closecall

Certification is a crucial stage in any aircraft interior project – as Air New Zealand recently discovered when developing its new Skycouch and Spaceseat products

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It was the sort of phone call that experts in aviation certification have come to expect: "We need approval urgently," an Air New Zealand executive from Auckland told Nigel Smith, managing director of Bristol, UK-based SWS Certification. "It's about Skycouch – can you come down at once?"

Within a few days Smith was in Auckland to see the situation at first-hand. The date was November 2010 and the airline was about to take delivery of the first of an order of Boeing 777-300ERs with highly innovative seating – the Spaceseat and Skycouch – intended to help boost sales for the long-haul carrier in a highly competitive market.

Indeed the airline did have a problem. The FAA had decided they were not able to issue certification approval for Skycouch – the row of three economy-class seats specifically engineered to provide a lie-flat, flexible space – within the current regulations. That meant the seats, which had been conceived by Air New Zealand and manufactured by Recaro, could now only be used in the normal sit-down configuration instead of as planned. The FAA had ruled that the leg rests, crucial in creating the 'couch', could not be extended above 60°.

Eager to bring the concept to market, the airline had to find an alternative way to allow operation of the Skycouch in commercial service. The first aircraft was due for delivery soon and the certification had to be complete before Air New Zealand began operating the first three 777s in four months' time.

NO GUARANTEES

Smith is a veteran of certification battles. SWS, whose clients include Virgin Atlantic, Reynard, BE Aerospace, STG Aerospace and AgustaWestland among others, advises on the approvals process for cabin interiors including seating, galleys and inserts, avionics and their installation, electrical systems and structures. And as he explains, companies all too often view the certification of new products, whether seats or anything else, as a semi-automatic process.

"The certification process generally gets involved in the design programme far too late," he says. "Typically, it works like this. The senior management gives their approval to a nice-looking design concept often involving physical mock-ups. Next, the company gets into the engineering and goes

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risk rewarded

The Skycouch is a row of three economy seats with a leg rest extension that folds up to create a lie-flat space all the way to the seatback in front. The product is available on Air New Zealand's new 777-300ERs, flying between Auckland, Los Angeles and London. It's specifically aimed at couples in search of some extra room, and parents travelling with children. Meanwhile, the premium-economy Spaceseat features a hardback shell so a passenger in front cannot recline into the personal space of the person behind, with recline created by a base that slides forward and angles up. The centre seats angle outwards from each other for privacy, or can be combined so couples can snuggle up or dine at a common table, while window seats are angled to offer privacy for individual passengers.

"The majority of our long-haul flights are overnight and we fly on average 90 minutes longer than any other airline," explains Ed Sims, group general manager of Air New Zealand. "That's why we set out to overcome the seemingly impossible challenge of finding a way for people to lie down in economy without compromising affordability. Few airlines have invested time and money beyond first class, whereas we have focused on the areas where most of our passengers sit, by reinventing every aspect of our economy and premium-economy customer experience."

The airline's efforts haven't gone unnoticed – the Skycouch won the Crystal Cabin Award for Passenger Comfort, and 'best furniture design' from *Design Week* magazine. Meanwhile, the Spaceseat has also won its fair share of gongs, including a Wallpaper design award and a Red Dot 2011 product design award. But it's not just about prizes – more than 30 airlines have been in contact with Air New Zealand regarding the new seats and formal negotiations are under way with carriers from Asia, North America and Europe to license the seats following an 18-month period of exclusivity for Air New Zealand.

02. With its leg rests fully extended, the Skycouch provides plenty of room for couples to stretch out
03. Skycouch arm rests stow fully flat to aid comfort and access

looking for manufacturers. And that's when things tend to run into trouble. Certification and approvals should be embedded in the entire process from the very start."

The product itself is often only part of the process. "The process has to take into account the proposed installation, type and location of operation, and the regulators involved among other matters," he adds.

POWERS OF PERSUASION Some aviation manufacturers already know this. When STG Aerospace was designing its award-winning wireless emergency primary power system (WEPPS) – a "fit for life" product that manages the system in the event of a breakdown – it involved SWS from the outset and the relationship helped gain certification for many types of aircraft. For Ben Brown, STG Aerospace's director of operations and quality, this is only common sense.

"Certification must be concurrent with engineering," he says. "If it isn't, you'll get into trouble. When you embark on the development of a product, the certification requirements will be the key drivers in determining the design assurance level that must be met. It will fundamentally affect the architecture of your product – and that's not something you simply tweak once the product is designed. You then need to add your own requirements for robustness. Authorities are concerned only with a product's safety, not with how good it is."

SCREEN TEST Generally, it's the most interesting and innovative products that attract the most attention from regulators. When a major carrier came up with a first-class cabin featuring electrically operated sliding doors, it ran into a last-minute, highly technical debate about whether these were to be classified as 'doors' or 'screens'. Among other issues, the certification process had to resolve whether the doors would open in the event of a technical failure or risk injuring the occupant during normal operation.

There's a better and ultimately more efficient way and that's to view certification as an integral element of the creative process and not as an innovation-destroying burden. "We can't allow innovation to be stifled by certification issues," argues Smith.

And because it's one of the key points of differentiation, seating often attracts the most attention. "The more innovative the seat, the greater the certification challenge," declares Smith. He had worked with Air New Zealand for two years on the concept phase of the award-winning Spaceseat in premium economy, drawing up the critical path for evaluation, certification and approval, and providing a running stream of expert advice on issues as they predictably arose with such a radically different and exciting product design. In all, SWS provided some 2,000 opinions, informal or otherwise, during the conversion of Spaceseat from concept to reality.

At first sight Skycouch did not appear to present anything like the challenges of Spaceseat. The difference however was that Skycouch was being marketed as a purpose-designed, multi-occupancy three-seat berth and recreational area. It was the first time an airline had done so, certainly in economy, and that was the nub of the problem. How to approach and evaluate it?

In the case of Skycouch, the main issue was occupant safety and the potential for injury during turbulence. If individuals – adults or children – are lying prone side by side, that required the attachment of the seatbelt to the seat in front. Seating regulations are mainly concerned with the risks involved during taxi, take-off, landing and inflight

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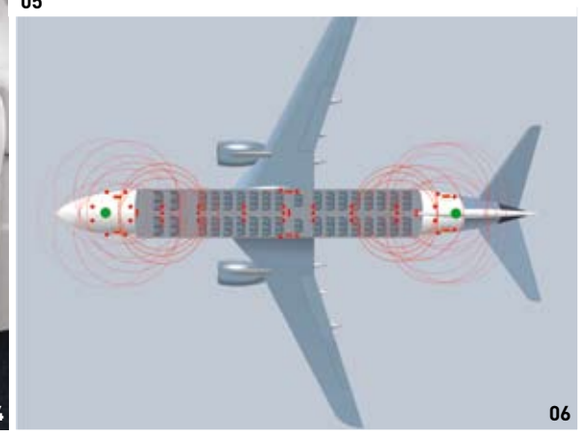

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04. Air New Zealand's award-winning Spaceseat
05. STG Aerospace's WEPPS diagnostic panel
06. WEPPS is a new-generation power system for emergency lighting, featuring a built-in wireless monitoring system

turbulence – it's all about passengers not suffering serious injury during an emergency landing.

With flammability, structural and other issues signed off, it all came down to the issue of occupancy injury because of turbulence. At that point, Air New Zealand decided it would probably not be able to win approval on its own in the required timescale. "It was felt that the assistance of SWS to provide a level of independent assessment and approval would give the regulator [New Zealand's CAA] further comfort that all aspects had been reviewed," explains Kerry Reeves, the airline's manager for aircraft programmes.

With Smith working alternately from New Zealand and Britain, Air New Zealand and SWS evaluated the entire turbulence-related flight data records for its existing 777 fleet, plus FAA and EASA research among a mountain of other material.

Wichita State University, a world authority on aviation, also stepped into the breach with analytical, finite element modelling on a wide variety of issues – the interrelationship between Skycouch and the seat in front, the effectiveness of forward-attached seatbelts, the risk of head and chest injuries for adults, children and infants of various sizes. One by one, tough pass or fail criteria were drawn up – and met. "Wichita was brilliant and extremely supportive," enthuses Smith.

Meanwhile in Europe, Recaro carried out extra static testing while Amsafe ran its specially designed seatbelts through more rigorous tests and qualification.

Finally, Smith returned to New Zealand in March 2011 armed with two boxes of files, DVDs of tests and supporting certification data, and a couple of briefcases. In March, the authority gave its approval after demanding considerable degrees of proof and testing.

Was it worth it? Reeves certainly thinks so, pointing to a welcome boost to the airline's profits: "Skycouch provides us with a significant improvement in yield because this space/seat is often unsold or under-utilised," he explains.

As challenging as the process was, the certification for Skycouch may have produced long-term benefits for the industry as a whole. There is now a vast reservoir of data that should pave the way for new kinds of passenger-friendly seating that will make the flying experience more congenial. And Wichita's dynamic model tests, backed up by a body of hard data, were able to meet the developed criteria at a much reduced cost and time. Physical testing would have required a significant amount of expensive hardware.

Smith's experience has convinced him that the entire certification process runs more smoothly when related issues and experts are involved early in the concept and design phase. The more innovative the product or application, the greater the need for early consideration of certification challenges. "The Skycouch project showed how important it was for all the parties to work together," he concludes. "This way final certification and airworthiness approval becomes a known rather than high-risk process. It also gives customers a more realistic version of their initial concept." ☒