Mirus's Falcon seat for the economy cabin is compatible with 13.3-inch IFE screens. With its 3D formed shape back shell, the seat is designed for maximum comfort with minimum additional material. Image: Mirus Aircraft Seating

The comfort conundrum

Has genuine comfort been lost in the quest to deliver passenger experience? Are we really sitting more comfortably in today's airliner cabins than those of the past or is it just a question of changed perception? Paul Eden investigates.

In June 1999, newly married, my wife and I flew from San Francisco to Hawaii on one of United's final DC-10 services. There was no passenger experience, and the cabin was that of an aircraft in its last days of service. Yet the seat was no less comfortable than what I experienced in on board several flights during 2024 and more comfortable than most. So, has seat comfort really improved, or do we just perceive that it has?

Kevin Crowder, New Product Development Manager at Mirus Aircraft Seating, says: "Nineties-era seating would have had considerably more foam padding and upholstery, with little thought to space or fuel efficiency, while today there is an ever-growing demand to balance passenger comfort with cabin densification, sustainability and passenger experience. An OEM's task is to create a seat that is comfortable, lightweight and ensures the best passenger experience."

Alan McInnes, VP Business Development at Unum Aircraft Seating, says: "Passenger comfort has evolved significantly over the years. Business Class today, with lie-flat seats, arguably surpasses the First Class experience of a decade ago. However, some airlines approach comfort as a checklist of features, which can sometimes lead to unnecessary additions that fail to enhance the passenger experience. True comfort should be a carefully curated experience that enables passengers to control their own environment, recognising that a 6 ft 6 in passenger has different needs from someone who is 5 ft 6 in."

Dr Mark Hiller, CEO of Recaro Aircraft Seating, says: "I'd respond to that question from a different angle. The ticket price on the DC-10 was probably similar or even more than an equivalent ticket today. The price equivalent now might be a premium economy,

> Ultimately, comfort is experiential. The most successful designs remove sources of discomfort and promote healthy posture.
>
> **Alan McInnes, VP Business Development, Unum Aircraft Seating**

business class or even first class ticket, and in that sense today's offer is more comfortable."

EVOLVING ERGONOMICS

"Comfort is typically subjective to the end user's ergonomics in the seat," says Crowder.

Ensuring a seat meets the requirements of as many users as possible, however, relies on multiple factors, including design, materials and physiology.

McInnes notes: "Advancements in materials and ergonomic design have resulted in more comfortable and durable seating options. Ultimately, comfort is experiential. The most successful designs remove sources of discomfort and promote healthy posture.

"Our approach to business class seating focuses on adaptability. Comfort is not static – it's about enabling the 'next most comfortable position'. Our zero-gravity position and infinite adjustability features enable passengers to find their perfectly supported position, evenly distributing body weight, reducing pressure points, and encouraging natural relaxation."

Crowder says Mirus employs a variety of tools in its design process, including pressure mapping and material combination data, and acknowledges the importance of subjective comfort trials.

"One aspect we pride ourselves on is our understanding of ergo-forming seatback shells, developing a 3D formed shape sympathetic to the comfort of the human body. The shape is complemented with foams proposed by us and approved by each airline.

"This comfort level is often tailored and quite unique to an airline's requirements. Our engineers work closely with the cover suppliers that are instrumental in ensuring the airline customer experience team is satisfied with the formula of materials that defines their customer comfort.

"Of course, there is a cost-weight exercise at play in evaluating the return on investment in materials, but an important takeaway is that more foam does not equal more comfort – ergonomics does."

LIGHT WORK

My 1999 trip included quite a bit of hopping between islands on short Boeing 737 flights.

Today the 737 is more familiar to your correspondent as a low-cost platform and here the seats are noticeably different.

Thinner squabs and backrests and, in some cases, relocated literature pockets or even none at all, are significant evolutions in seat design. Thinner, lighter seats help reduce fuel burn, which is good for profits and sustainability.

Light weight is now something all seat manufacturers strive towards, including Expliseat.

Unique in the market, its extensive use of titanium and carbon fibre poses tough engineering challenges that the company is increasingly answering in-house.

It has achieved the market's lightest seats, but titanium is expensive, so are airlines choosing to pay a premium for sustainability?

Antonio Ficca, Expliseat's VP Strategy & Marketing, says: "Our customers value the technology and consider our seats more of an investment than a commodity. We invested in technology that unlocks value for the airline, value that can be turned into investment. That doesn't mean we don't come under cost

The Unum One seat offers flexibility and, crucially, passenger comfort. Image: Unum Aircraft Seating

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pressure, because we do. We've been working to reduce costs and a major part of that has been incorporating some of our supply chain under Expliseat control."

Its technologies and materials are exotic, and Expliseat's products of course meet all regulatory requirements. But at the same time, they might be said to be somewhat minimalistic in appearance and that does not sit well in the mind's eye with comfort.

Ficca says: "We recognised early on that aluminium would not do the job if we wanted to disrupt the market. Traditional seat structures have become slimmer as the only way to lose weight has been to reduce the material used, but with our technology we can build robust, lightweight seats whose quality and functionality provide a perception of comfort, even before the passenger sits down."

Recaro's Hiller notes that appearances can be deceptive. "Seat cushions were much bigger 20 years ago and looked more comfortable. But they used a metal pan on which thick foam was placed to provide comfort. Now we use flexible fabric netting with a thin layer of foam on top. The look and feel are perhaps different, but if you consider pressure mapping and objective measures of comfort, they have improved."

Recaro is not alone in building seats for low-cost, short-haul and long-haul economy and premium cabins. In each case the airline has different requirements, but the passenger just wants to be comfortable, so how does one manufacturer satisfy a range of markets?

"Short-haul economy and long-haul economy seats need different features," says Hiller. "For short-range you wouldn't normally include heavy, expensive IFE, but you would provide power for passengers to use their own devices. For long haul, the airline wants to deliver content through a full IFE fit and for us that means integrating many more features."

LOOK AND FEEL

Passengers are unlikely to notice or care about underlying seat structure. Comfort is perceived through the sensation of sitting in it and the look and feel of a seat's materials.

Seat covers are instrumental in that first impression, promising comfort as well as presenting branding and styling cues.

Inevitably, there is far more to

Muirhead now offers a comprehensive leather seat cover service – from raw materials through design and manufacture to installation. Image: Muirhead

manufacturing seat covers than sewing fabric to fit, including lamination, where other materials are integrated with the cover.

Headquartered in Mexico, Soisa Aircraft Interiors specialises in seat cover manufacturing. The company's Chief Executive Officer, Jacobo Mesta, explains the lamination process as follows.

"It involves adding adhesive and foam to fabric, synthetic leather or leather to increase the aesthetics and comfort of the dress cover," he says. "Two types of equipment are used for lamination, depending on whether a design is to be added or not. The process then depends on the material being laminated, because the machines must be carefully set up for a good result."

Soisa also addresses that most contentious of seat items, the armrest. The company manufactures replacement armrests, a complex task.

Mesta says: "It is definitely not a case of one size fits all. It requires very artisan workmanship that needs skilled people who are not easy to find. We offer many different armrest part numbers and have a special team of seven people to engineer them. Each new project requires considerable communication with the owner of the part number to ensure we get to the perfect fit, even if our engineering teams need to make changes."

Mesta hints at the complexities of working with different seat cover materials, including leather. Long a supplier of natural leather to the airline industry, Scotland's Muirhead recently expanded its offer from leather manufacture and supply through to fitting completed cover sets.

Martin Longden, Head of Cabin Engineering at Muirhead, says the capability was established over five years but only now is the company ready to take it to a wider market.

"We looked at areas where some of our customers faced challenges. Leather is a very individual, artisanal product and many 'cut and sew' facilities are set up for synthetics and traditional fabrics, which means they struggle with leather because it needs different processes. This can lead to disagreements within the supply chain and Muirhead realised that it could provide an expert seat cover manufacturing service entirely under its own control."

The resulting products are also more cost-effective because fewer transactions are involved between suppliers, but that is of little consequence to the passenger.

More significantly, leather looks and feels like the quality product it is, and that characteristic can lift even the most cost-sensitive cabin. It turns out that Ryanair has been using Muirhead leather seat covers for the best part of a decade.

PRESSURE POINTS

It is unlikely that the DC-10 seat from 1999 was manufactured with any real consideration for pressure points or other human factors, but such modern data is now crucial to seat OEMs.

Having pioneered its technology in the automotive industry, Comfort Motion Global – CMG – is taking the science of pressure points and passenger comfort a step beyond with its Healthy Motion Seating.

Among the finalists in the Passenger Comfort category for the 2025 Crystal Cabin Awards, Healthy Motion Seating employs existing actuation systems in premium class seats to subtly adjust passenger posture, ensuring continued comfort even before the passenger feels the need to move.

Jeffrey Calkins, who is responsible for CMG's business development in the aviation sector, says: "We are seeing major airlines

High-end refurbishing

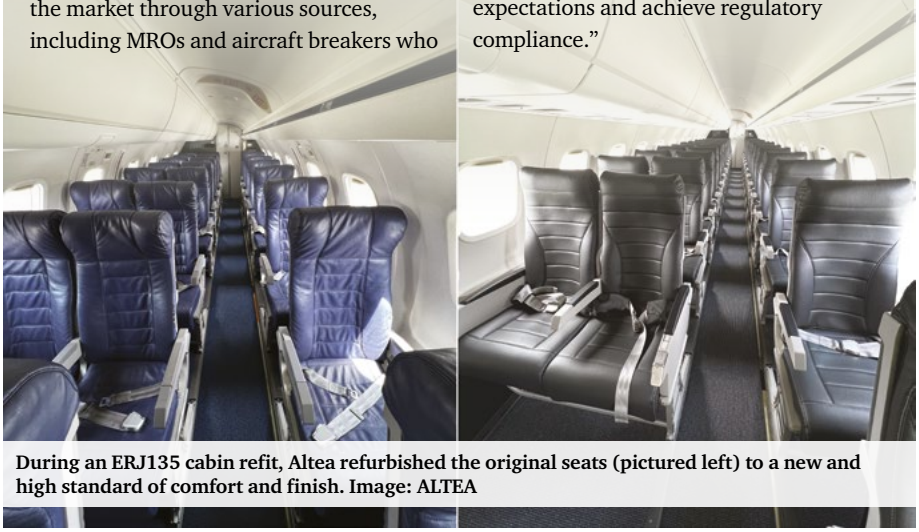
The bizliner sector might be an unexpected source for a seat recycling story, but London, UK-headquartered Altea proves that popular perceptions are sometimes very wrong.

Altea partner Robin Dunlop notes that sometimes the company will design a bizliner interior requiring several business-class type seats. Where possible, it will source used seats and refurbish them to customer requirements.

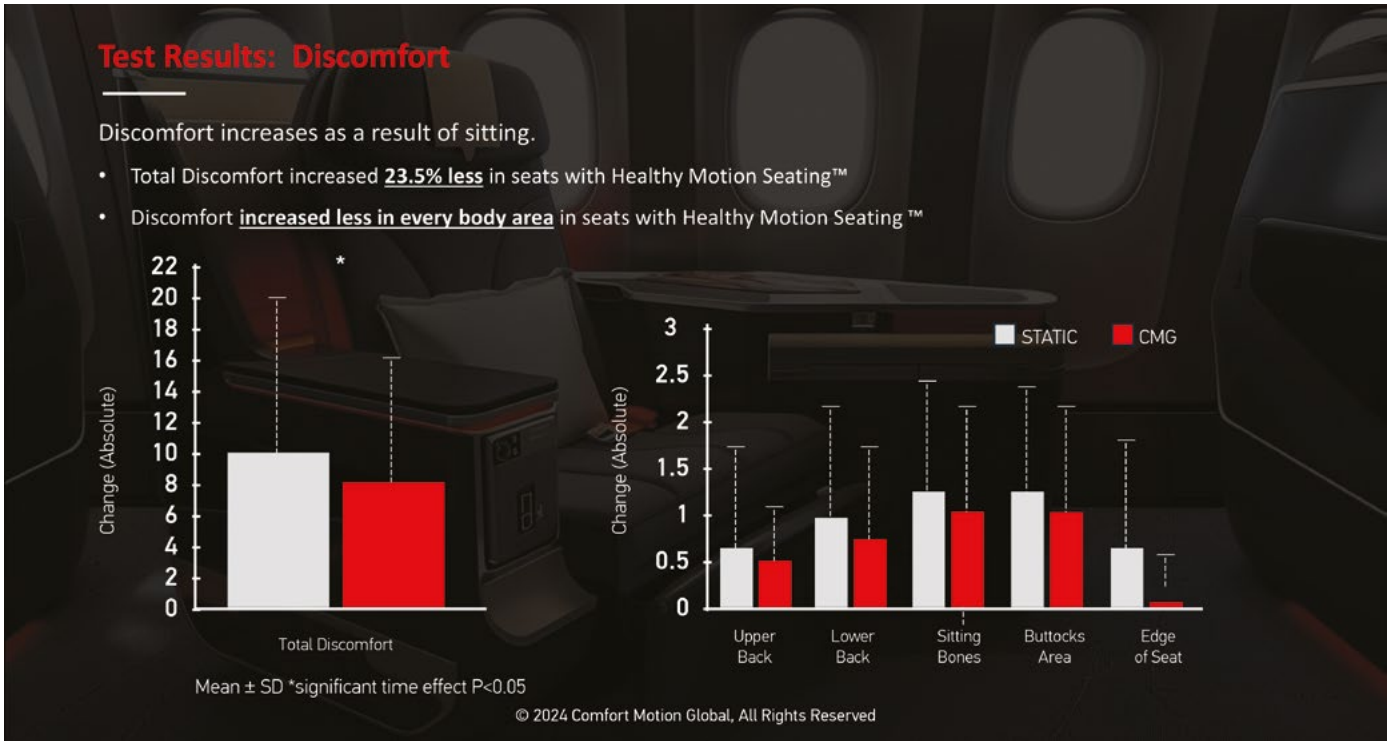
"We assess what is openly available on the market through various sources, including MROs and aircraft breakers who deal in such parts. We also have a network through which we can target aircraft undergoing reconfiguration or refit where the original seats are no longer required."

Interestingly, comfort is unlikely to be the key factor, however.

"It's normally budget and schedule that drive the decision-making," says Dunlop. "New seats cost a lot and are time-consuming to manufacture, so we'll choose refurbished seats if we can make them look great, meet customer expectations and achieve regulatory compliance."



During an ERJ135 cabin refit, Altea refurbished the original seats (pictured left) to a new and high standard of comfort and finish. Image: ALTEA



This graphic tracks discomfort and demonstrates the reduced discomfort experienced by a CMG user compared to a passenger sitting in a static seat. Image: Comfort Motion Global

with long-haul routes increasingly placing a high priority on passenger health and wellbeing. They see our Healthy Motion Seating as a differentiator."

A software application, Healthy Motion Seating significantly improves passenger comfort without adding weight.

Calkins says: "It follows the existing kinematics of the seat manufacturer. One of our key patents involves 'slowing' the motion of the actuation down to provide gentle, subtle moves from one comfortable position to another, like melting butter."

It almost sounds too good to be true, but the proof of its effectiveness is already out there in the automotive world. Mercedes-Benz and Bentley conducted extensive testing and subsequently went from single model deployment to fleet-wide within four years of launch.

HUMAN-CENTRED DESIGN

In other interesting news for seating comfort, aircraft seating manufacturer Geven, which produces a wide range of economy, premium economy, business class and regional aircraft seating, as well as other cabin interiors, has been working on a project called CASTLE.

This focuses on human-centred cabin interior design, exemplifying improvements in passenger comfort and ergonomics and addressing the needs of passengers with reduced mobility.

The project features innovative aircraft seating and uses eco-friendly composites derived from recyclable and bio-based materials.

Then there is Chaise Longue, a Spanish start-up founded by CEO Alejandro Núñez Vicente, whose two-level seating concept for widebody cabins might seem more Lego double-decker couch than realistic proposal, had it not recently been picked up by Airbus for possible application to its aircraft.

In fact, the innovative design does not directly place passengers one above the other, but replaces the central seat rows with alternating upper and lower positions.

Vicente says: "We place passengers at two different levels, one as normal and the other just a little higher. It provides each passenger with more space and greater comfort. They may fully recline their seatbacks without invading the personal space of the passenger behind, for example.

"We don't aim to increase passenger capacity, but our modules work at the same pitch used today while completely transforming the perception of space.

"The concept sits between economy and premium economy and provides a feeling of greater privacy. It also provides passengers with the opportunity to make comfort decisions never previously available.

"In a typical economy seat today, passengers choose what film to watch and between bad and slightly worse angles of recline. We allow them to make a whole new choice, between economy, lower centre economy and upper level economy."

Vicente and his team have already thought carefully about access to the upper seats, how cabin crew will serve them and how to manage airline executive and passenger perceptions.

Testing is continuing under the added impetus of Airbus involvement, promising comfort well beyond that of the overly padded seats of 25 years ago. ■