How Orlando International built passenger experience and technology into its new South Terminal Complex

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Abstract

In the opening years of the 21st century, the City of Orlando transformed itself into one of the premier destinations in the United States. Fuelled by its innovative entertainment and theme-park industry, Orlando expanded steadily into a balanced mix of research and development, aerospace, *information technologies and healthcare and tourism, augmented by a growing population and attractive environment. The Orlando International Airport reflects these trends, and after several initiations in the development of its south campus, which were deferred by economic downturns, the Greater Orlando Aviation Authority (GOAA) realised sufficient, sustained traffic growth and commenced the planning of a South Terminal Complex in 2012. As airport technological advancements exploded in the years following 2001, GOAA imagined the new South Terminal facilities to be not only state-of-the-art, reflecting the vibrancy and hospitality of Central Florida, but also incorporating technologies seen only in the world's most visionary airports. Pivotal to the South Terminal vision was the elevation of the passenger experience, known by GOAA and the Orlando community as The Orlando Experience, to a new world-class level. Achieving this vision within the many practical boundary conditions that face airports everywhere — efficiency of movement, cost management, operating flexibility for air carriers etc — demanded a novel approach to terminal development. GOAA undertook a conceptually simple but rarely practiced programme to create a practically remarkable passenger facility. This paper examines the background, approach and delivery of GOAA's successful programme, focusing on integrating technological components and innovations into a large capital programme. Also, while technology and innovation have become the handmaidens of elevated passenger experience for airports, rarely have they been built into the design and construction of a new facility at the scale of Orlando.*

Keywords

airport development, airport technology, Orlando International Airport, multimedia systems, airport design, airport construction, innovation, airport customer experience

ORLANDO AIRPORT DEVELOPMENT

Since its inception as a joint military–civilian facility with McCoy Air Force Base, the Orlando International Airport (MCO) has grown with Central Florida, first as a gateway to Walt Disney World, and gradually becoming the fourth largest origination and destination airport and 10th busiest airport in the United States. As Orlando's economy grew and diversified, MCO grew in passengers, flight operations, destinations and air carriers — adopting its own distinctive persona as a reflection of the hospitality and customer service in the area.

The existing North Terminal Complex (NTC) was conceived as a hub-and-spoke facility, with a central processor serving four remote 'airsides' — or passenger concourses — via automated people mover trains (Figure 1). The configuration served the airport well as passenger enplanements advanced towards 30 million per year, but as traffic continued to surpass this level and approach 40 million, GOAA realised additional capacity was required and that the NTC was unable to accommodate this growth (Figure 2).

SOUTH CAMPUS DEVELOPMENT AND ECONOMIC UNCERTAINTY

GOAA had long envisioned the development of a south passenger campus and reserved land for the expansion. Early concept and design work for the 'South Terminal' had commenced twice and been suspended as traffic flattened or dipped slightly (the economic recession of 2008 and the aftermath of the 11th September, 2001,

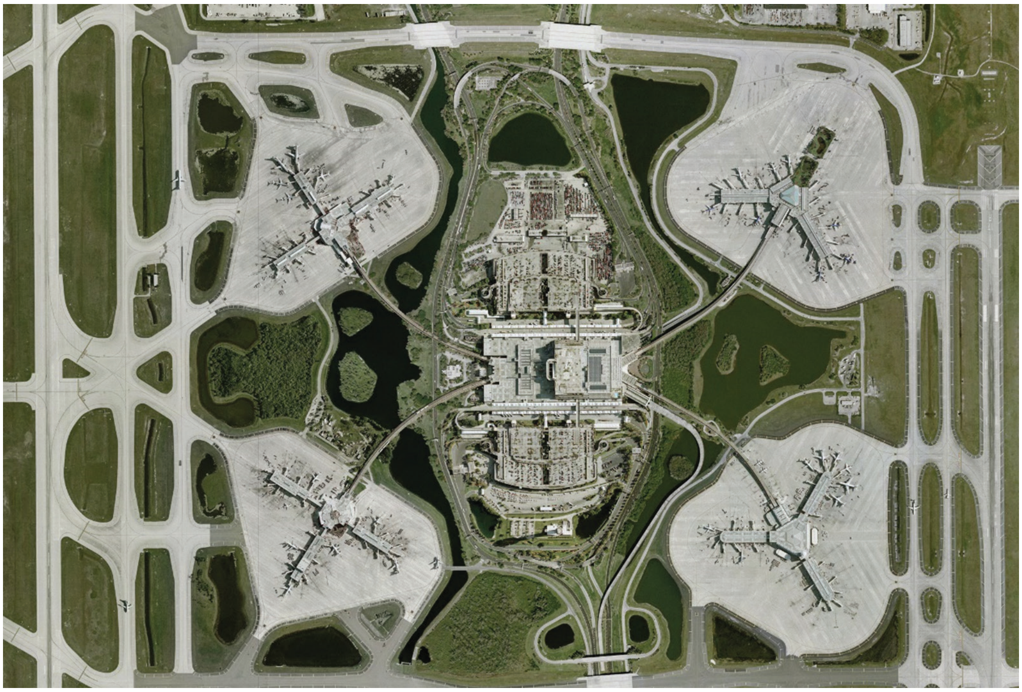

Figure 1 Aerial view of existing North Terminal Complex

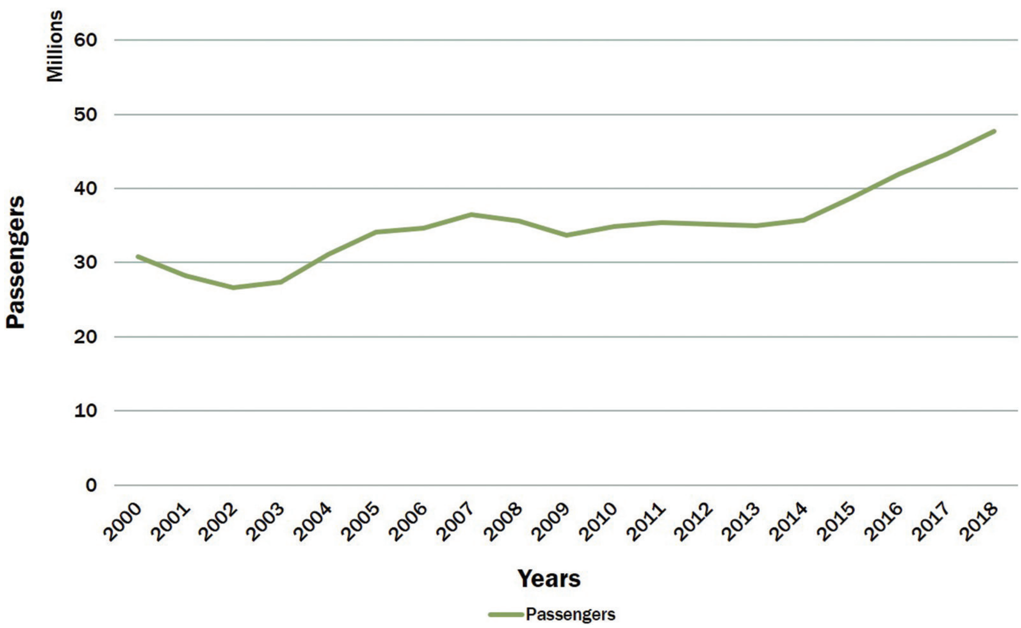

Figure 2 Orlando International Airport passenger traffic trend, 2000–2018

attacks, respectively). A sustained growth trajectory and confident long-term outlook prompted GOAA to undertake the third incarnation of the South Terminal Complex, differing in geometry and incorporating significant multimodal elements from light and regional rail connections.

A Note to Readers: Throughout this paper, the terms 'Orlando South Terminal', and 'South Terminal Complex (STC)' will be used interchangeably in reference to the complex of buildings on the south campus, including the south automated people mover station, intermodal transfer facility, landside–airside terminal buildings and associated parking garages.

THE CHALLENGE

Aspirations to world class

The 2021 adaptation of the South Terminal C Phase 1 (opening in 3Q 2021) is envisioned as much more than the initial addition of 19 jet gates. Serving as Orlando's international gateway, the STC provides a stimulating experience for both arriving and departing passengers, whether Orlando is home or a destination. The STC is a multimodal facility that connects air, rail (commuter and regional Virgin Trains USA) and surface transportation for more than 40 million people annually. GOAA and its design team insisted that the new facilities embody an updated and progressive version of the venerated Orlando Experience — the eponymous term employed by GOAA to describe a memorable travel experience at Orlando International Airport.

GOAA fastened its sights on airports that were most admired in the world and travelled to many of them to seek out both education and inspiration for their new terminal. The GOAA team, which comprised several of its senior executives, such as the Director of Engineering and the Chief Information Officer, concluded that technology innovation needed to be a foundational element of the STC and that it was to be an integral part of the building programme from the beginning. The team came to believe that the innovation element should be viewed on equal footing with the architectural design — and in fact should be part of that design.

This was the challenge at its most fundamental level: How to bring an exciting and critical piece of The Orlando Experience 2.0 into a large capital undertaking in an industry unaccustomed to this new reality?

The design team was led by Fentress Architects (design architect), HNTB (architect of record) and Burns Engineering (technology and multimedia engineering). GOAA asked this triumvirate to collaboratively develop ideas that could make the STC world class in a uniquely 'Orlando' way (Figure 3).

INFLUENCE OF LOCAL ECONOMY AND CULTURE

Although theme parks and entertainment-based tourism continue to be one strong basis for the economy of Central Florida, it is not the sole foundation. The area remains rich in agriculture, particularly fruit growing, boasts abundant waterways and has developed significant industrial strength in medical research, technology and military/space research. The University of Central Florida has become a national leader in academic research and innovation.

As a result of economic and cultural diversification, GOAA emphasised a broader edition of The Orlando Experience for the South Terminal. The passenger experience was conceptualised as welcoming visitors as well as acquainting them with the 'New

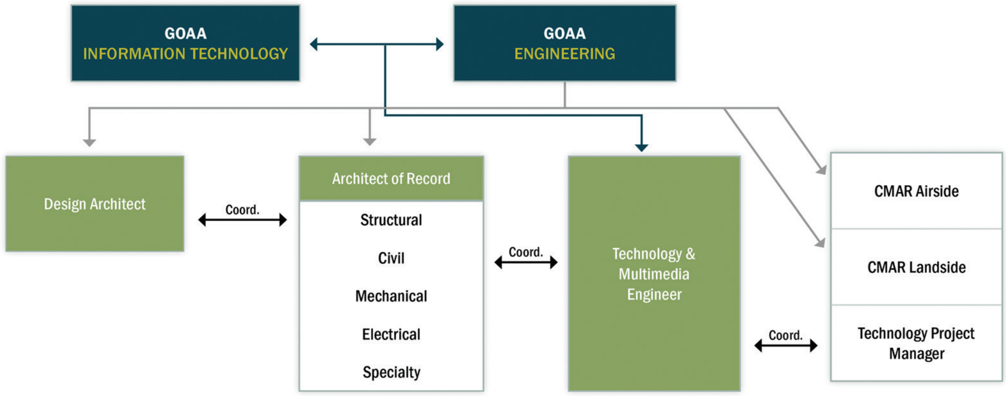

Figure 3 South Terminal Complex project team organization concept
Notes: CMAR, construction manager at-risk; GOAA, Greater Orlando Aviation Authority.

Orlando', an exciting gateway to the vibrant culture of Central Florida.

PRACTICAL PARAMETERS

Every significant capital project runs into the limiting conditions that are intrinsic to airport terminals. Projects like the Orlando South Terminal that aspire to elevated aesthetic and hospitality objectives are even more attuned to practicalities. In the case of the STC, the most pressing parameters are efficiency of movement (both passengers and baggage), capital cost and air carrier accommodation.

The design team was conscious of these conditions and devoted extensive efforts throughout the planning and engineering programme to keep the limiting requirements satisfied (as will be shown later in this paper). Although incorporating innovation into the STC from the start was a departure from traditional capital design and construction methodology, it proved prescient, as most of the technology innovations introduced enhanced efficiencies and lowered costs.

Approach to capacity building

In recent years, the American heavy construction industry has made strong advances in the delivery of complex projects with alternative models to the design–bid–build strategy. Driven in part by the demand for additional airport capacity in the shortest time possible and at competitive costs, nearly all construction contractors, design firms and airport operators have successfully employed variations of design–build (DB), progressive design–build (PDB), construction manager at-risk (CMAR) and integrated project delivery (IPD) schemes. Several new airport-terminal facilities delivered under these approaches have appeared over the past five years.

GOAA has experience with alternate delivery methods and chose the CMAR model for the STC landside and airside terminal construction. The factors involved in this selection relate directly to GOAA's aspirations for the new terminal.

In some manifestations of integrated delivery, particularly design–build and public–private partnership models, the airport operator sacrifices a great deal of participation and design control in return for risk reduction. GOAA has developed a strong body of experience and technical preferences that have served it well; this experience crosses all engineering, architecture and IT (information technology) disciplines. This institutional strength, combined with the desire to create a remarkable facility in addition to adding capacity, led GOAA to consider delivery approaches that allowed a greater degree of design influence.

A point that is too often overlooked in the development of airports facilities is the expertise of the airport operator. With the CMAR delivery process, however, GOAA could (and does) participate actively in the planning and design of its new terminal, allowing them to utilise their experience and expertise in the most beneficial way. The CMAR process also allowed GOAA's technology priorities to receive full attention. Guaranteed maximum prices could be established later in the design process when technology and innovation had been built into the design.

In this respect, GOAA developed a unique approach to capital development that reflects their situation and culture. In addition, the GOAA approach allowed greater focus on the passenger experience, which can often get diminished in construction-heavy development approaches.

Approach to technology integration

A current state-of-the-art passenger terminal relies on 20 technology systems — at the low end. Some facilities may have up to 40 different systems, including software applications.

The approach to technology and systems was to divide them into three broad categories:

- Base building systems, such as fire alarm, building automation, paging and communication systems
- Passenger customer service and employee facing technologies such as common use self-service (CUSS), Common Use Passenger Processing System (CUPPS), access control, customs border protection (CBP) processing and baggage systems
- Advanced technology systems, such as multimedia, wayfinding and automated aircraft boarding

Not all of these systems are intuitively obvious to design teams unaccustomed to dealing with them. Many of these systems, however, interact with one another — some exchange data, others interlock in conventional relay approaches, while certain systems require data connectivity provided by a consolidated infrastructure.

In the case of the South Terminal — a greenfield development in an existing airport campus — some systems are extensions of existing or 'legacy' systems, and new systems need to be compatible with existing ones so that GOAA does not end up with multiple systems serving the same function.

Adding to this complexity was GOAA's requirement that they purchase certain hardware and software themselves, rather than rely on the CMAR contractors. The result was a highly interwoven schema of technology, differing in design and procurement approach, with many points of integration. This reality dictated a systematic programme so that the entire puzzle could be understood broadly at the outset.

A key feature of the Technology and Multimedia programme for the STC is the introduction of high-impact, large-format multimedia features throughout the terminal. These features provide some of the visual 'wow factor' and frisson that GOAA envisions for its terminal, allowing visitors to experience arrival and departures in visually exciting and memorable ways.

The creative team of MRA International and Sardi Design coined the term experiential media environment (EME) to refer to a series of imaginative digital media installations throughout the terminal, each of which is architecturally integrated to the STC flow and function. The EME features demand a unique set of technologists and creators to define media concepts, content development and delivery, and specialty engineering for audio-visual control and unique structures.

In totality, the innovative technology undertaking in Orlando requires a robust team of specialists operating within the context of a terminal design programme, with a highly engaged and capable owner. Making this unique team successful required sustained commitment from parties who do not always speak the same technical languages.

KEY TECHNOLOGY INITIATIVES

The innovation and technology aspiration for the STC embraced seven elements. Some of the elements had been introduced at other airports individually, often in limited application. GOAA tackled technology on a larger scale, with the first introduction of all salient innovations that could be viewed as commercial at the time of design — allowing for innovation that becomes relevant during the design–construction period (a topic that will be covered later in this paper).

EXPERIENTIAL MEDIA ENVIRONMENT

The terminal's digital centrepiece — the EME — is a large-scale digital storytelling platform. Using ultra high-resolution light emitting diode (LED) panels, specialised video control and immersive technologies, the EME brings to life The Orlando Experience in four thematic ways:

1. Orlando — Like No Place Else on Earth
2. You Only Know the Half of It — Orlando as a Constellation of Experiences
3. Orlando as a Wonderland — Celebrating the Manmade and the Natural
4. Always in Beta — Emerging Orlando

Through an extensive series of workshops with the design team, the EME gradually settled on three magnificent media features blended into the STC architecture.

Windows on orlando

A 31' × 33' triptych with 4' mirror reveals built into the wall becomes a huge digital window that creates anticipation and expectation for arriving passengers. The moving images cross windowpanes to unveil Orlando in surprising and compelling ways. For departing passengers, the windows also serve as a lasting impression and memory of their Orlando experience (Figure 4).

Figure 4 Windows in Orlando

Figure 5 Moment Vault in Palm Court

Moment vault

The Moment Vault comprises three 20' × 26' curved, double-sided video structures, located in the Palm Court on the airside terminal. The Palm Court is a gathering space at the airside terminus of the Boulevard connecting landside and airside (Figure 5). The Moment Vault functions as an arrival marker for inbound passengers, who generally exhibit less dwell time than departing passengers. The departing experience

Figure 6 Portal

is intended to be more immersive, as visitors can experience themselves in various Orlando scenes and moments, recreating and stimulating recollection of their visit.

Tourbillon (Portal)

Originally named The Tourbillon after the horological mechanism for countering gravity, the landside media feature came to a less arcane name of The Portal, reflecting its mission for both arriving and departing passengers. The Portal is a 67', two-storey helical structure with double-sided LED panels displayed to both inner and outer diameter viewers (Figure 6). Arriving passengers experience this arresting combination of structural and digital art from above, on the outer surfaces. In this view, Orlando is introduced in a moving panorama. Departing passengers experience The Portal from below, on the inner surfaces. In this view, visitors feel an upward vortex of images, as memory and reflection.

Rich content dynamic signage and wayfinding

GOAA pioneered the use of ultra-high definition dynamic signage in the renovation of the ticketing lobbies of the NTC. The installation uses an ultra-high definition video wall, which fully integrates with the airport operational systems to deliver dynamic wayfinding along with flight information, destination time and weather, security and gate information (Figure 7). In addition, GOAA can display engaging games to entertain young travellers and decrease perceived wait times.

Electronic dynamic signage (dynamic signage) systems will be used to provide passengers and airport staff with the following types of information:

- Airport messaging
- Branding signage — airline
- Baggage-information display
- Flight-information display
- Gate-information display
- Holdroom signage airline

Figure 7 North Terminal Complex high-definition video ribbon at ticketing area

- Parking information
- Ramp-information display
- Roadway signage
- Wayfinding

The STC design includes the opportunity to display targeted information to passengers in order to meet the ever-changing needs and demographics of traffic through the Orlando Airport. This includes wayfinding, airport messaging and airline branding and messaging. The system also provides a feature-rich environment that provides information in a visual, attractive and memorable method.

Passive optical network infrastructure

Based on early analysis and comparisons of technical merits, GOAA chose to implement passive optical network (PON) technology for most of its communication infrastructure. PON technology is an alternative to traditional unshielded twisted pair copper communication distribution, offering greater flexibility and space utilisation. The PON approach is a 'Layer 2' transport medium, providing converged data from voice, video, wireless and computer systems at high speeds over optical fibre.

PON employs a point-to-multipoint network architecture. The use of unpowered splitters allows a single fibre to serve multiple endpoints. This passive network configuration means individual fibres do not need to be provisioned between hub and each endpoint.

The PON suite includes cabling, conduits, optical network terminals (ONTs), optical line terminals (OLTs), passive optical splitters, small form-factor enclosures, core switches, ancillary layer II data switches, PON management software, network firewalls, DC rectifier power supplies and equipment racks. The PON/POL (passive optical line) will be tested and certified as a fully operational enterprise network and will integrate with the existing NTC network.

PON architecture consists of three major components: the OLT, ONTs and optical splitters. The OLT resides in a central office and is responsible for controlling the flow of information across the fibre network. The OLT broadcasts voice, data, and video traffic to all ONTs on the network while also accepting and distributing upstream traffic from the ONTs.

The OLT plays a role analogous to a core switch in a traditional LAN (local area network). From the OLT in the main distribution frame, VLANs (virtual local area networks) are mapped through various single-mode fibre optic cables for each of the appropriate technologies. While a PON requires only one fibre optic strand for communication to each area, multistrand cables were provided to allow for additional capacity or future applications.

Orlando emerged as one of the world leaders in adoption of the PON technology for their airport environment. The airport adopted a rigorous programme of manufacturer and integrator selection to provide a high level of assurance that the technology is suitable in installation, performance, operability and maintenance.

Automated self-boarding and biometric exit

Automated self-boarding gates, using a boarding pass reader with mechanised boarding lanes, has taken hold in several European airports as a means of more efficiently boarding aircrafts. In the United States, the adoption had lagged. Concurrently, the US CBP agency has been steadily improving the biometric technology of facial recognition, which allows matching a facial image captured at boarding to a gallery of valid passport holders.

Orlando piloted a facial recognition system with British Airways for automated boarding and international exit

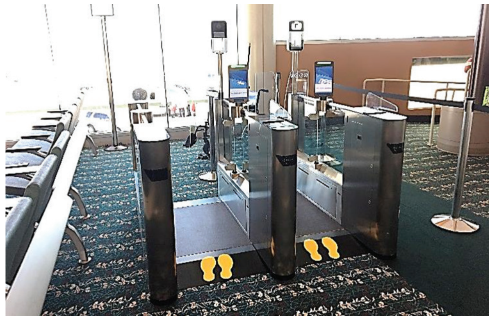

Figure 8 Biometric E-Gate Demonstration Project

from the United States (Figure 8). The demonstration was successful, resulting not only in a highly accurate facial matching rate, but a significantly reduced boarding time as well. GOAA began introduction of the system at existing international gates in the North Terminal and approved the incorporation of automated exit, or 'e-gates', in the STC.

The e-gate design for the South Terminal provides integrated camera capture and independent connections to the airline departure control system and CBP database.

Self check-in services

The CUSS kiosks support multiple airlines from a single kiosk and are configurable to provide passengers some or all of the following functions:

- Flight check-in
- Boarding pass printing
- Bag tag printing
- Flight rebooking
- Fee collection

Passenger check-in is in rapid evolution as more passengers adopt mobile services. As a result, the STC design is founded on maximum flexibility. Design considerations include:

- Rapid reconfiguration, installation and operation of check-in process elements, whether the kiosk is stand-alone or installed in the counter
- Placement of CUSS kiosks consistent with modularity considerations to the entire check-in counter configuration, and for adjustments of kiosk usage through the 1-step and 2-step process
- Future use of biometric readers in CUSS kiosks
- Future use of camera-mount matrices
- Use of overhead LCD mounted display
- Deployment of low-profile raised flooring system providing GOAA flexibility in application and expansion for future needs and growth
- Application of the Ethernet PON configured as a dedicated local area network to assist in the ability to accommodate diversity in CUSS topologies

Based on simulations of passenger flows, the STC accommodates up to 80 CUSS kiosks to be deployed in the check-in hall: 30 for the anchor carrier and 50 for the foreign carriers.

Virtual ramp control

The emergence of multiple sensor integration and video analytics has enabled the ability to execute air traffic and ramp control remotely. As GOAA transitions from individual air carrier ramp control to airport control, it has sought an advanced technology solution known as virtual ramp control (VRC). VRC systems have been installed at a few US airports, including Ft. Lauderdale–Hollywood International and Dallas Fort Worth International Airports. VRC systems use cameras to simulate a 360-degree 'out-of-the-window' view of the movement area, and integrate with existing ramp data sources (airport surface detection equipment radar, airport operational database) to deliver real-time views and graphical analysis of ground movement.

The VRC system provides automated movement tracking, high-definition video consoles, recording and playback features and brightness/polarisation control for maximum user effectiveness. Like most other technology procurements for the STC, the VRC is being solicited and procured in a series of focused demonstrations, user requirement capture workshops and owner-driven selection. This underscores a highlight of the GOAA process: the integration of IT-led initiatives with the ongoing capital programme.

Technology integration lab

The comprehensive nature of the technology programme for the STC, combined with innovation elements and integration with legacy systems, suggested the creation of a special purpose facility dedicated to testing systems in a GOAA network environment before installation in the terminal. The technology integration lab (TIL) serves as a test-bed for particularly sensitive deployments, like the PON, VRC and various video display technologies.

SAFEGUARDS AND OPERATING MODEL

Large and ambitious undertakings like the STC are often challenged by the limitations of construction cost, schedule and facility functionality. Each of these limits arises organically from the airport's financing models, its commitments to air carriers and its reputation/credibility in the community. Astute airport — development teams impose rigorous project controls to measure, monitor and modify the programme as it progresses.

In this section, there is the focus on the innovation and technology elements of the STC, which represents a significant contribution to cost and performance, in addition to having influence on construction schedules.

COST CONTROL

The technology and multimedia budget for the STC was constituted very early in the programme, at the conceptual level. Conceptual estimating demands a team experienced in airport technology design and implementation, as quantity take-offs are not available. At this stage, the CMARs had yet to be engaged so the budgeting process relied on the design team.

The STC approach is a departure from traditional capital project development, where technologies are often categorised as general allowances without investment in any conceptual cost estimating. This strategy can plant the seeds of discord later, as costs are compared unfavourably against an inaccurate initial budget. The STC team established a sound baseline budget per system, independently reviewed by a competent cost-estimating professional firm. This proved extremely valuable in later stages of the project.

The technology budget was reviewed at every stage of design, with increasing levels of confidence as design progressed; appropriate adjustments were enacted to stay within the original project budget. The CMARs provided valuable, early budget confirmation commencing after the design-development stage.

The overall STC programme was, like most large terminal projects, not immune to cost pressure. A strong economy in Central Florida contributed to pricing premiums that needed to be reconciled during the design phases. The technology and multimedia budgets were part of the value engineering process to bring the STC into range — an excellent example of viewing the technology aspects of the terminal as integral to the building, rather than supplemental features that are optional.

OWNER'S AUTHORISED REPRESENTATIVE FOR TECHNOLOGY

GOAA operates with a series of owner's authorised representatives (OARs) to facilitate communication and direction to design teams. The OAR acts on behalf of GOAA on everyday matters of design direction, delivery schedules, budgets and other project-management tasks. The OAR system has worked well for large capital undertakings that require more project-management capacity than GOAA has on staff.

For the STC, GOAA enlisted two OARs for the technology team: one for technology/multimedia and one for security. The two OARs were deep in these specialties and became integral to the design and implementation efforts, providing an additional safeguard function for the project.

VIDEO STEERING GROUP

The EME, combined with a dynamic signage programme, becomes an apotheosis of digital display in an airport. The vibrant video environment has the potential to delight passengers, but also to overwhelm them and create an ambience counter to GOAA's goals, if left unmanaged. To address this challenge, GOAA created a video steering group to discuss content, content development, policy and direction. The steering group provided a forum for different storytelling concepts to be discussed, as well as various policy proposals. One common issue that arises when developing large digital canvasses is the introduction of advertising. While especially attractive in Orlando — a thematic and tourism-driven economy — GOAA steadfastly decided against purposing the digital signage elements for advertising.

FLEXIBILITY AND SCALING

Airports experiencing rapid passenger enplanement growth and unpredictable regulation value flexible facility designs that can remain functional and creative under changed circumstances. The airport-development landscape is replete with examples of terminals that required significant rework, renovation or reconfiguration to answer an unanticipated change.

The solution to this problem is not to get better at predicting the future, but to get better at accommodating an unpredictable future. Among the developments that the technology team could reliably foresee included:

- Introduction of 5G wireless technology
- Introduction of biometric identification and processing at the Transportation Security Administration (TSA) checkpoint
- Expansion of the use of dynamic displays

These alone justified a significant expansion of communication distributions rooms beyond what a traditional terminal would support. In addition, the technology team advanced an expansive use of innovative 'low profile' raised floor throughout areas that needed maximum flexibility. Rather than the standard deep (8"–12") raised floors associated with computer rooms, the STC incorporates much shallower flooring, preserving valuable floor-to-floor structural depths and allowing much greater flexibility for unpredictable technology additions.

LEARNING MOMENTS

Orlando's new South Terminal set a new standard for technology innovation that is built into a construction project. GOAA's ambitions were high — design and construct a state-of-the-art passenger facility that reflects the vibrancy, beauty and hospitality of the region, incorporating advanced technologies and maintaining the efficient processing expected in a high-volume airport. To achieve these goals, GOAA created a new model for building a passenger terminal.

The process of innovation is not without its challenges — and many learning moments.

Anything new must be incorporated into the old. The notion of contracting independently for technology and multimedia engineering raised questions about coordination of disciplines. To ensure time-tested standards for minimising construction risk coordinated with all design documents, GOAA insisted the technology team be integrated into all normal design-coordination activities — both the terminal-design and technology teams accepted this with the spirit of success. The process worked splendidly, and no significant issues arose by incorporating a new strategy into an old one.

Legacy thinking can predominate because it is safer. There is a strong and natural tendency, especially when a new design takes place in an existing airport campus, to replicate. Replicating design strategies that have worked well over time has a valid place in making sure that facilities and systems work, but it takes intentional thinking to not allow replication to crowd out advances that can offer great benefits. GOAA adopted a blended approach, systematically reviewing each application for candidacy in a newer technology. The authority encouraged debate and ultimately made sound decisions about when to innovate and when to stick to tried and true. GOAA sometimes relied on demonstration projects (eg British Airways e-gates) to provide persuasive arguments, or on other trials or developments in the industry (such as VRC) to guide its thinking.

Dealing with fast changes and rapid adoption requires sustained diligence. A perennial challenge for technology systems in capital development is dealing with changes that occur within the timespan of construction. The construction duration for the STC is 36 months, which is not unusual for a project of this magnitude. The 36 months in innovation and technology can see multiple disturbances in system development, including new releases, product obsolescence, commercial maturity and entirely new technologies.

The STC team anticipated this problem and convened a standing monthly review with GOAA's Chief Information Officer to discuss innovation and specifically which technologies were advancing at a rate that could make them candidates for inclusion in the STC. This process captured the facial biometric introduction, which would have otherwise been missed for the terminal opening. Although the notion of continuing to perform innovation research after pricing and design has been set can be seen as problematic, it also offers the opportunity to avoid opening a technologically obsolete facility.

INTO THE FUTURE

At this writing, traffic at Orlando International Airport continues to grow, and the requirement for additional capacity is growing with it. GOAA is in the planning stages for Phase 2 of the STC. The ultimate buildout of the Terminal C south campus may comprise up to 60 gates. The technology trajectory of future expansions will have the foundation set by the efforts of GOAA during Phase 1. Most of the influential process approaches — innovation approach, design team composition/selection, continuous benchmarking and broad IT participation — will translate easily to future development.

GOAA is continuously evaluating innovations that can improve its service and operation. The airport is considering:

- Smart parking guidance
- Light detection and ranging (LIDAR) for location-based services
- Common-use bag drop pilot
- Internet of things (IoT) deployment potential
- Cybersecurity concerns with IoT
- GOAA information hub
- 5G wireless impacts and adoption

CONCLUSION

Orlando and its team of project managers, architects and engineers have defined a new model for delivering a complex passenger terminal that incorporates essential and remarkable technologies. Although many projects leave innovation to separate initiatives to be led by an IT Department, GOAA chose the path of integrated design. While this presented a significant departure from tradition, the result is a new facility that is as state-of-the-art technologically — and visually extraordinary — as it is architecturally beautiful. This model can serve as a valuable reference point for the airport-development industry, as it meets the dual challenges of capacity and technology.