

The risk of a pilot becoming incapacitated in flight is very low, recent studies show, but an incident early last year — and others in the past — exemplify another point made in the studies: In the rare event that incapacitation does occur, a flight can be seriously threatened.

In its report on the incident, the Irish Air Accident Investigation Unit (AAIU) said there were signs that something was not right with the first officer when he reported late for duty at Toronto's Pearson International Airport the morning of Jan. 28, 2008.<sup>1</sup> The commander said that the first officer appeared to be "quite harried" when he arrived on the flight deck of the Boeing 767-300. The commander assured the first officer that all the preflight preparations for the flight to London Heathrow Airport had been completed and encouraged him to "settle down."

The commander became increasingly concerned about the first officer's behavior after the flight got under way. The first officer left the flight deck several times and did not follow standard procedure when he returned.

"In conversation, he remarked several times that he was very tired," the report said. "With the workload now light in cruise, the commander suggested that [he] take a controlled rest break on the flight deck. The commander was concerned not only for the well-being of his first officer but of the possibility of having to carry out a CAT III autoland approach at Heathrow due to low weather [conditions]. He considered it prudent to let his colleague rest now and be fully alert for the descent and approach at the destination."

### 'Confused and Disoriented'

The aircraft was midway across the North Atlantic when "it soon became apparent that the first officer was quite ill," the report said, noting that his speech began to have a "rambling and disjointed nature." After another extended rest break, his behavior became "belligerent and uncooperative." After calling the lead flight attendant to the flight deck, the commander

told the first officer that if he did not begin to cooperate, he would be considered incapacitated and dealt with accordingly.

The first officer did not respond, so the commander told the lead flight attendant to "secure the first officer away from the controls" and enlist the aid of other cabin crewmembers to remove him from the flight deck, the report said. One crewmember sustained a wrist injury while doing so. Two physicians among the 146 passengers attended the first officer, who was described as confused and disoriented.

After communicating via data-link with company dispatch personnel in Toronto, the commander declared a medical emergency and told air traffic control that he was diverting the flight to Shannon, Ireland, which had good weather conditions.

Before beginning the descent, the commander asked the lead flight attendant to check the passenger list, to see if any company pilots were aboard. "No line pilots were on board, but one of the flight attendants held a commercial pilot's license with a multi-engine rating and a noncurrent instrument rating," the report said. The commander summoned her to the flight deck.

"The flight attendant provided useful assistance to the commander, who remarked in a statement to the investigation that she was 'not out of place' while occupying the right-hand seat," the report said.

After an uneventful landing, the flight was met by physicians who assisted the first officer

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**There is no checklist for pilot incapacitation, a rare but serious threat.** BY MARK LACAGNINA

# Down

A first officer appeared to be under considerable stress as the transatlantic flight got under way and eventually would be carried off the flight deck of this 767.



# and Out

and assessed his medical condition. The first officer then was transported to a local hospital. “[He] remained under hospital care for 11 days, where a gradual improvement in his condition was made,” the report said. “On 8 February, he was flown home [by air ambulance] to Canada, where his care continued.”

The report provided no details about the first officer’s medical condition and did not specify his age.

### Serious Incident

The AAIU commended the commander and flight attendants. “Incapacitation of a member of a flight crew is a serious incident,” the report said. “The commander, realizing he was faced with a difficult and serious situation, used tact and understanding, and kept control of the situation at all times. The situation was dealt with in a professional manner, employing the principles of crew resource management.”

The report cited a Transport Canada technical publication (TP) that provides guidance on recognizing and dealing with pilot incapacitation.<sup>2</sup> Differentiating between *sudden*, *serious* and *subtle* incapacitation, the TP says that the leading causes of sudden pilot incapacitation are gastrointestinal problems such as stomach cramps, nausea and diarrhea.

“Heart problems and fainting are the main causes of serious incapacitation,” the TP says. “Complaints of chest pain (often confused with indigestion), weakness, palpitation or nausea should be taken seriously. Pallor [paleness], unusual sweating, repeated yawning or shortness of breath should all trigger suspicion.”

Common causes of subtle pilot incapacitation include hypoxia, hypoglycemia (low blood sugar), extreme

fatigue, alcohol, drugs and “other toxic substances,” the TP says. Subtle incapacitation also can be triggered by a stroke or brain tumor.

Symptoms of subtle incapacitation are likely to be noticed during periods of high stress or workload. “The victim may not respond to stimulus, may make illogical decisions or may appear to be manipulating controls in an ineffective or hazardous manner,” the TP says. It recommends that, if the victim does not respond normally to two consecutive challenges or one significant warning, such as when an aircraft is flown below decision height without the required visual references, the other pilot should take the following actions:

- “Do whatever is necessary to maintain control of the aircraft.”
- “If you need to restrain the victim, do only what is needed to deal with an immediate threat to control. You will have time [later] to further secure the victim.”
- “Climb to and maintain a safe altitude.”
- “If you are on an approach which has destabilized, initiate a missed approach following standard procedures. You may not have access to a checklist, so take extra care to accomplish essential tasks.”
- “Keep your thoughts organized. Saying your actions out loud may help you stay focused. If the aircraft is autopilot-equipped, engage the autopilot at an operationally safe altitude to lessen your workload.”

The TP says that other crewmembers or passengers should be enlisted to secure the incapacitated pilot — by moving his or her seat to the full-aft position and tightening the shoulder harness — or to remove the pilot from the seat.

### Single-Pilot Fatalities

A study by the Australian Transport Safety Bureau (ATSB) in 2007 focused on 98 pilot-incapacitation events that occurred from 1975 through March 2006.<sup>3</sup> Noting that these events comprised 0.6 percent of all occurrences in the ATSB accident/incident database during the period, the report said, “The results of this study demonstrate that the risk of a pilot suffering from an in-flight medical condition or incapacitation event is low.”

Nevertheless, the report said that pilot incapacitation “represents a serious potential threat to flight safety.” The pilot-incapacitation events included 10 fatal accidents, in which 24 people were killed, and six nonfatal accidents.

All the fatal accidents involved single-pilot flight operations, including four conducted by charter or business pilots. Eight fatalities occurred when a Beech Super King Air 200 crashed in September 2000.<sup>4</sup> ATSB determined that the cabin likely depressurized while the airplane was climbing to 25,000 ft for a charter flight of about 1.5 hours’ duration; the King Air continued flying for about 3.5 hours after passing the destination.

Overall, the greatest cause of pilot incapacitation was acute gastrointestinal illness, typically from food poisoning, in 21 cases, followed by exposure to smoke or toxic fumes, in 12 cases. Nine pilots lost consciousness for unspecified reasons. Eight suffered heart attacks, five of which were fatal. Five pilots suffered symptoms of infectious diseases, mostly viral infections, although one case involved malaria. Five others were incapacitated by trauma resulting from bird strikes, a windshield shattered by hail and an injury during an emergency ground evacuation. Four

## Recent U.S. Pilot-Incapacitation Events\*

**June 30, 2008** — The pilot engaged the services of a flight instructor to prepare for a re-examination required by his involvement in a previous aviation incident. During departure from Rochester, New Hampshire, the Beech 95's cabin door opened, and the pilot turned back to the airport. He did not line up properly with the runway, and the instructor assumed control. With no wheel-brake controls on his side of the cockpit, the instructor told the pilot several times to apply the brakes after landing, but there was no response. The airplane received minor damage when it overran the runway. The incident report did not specify the cause of the pilot's incapacitation.

**Feb. 24, 2008** — The pilot of a Cessna 525 CitationJet was conducting a night flight with three passengers when he became woozy and declared an emergency. He landed without further incident at Worcester, Massachusetts. He was examined at a local hospital and released after no medical abnormalities were found.

**Dec. 17, 2007** — Five carbon dioxide cylinders had been loaded improperly, and without safety caps over their valves, in a Beech 1900. During departure from Aniak, Alaska, the pilots heard a "hissing" sound, rejected the takeoff and taxied back to the ramp. Soon after the engines were shut down, both pilots lost consciousness; the copilot sustained minor injuries when he collapsed while trying to open the forward door.

**June 17, 2007** — A Boeing 777-200 was en route from Chicago to an unspecified destination when the first officer apparently suffered a stroke. The captain returned to Chicago, where the first officer was transported to a hospital.

**June 5, 2007** — The first officer of a 737-500 complained of severe stomach cramps during a flight from Tulsa, Oklahoma, to Denver. The captain requested and received expedited handling from air traffic control, and landed without further incident in Denver.

**May 7, 2007** — The captain of a 737-500 suffered an apparent heart attack during a flight from Washington to Chicago.

A physician assistant aboard as a passenger recommended that the captain be removed from the flight deck and placed on the floor of the forward galley for treatment. The first officer declared a medical emergency and kept a flight attendant on the flight deck to assist him during the diversion to Dayton, Ohio. "After landing, the first officer moved over to the left seat and taxied the aircraft to the gate, where emergency medical assistance was standing by," the incident report said.

**May 30, 2006** — A few minutes after a Bell 206L-3 was landed on a platform off the shore of Grand Isle, Louisiana, the 55-year-old pilot was found unconscious. He was removed from the helicopter and transported to a hospital, where he was pronounced dead; the cause of death was coronary insufficiency from cardiac disease.

**Aug. 28, 2005** — The captain of an Embraer 145 suffered a mild heart attack while departing from Pittsburgh for a flight to Portland, Maine. The first officer assumed control, returned to Pittsburgh and landed the airplane without further incident. "Further investigation revealed that the captain was incapacitated and unresponsive in flight and on the ground after this event occurred," the incident report said. "The captain was taken to a hospital and is expected to make a full recovery."

**May 5, 2005** — The pilot of a Gulfstream 695A Commander suffered a fatal heart attack during a flight from North Las Vegas Airport to San Diego. The passenger in the right front seat, who was not a licensed pilot, flew the airplane back to the departure airport while the rear-seat passenger held the pilot away from the flight controls. Both passengers were injured, one seriously, when the Commander stalled at low altitude and struck terrain during the fourth landing attempt.

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\*Selected from reports compiled by Air Data Research from U.S. Federal Aviation Administration and U.S. National Transportation Safety Board databases.

pilots suffered respiratory symptoms of acute pneumonia and severe emphysema.

Noting the prevalence of gastrointestinal illness, the report said, "It is important that crew meals are prepared to the highest possible hygiene standards

and that pilots receive different crew meals to help reduce the overall risk." Pilots also should be careful of what they eat and drink before flying and during layovers. "Contaminated food and water consumed in these periods may then produce an acute

gastrointestinal illness some hours later," the report said.

While heart attack was involved in only eight of the 98 pilot-incapacitation events, it accounted for half of the fatal accidents and the deaths of seven passengers. The report said that "cardiovascular



disease still ranks as the single biggest cause for medical disqualification of pilots” and that cardiac events may be under-reported “especially in difficult postmortem circumstances” following accidents.

The study results show that “there is a low chance of a medical condition or incapacitation event adversely affecting the outcome of a flight,” the report said. “The medical certification system appears to be working well. However, it remains important that this system continues to evolve with, and be based on, the changes and developments in scientific research and medical practice.”

### Insidious and Dangerous

A 2004 study by the U.S. Federal Aviation Administration (FAA) focused on 47 flights during a six-year period ending in 1998 in which pilots became incapacitated or impaired — that is, able to perform only limited flight duties.<sup>5</sup> The report on the study said that the rate of in-flight pilot incapacitations/impairments was 0.058 per 100,000 flight hours.

The report said that safety was seriously threatened in seven events:

- A Boeing 737 first officer suffering a grand mal seizure related to alcohol withdrawal “suddenly screamed, extended his arms up rigidly, pushed full right rudder and slumped over the yoke during an approach,” the report said. “The captain regained control after flight attendants pulled the first officer off the controls.”
- A Boeing 727 freighter captain and flight engineer temporarily lost consciousness after the flight engineer inadvertently depressurized the cabin at 33,000 ft. The first officer donned his oxygen mask and performed an emergency descent.
- While taxiing after landing, the “captain stiffened so violently during an epileptic seizure” that he suffered a broken shoulder and back, and applied sufficient pressure on the right rudder pedal and wheel brake to cause the airplane to suddenly turn and stop.
- An Airbus A300 captain suffering a cerebral infarction (blood-flow blockage) did not call for landing gear extension during approach and “simply nodded agreement when the first officer questioned him about it.” While taxiing to the gate, he applied full takeoff power twice before the first officer shut down the engines and called for assistance.
- A McDonnell Douglas MD-88 captain wearing monovision contact lenses — which correct for near vision in one eye and distant vision in the other eye — perceived the airplane to be higher than it was during an overwater approach in rain and fog. “This resulted in a steeper-than-normal final approach, causing the aircraft to strike the approach lights,” the report said. Three passengers sustained minor injuries during the subsequent evacuation.
- The captain and first officer were impaired by fatigue when a Douglas DC-8 freighter stalled

during an approach and struck terrain. All three flight crewmembers were seriously injured in the crash.

The latter two events, the only accidents among the 47 flights, both involved pilot impairment, which the report characterized as insidious. “When a dramatic incapacitating event such as a heart attack or epileptic seizure occurs, it is often obvious and can be dealt with by the unaffected crewmember,” the report said. “In the two impairments that ended in aircraft accidents, the pilots were probably not aware there was a problem. ... It may be that subtle impairment of a pilot is more dangerous than obvious medical incapacitation.”

### Notes

1. AAIU Synoptic Report no. 2008-027. Nov. 19, 2008.
2. Transport Canada. *Pilot Incapacitation*. TP 11629E. April 2007.
3. Newman, David G. *Pilot Incapacitation: Analysis of Medical Conditions Affecting Pilots Involved in Accidents and Incidents, 1 January 1975 to 31 March 2006*. ATSB. B2006/0170. January 2007.
4. ATSB Aviation Safety Report BO/200003771.
5. DeJohn, C.A.; Wolbrink, A.M.; Larcher, J.G. *In-Flight Medical Incapacitation and Impairment of U.S. Airline Pilots: 1993 to 1998*. Civil Aerospace Medical Institute. DOT/FAA/AM/04/16. October 2004. Reprinted in *Flight Safety Digest* Volume 24 (January 2005): 1–23.

### Further Reading

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- Rosenkrans, Wayne. “Cabin Fever.” ASW Volume 2 (August 2007): 22–26.
- Werfelman, Linda. “Too Old to Fly?” ASW Volume 2 (February 2007): 11–15.