

ARE PLANES WE FLY MORE AT RISK?

ALASKA AIRLINES FLIGHT 261



ASSOCIATED PRESS FILE PHOTO

JAN. 31, 2000 | NUMBER KILLED: 88

WHAT HAPPENED | The MD-83 jet was flying from Mexico to San Francisco when its stabilizer broke off, causing the plane to plunge into the Pacific Ocean.

INVESTIGATORS FOUND | Insufficient lubrication led to excessive wear and the eventual failure of the plane's jackscrew, a tail component that helps move the plane's stabilizer and sets the angle of flight. The NTSB faulted Alaska Airlines and the FAA, which it said allowed the airline to extend the intervals for lubricating tail components and inspecting them for wear.

ABOVE | Workers find a seat cushion from the plane in the Pacific Ocean.

EMERY WORLDWIDE AIRLINES FLIGHT 17



ASSOCIATED PRESS FILE PHOTO

FEB. 16, 2000 | NUMBER KILLED: 3

WHAT HAPPENED | The DC-8 jet crashed in Rancho Cordova, Calif., two minutes after takeoff when pilots lost control.

INVESTIGATORS FOUND | Pilots lost control because an improperly installed bolt fell out. The NTSB found the maintenance manual unclear, but couldn't determine whether Emery or a third-party contractor was responsible for the faulty maintenance. Both worked on the plane before the fiery crash.

ABOVE | Fire and smoke billow from crash site.

U.S. AIRWAYS EXPRESS FLIGHT 5481



REUTERS FILE PHOTO

JAN. 8, 2003 | NUMBER KILLED: 21

WHAT HAPPENED | The Beech 1900D crashed 37 seconds into takeoff in Charlotte when pilots were unable to control the plane.

INVESTIGATORS FOUND | Cables that control the plane's pitch were improperly adjusted, NTSB investigators say, at a Huntington, W.Va., repair station. Investigators also found the plane was overloaded and tail-heavy when it took off. The board is expected to issue its final report on the crash early next year.

ABOVE | Firefighters try to extinguish a blaze at the crash site.

COLGAN AIR



ASSOCIATED PRESS FILE PHOTO

AUG. 26, 2003 | NUMBER KILLED: 2

WHAT HAPPENED | A Beech 1900D crashed off Cape Cod, Mass., minutes after takeoff on a flight to Albany, N.Y., to be positioned for a future passenger flight for US Airways Express.

INVESTIGATORS FOUND | The crash came on the first flight after maintenance. A maintenance manual illustration was backward. That may have led to repairs that made it hard for pilots to control the plane, sources say. Maintenance is the chief focus of the pending investigation, sources told The Observer.

ABOVE | Dive team members respond to the crash.

Progress in the Skies

Improvements in training and technology have enhanced the overall safety of air travel. Many of the changes have occurred over the past 40 years.

GPWS Ground Proximity Warning System

- Radar devices installed in the '70s warned of rising terrain with about 10 seconds notice. Enhanced GPS uses global positioning satellites to give about 60 seconds notice.
- GPWS installed in '70s, EGPWS required by 2005.

TCAS Traffic Alert and Collision Avoidance System

- Computers in jets communicate, signal impending collisions.
- Installed in most planes in the 1990s.

CRM Cockpit Resource Management

- Trains pilots to work as a team with improved communication among the cockpit crew members.
- Introduced at select airlines in the 1980s after crashes showed crew members failed to communicate; now required at all carriers.

FLY BY WIRE

- Prevents planes from making a dive, climb or roll steeper than built-in limits allow.
- Installed in Airbus jets, beginning in 1987.
- Boeing prefers to give pilots direct operational control at all times.

FOQA Flight Operations Quality Assurance

- Uses information from flight data recorders to help crews work more efficiently and spot emerging trends.
- Began on selected airlines in mid-1990s, now on most airlines.

SIMULATORS

- Cockpit simulators allow pilots to train for emergency situations and learn from mistakes.
- Full-motion simulators, introduced in the 1950s, are continually updated.

TRANSPONDERS

- The airborne radar units provide air traffic controllers the plane's exact location, altitude, identification, speed and direction. First installed in the 1960s, constantly updated.
- FAA also assigned extra controllers in high-traffic areas and reduced approach speeds.

DOPPLER Terminal Doppler Weather Radar

- Can detect most dangerous "wind shear" downdrafts.
- First installed in Houston in 1994, now at most major airports, including Charlotte's. Some planes now have on-board Doppler radar.

ASR Airport Surveillance Radar

- Assures that planes keep adequate distance from each other.
- Constantly updated.
- Installed at Charlotte/Douglas in 1991.

ASDE Airport Surface Detection Equipment

- An enhanced ground radar system tracks vehicles and planes on runways and taxiways, enabling controllers to detect potential runway conflicts. Software alerts controllers to potential collisions.
- Currently used at most major airports. Installed at Charlotte/Douglas in 2001.

SOURCE: FAA, CHARLOTTE/DOUGLAS INTERNATIONAL AIRPORT

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Special Report | A Summary

TODAY | Maintenance mistakes increasingly play a role in fatal U.S. air crashes.

The Observer found that faulty maintenance contributed to 42 percent of fatal U.S. airline accidents since 1994, excluding the Sept. 11 attacks. Maintenance mistakes made up just 16 percent a decade earlier.

Now, cuts in spending on maintenance are threatening safety.

Most airlines are cutting spending on their own maintenance operations. They're contracting out more repairs to third-party companies, which usually employ lower-paid, less-experienced mechanics.

Over the past 20 years, the airline industry has invested millions in technology and training to greatly reduce the number of crashes due to pilot error and weather.

But the industry has not taken similar steps to cut back the likelihood of fatal crashes due to poor maintenance.

MONDAY | The crash in Charlotte of Flight 5481 illustrates much of what can go wrong in the maintenance safety system.

TUESDAY | Mechanics say cost-cutting pressures make it harder for them to do their jobs right.

WEDNESDAY | Aviation safety experts offer ideas to improve maintenance.

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Shifts felt in airline industry

Air Safety from previous page

The year before the accident, the plane's autopilot malfunctioned more than 50 times, according to maintenance records.

Also, 12 years earlier, that same plane's autopilot forced it to surge up while over the Pacific. In that accident, a flight attendant fractured an ankle.

Continental says the problem was intermittent, its cause hard to determine. The airline says it has since refined procedures for diagnosing such problems.

Maintenance spending cut as airlines face hard times

Following the economic slowdown in 2000 and the terrorist attacks the next year, the airlines' fortunes fell dramatically. The industry has lost about \$25 billion since the start of 2001, including a record \$11 billion in 2002.

Airlines have eliminated free meals on all but the longest flights and have imposed a range of fees that cover such items as paper tickets, excess baggage and standby flying.

Most airlines are also spending less on maintenance, which

makes up about 12 percent of their total spending.

Airlines cut total maintenance spending more than \$1 billion from 2000 to 2002. Maintenance spending per flight dropped about 4 percent in that period.

For the top nine major airlines, maintenance spending per flight dropped 1 percent.

At US Airways, the spending rate rose. The airline reduced its total maintenance spending from 2000 to 2002, but the number of flights dropped more.

Many smaller airlines have cut spending rates more drastically. One group of six regional airlines cut maintenance spending per flight by 17 percent.

Some smaller airlines said they were able to cut spending by replacing old planes with new ones, which require far less maintenance.

Professors at Embry Riddle Aeronautical University, based in Daytona Beach, Fla., are examining a correlation between maintenance spending and safety. The researchers are finding airlines that spend less on maintenance tend to report more mechanical problems to the FAA.

"There certainly is a tendency

when things are very tight to try to save money on maintenance," says Dawna Rhoades, an assistant professor involved in the study. "Long term, if you neglect maintenance, it's going to catch up with you."

Airlines insist they have not compromised safety.

Major airlines employ safety officials who have executive status, enabling them to push for high standards at the company.

"The FAA helps back us up, but ... the primary responsibility for the safe operation of the airline rests with the airline and its personnel," said William Bozin, US Airways vice president of safety and regulatory compliance.

American Airlines will save money by retiring 111 older aircraft by the end of 2004 and closing an engine shop that serviced some of them, said airline spokesman John Hotard. It has also cut hundreds of mechanics' jobs and reduced the salaries of those remaining.

American says it spent \$178 million less on maintenance in the first nine months of 2003 than it did in the same period a year earlier. But the airline says

lower costs have enabled it to bring some outsourced work back in-house.

"We have done nothing that would compromise the quality of our maintenance," said Hotard.

Some of the most notable changes have been at small and midsize airlines, which have expanded as the majors shrink.

Since 1999, ATA, which serves Charlotte, added 44 new jets and retired 32 older ones. The airline says it will be seven or eight years before the new planes need heavy maintenance checks, which take three weeks to a month.

Smaller airlines often face bigger challenges

The smaller airlines tend to have less experienced mechanics, higher turnover, and far smaller engineering and quality assurance staffs.

Line mechanics, who repair problems and do routine maintenance checks, earn about 55 percent more at the major airlines than at the regional carriers, according to a recent survey by Aviation Maintenance magazine.

Most of the FAA's maintenance

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