RAPID DESCENT

A series of unfortunate events leads a 737 captain to dive to the wrong conclusion.

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Our Boeing 737 was scheduled to depart from Nauru Island for Apia in Western Samoa at 0330 local time. The initial track was 113 degrees magnetic from the NDB. Planned cruise altitude was 33,000ft, trip distance was 1485nm and flight time was 3.5 hours – nearly every minute of it over water.

Climbing through 25,000ft, we experienced some early signs of engine icing and promptly switched the engine anti-ice system on. Moments later, we were surprised to hear an "all stations" broadcast from a Boeing 747; the jet was crossing our radial, climbing through our planned altitude and 40nm in front of us. We were outside controlled airspace and – worryingly – the local flight service unit had not notified us of the 747's presence.

We exchanged position information with the 747 and were just passing FL320 when a warning horn sounded in the cockpit. At first, I thought the alert, which sounded like the warning beeps of a reversing truck, was an over-speed signal. It took us a full 25 seconds to twig that the problem was to do with the cabin pressurisation system. Neither of us had noticed a discernable pressure change, but the gauge was indicating 13,000ft and climbing, when it should have been steady at 8,000ft.

From here, it was a comedy of errors on my part. While donning my oxygen mask, I managed to knock my spectacles onto the floor. There was a delay of a few seconds as we both fumbled in the dim light to locate the tiny volume control knobs to activate the oxygen mask intercom system.

The cabin altitude needle, now indicating 3,000ft, had dropped 10,000ft in a minute. Unable to relieve the pressure in my ears, I was experiencing severe and distracting pain.

With the intercom switched on, I recited the rapid depressurisation checklist, which included directing the first officer to fully close the main outflow valve switch on the panel above his head. It's impossible to read the position of the outflow indicator needle from the left seat, so I was relying on the first officer to monitor it.

I made a public address to inform the passengers of the impending emergency descent, then closed the throttles, extended the speed brake, and put the aircraft into a steep dive.

Over-pressure condition: At this point, it is worth noting that there were a couple of other issues on my mind. For one, I was aware that there was an elderly woman on board who had never flown before. Would she be able to fit the oxygen mask over her head and what effect would a possible shortage of oxygen have on her health?

I also had my doubts about the inexperienced cabin crew and their ability to assist passengers with their oxygen masks. With that in mind, I was keen to get to a lower altitude as soon as possible.

We were descending at 6,000ft per minute. I concentrated on flying the descent while the first officer looked after the pressurisation panel. My ears were beginning to hurt and without my glasses it was difficult to focus on the instruments. I handed over control to the first officer while I groped on the floor for my glasses, finally retrieving them from near the base of the control column.

The cabin altitude needle, now indicating 3,000ft, had dropped 10,000ft in a minute. Unable to relieve the pressure in my ears, I was experiencing severe and distracting pain. The closure of the outflow valve from its normal, slightly-open position to the fully closed position had

resulted in an over-pressure condition.

The first officer was doing a sterling job and I managed to turn my attention (and newly restored vision) to the pressurisation panel.

At 20,000ft, with the cabin altitude under control, I re-engaged the autopilot while we assessed the situation. After some discussion we concluded that it would be foolish to continue on to Samoa with a dodgy pressurisation system. I decided to return to base at Nauru. Apart from a few sore ears, the passengers were in good shape.

An engineer changed the pressurisation controller, and we flew to Samoa without further problems.

It transpired the crew who had flown the aircraft before us had reported fluctuating cabin rates of climb and written up the defect after landing. An engineer had replaced the offending pressurisation controller and signed the defect report, which happened to be on the very last page of the maintenance sheet. He left a new maintenance book in the cockpit for us to use then knocked off for the night. We only saw the new document, which, of course, contained no defects.

Clearly there was no need for the rapid descent. I should have directed the first officer to the unscheduled pressurisation change checklist, rather than the rapid depressurisation checklist. This would have allowed a more leisurely series of actions to regain cabin pressure. If that failed, a decision could then be made to execute a rapid descent.

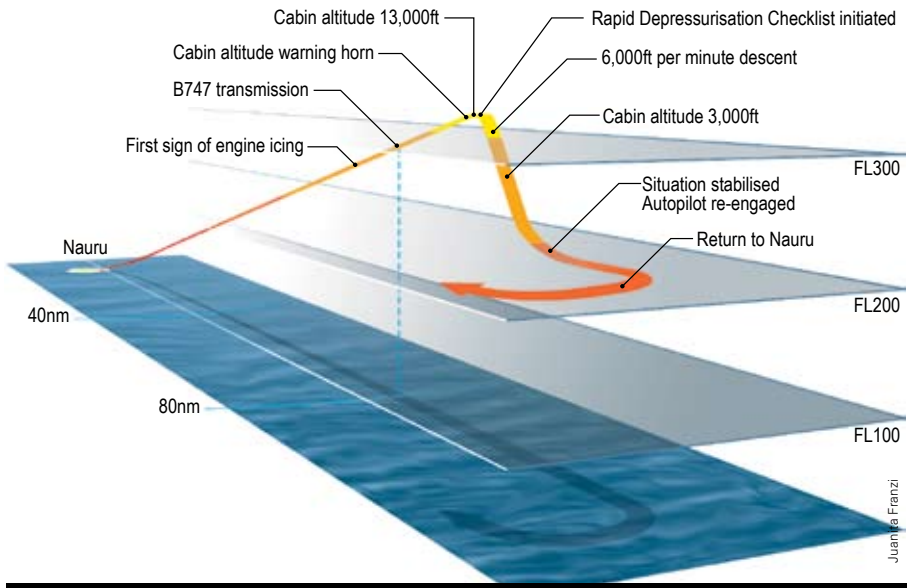
At the time the urge to descend quickly was strong. Lack of oxygen appeared to pose a threat to my elderly passenger (and others) and I was not entirely confident that the flight attendants could manage the situation.

In the real-world event I rushed into the emergency descent – perhaps unconsciously primed by previous simulator training – rather than keeping a cool head and sitting on my hands until the problem was properly diagnosed.

The author's name has been withheld by request.

$500 Highly commended

DOWN TIME



Situation stabilised: After the warning horn sounded, the B737 flight crew initiated a rapid descent, dropping 10,000ft in a minute. Once the situation had stabilised, the flight crew returned to Nauru, rather than continue to Samoa with a pressurisation problem.

ANALYSIS

MURPHY'S LAW

John Laming & staff writers

This pilot certainly struck an unusual set of circumstances. You can't help thinking that if the original maintenance information had been available to the crew before departure, the captain would have known of the problem with the pressurisation controller and been less inclined to act hastily at the first sign of an unscheduled pressurisation change.

The combination of several distracting events close together – engine icing, unannounced traffic and the activation of the cabin altitude warning horn, all within the space of a few minutes during a night climb in instrument meteorological conditions (IMC) – no doubt contributed to the confusion in the cockpit.

While the pilot's immediate concern for his passengers' welfare is understandable, the first sounding of the cabin altitude warning called for a cold, calm appraisal of the situation. As the captain concedes, if all the facts of the situation had been considered, a rapid descent would not have been executed.

Some operators require flight crews to monitor cabin pressurisation every 5,000ft in the climb. This is a sensible precaution and it might have helped the crew in this case detect and resolve the problem earlier.

Checklist check-up: The Boeing after take-off checklist does require a check of the pressurisation system once the flaps are retracted, though the author doesn't say if this check was conducted. If it was, we can assume that the problem was not evident at that stage.

The pilots were correct to don their oxygen masks as soon as they realised there was a problem with the cabin pressurisation system. The fact the pilot dropped his glasses in the process was unfortunate and clearly added more stress to an already problematic situation.

At this point, the captain initiated the rapid depressurisation checklist, which calls for the first officer to close the outflow valve switch. This is aimed at reducing the flow of air from the cabin in the event of major structural damage or a window blowout. However, if the pressurisation fault is relatively benign, as in this incident, full closure of the outflow valve results in an immediate build up of pressure in the cabin. In this case, the increased pressure resulted in considerable discomfort, in the form of ear pain, for the crew and passengers.

Once it became clear that the cabin pressurisation was under control, the captain made the correct decision to return to the departure airport rather than continue the flight with an unknown pressurisation defect.

The pilot makes a good point about simulator training. There is a tendency for simulator instructors to focus on rapid depressurisation events. Appropriate consideration should also be given to unscheduled depressurisation changes and their diagnosis.

Finally, it's worth noting that there was a short period where the pilots were unable to identify the reason for the warning horn, which in the 737 serves a dual purpose as a cabin altitude and take-off configuration warning.