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Date of report 7/10/95	Name and title Brent Gilroy, Vice President	Signature <i>Brent Gilroy</i>
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New

Gerry Chandler
Popular Science
1405 McCall Dr
Anniston, AL 36207

July 6, 1995

Dear Gerry,

It was good to talk to you this morning. We really do need to catch up.

Enclosed you will find the following documents:

- Article from *C/R News* on weather experts conclusion drawn from the ATR tests.
- *Washington Post* article on technology that could help pilots avoid killer weather. The kicker here is that the government is now cutting back on weather funding.
- Safety reports on icing accidents or incidents involving aircraft other than the ATR.
- The press releases we published on the Edwards tests.
- Notes from NTSB hearings.

My own personal feelings is that there has been a growing complacency in aviation concerning weather. This complacency is illustrated by such accidents as USAir at LaGuardia and Air Florida at Washington, DC.

You will see that the weather experts who testified at the NTSB hearings indicated that when it comes to severe icing conditions we need better forecasting methods. Thus the importance of finding the early warning systems for pilots to alert them to the fact they are flying not only in icing conditions but severe icing conditions such as super cooled drizzle drops.

Through the Edwards tests we have found just such an early warning system--a visual cue that occurs within 30 seconds of entering freezing rain and drizzle, some 10 minutes before ice can build up on the wings.

I hope this is helpful. Please call if you have any other questions. I will be on vacation next week but will check in with you periodically. Also, I will be working from home July 7 at 703-550-8011. Leave a message there if you need me over my vacation which stretches from July 10-17.

All the best--

Kathryn B. Creedy

DEPT. OF JUSTICE
CRIMINAL DIVISION
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INTERNAL SECURITY
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NTSB HEARINGS

New

- Weather experts testified that Flight 4184 was flying through a rare form of freezing precipitation. University of Wyoming Professor Dr. John Marwitz, who has studied freezing rain and drizzle for a decade, noted that the ATR 72 design did not make it particularly vulnerable to the rare freezing precipitation he called "super cooled drizzle drops." In fact, he said, any twin-engine propeller plane would have been vulnerable to this hazardous weather because they fly at altitudes where such weather occurs. He noted that a number of different types of aircraft need to be tested behind the tanker to see how they perform. He indicated that the unique weather phenomenon was not known to occur outside the mountainous areas in which research has been conducted. However, that phenomenon was over northwestern Indiana on October 31. He noted that forecasters must be educated on how to forecast this weather.
- Dr. Marcia Politovitch, a meteorologist for the National Center for Atmosphere Research, questioned FAA certification standards saying they assume freezing rain is easy to predict and avoid when it actually can be impossible to predict. In addition, she said that certification standards test only for tiny water droplets which are essentially just clouds, rather than the more challenging freezing rain or freezing drizzle.

Certification standards, said Marwitz, covered 99.9% of weather, but the other .1% cannot be ignored since it is very dangerous. "It may be one-tenth of the icing or one-tenth of 1% of the icing," he said. "But that's like saying tornadoes are not a problem because they are one-tenth of 1% of all convection. This stuff is so benign looking when you fly along. You look and there's not a lot out there." But suddenly, "you recognize that this airplane is like a lead sled." Both weather experts are part of a group that has, for a decade, criticized government icing certification standards which date to the 1940s.

- Witnesses representing Air Traffic Control confirmed that the weather over northwestern Indiana last October 31 was unusual, saying it was more typical of spring conditions than those that would be expected in the fall. Even so, Area Supervisor of the Chicago ATC center at Aurora, IL Micheal Debb, said the weather forecast called for the possibility of light icing, which would give little problem to aircraft like the ATR. In his motivational message at the end of his briefing he noted "Icing kills. It's your job to know the freezing level in your sector, and the tops and bases [of clouds]...that is, the fastest way out of the ice...."

The only reports of icing conditions were 37 miles from the flight path of the ATR. Icing reports were not passed on to the crew by air traffic control. Had they requested permission to leave those severe icing conditions, they would have been accommodated immediately. In addition, ATC was more concerned about high winds than icing, which prompted the use of only two of the three runways at the airport and thus putting aircraft in hold. Richard Riegler, acting as national operations manager at the FAA control center in Virginia, said that it was unacceptable to hold an aircraft in known icing conditions for 34 minutes.

- ATC witnesses also revealed that Flight 4184, originally scheduled as a 47-minute flight to Chicago, was held on the ground for 42 minutes at Indianapolis in order to avoid lengthy in-flight holding. However, it was then put into a holding pattern for another 35 minutes before it crashed. ATC was giving landing priority to flight banks arriving from the west. Flight 4184 was the only aircraft in a holding pattern at that time. Questioners pointed out that if Flight 4184 had not been held at Indianapolis, it may have beaten the bank and been able to land before the rush began.
- Witnesses also testified that while the crew of Flight 4184 was generally aware they were in icing conditions, they apparently remained unconcerned as to the amount of ice. The crew apparently did not think it necessary to take evasive action because of the icing or to report they were in icing conditions to ATC so other pilots could be alerted. Jerry Barron, the airline's FAA principal operations inspector, told investigators "I would think that I would expect more exchange between the captain and first officer about the ice than was there." He also noted the confusion surrounding use of the aircraft-dispatch message system.
- Aerospatiale Flight Test Director Gilbert Defer testified that when simulating the Roselawn accident flight, he was able to maintain control of the ATR 72. He also said that ice formed on the cockpit side windows after 30 seconds of flight in large droplet icing conditions, which was some 10 minutes before a significant amount of ice built up on the wings. "Recovery is possible with the pilot holding the control wheel firmly," he said. "You have to fight the roll with the wheel to overcome the surprise effect that is there. The recovery technique is no magic."
- Mr. Defer ATR insisted that the Edwards Air Force Base tests show that control anomalies arose only when aircraft are flown into icing conditions much more severe than those covered by existing certification standards. Mr. Defer also indicated in response to NTSB questioning that he does not believe the accretion phenomenon in these conditions is unique to the ATR.
- FAA Engineer John Dow, a safety engineer and icing expert, testified, "I'm not sure anybody in the world has numbers that can lead to an engineering solution to the problem," of the impact of freezing rain and drizzle on aircraft. Several questioners queried as to whether the increased boot size, proposed for the ATR, would solve the problem. FAA engineer Gary Lium said that if the boot modification "is approved, we believe it will solve the problem we set out to solve."
- FAA certification experts confirmed that the results of the Special Certification Review confirm that the ATR "complies with the certification" standards.
- FAA said it would study past incidents of the rolling of turboprop planes in icy weather to see whether they involved the same kind of problem that led to the crash at Roselawn. The study, using government computer databases and manufacturer records, should be completed by October. John Dow indicated the FAA has already targeted a couple of incidents for further study. He also stated that Appendix C, the FAA's icing certification

standards, do not cover freezing rain or freezing drizzle, but that "it needs to be done, and it will be done."

- FAA said it was committed to screening other airplanes to determine their susceptibility to this problem. FAA is considering a variety of tests to determine how ice builds on wings of other turboprops in severe icing conditions. FAA is considering tests of these airplanes that range from computer simulation to high-speed taxi tests to flights behind the icing tanker plane.

Commuter Regional Airline News.

The Weekly Newsletter Covering the North American Regional Marketplace

POST RAA WRAP-UP ISSUE

New

IN THIS ISSUE:

- Jetstream Debuts Safety Video at RAA 2
- RAA Forms Safety, PR Committees 3
- One on One with Robert Priddy, Part II 4-6
- AMO Leases Three 146s to TriStar 9
- Connection Partners Outline Safety Program 9
- Regionals Post 8% Growth 11

WEATHER EXPERT NOTES ICING DATA GLEANED FROM ATR ACCIDENT

SAN ANTONIO, TEXAS — Little to nothing was known about freezing rain until research following the ATR accident in Roselawn, Ind., last October, according to a weather expert speaking at a Regional Airline Association forum here on aircraft icing.

"Looking at all the meteorological data at the time of the crash, all indications pointed to icing as a cause," said John Marwitz, a professor of atmospheric science at the University of Wyoming. "The cloud-top temperature and the presence of wind shear were both in the correct range to cause ice [buildup]."

Testing in icing conditions has been conducted as early as 1977 in California's Sierra Madre Mountains, but the ATR accident is the first verification that these conditions are possible far away from mountains, said Marwitz.

He offered three recommendations: pilot training on recognizing icing conditions and evasive action; a study to forecast super-cooled drizzle drops, including a demonstration project with the National Weather Service on forecasting icing conditions; and a coordinated effort for an icing physics study.

Testimony from the GAO also noted FAA's management structure changes, but said it's "too early to tell if these initiatives will be successful."

OTA's findings about a lack of confidence at FAA about making meaningful changes were buttressed by GAO research. The GAO said FAA officials believe one of the biggest obstacles is FAA's culture, which is described, by FAA officials, as being "averse to risk and [a culture that] often pits one internal organization against another." Those officials also told the GAO that the agency's culture inhibits the effective flow of information.

The GAO is in the process of studying FAA's culture as it relates to acquisition, and is planning a report on its findings later this year.

John Dow, icing specialist for FAA's central region, said that FAA's efforts are now focused on how to ensure that no other aircraft have similar problems with their deicing boot. Dow said that the FAA issued a memo on March 27 stating that rigorous tests, similar to those that ATR went through, are on the horizon.

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The first phase will be a screening of pneumatic boots and unpowered controls for all applicable aircraft in scheduled revenue service. In the fall, the FAA plans to announce the outcome of an icing study, its decision on whether to include a large drizzle drop environment into its certification process and plans to promote new ways of forecasting these rare environs.

The third panel member, Robert Briot, vice president for flight operations for ATR, echoed that the French manufacturer knew very little about freezing drizzle before October 31. Briot, who displayed a second-by-second replay of events leading up to the accident, said that the loss of control hinged on the time in which the autopilot was disengaged.

ATR, in months of exhaustive studies, has attempted to recreate the accident more than 500 times, using three different types of aircraft including the ATR-72. Using such coefficients as aileron degree, pilot force, wing bank, local AOA, elevator and pitch, no combination of factors have been completely consistent with the Roselawn accident.

JETSTREAM TAKES PRO-ACTIVE APPROACH TO IMPROVING PUBLIC PERCEPTION

SAN ANTONIO, TEXAS - In the first public showing of a video intended to address the public's misconceptions about regional aircraft, Jetstream Aircraft unveiled a 28-minute film stressing the technological advances of regional aircraft and reacting to negative press that has hovered over the industry for the last nine months.

Jetstream also formed an Air Safety Perception Group which addresses safety issues and lobbies organizations like the European Regional Airline Association and the Regional Airline Association to make a cohesive effort to combat misinformation.

The Scottish manufacturer is also creating a network of industry experts that media can draw upon in the event of another accident, thereby increasing the chance that more than the voice of International Airline Passenger Association President David Stempler would be heard over the international airwaves.

The video — Regional Airline Safety: A Question of Perception — featured voices from the U.S. Federal Aviation Administration, the Flight Safety Foundation, Jetstream operators and Jetstream engineers. It touched on icing detection, pilot and crew training and, most notably, stressed that turboprops are powered by jet engines not pistons, a fact unknown by much of the traveling public.

In a question and answer period following the presentation, Nick Godwin, director of marketing for Jetstream, said in reaction to the possibility of Jetstream Aircraft being submitted to new FAA-mandated icing tests, that the only way to determine if an aircraft is safe in icing conditions is "to go out and find the ice, not simulate it behind a tanker or form it out of styrofoam." He added that Jetstream did just that in tests for the J41 and made changes to the aircraft as a result.

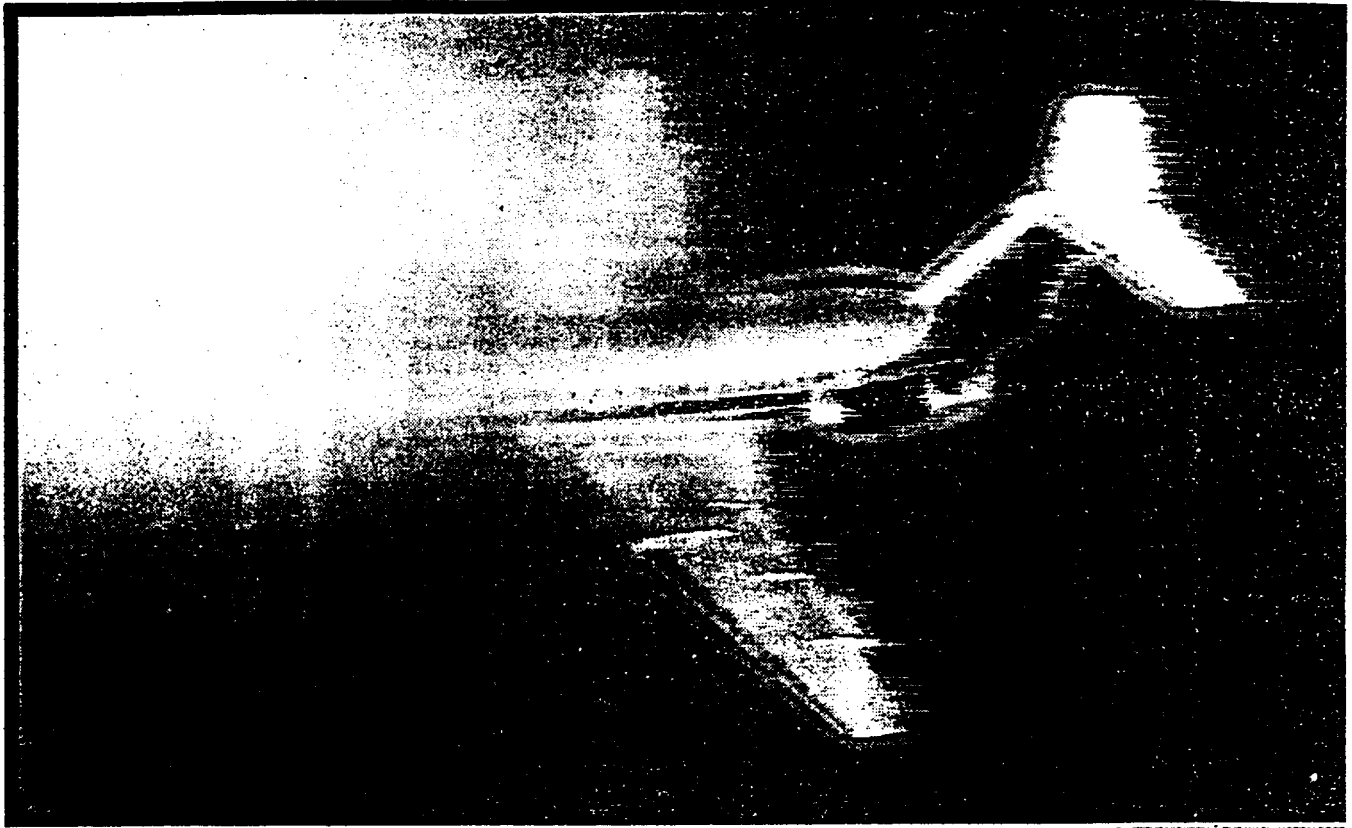
DELTA'S LAUBER SAYS 1994 ACCIDENTS DON'T SHOW EROSION OF SAFETY

SAN ANTONIO, TEXAS — Increased scrutiny from Congress, the administration and the traveling public should move commuter airlines to establish safety programs that increase public confidence, said Dr. John Lauber, vice president of corporate safety and compliance for Delta Air Lines.

"These are interesting times in the industry. This is an ongoing public debate and it is being driven in a direction that we need to understand," said Lauber, a former member of the National Transportation Safety Board, at a luncheon speech during the Regional Airline Association meeting May 17. "In the last six months of 1994, we experienced the first accident after no accident for two years. Since then, there have been several accidents and the stories have been put on the front page and on the television."

As the accident investigations continue, airline safety stays in the public eye, said Lauber. "We can expect to continue to be in the spotlight even if there are no more accidents. There are several aspects of the public debate to keep in mind," he noted.

Alluding to a recent cover story in *Newsweek* magazine that measured the safety of major and commuter airlines, Lauber noted several aspects of the debate to keep in mind. "There is no statistical data that airline safety has taken a drop," he stated.



BY STEVE MOKERY—THE WASHINGTON POST

Into Conditions Unknown

By Don Phillips
Washington Post Staff Writer

Five weeks after American Eagle Flight 4184 crashed in Indiana and killed 68 people, the Federal Aviation Administration canceled tests on technology that had demonstrated an ability to detect super-cooled drizzle drops, the tongue-twisting but invisible weather phenomenon apparently responsible for downing the plane.

There just wasn't enough money to continue the program.

In its upcoming budget, the FAA is slashing weather research so deeply, some scientists say, that development will stop on ways to detect deadly weather that pilots cannot see and forecasters cannot predict. Examples include turbulence and super-cooled drizzle drops, a particularly dangerous form of icing.

Budget cutters also have their knives sharpened for the National Weather Service, which gathers aviation weather data and feeds it to the FAA.

The result of shrinking federal budgets and years of bureaucratic squabbling is that the largest single nonhuman factor in airline crashes—the weather—is getting less attention at a time when the mechanical reliability of airplanes has never been higher.

Weather dictates when and where a plane can fly. Sometimes it dictates when a plane will crash. From 1988 to 1994, weather was at least a factor in 86 of the 293 domestic airline accidents, including 22 of the 65 fatal accidents.

*Technology is emerging
that could make it possible
for pilots to anticipate
and avoid killer weather.
But federal budget cuts
and bureaucratic snags
are killing research and
development of new
systems — and the chance
to ease a toll in human
life and airline losses.*

Marietta Cost/Benefit Analysis Group, delays caused by weather cost scheduled airlines \$4.1 billion a year. About \$1.7 billion worth of delays could be avoided with better weather detection, the group estimates.

And when an event such as the Indiana crash causes the FAA to ground an aircraft, the costs to the airline industry skyrocket. The FAA said the type of plane involved—an ATR-72, and its smaller brother, the ATR-42—could not be flown in conditions where icing might occur until de-icing equipment could be improved.

Since icing conditions cannot be predicted or tracked with precision, the airlines took the planes out of service or moved them to warmer-weather routes, at huge expense. No industry-wide total is available, but American Eagle alone estimated it lost \$20 million in the first three months of this year because of aircraft repositioning costs and a reduction in passengers.

Icing is only one of several weather detection problems that affect aviation safety. Turbulence and winds also are serious issues; some experts regard them as more serious than icing. All weather research is going to suffer from budget cuts as Congress attempts to eliminate the deficit in the next few years.

"Essentially, what they're doing is decimating the research and development effort," said Robert Serafin, director of the National Center for Atmospheric Research in Boulder, Colo., which has landed many FAA research contracts. "How can an agency that says it recognizes the importance of weather essentially ignore weather?" he asks.

Two groups—the National Research Council and an FAA advisory subcommittee headed by

WP 5/28/95 H1

former administrator Najeeb Halaby—are studying FAA weather programs to help sort out the issues and recommend solutions. “There’s been a long history of the FAA lagging behind the technology that is available,” Halaby said.

Talk, but No Turkey

A Washington Post review of five years of FAA documents, plus interviews with dozens of officials, paints a picture of an agency that talks a lot about the weather but doesn’t get much done about it.

“What you end up with is nothing happening, and nothing has been happening for a long time,” said John Ryan, vice president for air traffic management of the Air Transport Association, which represents major airlines and which is one of the many aviation groups angry with the FAA for what it sees as excessive delays in deploying advanced weather forecasting systems.

George Donohue, the FAA’s new associate administrator for research and acquisitions, does not entirely disagree. “I found we were spending a lot of money on weather, but we weren’t delivering any,” he said.

When an FAA-funded research program results in a solution, the equipment then ordered for deployment around the nation’s aviation network can mean huge contracts to develop and build the radars and computers and other devices needed. But the up-and-down nature of FAA research puts its contractors on an emotional elevator: One day they think they have a project, the next day it’s canceled.

Although FAA officials and airlines say the United States has the best aviation weather forecast system in the world, little operational equipment is now available to predict the most dangerous or costly phenomena, to spot them, to determine at what altitudes they form, or to measure their severity.

No single official or office at the FAA has overall responsibility for meshing the collection of weather information with the immediate needs of pilots to be told what’s going on. And while the National Weather Service provides most aviation weather to pilots, the FAA foots the bill and pays for airport weather radar systems and aviation-related weather hardware.

When equipment is developed that can solve a problem—wind-shear detecting radar is a recent example—it takes years to get it in the field. Wind shear, an invisible but pronounced shifting of wind directions and speeds that can literally pull a plane to the ground—has killed at least 170 people in nine accidents since 1983; a radar system that could detect it was proven in the late 1980s. Even now, only 16 of the 47 major airports in the United States have that radar, and of those 16 systems, only two are fully commissioned.

‘Vanilla Weather’

Donohue said it is clear that the FAA must take greater responsibility for aviation weather because budget cuts will force the National Weather Service to concentrate on its main purpose, serving the general public. “The weather service is going to provide vanilla weather because it’s all they can provide,” Donohue said.

Already, the Weather Service is closing smaller offices and turning to automation with the Automated Surface Observing System (ASOS), which is to be located at 782 locations around the country to send weather observations to central points.

However, few systems have been so reviled by the aviation community. Ryan of the Air Transport Association said the ASOS can’t detect thunderstorms and snow accumulation. Richard Swauger, an official of the National Air Traffic Controllers Association, said the FAA has “terribly misspent money on the ASOS.”

Donohue said ASOS is an example of what is wrong with FAA planning and procurement. He said, for instance, that the FAA and the weather service spent a lot of money getting ASOS into the field only to discover that it could not be used because it lacked a communications switch.

Donohue said the FAA must find the money to be certain that the automated observation stations are matched by humans who can second-guess the data and do something as simple as look out the window.

FAA Administrator David R. Hinson said that, even with more efficient management, budget constraints will force some tough decisions. While he acknowledges getting pressure from researchers, airlines, pilots and Congress, he said, “Our job is to sort of get deaf and decide where we want to spend our money.”

The Dangers of Ice

One of the questions the FAA has to answer is whether and how to provide better predictions of icing conditions. When ice collects on an airplane’s wings, it disrupts the flow of air over the wing. That flow of air imparts “lift,” which keeps the plane flying. If the wing loses lift, the plane stops flying.

Today’s weather technology can only infer the presence of conditions where ice might form, and that inference is little more than generalization. Icing “forecasts” today apply to thousands of square miles, while the actually icing may occur in a much smaller area. Basically, pilots know they are in icing conditions when they see ice form on their aircraft.

Icing can range from “light” icing, in which all commercial planes are certified to operate, to freezing rain or freezing drizzle, for which the only means of survival is escape.

Research at the University of Wyoming has shown that the most dangerous icing is super-cooled drizzle drops. This insidious killer disguises itself as little more than freezing fog, which is not a threat to airplanes and into which pilots often fly. But super-cooled drizzle drops are about the diameter of half a pencil lead, slightly larger than freezing fog droplets, and they form ice quickly.

“This stuff is so benign-looking,” said John Marwitz, research professor at the University of Wyoming. “You fly along and all of a sudden this thing [the plane] becomes a lead sled.”

On Halloween afternoon last year, the pilots of American Eagle Flight 4184 could see ice forming and turned on their anti-ice systems. But they had no idea they were in super-cooled drizzle drops.

On the ground, no one knew that icing of any kind was occurring as the plane circled over Indiana awaiting clearance to land at Chicago’s O’Hare International Airport. Suddenly, the plane, a twin-engine ATR-

WP 5/28/96 H1

72 turboprop, rolled out of control and plunged to the ground.

Ill-Fated Program

Four years earlier, the FAA had launched a program intended to predict icing conditions and other weather phenomena and warn pilots about them. In a Nov. 1, 1990, letter, the FAA committed itself to a five-year program of \$60 million to \$70 million "that will enhance the safety, capacity and efficiency of a national airspace system that all too frequently must operate in adverse weather conditions."

For three years, the program prospered, and the FAA budget for the National Center for Atmospheric Research (NCAR) and the National Oceanic and Atmospheric Administration's Forecast Systems Laboratory increased from \$6 million in fiscal 1990 to \$17.9 million by fiscal 1993.

But in fiscal 1994, the program was abruptly reduced. The total budget slipped to \$12.4 million in fiscal 1994 and 1995. Weather research

programs, particularly on icing, were set back. Demonstration programs were delayed, then canceled. A number of researchers were laid off.

On Dec. 7, 1994, coincidentally five weeks after the crash of Flight 4184, an internal FAA memo declared simply, "Due to severe funding restraints . . . the Capital Investment Plan Steering Committee . . . has eliminated funding" for the weather prediction system that included an ability to detect super-cooled drizzle drops.

The total FAA fiscal 1996 budget request for NCAR and the Forecast Systems Laboratory plunged to \$4.9 million.

A. E. MacDonald, director of the Forecast Systems Laboratory, said the weather prediction system, known as the Advanced Weather Products Generator (AWPG), could have been ready for deployment within two years. But now, he said, "the aviation community won't get these things for another 10 years."

What's Ahead

The FAA said the fiscal 1996 request for icing research in isolation will remain at \$875,000, the same as fiscal 1995. But NCAR scientists said that if that proves to be so, the icing program would drain resources from other research on turbulence and winds that they consider more important.

WSI Corp., of Billerica, Mass., one of several private weather companies that provide data to television stations, airlines and government agencies, is attempting to revive the program that detects super-cooled drizzle drops and other dangerous icing phenomena. The high upfront expense, however, is complicating negotiations for a private contract with NCAR.

Maria Perone, WSI's manager of data services, said she is fed up with FAA's frequent program shifts. "One minute they're off, and one minute they're hot to trot," she said. "Right now, they're just jerking industry around."

Martin Marietta Corp. (now part of Lockheed Martin Corp.) had spent \$8.1 million of its own money to begin development of its Terminal Area Surveillance Radar, intended to be the 21st-century successor to the current generation of weather radars. That program was also cut in December. A demonstration radar was halfway built and now will be shelved.

"We're obviously very disappointed that the budget was zeroed out," said Howard Luebcke, director of air traffic control programs for the company. "However, we understand that the FAA has a tight budget."

Hinson said that such stories illustrate the need to restructure the FAA's procurement and decision-making process.

"I'm fixing that," he said. "At least I'm trying to fix that." A reorganization of the FAA is underway.

"Our budget is down half a billion dollars in the last three years," he said. "But demands are increasing worldwide. All of these demands are increasing while our resources are declining, meaning we have to be smart managers."

One System A Success, But Stored

Even successful programs can fall victim to the Federal Aviation Administration's procurement system.

Take Next Generation Radar, for example. Known as NEXRAD, it provides high-resolution Doppler weather radar coverage over wide areas and gives early warning of fast-developing storms and other threatening phenomena.

But five new \$2 million NEXRADs will go into storage as soon as they are delivered because the FAA underestimated the cost of site preparation and Congress has not provided the additional funds.

Northern Alaska, parts of Hawaii and parts of the Caribbean south of Florida will do without enhanced NEXRAD coverage for at least the next budget cycle. Don Turnbull, the FAA's manager of radar programs, said the FAA will not ask Congress for the money in fiscal 1996 because of the tight fiscal climate.

"The costs are really quite staggering when you have to put sites in the tundra and the permafrost," said Turnbull.

— Don Phillips

WP 5/28/95 HI

Weather Systems: Winners and Losers

When the Federal Aviation Administration had to start cutting its aviation weather budget, the big loser was a program called the Advanced Weather Products Generator (AWPG).

The AWPG was to assimilate the mass of weather data provided by radar, human observation and other sources, then provide both forecasts and real-time weather information on easy-to-read three-dimensional displays. Anyone with a processor—eventually including pilots in flight—could “dial up” precise weather information for any seven-mile area in the country.

The AWPG had passed preliminary tests and developers assert it could have been operational within two years. But it has been abandoned after consuming \$48.3 million in FAA research money.

The primary contractors are the National Center for Atmospheric Research and the Forecast Systems Laboratory of the National Oceanic and Atmospheric Administration, both in Boulder, Colo.

The winner is the Integrated Terminal Weather System (ITWS), which is drawing high marks from the aviation community even before it is deployed. It will provide so-called “nowcasts”—predictions of weather

changes in the next 30 minutes—at 45 major airports.

It would consolidate current weather observations and radar data, then add predictions of ceiling, visibility and snowfall rates, information not now available.

ITWS is scheduled for completion by 2003, at a cost of \$343.7 million. The prime contractor is Lincoln Laboratories at the Massachusetts Institute of Technology.

A third system, called the Weather and Radar Processor (WARP), is in never-never land. The FAA includes it in its proposals, but Congress refused to fund it last year and is looking for more budget cuts this year. WARP is supposed to assume many capabilities of AWPG, including the combination of current en route weather information in one central weather display.

If Congress revives WARP in the fiscal 1996 budget, the first development contract for the basic system could be let in 1996, but the AWPG capabilities—including the ability to spot super-cooled drizzle drops—would not be available until late in the next decade. The FAA has already spent \$82.6 million on WARP and its predecessor programs.

— Don Phillips