



Hangars are now being equipped with advanced Wi-Fi and data transmission capabilities to accommodate the widespread use of tablets and other digital technologies in hangar operations. Image: iStock

Cover story

Aircraft hangars at regional airports are undergoing transformative changes driven by technological advancements, evolving operational needs, sustainability considerations and client demands for efficient and environmentally friendly structures. Paul Sillers gets the inside scoop.

Recent advancements in building materials, such as insulated metal panels and pre-engineered metal buildings, offer enhanced durability and cost-effectiveness for the next generation of aircraft hangars.

Moreover, the integration of advanced IT has revolutionised hangar operations.

"We're finding that the equipment we use to service, monitor and store aircraft has improved because now we're eliminating paper and dealing with digital databases," says Ted Oberlies, Senior Vice President at Ghafari Associates, a global architecture, engineering and consulting firm that has designed hangars for such carriers as Southwest Airlines, American Airlines and Azul Brazilian Airlines.

"People are walking around the hangar using tablets, therefore we're starting to design these facilities for what we've termed aviation 4.0 – an adaptation for aviation of the fourth generation of the Industrial Revolution.

"That includes information science and the Internet of Things for anything that affects the health monitoring and servicing of aircraft, whether that's your Dassault private jet or a Lufthansa Cityline regional plane."

Ghafari Associates recently built a new regional maintenance centre at a small airport in Kansas for American Airlines' Embraer 175 regional jets.

"And the only difference between that hangar and a hangar that we have

designed for A321s or even Boeing 777s is the dimensions of the building," Oberlies tells *Regional Gateway*. "Otherwise, the utilities, the technology are the same."

ADVANCED WI-FI AND ROBOTICS

Ghafari Associates is now outfitting hangars with advanced Wi-Fi and data transmission capabilities because, says Oberlies, "we're going to a more digital arrangement with respect to everything that touches the aeroplane. That means getting maintenance task cards on a tablet and ordering parts from the iPad."

That increased use of data inside the hangars necessitates improved cellular transmission capabilities, so cellular devices and repeaters are being installed inside these spaces to ensure staff and employees have consistent cell service.

Looking ahead, Oberlies says that the adoption of autonomous and robotic technologies in aircraft maintenance is expected to increase. This will necessitate cleaner environments with robust data transmission and electrical infrastructure to support both current and future needs.



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“We’re seeing 20 to 30 per cent increases in the electrical infrastructure that we’re putting in to provide for electrification of support vehicles needed to service the aircraft inside and outside of the hangar. In the case of regional airports and fixed base operators (FBOs), we’re also provisioning for electric customer vehicles – the cars they’re driving to and from the hangar.”

Further into the future, Oberlies says, “the imminent arrival of electric aircraft, such as the Eviation Alice, presents further challenges and opportunities for hangar design”.

These aircraft will require specialised provisioning for charging and maintenance.

On the sustainability front, LEED certification – Leadership in Energy and Environmental Design – is a pivotal factor in modern hangar design.

Initially developed to promote environmentally responsible building practices, LEED has evolved through various versions, with LEED v5 set to roll out soon.

These standards encompass energy efficiency, material selection and site sustainability.

SHIFTING FOCUS

Ben Bakas, Architectural Department Manager at Burns & McDonnell, a leading engineering, architecture and construction firm that has designed over 150 hangars, says there has been a significant shift towards sustainability in recent years, contrasting with a past focus on cost-efficiency and rapid project completion.

Today, achieving LEED certification often sets the benchmark for hangar

project success, although implementation varies depending on client priorities and budget constraints.

“The cost of construction in hangars has just exploded,” says Bakas. “And I think that’s a shock to many of our clients to find out how expensive the construction and materials associated with these buildings have become, especially post-Covid.”

The choice of materials plays a crucial role in sustainable hangar design. low-VOC materials (volatile organic compounds can be harmful to humans and the environment), recyclable components and energy-efficient HVAC systems (heating, ventilation and air conditioning) are integral to minimising environmental impact and operational costs.

However, meeting stringent energy codes and exploring all-electric options inevitably impacts the economics of hangar design and construction.

“The way that our clients budget for construction doesn’t apply any more,” says Bakas. “A lot of our clients use historic metrics to establish a budget and get funding for projects. And then we tell them, we as a designer/builder get actual market pricing from several

Sustainability was a key consideration in Ghafari Associates’ design for the AA hangar at Chicago O’Hare. Image: Ghafari Associates





contractors that do this type of work, and realise these are the prices. This is what's happening – we can't really control what the market is doing."

PHASED APPROACH

To tackle these economic challenges, Bakas cites an example where a "very cost-conscious" client is implementing a new hangar in stages.

"We're working on a hangar which has a tensile PVC-type composite roofing fabric structure that is tensioned and spans across that frame like a big tent with some structure underneath it."

The airline client wants the ability to add on a second hangar and eventually relocate those hangars to another position at the airport. Burns & McDonnell looked at a variety of options, and fabric buildings were deemed to be the most cost-effective type, offering the potential for being mobilised at some future time.

To facilitate the process, Bakas explains that his company carried out a "design charrette" – an intensive working session where all the stakeholder designers, architects and engineers, as well as the owner and the operator, convened to define the project parameters.

"We talked about the current and future aircraft fleet that the airline plans to store or maintain in the hangar. Newer aircraft may have a wider wingspan or the tail may be taller, so you have to make provision for a taller door opening or a wider building.

"Then there were questions of whether platforms and equipment must be accommodated in the hangar, whether integral maintenance shops might be included and how many employees are going to work in that space.

"Then we calculated the turning radius for different aircraft types and

Blue Grass Airport's new hangar reaches the home straight



The new hangar at Blue Grass Airport will be able to hold large business jets. Image: Blue Grass Airport

Lexington, Kentucky, renowned as the horse capital of the world, owes its equine prominence to the calcium-rich limestone in the ground that strengthens horse bones.

This unique feature attracts horse enthusiasts and buyers globally.

The city's Blue Grass Airport, which serves 1.4 million passengers annually, plays a crucial role in accommodating the influx of visitors arriving for horse sales held throughout the year.

During these events, the airport's ramps are filled with various aircraft sizes, from two-seater piston aircraft to large corporate jets, reflecting the diverse

international interest in Lexington's horses.

This incoming traffic necessitates robust infrastructure at the airport to store large aircraft, ensuring that visitors can conveniently and securely house their planes during their stay.

"The biggest trend we're seeing is that aircraft owners, within the last 10 years or so, are wanting larger hangars that align with aircraft production trends right

now," says Travis Crilly, VP Commercial Development, Blue Grass Airport.

"Manufacturers are producing bigger aircraft with larger and more efficient wings, so hangars need to be adjusted."

Crilly says: "The owners of aircraft of that size and associated dollar value always want those planes protected to the [fullest] extent practicable. The concern for the Lexington area is when we have significant thunderstorms in the spring, summer and fall – coinciding with horse auction seasons – and those owners are willing to pay the rates to put their aeroplanes under cover."

To address this need, Blue Grass Airport

is in the midst of a comprehensive multi-year expansion plan, integrating both commercial and general aviation needs.

This plan includes construction of a new 50,000 square foot hangar with 30 foot high doors designed to accommodate such business jets as the Global Express 7500/8000.

The new hangar is expected to be completed this autumn.

Lexington's geographical constraints and rolling hills pose challenges for further development, but the airport's commitment to meeting these demands is evident.

From the customer experience angle, a small portion of the new hangar has been designed as a waiting reception area.

Blue Grass Airport's Amy Caudill, VP Marketing and Community Relations, says: "One of our goals in this area is to create a sense of place, just like an airport terminal. We want people to feel like they are in Lexington as soon as they arrive.

"So we definitely are looking to try and incorporate equine artwork and things that reflect our region. That's really important to us to make sure that everyone feels like they're in Lexington as soon as they get here."



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ensured clearances are maintained to make sure that they can get in the future aircraft that they want to access the building."

ROBUST DIGITAL FRAMEWORKS

Another aspect that is becoming more prevalent in hangar design is AI-driven security systems and digital infrastructure management.

Increasing cybersecurity concerns underscore the importance of robust digital frameworks and back-up power systems to ensure operational continuity during disruptions.

"We're seeing a lot more interest in AI and security and cybersecurity," says Bakas. "There's a lot more hacking going on these days, so the digital technology folks are pretty well engaged with us during the design process to make sure



that we have inbuilt resiliency and redundancy, including back-up power for critical infrastructure. It can be costly to do that, but the cost of that initial expense is saved the first time you have an impact."

AI, he adds, is becoming a new focus for their clients and aligns with digital building management systems that monitor and optimise energy usage of their buildings.

And from the security angle, the integration of AI into hangar security systems is essential for intrusion detection and loss prevention.

"We have hangar facilities that have storage for aircraft components, and these parts are really expensive," says Bakas. "Our clients want to make sure that those parts stay where they're supposed to be and don't walk off." ■

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