

# The Long Road to ZQN Night Ops

What it took to bring NZ613 into Queenstown at 19:20 hrs on 23 May 2016.

Where it really began was in 2004 when Qantas trialled Required Navigation Performance (RNP) technology at Queenstown.

The GPS-based technology allowed aircraft to follow precise paths through the unfriendly surrounding terrain and, crucially, lowered the altitude decision point.

Prior to that, according to Air New Zealand's Manager of Aircraft Operations, Captain Graham Cheal, if the cloud was lower than 3000 feet above the airport, aircraft had to divert. RNP lowered that cloud limit to a minimum of 250 feet.

Apart from the confidence RNP brought to airlines and their passengers that they stood a better chance of getting in and out of Queenstown, it also made the prospect of night flights more real.

In 2012, Queenstown Airport Corporation called together Air New Zealand, Jetstar, Qantas, and Airways. With risk specialists Navigatus facilitating, the group explored what risks would exist with night flights.

"It was a massive and extremely thorough risk assessment," says Graham Cheal. "The group looked at every possible risk, things from VFR helicopters straying into airspace, to engine failure, to adverse wind, to loss of situational awareness, to runway overrun."

"Every threat to safety was put into an enormous model, past research was consulted, probabilities calculated, mitigations identified, and their effectiveness assessed. All that gave us a modified probability of the risk of operating into Queenstown at night."

That huge project, called the Foundation Safety Case (FSC) proved that, theoretically, night flights could be done as long as all the controls were in place.

Once the FSC reassured the CAA and its sister regulator, CASA, that the level of risk involved in night operations was

mitigated to an acceptable level, the regulators accepted the FSC, in May 2014.

The airlines then began a second huge project, preparing their Operator Safety Case (OSC), detailing how they were going to comply with the controls outlined in the FSC.

CAA's General Manager, Air Transport and Airworthiness, Mark Hughes, led the CAA team involved in the Queenstown project. He says the CAA set performance objectives which gave airlines flexibility as to how they approached those controls.

"That approach allowed the airlines to choose the combination of technology, training, and procedures best suited to their operation to achieve safety objectives and to obtain CAA approval."

Graham Cheal says to comply, Air New Zealand invested in technology such as Head Up Display (HUD) which gives increased stability of approaches and better touchdown positions for landing.

The airline also invested in a Runway Overrun Prevention System. This continually calculates the aircraft's energy state (airspeed, wind speed and direction, etc) and will warn the pilot if the landing distance required to stop is greater than that available.

The airline also imported a human factors specialist from England, who brought with him, among other things, electronic 'eye-tracker' glasses worn by the pilots during sim training for Queenstown night operations. The trainers could see exactly where pilots were looking during different phases of flight.

Graham Cheal says the biggest controls the airline worked on were the weather limits and how to determine an effective decision altitude.

"In the simulator we started with the worst possible visibility/ cloud base and then slowly improved the weather looking for improvements in visual cues and performance. One of the different techniques at night is to have a higher cloud base limit than the decision altitude. That gives the pilot time to build their situational awareness before having to make their decision to continue the approach."

Twenty-four Air New Zealand crews went through special training, with the captain exposed to 'overlearning' – repetition of a task to take skill way beyond proficiency. At the same time, the first officer, separately, was learning specialist monitoring skills.

"The OSC was, like the FSC, a very comprehensive job. For me, it was eight months of up to 14-hour days," says Graham Cheal.

It was a process from which traditional commercial rivalries were absent, with the pilots of Air New Zealand and Jetstar collaborating on finding answers to issues raised by night operations.

"We worked together in the FSC workshops, identifying risks and solutions. And later during the OSC process, we shared data, we compared the results of the sim. Sometimes we'd solve some problem and share that with them. Other times they'd solve something for us," says Captain Cheal.

Meanwhile, on the ground, the runway was being widened from 30 m to 45 m – to diminish the risk of an excursion – and its surface greatly improved. A comprehensive airfield lighting project, managed by Airways, was under way.

"That was certainly a lesson in coordination," says Mike Clay, Queenstown Airport's General Manager, Operations. "For six months, every night the runway would be handed over to the Downer/Beca team who were doing the actual upgrading, and they handed it back ready to go before the first scheduled flight next morning."

Technical Director for Airports with the engineering company, Beca, is Tristan Hughes. He notes that the construction team was acutely aware of the potential safety risks to aircraft, including Foreign Object Debris (FOD) from construction. Downer carried out FOD walks each morning before handover to airport operations.

"Contingencies were also put in place should equipment fail. We had replacements ready, and even a crane was on standby to lift an immobilised piece of equipment off the runway."

Over at Queenstown Tower, things were a little more straightforward.



On finals for Runway 23 Queenstown: the Head Up Display in the Air New Zealand A320 simulator. Photo courtesy of Sam Goris.

"Our big piece of work was three years ago," says Clayton Lightfoot, Chief Controller. "We put in a Performance Based Navigation route structure, which reduced the complexity of Queenstown's airspace, and allowed us to more than double the traffic we could handle."

"In terms of night ops, more than half our staff trained and worked elsewhere, including at night, and the rest had to learn only a few subtle things about visual separation at night."

"All we really needed to teach staff was which switch to push to turn on the lighting!"

Mark Hughes says the communication, collaboration, cooperation and coordination of everything and everyone involved made the massive project a pleasure to be a part of.

"When you distil it down, for the CAA team, it was an application to extend the privileges of a document holder and a certification exercise. It was just a very, very big one, involving lots of participants."

That approach was echoed by Nick Jackson from CAA's Aeronautical Services.

"We had to stand back from the excitement of what the development represented, and just concentrate on whether or not the improvements complied with the Civil Aviation Rules."

Mark Hughes says the safe touchdown of NZ613 in May represents a great result for everyone.

"It means an increase in the operating window, thus an increase in capacity, which is good from a commercial point of view, but we have all done it in a way that is safe."

"The public can absolutely have confidence in that. It's been tested so many times along the way. I personally have full confidence in it." ■

