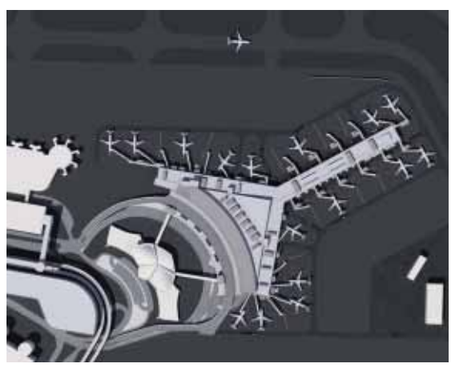
JETBLUE AIRWAYS TERMINAL

Steel Takes Flight

The swooping, winged roof. The distinctive purple, peaked windows. The retro-futuristic lobby, with its egg-shaped timetables. Eero Saarinen's Terminal 5 building at John F. Kennedy International Airport is arguably the most famous airport structure in the world. But despite these distinctive features, the terminal has lain moribund since 2001, when TWA went out of business. The chief reason: It was rendered in concrete, making the building's outdated structure almost impossible to retrofit. In the fast-paced and, at times, turbulent nature of the modern airline industry, this is a major hindrance to progress. That is why the designers of the new Terminal 5 for JetBlue Airways turned to structural steel, which provided unmatched flexibility and economy for the hyper-efficient, cost-conscious airline.

"Structural steel framing offers airport terminals the ability to be as flexible as possible with future programming," says Cliff Bollmann, a senior associate for Gensler. "With the introduction of new aircraft, gates may change around, floor areas might change, areas once underutilized as hold rooms might become concessions. The greater flexibility and more column-free floor plate a structural system offers is tremendously appreciated and makes going to a steel system really a no-brainer."

Previous The new Terminal 5 subtly references Eero Saarinen's architectural ode to flight.
Facing Two elevated walkways, framed in structural steel, link the original terminal to the new one.
Above The galvanized corrugated steel deck gave the designers the aesthetic they were looking for without need of additional finishing.
Below Site plan



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Above: © Prakash Patel courtesy of Gensler; drawing: Gensler

Nowhere was this flexibility more paramount than in reconfiguring and expanding the terminal's security facilities, some of the first that were designed ground-up after 9/11. "In the past, you had banks of check-in counters with a few security checkpoints, but with Internet check-ins, fewer bags, and heightened security concerns, we've been able to flip that," says Bollmann of Gensler's approach to the challenges of a post-9/11 terminal. The entry hall at Terminal 5 contains a few dozen e-ticket kiosks and a handful of luggage counters that flank a massive 20-gate security bank, which is designed to get customers through the discomfiting screening process as quickly and comfortably as possible.

According to Bollmann, it was crucial that the entry hall employ structural steel to ensure it could accommodate a continually evolving security technology (during the four-year design process, the security systems changed more than half-a-dozen times). The construction involved a relatively standard column and deck system utilizing wide flange members of ASTM A992 Grade 50 steel. The erection was completed piece-by-piece using mobile cranes, and connections between the members were, for the most part, made with high strength bolts, ASTM A325 and A490. In the ticketing hall, girders varied from W24x68 to W36x194 and beams ranged from W10x12 to W24x76. The concourse's girders were typically W33x130 at exterior sections and W36x150 at interior bays, and the beams ranged from W16x26 to W24x68. The concourses were also edged with W33x118 beams installed on their sides, 13 feet 6 inches above the floor and supported at third points with steel rods, creating spans of 42 feet. These members function as a wind girt system and allowed framing the concourse's curtain wall and window sections in light gauge metals without using supplemental hot-rolled steel backup members.

The real drama in the 750-foot-long crescent-shaped entry hall comes from an elegantly uncomplicated but striking roof structure. The designers wanted a column-free space that would provide an inviting, uncluttered gateway with unimpeded circulation. By employing galvanized corrugated steel, the designers not only got the strength they needed for the roof but also an attractive covering that did not need additional finish, thereby saving money, a chief concern for a cost-conscious carrier like JetBlue.

The corrugated deck employs radial-cut sheets that widen from 6 to 7 feet along their considerable 72-foot length. The material is 18 gauge 1½-inch decking made from Grade 50 steel. Lateral joists that support the deck were field welded in place, adding to both the visual vitality and structural drama of the roof. "It became the structure, the infill, and the finish all at once," says Joel Stahmer, the project engineer at Ammann & Whitney. "I don't think you get much more efficient than that." The designers took a similar approach on the far side of the security gates, in the marketplace, where travelers will spend the bulk of their time. "We now get everyone through security so quickly we need a place for them to decompress," says Bal Cherwoo, principal-in-charge at Ammann & Whitney. "We wanted a space that was both comfortable and impressive, but not ostentatious."

Bollmann, who described the marketplace as a "civic gesture," said the team looked at more than 20 structural solutions to the vaulted triangular space, off of which shoot the terminal's three concourses in a Y-shaped configuration. The team settled on a king post truss. "It's a very utilitarian way to support our roof that also provides a very dynamic elegance," says Bollmann. "Plus, it educates. By exposing that structure and leaving it open to the public, we can expose them to how the room stands up." The king post truss uses a W14 top chord, a 6-inch-diameter schedule 40 pipe for the post, and a 1½-inch-diameter Grade 105 rod for the lower tension rod.

Above and facing The steel trusses in the 750-foot entry hall created a flexible, column free space capable of adapting to the airline's future needs.

Overleaf In addition to lending flexibility for future uses, structural steel helped the designers adapt to changes in security technology during the design process.

This spread and overleaf: © Prakash Patel courtesy of Gensler

While much of the structural steel in the terminal was left exposed for aesthetic reasons, the chief concern was cost. "We had to justify everything, every last bolt," Stahmer said. With such value engineering involved—the massive project cost a mere $800 million—the design team looked everywhere for efficiencies. At the hold rooms for the gates, this meant adding an additional column—from three to four in the 35-foot spans—that meant less of an open entryway above ground but also the ability to use the same columns to support the massive baggage handling system below. "It's one giant conveyor," Stahmer joked. "Essentially the building we're doing is built around a baggage system."

But the role steel played in accommodating this, as well as the rest of the terminal, was no joke. "Steel did everything," Bollmann said. "It drove the efficiency of the space, the aesthetic, everything. We would not be in the same place if we were using other materials, we would have had to create a totally different design, one that frankly might not have worked, at least not on the budget we had." And JetBlue could not be happier. "From day one, when we hired Gensler, we made sure that they understood our brand, our approach, and that the building really needed to express and embrace that," says Richard Smith, the project manager for the airline. "I don't think they could have done a better job." M

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Cliff Bollmann, a senior associate for Gensler

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Location: **John F. Kennedy Airport, New York, NY**
Owner: **jetBlue Airways Corporation**, *Floral Park, NY*
Architect: **Gensler**, *New York, NY*
Structural Engineer: **Ammann & Whitney**, *New York, NY*
Mechanical Engineer: **Arup**, *New York, NY*
Construction Manager: **Turner Construction**, *New York, NY*
Curtain Wall Consultant: **Gilsanz Murray Steficek**, *New York, NY*
Structural Steel Fabricators: **Helmark Structural Steel Inc.**, *Wilmington, DE*; **Beauce Atlas, QC**, Canada
Structural Steel Erector: **Falcon Steel Erection**, *Wilmington, DE*;
Miscellaneous Iron Fabricator and Erector: **FMB Inc.**, *Harrison, NJ*
Architectural Metal Fabricator and Erector: **Champion Metal & Glass, Inc.**, *Deer Park, NJ*
Ornamental Metal Fabricator and Erector: **Champion Metal & Glass, Inc.**, *Deer Park, NJ*
Metal Deck Erector: **A.C. Associates**, *Lyndhurst, NJ*