

Flight Check

Incidents Prompt New Scrutiny Of Airplane Software Glitches

As Programs Grow Complex,
Bugs Are Hard to Detect;
A Jet's Roller-Coaster Ride

Teaching Pilots to Get Control

By DANIEL MICHAELS
And ANDY PASZTOR

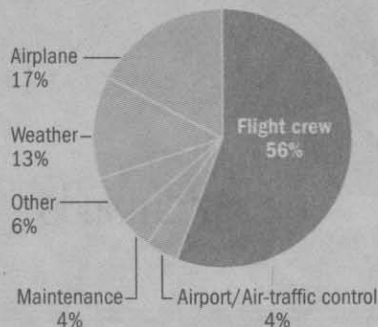
As a Malaysia Airlines jetliner cruised from Perth, Australia, to Kuala Lumpur, Malaysia, one evening last August, it suddenly took on a mind of its own and zoomed 3,000 feet upward.

The captain disconnected the autopilot and pointed the Boeing 777's nose down to avoid stalling, but was jerked into a steep dive. He throttled back sharply on both engines, trying to slow the plane. Instead, the jet raced into another climb. The crew eventually regained control and manually flew their 177 passengers safely back to Australia.

Investigators quickly discovered the reason for the plane's roller-coaster ride 38,000 feet above the Indian Ocean. A defective software program had provided

Accident Analysis

Primary cause of major commercial-jet accidents world-wide, as determined by the investigating authority:



Note: Includes only accidents with known causes, 1995 to 2004.

Source: Boeing

incorrect data about the aircraft's speed and acceleration, confusing flight computers. The computers had also failed, at first, to respond to the pilot's commands. Within weeks Boeing Co. warned airlines world-wide to install a fix provided by Honeywell International Inc., which makes the flight computers and supplied the faulty software.

Such glitches, while extremely rare, are emerging as a top safety challenge in the air. With well over five million lines of code used on the latest jetliners, versus fewer than a million on older planes, it's increasingly difficult to detect and fix embedded problems before they surprise pilots.

Plane makers are accustomed to testing metals and plastics under almost every conceivable kind of extreme stress, while software used on commercial aircraft is prepared and checked much more rigorously than applications developed for everyday uses. But it's impossible to run a big computer program through every scenario to detect the bugs that invariably crop up. And in airplanes, such vulnerability to undiscovered errors can lead to consequences far more dire than an email outage or spreadsheet error.

Now officials have begun re-examining flight data from past accidents and incidents, searching for ways in which bugs might have contributed to slip-ups or led to other problems. "It's our next big area of work," says Peggy Gilligan, a top safety official at the Federal Aviation Administration in Washington. She says industry and government experts recently "came to the realization that we haven't looked at this area" closely enough. Regulators also are studying how to improve detection of wayward software and train pilots better to handle crises involving computer breakdowns.

Serious software bugs such as those aboard Malaysia Airlines Flight 124 haven't been blamed for any major commercial jet crash. Advances in electronics are a big reason air travel has become safer. But several incidents—including one that caused a Virgin Atlantic plane to make an emergency landing in Amsterdam last year—are ringing alarm bells.

"A total loss of flight control could be worse than a fire on board," says Robin McCall, a veteran Delta Air Lines captain who flew highly automated Boeing 767s before retiring last year.

Capt. McCall says automation failures can make it tough for pilots to revert to basic flight procedures and work around the problem. The Malaysia Airlines drama, he says, is "among the scariest scenarios in all of modern aviation, since the plane was out of control" for some 45 seconds, despite the crew's efforts.

Malaysia Airlines and Honeywell declined to comment on the incident because it remains under investigation. Its details are discussed in reports by Australia's aviation authority. Scott Pelton, Boeing's chief engineer for electronic systems, says the incident was "clearly unacceptable" and prompted swift remedial action.

In theory, most advanced jetliners can take off, climb, navigate along a prescribed route, descend to their destination and roll to a halt at the end of the runway—all without human intervention.

Autopilot programs were first created to make planes fly more smoothly and reduce pilot distractions by taking over rote tasks. Today's software also handles many other vital aspects of flight, such as adjusting cabin air pressure, maximizing fuel efficiency and warning of impending mechanical breakdowns or collision threats.

Advances planned for the Airbus A380 superjumbo jet, due to start passenger service later this year, and Boeing's long-range 787 Dreamliner, due in 2008, will take automation to new heights. Instead of independent hardware and software systems for each task, the new jets will save weight by relying on redundant cen-

Please Turn to Page A11, Column 1