HEAVY WEATHER

Weather occurrences are not "just the cost of doing business" – their risks can be managed, says John Dutcher.

Boeing/digitally enhanced

Just after take-off from Coolangatta Airport, VH-EAL, a Boeing 767 on its way to Sydney with 216 passengers and crew aboard, ran into some heavy weather.

At 800 ft, the aircraft encountered strong rain, hail and windshear.

Shortly afterwards one of the cabin crew spotted dents in the leading edges of the wings, and immediately reported the damage to the captain. The flight crew diverted out to sea to get around the poor weather and continued on to Sydney.

The approach to Kingsford-Smith was configured early because the flight crew were concerned that the wing damage might result in problems extending flap and leading edge devices. Fortunately the landing was uneventful. However, the costs of inspection and repair were significant.

NASA estimates the cost to US operators of weather related damage runs to more than $US100 million a year.

One US airline estimates that each encounter with severe turbulence costs it an average of $US750,000. There has been no similar study of the costs of weather related occurrences in Australia.

However, the circumstances that led to the VH-EAL incident indicate that Australian operators need to be wary of the risks involved.

Met information: Before departure, the flight crew were given a meteorological briefing package by the operator. They also discussed the weather with the Bureau of Meteorology (BoM) meteorologist in the operator's flight dispatch department.

A timeline of events and discussions that took place during pre-flight and departure from Coolangatta points to what happened.

At around 13:10 Coolangatta automatic terminal information service (ATIS) echo was issued by ATC.

ATIS echo included runway 32 (active), wind from 350 degrees at 22 kt, crosswind maximum 15 kt. Visibility greater than 10 km and three to four eighths of cloud at 2,500 ft. It indicated no adverse weather conditions at Coolangatta.

1330:03, a Boeing 737 aircraft was cleared for take-off from runway 32 at Coolangatta.

1330:24, VH-EAL was issued an airways clearance.

1332:11, an Airtrainer CT4 aircraft was cleared to land on runway 35 at Coolangatta.

At about 1336, the BoM forecasters first became aware of the severe nature of the thunderstorm involved in the occurrence.

"ATIS Echo included runway 32 (active runway), wind from 350 degrees at 22 kt, crosswind maximum 15 kt, visibility greater than 10 km and three to four eighths of cloud at 2,500 ft. It indicated no adverse weather conditions at Coolangatta."

1338:22, ATIS Foxtrot was issued.

ATIS Foxtrot "included information to expect a VOR/DME approach, runway 32 wet, wind at 350 degrees at 20 kt, crosswind maximum 15 kt, visibility reducing to 5,000 m in rain and thunderstorms, five to seven eighths of cloud at 2,500 ft and one to two eighths of cloud at 1,500 ft."

1338:27, a Raytheon Beech 200 Super King Air aircraft was cleared to land on runway 35 at Coolangatta.

1339:07, VH-EAL requested taxi clearance and advised it had received ATIS Echo (45 seconds after ATIS Foxtrot was issued). The surface movement controller (SMC) controller did not advise the crew of the changed ATIS or advise them of the changed conditions.

1340, the thunderstorm, continuing to intensify, moves to the Coolangatta area, and begins to pass over Coolangatta Airport.

1343, the Coolangatta tower controller advised the approach controller that visibility at Coolangatta was 2,000 m in heavy rain.

1345:00, VH-EAL was cleared for take-off from runway 32 and assigned a departure heading of 060 degrees at 2 DME.

1346:49, the crew of VH-EAL advised the Coolangatta Tower controller that they had stopped the turn and were heading 030 degrees due to adverse weather.

1347:51, the crew of VH-EAL requested that approach advise Coolangatta tower that they encountered heavy rain and hail on departure from runway 32.

During the turn-around at Coolangatta, the crew updated the Sydney TAF using the aircraft communications addressing and reporting system (ACARS) and obtained Coolangatta ATIS Echo.

The Australian Transport Safety Bureau (ATSB) found that the meteorologist reported that they were aware of the development of the thunderstorm in the vicinity of Coolangatta Airport. That information was passed to the operator's port staff at Coolangatta. However, it was not passed to the crew of VH-EAL, as the operator lacked a procedure for disseminating this information to crews once they had commenced taxiing.

BoM forecasters became aware of the severity of the thunderstorm some 9 minutes before VH-EAL was cleared for take-off. But the forecasters did not contact Coolangatta air traffic services (ATS) to advise them of the hazardous weather approaching.

Coolangatta ATS reported that they had access to METRAD/RAPIC; however ATS did not offer, nor did the crew request, weather information accessed from the METRAD/RAPIC display.

Coolangatta controllers could see that the thunderstorm was approaching and that weather conditions were deteriorating, yet they did not contact BoM staff to find out more about the severity of the approaching weather. As a result, neither BoM nor Coolangatta controllers had a complete picture of the deteriorating meteorological situation.

In addition to the absence of any reports about the adverse weather encounters, a possible "social influence" may have played a role in the aircrew's decision making.

A study by the Massachusetts Institute of Technology (MIT) attempted to quantify the behaviour of pilots who encountered thunderstorms while arriving in the Dallas-Fort Worth terminal airspace.

The study found that pilots of arriving aircraft that encounter heavy weather are more likely to penetrate the weather if another aircraft has recently flown through that airspace. However, the study did not review the behaviour of pilots during the departure phase.

In the VH-EAL occurrence, there may have been limitations in the aircraft's radar displays because the intensity of the thunderstorm could have affected signals due to absorption by hail and heavy precipitation.

BoM Radar displays (used by ATS) are updated every 10 minutes and so can be up to 10 minutes behind the actual conditions. Also the flight crew may not have been aware that the data contained in the ATIS was restricted to 5 nm from the aerodrome reference point.

Neither the Bureau of Meteorology nor the Coolangatta controllers had a complete picture.

It is clear that the many failures of information sharing, both within and between organisations, contributed to this incident. The good news is that these hazards can be managed.

Safety management: Before you can manage a hazard you need to understand how incidents are occurring.

Given that encounters with severe weather pose a safety and financial risk to operators, a program of investigating and analysing weather encounters should form part of any operator's safety management system (SMS).

A sound framework for analysing weather related hazards and incidents is critical. You need to look at a range of contributing factors, and this can be done using a "weather analysis checklist" (see diagram).

The checklist represents a logical structure for analysis, moving downward from stability, since stability determines virtually every subsequent factor.

Armed with a better understanding of weather encounters, operators can prioritise resources to manage these risks, allowing for gains in efficiency and safety to be realised.

A "weather risk control system" (Wx-RCS) could be developed and formally integrated into your overall safety management framework.

As with any safety management system, a Wx-RCS would feature a process of risk assessment, policy development, the organisation of control, communication, and so on, and a framework for planning and implementing change and corrective action.

In addition, a Wx-RCS would contain a program of performance measurements and periodic auditing and performance reviews to allow for continuous improvement.

Any Wx-RCS would also feature advanced training of aircrews and dispatchers in areas like numerical weather predication, stability indices, and operational satellite and radar interpretation.

Although such training programs are not required under existing regulations, they would bolster crew understanding of hazardous weather conditions, and improve dispatcher and aircrew short-term forecasting skills.

Standard operating procedures could be developed on review of weather products and processes for sharing weather information.

You could measure and monitor the effectiveness of remedial actions by analysing occurrence and trend data as well as the success of flight forecasts. Integrating weather occurrence risk management into your safety management system could save your organisation money, and reduce the risks of a serious incident or accident occurring.

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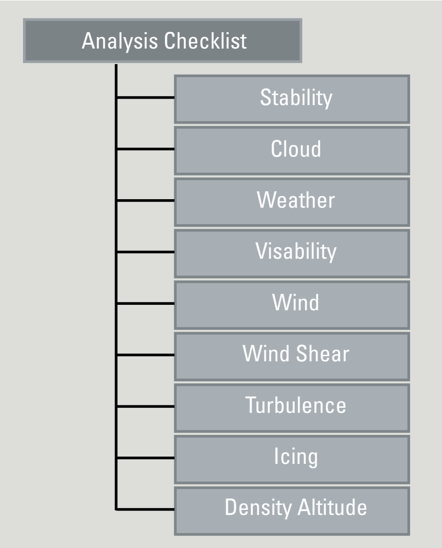
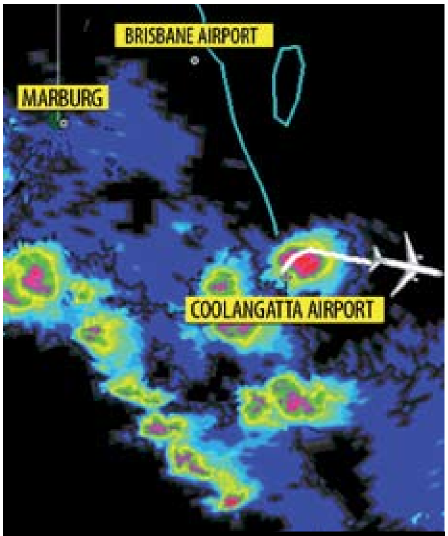


Weather analysis checklist.


Hail damage to the wings of VH-EAL.



The aircraft diverted out to sea and away from the storm.