rope to the others, so the men in the copter assumed he was in the best shape of all. Now it was his turn.

Usher hovered over the spot where he had been.

No one was there. Windsor and Usher looked. *No one was there.* They hovered over the wreckage for ten minutes, looking and hoping. Then they lifted over to a bridge span and landed.

Several theories emerged about who this man in the water was. Rescuers and survivors searched their memories of what he looked like—the color of his hair, whether he had a full beard or a mustache—and they looked at photographs of the victims to try to pick him out. Some thought at first that it was Theodore Smolen, one of the Fairchild employees, but an autopsy ruled him out by determining that he had died immediately of traumatic injuries. Others thought the sixth man was Arland Williams, the bank examiner from Atlanta. The evidence pointing to him was strong—he was the only passenger who drowned and had no other fatal injuries—but was not conclusive; it is conceivable that the sixth man was someone else who died while hanging to the wreckage from severe lower-body injuries invisible to the survivors and rescuers. Federal investigators made no official determination, saying only that the three possibilities were Williams and two other unidentified men.

There also was second-guessing in the press about whether better rescue equipment could have saved him. There were a lot of "what ifs." What if Eagle One or some other helicopter had been equipped with pontoons so it could have landed on the water? What if people on shore had launched rubber rafts, difficult as that might have been among the chunks of ice? What if the man in the water had taken the line himself at the beginning?

Radio reporters and television cameras added to the drama. A radio station's airborne traffic reporter, who was grounded at the airport by the snow, raced over on foot and broadcast an emotion-filled live account until his radio batteries died. Local film crews, one of which had been at the airport doing a weather story, reached the scene in time to provide color pictures that would be played throughout the country on the nightly news.

Although five survivors were out of the water, they were not free of the dangers of hypothermia. Staffs were on alert at the Washington Hospital Center and George Washington University Hospital, both in the District, and at National Orthopaedic and Rehabilitation Hospital in Arlington. A confused communication from the scene reported the possibility of as many as 45 badly injured

survivors, so the hospitals were ready with scores of doctors and nurses as well as free operating rooms and beds. Oddly, Washington Hospital Center, whose Medstar trauma unit is one of the area's best equipped, received only one of the survivors—Patricia Felch, who was taken there by Army helicopter. The others went by ambulance to National Orthopaedic in Arlington.

The survivors had been in the cold water between 22 and 35 minutes. They were still shivering when they got to the hospitals, and Duncan fought with doctors who tried to remove her blankets to examine her injuries. The body temperatures of Stiley, Hamilton, and Felch—normally 98.6 degrees—were down to around 93. Duncan's was less than 90, and Tirado registered 81 degrees, below what is usually considered fatal. They were given warm-water treatments to raise their temperatures. Lenny Skutnik was put in a hot tub for fifteen minutes, his clothes were dried, and he then was released to the grasping hands of reporters.

Back at the river, now shrouded in darkness, emergency lights were set up. Before quitting for the night, search teams pulled seven bodies from the water, placed them in body bags, and sent them to morgues. Around 11, a police officer found a woman who apparently had abandoned her car sometime after the crash still standing in shock on the bridge. He took her to a warm office in Crystal City.

“Larry, Unless They Switched Crews, Marilyn Was on That Flight.”

Larry Nichols was finishing the Jeep, around 4:30, when the telephone rang, the sound wafting out through the open kitchen window. It was too early for Marilyn to be calling from Lauderdale. Had to be somebody else. He and his dog Sam ran inside, and he picked up the receiver.

It was Marilyn's mother in Orlando, and she was hysterical. She had been watching television, and they'd broken in with a news bulletin that an Air Florida jet had just crashed into a bridge in the middle of a snowstorm in Washington. Was Marilyn on the plane?

Nichols saw “Trip #58,” which Marilyn had jotted on the calendar, and he hadn't any idea of the answer. He tried to calm his mother-in-law. He told her not to jump to any conclusions until he got some facts. He'd call Air Florida



While Larry Nichols drove an Audi to impress his real-estate clients, his wife, Marilyn, preferred her light-blue Jeep.

headquarters in Miami to see what he could find out. Stay by the phone. He'd call right back.

He dialed Air Florida, identified himself, and was transferred to a woman in the executive office. He gave her the trip number from the calendar and asked if Marilyn was on the downed plane. He waited for four or five minutes, until someone came back on the line: “No, Mr. Nichols, she was not on that flight.”

What a relief. He quickly dialed Marilyn's mother in Orlando to pass on the news. And when his phone started ringing with calls from worried friends, neighbors, and other flight attendants, he told them the same. He expected Marilyn would be calling any moment from Fort Lauderdale.

By 6:30, she had not called. By 6:45, still nothing. Nichols was uneasy. Perhaps that person at Air Florida had made a mistake. When another flight attendant whom Marilyn knew called to inquire about her, he glanced over at the calendar and had an idea. Would she please check

her “bid sheet”—the one that lists all destinations on each trip—to see if Trip #58 had been scheduled to go into Washington? She was gone for a moment, then came back to the phone: “Larry, unless they switched crews, Marilyn was on that flight.”

That was when the idea of losing her hit him. Here he was a happy husband, almost a father. Now this.

Still, there might be some hope. No one from Air Florida had yet confirmed that she was on the plane. He dialed the airline's number again, and this time someone told him the airline “couldn't be sure.” He was advised to stay by the phone, with the promise that someone would call as soon as anything was confirmed. More waiting. Then another insistent call to Air Florida. This time someone said, “Mr. Nichols, we don't know how to tell you this, but your wife was on the flight.” No, the airline didn't know if she had survived.

By now several friends and neighbors had brought in extra televisions and were

waiting with him in the townhouse. They watched four sets, ran replays of the rescue effort on a videotape recorder, and listened over a shortwave radio to see if they could pick up local news in Washington. They watched Lenny Skutnik save Priscilla Tirado and the Park Service helicopter pull a half-frozen flight attendant out of the water and deposit her safely on the river bank. Was it Marilyn? Larry feared it was not.

A sense of doom swept over him as well as anger that he hadn't been notified. Shortly after 11, when an Air Florida executive appeared on television with news that the status of the crew had been determined but wouldn't be disclosed until relatives were notified, Nichols called the airline again and demanded the information. They promised to call back.

A few minutes later, he saw a car pull up in the parking lot near the blue Jeep. Three young women got out, and he ran outside to confront them. They told him his wife was dead.

At Air Florida's headquarters, in a low-rise office park northwest of Miami Airport, the airline was going about its usual business that afternoon. Eli Timoner, the company's founder and chief executive officer, was in Seattle to witness the rollout of Boeing's 757, a new generation jet that the airline had contracted to buy. Many of the company's other top managers were in the office.

An aide rushed in with the news: "We've had a report of an accident on takeoff in Washington." Simultaneously, the wife of Robert Booth, the senior marketing man, called to report what she had heard on news bulletins. "Bobby," she said. "There's been an accident." Although several of the executives had worked crashes while at other airlines, Air Florida itself had never had a fatality.

There was a disaster contingency plan, and they began rushing it into effect. The conference room, which had been equipped with extra phone jacks, became the "crisis center" and began filling with people from flight operations, marketing, finance, and public relations as well as one of the airline's attorneys and its insurance manager. Another room nearby was set aside for people who would begin notifying relatives once they had a verified passenger list. Security guards were posted outside the main building. In another building, a room normally used for flight training was turned over to reporters and camera crews who were demanding the passenger list.

In the open area where 300 agents normally sat in front of computer screens taking reservations, the earphones were buzzing. There were scores of calls from relatives and friends who thought they

knew someone who might be on the downed flight. The agents took their names and promised to call back as soon as anything was confirmed.

There was confusion about who might be on the plane. At first a false news report had said the plane had originated in White Plains, New York. Then, for nearly an hour, the crisis center in Miami was unable to get through the busy phone lines to reach National Airport.

Until National could be contacted, the only passenger list for Flight 90 was stored in a computer reservation system. But Air Florida knew from experience that such lists were not reliable because of last-minute cancellations and additions. Executives decided not to make it public, nor use it to notify families.

When they finally got through to Washington by phone, they asked the agent there to read off the name on each ticket that had been collected at the gate. One by one he worked through the stack of tickets, struggling at times with handwriting. The resulting list was then correlated with addresses and phone numbers in the computer, and on a portable chalkboard in the conference room rows of names began to appear.

As the night wore on, Air Florida began trying to find relatives of the dead to give them the news and to offer free transportation if they wanted to go to Washington. It was decided that families of crewmembers should be notified in person by teams of Air Florida employees dispatched to their homes. The families of passengers would get the final word in other ways—at home over the phone or in rooms set aside for them in a Washington hotel and at the Tampa airport. By midnight, the airline says, it had notified someone close to each victim—at least a friend, if a relative was unreachable. Apparently, however, that word did not reach some next-of-kin until 4 AM—twelve hours after the crash.

In Washington, relatives and friends of Flight 90 passengers arrived early that evening at the Marriott Hotel in Crystal City, which set aside a large room for them. Around 100 people showed up there to worry and wait for word on who had survived. Clergymen also arrived, as well as a crowd of reporters. Meanwhile, Air Florida employees were en route from Miami, eventually coming in later that night at Dulles, which had handled all flights into Washington after National was shut down following the crash. In the rush, many of them left Miami in summer clothes.

Beyond the grief of the relatives, other stories developed that night. A rumor spread that one of the Flight 90 passengers was the son of Senator Edward M. Kennedy, and one newspaper rushed it

into print. In fact, Teddy Jr. had flown out of National that day aboard a different flight. In addition, some of the "clergymen" who were consoling relatives turned out to be fakes. One was a reporter and another an escaped federal convict who had a history of showing up at disasters. He was later arrested by District police.

In the airport at Tampa, relatives and friends waiting for Flight 90 noticed on the arrival board that it was "delayed." This was not unusual, so there was no cause for concern. But when television crews began arriving in the airport, word of the crash passed quickly, and Air Florida offered the worried relatives and friends the privacy of a lounge near its ticket counter. A security guard was posted outside the door to keep reporters out and let clergymen in. A couple of times the guard took a little boy from the lounge and escorted him to the bathroom.

Some people came out and talked with the press. Two business executives who worked with Chalmers McIlwaine expressed hope that he was one of the survivors. "If anybody could survive something like this, it would be Chalmers," one of them said. "He's that kind of guy."

Hours passed without any word on who was dead and who had survived. A middle-aged man rushed from the lounge, ran down the concourse, and disappeared. "He's in bad shape," said one of the ministers. "They've had him on edge for six hours now, not knowing whether his brother is dead or alive. When he hears the news, I'm afraid he could go off the deep end."

He Could Not Bear the Thought of Her Trapped in That Icy River

On Thursday, the morning after the crash, the Virginia side of the Potomac at the foot of the bridge was crowded with a morgue wagon, an ambulance, a fire truck, a fuel trailer, police cars, buses, tents offering warmth and food, and some 400 recovery people. The temperature was still in the low twenties, and ice was building up on top of the demolished plane and its cargo of bodies.

On a boat in the river, workmen poked and jabbed at the ice with poles, reaching down occasionally to pick up a shoe, a sweater, or a piece of wreckage and place it in a plastic bag. Military divers, in bright-orange wetsuits, slipped off into the cold water and had to resurface after



It took divers eleven days to pull all 74 victims from the icy river. The water was so cold and murky that it was first feared that some bodies might never be found.

only a few minutes. A bulldozer and gravel trucks were building a new road from the edge of the George Washington Parkway across the grass to the shore. Policemen stood around the site turning back curiosity-seekers and keeping reporters in line. A helicopter whirred overhead, carrying a photographer from the National Transportation Safety Board.

Larry Nichols and his wife's brother boarded an Eastern Airlines jet in Miami and headed toward Washington. They were accompanied by several Air Florida employees and a close relative of Kelly Duncan's. Nichols wanted to be nearby as Marilyn's body was recovered. He wanted to bring her home to Florida. She hated cold weather so much that they had promised each other never to move north of Orlando. He could not bear the thought of her trapped in the icy river.

During the two-hour flight, he asked Duncan's relative to pass on his best wishes to the injured flight attendant in the hospital. And they talked about the heroism of Don Usher, Gene Windsor, and Lenny Skutnik. Nichols suggested that they get together and buy Skutnik a nice watch to replace the one he'd lost in the river.

When the flight arrived at National, Nichols and his brother-in-law went to the Marriott Hotel in Crystal City to check in and stop by Air Florida's crisis center. Airline employees were continuing to get organized—installing extra phone lines, working with the Red Cross to set up a suite for relatives of the victims, arranging for bodies to be taken from the morgue to a DC funeral home, and establishing liaisons with hospitals, federal investigators, and the District police officials in charge of recovery.

Eli Timoner, Air Florida's chief executive officer, arrived from Seattle, oversaw operations until mid-afternoon, then headed out of National in the snow toward Miami on one of his company's regular flights. "It hits very, very deeply," he told a reporter. "We had a perfect safety record until yesterday—perfect."

At the hotel, Nichols was edgy—bitter about the delay in being notified and convinced that the relatives of victims were being herded around and denied information that even reporters had. When he came out of an elevator, a clergyman in a white collar walked up and tried to console him. "It is all in God's plan,"

the man said. But Nichols snapped out his anger: "Then you better get that son-of-a-bitch down here, because I want to tell him to shove his plan up his ass." The clergyman moved away.

Nichols had seen the crash site on television, but he wanted to see it for himself. That was the only way, he thought, to make Marilyn's death real. People from Air Florida and District police tried to discourage him, but he was so persistent that they finally agreed to make arrangements. Shortly before 3 PM, he was told to go down to the lobby to wait for an escort, but not to tell reporters. An unmarked police car, a tiny Nova, pulled up outside with two District police officers in the front seat. They packed Nichols and his brother-in-law into the back seat, along with an Air Florida employee and the wife and twin brother of Larry Wheaton, the dead pilot.

On the way to the 14th Street Bridge, the ranking police officer was irritable. He groused at the other officer about the way he was driving and laid down ground rules to his passengers. They would drive across the bridge without stopping, then go back to the hotel. From the back seat came a round of protests, led by Nichols.

It was snowing and they couldn't see out the foggy windows. Couldn't they stop and get out for just a few minutes? The officer shouted at the driver: "Turn around! We've been too nice to these people already. I'm tired of this shit. Get 'em back to the hotel."

More outraged objections came from the back seat. What if you had a wife down there under the water? Finally, he relented. They could get out for a few minutes if they agreed to leave when he gave the signal. Agreed.

The car pulled onto the bridge, and they got out. Nichols was not dressed for the harsh weather—no gloves, no hat. But for a few minutes he and the others stood there in the cold and falling snow watching the recovery work in the river. They each moved off by themselves to cry.

On the way back to Crystal City, Nichols noticed that there was another Marriott—Twin Bridges—right near the crash site. He'd heard that this hotel was headquarters for recovery teams, federal investigators, and reporters, so he and his brother-in-law arranged to get a room. There they could watch television and keep warm, look out the window at the big crane being used to lift parts of the wreckage onto the bridge, and mingle with people who had the latest information. He was worried, because someone had told him the diving was so difficult that some bodies might not be recovered until spring—if at all.

The recovery operation proceeded slowly but methodically. In 25 feet or so of murky water, divers felt their way through the wreckage, trying to avoid tearing their suits on its jagged edges and popping up every few minutes to thaw out their breathing apparatus. Once, to become familiarized with what they were confronting, they went to the airport and crawled blindfolded around one of Air Florida's other 737s. They detected water-activated locator sounds from the two "black boxes," whose tapes of pilot conversations and aircraft performance perhaps held crash clues. The boxes seemed to be tangled in the largely intact tail section, but would not be pulled from the river until a week after the crash.

Reporters waited at the site every day, recording each new piece of wreckage brought up by the divers and cranes. Up came sections of the tail, fuselage, wings, and engines. Up came a wheel, still free to spin on its axle, and several sections of seats. Up came cockpit instruments and the pilots' logbook, galleys still filled with food, and those classified defense documents carried by Lieutenant Colonel Herbert Hiller and Arnold Ivener.

The reporters also kept track as bodies were pulled from the river, placed in body bags, and sent to the morgue. They

watched as a rabbi who was the father of one of the victims came to the water's edge and recited Kaddish, the Hebrew mourner's prayer. And they heard a young woman at the site tell how she had been delivered into the world 23 years before by Dr. William Liddle, the Fredericksburg pediatrician.

Gene Miller, the *Miami Herald's* Pulitzer-prize-winning reporter, wrote some of the most vivid accounts, including one about the visits of several area politicians: "At mid-morning, Senator John Warner . . . showed up. 'It's a very tragic situation,' Warner said, after the patrol boat had been moved into position to make an interesting background for TV cameras. . . . Later a US Park Service policeman groused over his coffee. 'It's a good thing [the politicians] had a trooper escort. I'm not sure I'd have let them in. Politicians at disasters turn my stomach.'"

On Saturday, Larry Nichols was in his hotel room trying to contend with calls from lawyers who offered to represent him in a "wrongful death" suit for a piece of the action. They'd call, and he'd slam down the receiver.

Late in the day, a call came from the morgue with word that a body had been recovered that was thought to be his wife. Would he please come to the morgue in Southeast DC to identify her? He took a taxi there, accompanied by friends who had come to console him. He stayed in a waiting room, while they went in and made the identification—by looking at photographs rather than seeing the body itself. The bow tie of her Air Florida uniform was still around her buttoned collar. Her necklace was missing, but she still wore a wristwatch and her wedding and engagement rings. The only mark on her face was a small bruise on one cheek.

Nichols's friends came out into the waiting room and asked if he wanted to see the pictures. He did not.

He cried for a moment, then left—just as the family of another crash victim came in to make their identification. He already had decided that Marilyn's body would be shipped back to Orlando, where her parents lived, and that she would be cremated after a memorial service.

On Sunday morning, with the temperature near zero, her body was loaded into the hold of an Air Florida jet bound for Orlando. In the cabin, Larry asked the attendant if they would be departing over the crash site. She wasn't sure, but would ask the captain. In the cockpit, the pilot showed him the takeoff route and advised him to sit on the left side of the plane to get a better view.

A few minutes later, the jet roared down the runway and lifted off into a sunny sky. Quickly, it passed over the

bridge where recovery teams were at work.

Seven days later—eleven days after the crash—they brought the body of Priscilla Tirado's baby out of the river. He was the last of the 74 victims. No one would have to wait until spring.

The Probable Causes Were Reduced to Three Mistakes by Air Florida's Pilots

When word of an airline crash reaches the offices of the National Transportation Safety Board in Southwest DC, a "go team" is on standby alert. The team's eleven investigators—some of them wear call beepers on weekends—meet in a hangar at National Airport, and they are flown immediately to the crash site. Wearing blue jumpsuits and official badges, they pick through the wreckage in the first phase of an investigation that usually takes months. Their assignment is to establish the "probable cause" of the crash and to make recommendations to prevent a recurrence.

On the Air Florida crash, this response was altered because the crash occurred just over a mile from the NTSB offices and because Washington's streets were clogged with snowbound traffic. Staff investigator Tim Borson was driving toward the 14th Street Bridge when he heard the news, so he parked his car, pulled on his coat and boots, and trudged to the bridge, where he asked police not to tow the wrecked cars. Rudolf Kapustin, a senior staff man with twenty years' experience in crash investigations, including the 1974 TWA crash into Mt. Weather in Virginia, was not on the go team that day, but because he was readily available he went from the office to the bridge to assume command of the inquiry.

Francis McAdams, a World War II Navy carrier pilot and aviation lawyer who is one of the five members of the safety board, was scheduled to head the go team. But the crash occurred as he was driving home through the snow. When his car stalled in Georgetown, he called his wife and she told him about the crash. He could not get a taxi, finally hitchhiked home, and after consulting with Kapustin by phone decided to delay visiting the site until 5:30 the next morning. Another board member, Patricia Goldman, was pressed into service answering press queries in the NTSB office, but then left to head the investigation of the fatal subway accident that occurred about the same time in the Metro

The Survivors

Kelly Duncan (immediate right), the flight attendant, brushed away tears as she was released from the hospital. One of the first things she did was wash the jet fuel from her hair.

Bert Hamilton (top middle), one of eight Fairchild employees aboard the flight, attributed his survival to "the grace of God."

Joseph Stiley (bottom middle), a GTE executive, told reporters at the hospital what he remembered about the sixth survivor—the man in the water—who drowned before he could be rescued.

Patricia Felch (far right), Stiley's administrative assistant, told federal investigators she remembered Priscilla Tirado, the fifth passenger rescued, screaming for her baby.



WICK WORLD

system a few blocks away.

The NTSB is one of those federal agencies we hear about only after a disaster. Its genealogy dates back to an investigative unit inside the federal aviation bureaucracy in the mid-1920s, but since 1974 it has been an independent board and has developed a reputation as something of a gadfly that attempts to stir the bigger FAA into action. With an annual budget of about \$17 million, NTSB has just under 300 staff members, a figure that is smaller now under the 21 percent staff reduction ordered by the Reagan administration. It investigates accidents involving planes, trains, ships, pipelines, cars, trucks, and buses, but the airliner crashes remain the ones that put it on the front pages.

Over the years, the NTSB has developed a standard investigative procedure. It sets up several teams of experts, including ex-pilots and technical people who live and breathe aviation. These teams reconstruct the wreckage at the site—"kicking tin," as they say—and delve into every aspect of the doomed flight. Interviews with eyewitnesses, photographs and measurements at the site, training records and personal histories of pilots, tests on engines and the airframe, maintenance records, autopsies of the flight crew, radar readouts, weather reports, and detailed accounts of the ac-

tions of pilots, controllers, and maintenance men—all are poured into the effort to develop a scenario of what went wrong.

Some of the most critical clues—and those that often gain the most attention from reporters—are contained in two so-called black boxes that have been required equipment in passenger jets since the mid-1960s. One of them, the cockpit voice recorder, feeds the conversation of the pilots into a loop of tape that records the last 30 minutes before impact. The other, the flight data recorder, measures altitude, airspeed, and other aspects of the aircraft's performance. Despite the nickname, the boxes are usually bright orange to aid in their retrieval. They are protected by a high-strength, fire-resistant metal casing, and are rarely destroyed. They are nearly always found, although sometimes the quality of the tapes is not as good as investigators would like.

Once retrieved, the recorders are taken back to the NTSB's Washington laboratory for analysis. This lab is the province of Paul Turner, the staff audio expert. Sophisticated speakers, sound filters, and reels of tape from previous crashes are packed into the small room. On the tables, casings from old recorders are used as ashtrays.

With this equipment—and sometimes with a hand from the FBI—Turner tries

to make sense out of the cockpit conversation and the performance of the plane. He runs the voice recordings through devices to reduce background noise, and brings in people who knew the pilots to identify which one said what. Sometimes the recordings have a ghost-like quality—"We're going in" followed by the sound of impact—and have included everything from racist jokes to chatter in praise of Richard Nixon. Turner, however, is listening for causation. In the Air Florida crash, a certain sound led him to suspect that the plane's engines had been running at lower-than-normal power on takeoff.

While the lab work and information gathering continue, the board conducts a public hearing to question survivors, airline executives, manufacturers, controllers, maintenance crews, and others—many of them flanked by watchful attorneys. Forty-five witnesses testified over nine days about the Air Florida crash.

This investigation quickly ruled out several potential causes. Autopsies on the pilots showed no sign that they had been incapacitated by alcohol, drugs, or heart attacks. The deicing fluid had not been contaminated by other chemicals. The plane had been properly maintained and equipped, and its engines appeared fully capable of developing enough power for a safe takeoff. One finding: Nineteen



vials of a mouse cancer virus carried aboard by microbiologist James Horton were of no danger to humans.

The board issued its final report nearly six months after the crash. Phrased in precise and technical language, it detailed the lapses and mistakes surrounding Flight 90. Least serious were several procedural errors that violated FAA rules or sensible practice, more serious were several "contributing factors," and most crucial were the "probable causes." Taken together they demonstrated the jet-age truism that crashes are collaborative efforts.

The procedural errors—which were obviated by more serious mistakes or whose contribution to the crash was uncertain—include these:

- The American Airlines maintenance crew, which was servicing Flight 90 under a contract with Air Florida, followed "deficient" procedures in deicing the plane. They used the wrong nozzle on the hose, applied a glycol solution that was too weak, and didn't put protective covers over sensitive parts of the plane.

- The controller, a man with twenty years of experience at National and Dulles, allowed the Eastern jet from the south to approach too close to the runway where Air Florida was preparing to take off to the north. Although National controllers are frequently said to bend the "sepa-

ration" rules between flights in this manner, his action on the Eastern flight was not by the book. The board was unable to determine if Captain Larry Wheaton's decision not to abort Flight 90 on the runway was influenced by fear that he would be tail-ended.

- The FAA, which operates National, had failed over the years to implement gate-holding or taxi procedures that shortened the delay between a plane's deicing and takeoff. The airport's lack of certain modern runway markers meant that Wheaton and co-pilot Roger Pettit had little visual help in recognizing that they were rolling too far down the runway. And the airport's water-rescue equipment, untested in ice-covered water, proved ineffective, leaving the fate of the survivors to the Park Service helicopter and Lenny Skutnik.

More serious were these contributing factors:

- The 49-minute delay from deicing to takeoff exposed the Air Florida jet to an accumulation of snow on its surface, a situation that reduced its aerodynamic margin of safety. The snow also added weight to the plane, but that was less crucial to its performance.

- The 737 pitched up its nose immediately after takeoff—a dangerous event that Boeing, its manufacturer, knew had occurred on some 737s when there

was even a "small amount" of snow and ice on the leading edges of the wings. Boeing had sent out circulars on three occasions warning pilots of this, but had not waved as many red flags as the board considered appropriate.

- The pilots were extraordinarily inexperienced at flying in snow conditions. Wheaton's eight takeoffs and landings in such conditions as a captain and Pettit's two experiences were far less than what would be expected among veteran pilots.

The most critical errors on Flight 90—the probable causes—were reduced by the board to three, all of them mistakes by Air Florida's pilots:

- They failed to turn on the anti-ice mechanism in their engines, an omission that resulted in the freezing of the device that measures engine thrust. This frozen monitor gave them a false reading, and led them to apply less power than was necessary to develop an adequate climb.

- They did not show enough caution in the face of the snowy, subfreezing weather. Neither they nor Air Florida's ground personnel made a complete visual check of the plane at the gate to make sure it was free of snow. Once on the taxiway, they did not return to the gate for more deicing, even though they were clearly aware that their plane had accumulated snow.

- Captain Wheaton mistakenly did not

exercise his authority to abort the flight early in its extraordinarily long runway roll, even though co-pilot Pettit warned him four times of "anomalous engine readings" that indicated such an emergency maneuver was appropriate.

What was most disturbing about the board's report was its conclusion that all these errors could have been overcome with a last-minute reaction by Pettit and Wheaton. Despite the false reading they got on their engine thrust while rolling down the runway, the board concluded that they should have recognized they faced an emergency that demanded that they add extra power. Perhaps they didn't add this extra thrust because pilots are trained by companies that straining engines may cause premature maintenance problems. But had they done so soon enough, the plane probably would have cleared the 14th Street Bridge and headed safely off to Tampa.

Wheaton and Pettit might still be flying jets, and taking time off to play with their sons. Arland Williams might still be examining bank records for the Federal Reserve Bank in Atlanta. Leon and Harriet Murek might be enjoying their new Florida condominium, and Robert Silberglied would be back in Panama chasing butterflies. Few people would recognize names like Lenny Skutnik, Don Usher, or Gene Windsor. Priscilla Tirado's son would be on the verge of walking, and the baby of Marilyn and Larry Nichols would be six weeks old.

The Crash of Flight 90: A Final Accounting

Nearly nine months have passed since the crash of Flight 90, but scars in the landscape remain. The gap in the banister of the 14th Street Bridge, where the plane first hit, is patched with concrete barriers, and a twelve-foot section of the original banister lies marooned on the Potomac River bank upstream. The gravel road built last winter to carry recovery vehicles across the soft sod from the edge of the George Washington Parkway still runs into a grove of trees at the edge of the water. Cyclists pump past on an asphalt trail, some stopping to look at the scene and visualize where and how the crash occurred. Deafening jets on takeoff from National cast fleeting shadows across the site.

In the courts, more than five dozen suits seeking millions of dollars in damages for the survivors and the families of dead passengers and motorists are awaiting action. Most have been filed against Air Florida, which has legal responsibility for the behavior of its pilots, as well as against Boeing and American

Airlines. Two other suits, filed by the families of Larry Wheaton and Roger Pettit, are in a federal court in Florida. They are aimed at Boeing, American Airlines, United Technologies (which manufactured the jet's Pratt & Whitney engines), Union Carbide (which produced the deicing fluid), and the FAA (which operates National and employs the controllers). None of them has been decided, although it seems likely that any monetary awards will be covered by Air Florida's insurance company, Lloyd's of London. Attorneys, many of them working for plaintiffs on a one-third contingency basis, are likely to make millions of dollars. For its part, Air Florida has attempted to shift blame for the crash away from its pilots toward Boeing and the pitch-up problem on its 737.

Air Florida, after stopping advertising for a few weeks and experiencing a modest decline in passengers, is now reporting business about the same as it would have anticipated without a crash. Its long string of profitable quarters has been reversed, but the losses are due mainly to

the recession and are not nearly as large as those of some competitors. Flight 90, which operated for several weeks out of Washington after the crash, has been canceled as part of a company effort to structure its routes more profitably. And the company has reported that it collected a \$5 million windfall on the destroyed jet—apparently not an unusual occurrence in jet crashes. The plane, which it was leasing, was insured for that much beyond its book value.

The NTSB, which has no power of its own to order changes in airline rules, has sent to the FAA a list of 21 recommendations to improve airline safety in light of what happened to Flight 90. Most call for more warnings and reminders to pilots, maintenance crews, and controllers about combatting snow and ice, including how to handle the special problems of 737s in such conditions. The board also reiterated a plea that the FAA require all co-pilots to undergo "assertiveness training" so they will not be timid in pointing out fatal errors to their captains.

The Heroes

Four men received life-saving awards for their rescue efforts, including Lenny Skutnik (below), helicopter pilot Don Usher and Gene Windsor (far right), and Roger Olian (immediate right), who struggled in the water for about twenty minutes before the copter arrived.



Lenny Skutnik, whose phone no longer rings with calls from reporters, is back at work at the Congressional Budget Office and lives with his wife and two children in his old apartment in Lorton. A philanthropic businessman is picking up his rent for a couple of years, and a couple of people who heard about his lost watch have sent him replacements. He has a suitcase filled with 2,000 letters from people who watched him rescue Priscilla Tirado on television, as well as lots of awards and memories of a standing ovation by the Congress during President Reagan's State of the Union address.

Don Usher and Gene Windsor, who are back on duty at the helicopter hangar in Anacostia Park, received the highest awards for heroism from the Interior Department and the Coast Guard. Roger Olian—whose long but futile swim to rescue the survivors from the icy water occurred before the television cameras arrived—has received three life-saving awards, and he is back at his old job as a sheet-metal worker. In the Federal Re-



The tail section of the Air Florida plane fell back into the river during the first try by recovery teams to lift it from the river, but it eventually was loaded onto a barge and trucked to a hangar at National Airport, where it was examined by federal investigators. All the survivors were seated near—either just behind or just in front of—where the tail sheared off from the fuselage.



serve Bank in Atlanta, employees have put up a plaque honoring Arland Williams, noting that he may have been the mysterious man in the water who was not rescued.

The five surviving passengers of Flight 90 are trying, after extended periods of recuperation from injuries, to reconstruct their lives outside the glare of publicity. Bert Hamilton, Joseph Stiley, and Patricia Felch (who was recently married) all remain in the Washington area. Priscilla Tirado, the only survivor who lost loved ones in the crash, lives in Florida. Kelly Duncan, the flight attendant who first said she might quit flying, is back working on Air Florida flights. She sent Usher and Windsor a picture postcard from London on one of her first trips.

Relatives and friends of the dead have dealt with their losses in their own ways. In March, a Fort Lauderdale man whose lover had been aboard Flight 90 called a gay newspaper, read into its answering machine a message describing the ecstasy of their love affair, then put a loaded revolver to his head and pulled the trigger. Larry Nichols dissolved his real-estate development business because it no longer seemed important, and for a few weeks woke up in the night startled by his wife's absence and watched their dog, Sam, mope around looking for her. He is hoping to create a national organization to comfort relatives following airline crashes and other disasters. And he had a jeweler inscribe his wedding ring with the word "Bear," a nickname Marilyn gave him. Everywhere he goes—even skydiving—he wears it around his neck. □