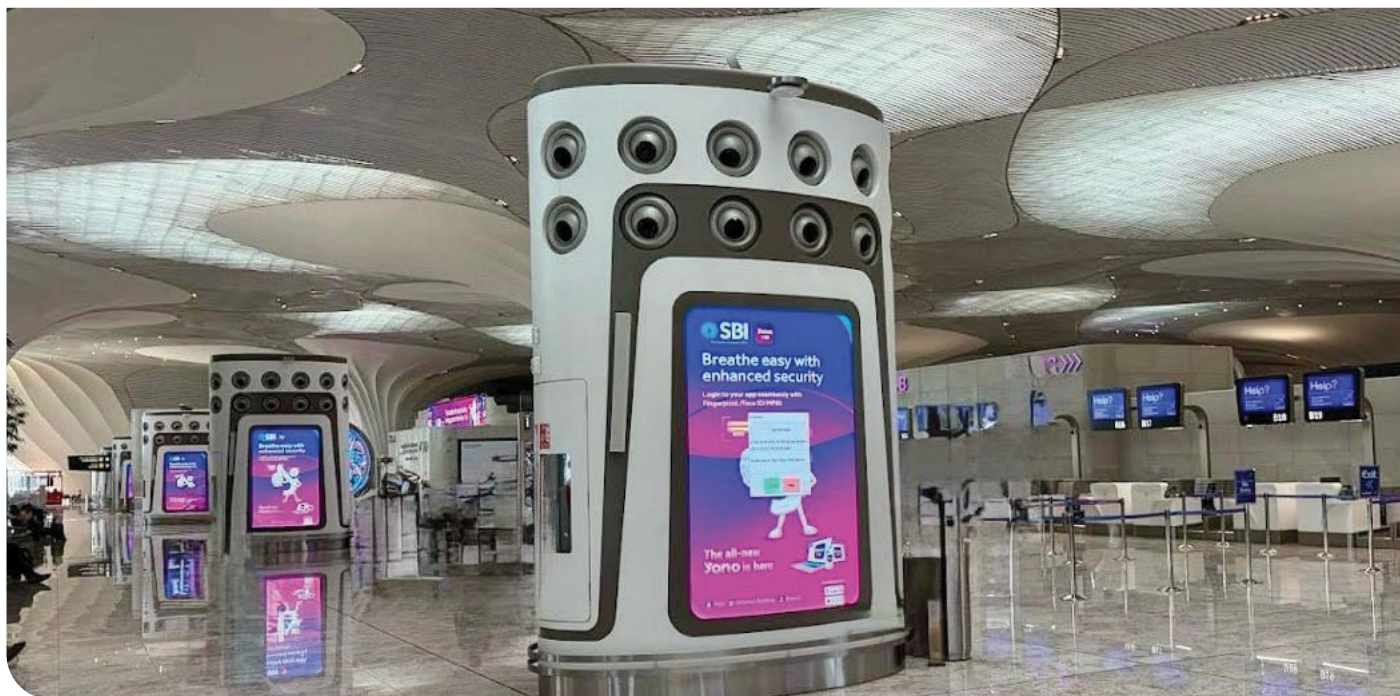


AV INFRASTRUCTURE: HOSPITALITY SEGMENT

*As India accelerates its investment in world-class infrastructure, the role of integrated communication and operational technologies has become increasingly critical in shaping safe, efficient, and future-ready public spaces. In this exclusive feature, **Pyramid Technologies** shares the story behind its contribution to the successful integration of **Navi Mumbai International Airport (NMIAL)**. From deploying a mission-critical Public Address and Voice Alarm (PAVA) system to designing sophisticated control room visualization environments, the project represents a landmark achievement in large-scale infrastructure integration.*



PRO AV INFRASTRUCTURE POWERS INDIA'S NEWEST INTERNATIONAL GATEWAY

Pyramid Technologies Delivers Mission-Critical PAVA and Control Room Visualisation Systems at Navi Mumbai International Airport

P pyramid Technologies served as the specialist systems integrator for the Public Address & Voice Alarm (PAVA) system and the mission-critical control room Video wall systems, including the video wall processing and control platform at Navi Mumbai International Airport (NMIAL) Terminal 1. As one of India's largest greenfield airport developments, the project demanded an integrated

communication infrastructure capable of supporting safety, operational efficiency, and an enhanced traveller experience.

Pyramid's scope included the design, engineering, supply, installation, integration, testing and commissioning of these systems. For the PAVA deployment, the team delivered a fully IP-based communication platform covering passenger circulation areas across the terminal, including check-in halls, security screening areas,

immigration zones, retail spaces, departure lounges, arrival areas, baggage reclaim zones and forecourt areas. The solution was designed to support both routine passenger communication and emergency life-safety operations.

Simultaneously, the systems integrator delivered video wall systems for the airport's key command and control centres, including the AOCC, AEOCC, SOCC, BHS Control Room and NOC. These facilities

enable operators with real-time visibility of airport operations, security systems and critical infrastructure.

A key aspect of the project was the integration of multiple airport subsystems into a unified operational environment, creating a resilient platform that supports safety, operational efficiency and passenger experience across the airport.

ENGINEERING FOR SAFETY, RESILIENCE, AND OPERATIONAL CONTINUITY

The primary requirements for both the Public Address & Voice Alarm (PAVA) and control room video wall systems, centred around passenger safety, operational continuity, and system resilience.

For the PAVA system, the airport required a fully compliant life-safety communication platform capable of delivering clear and intelligible announcements across all passenger-facing and operational areas of the terminal. The deployment needed to support routine passenger information, automated flight announcements, background music, and emergency evacuation messaging while maintaining seamless integration with key airport systems such as the Fire Alarm System (FAS), Automated Flight Announcement System (AFAS), Building Management System (BMS), and VoIP communications infrastructure.

For the video wall systems, the focus was on creating highly reliable command-and-control environments that provide operators with real-time visibility of airport operations. Each control centre had different operational roles ranging from airport operations and incident management to security surveillance, baggage handling, and ICT monitoring.

Across both systems, the overarching requirement was to ensure 24x7 availability, high redundancy, centralised monitoring and control, and the flexibility to support the airport's operational and emergency response needs without disruption.

BUILDING A UNIFIED OPERATIONAL ECOSYSTEM

Rather than approaching audio and visual technologies as standalone deployments, Pyramid engineered both systems as components of a unified operational ecosystem.

The PAVA infrastructure adopted a distributed IP-based architecture that enabled centralised communication management while maintaining resilience across multiple terminal zones. The platform was integrated with critical airport systems, ensuring coordinated communication during routine and emergency operations.

On the visualisation side, the video wall platforms consolidated information from airport operational systems, security applications, building management systems, and Airport Operational Database (AODB)-driven information sources. This integration provides operators with comprehensive situational awareness, enabling faster and more informed decision-making across the airport's various command and control centers.

INTEGRATING HIGH-END AV INFRASTRUCTURE

Given the diverse architectural spaces within the airport, Pyramid selected different loudspeaker technologies based on ceiling heights, passenger densities, ambient noise levels, and acoustic requirements.

The passenger terminal building was equipped with the PAVA system built on a fully IP-based architecture, combining **Bosch PRAESENSA** as the system backbone with **BOSE Professional loudspeaker** solutions as the front-end audio platform.

The deployment further incorporated redundant system controllers, Digital Signal Processors (DSPs), networked amplifiers, Public Address servers, music servers, IP call stations, ambient noise sensors, and a combination of ceiling loudspeakers, surface-mount loudspeakers, and passive line arrays. Large open spaces such as check-in halls and passenger circulation areas utilised Bose active beam-steering arrays to maximise intelligibility while minimising reflections from hard architectural surfaces.

OVERCOMING ACOUSTIC CHALLENGES AND COMPLEXITY AT SCALE

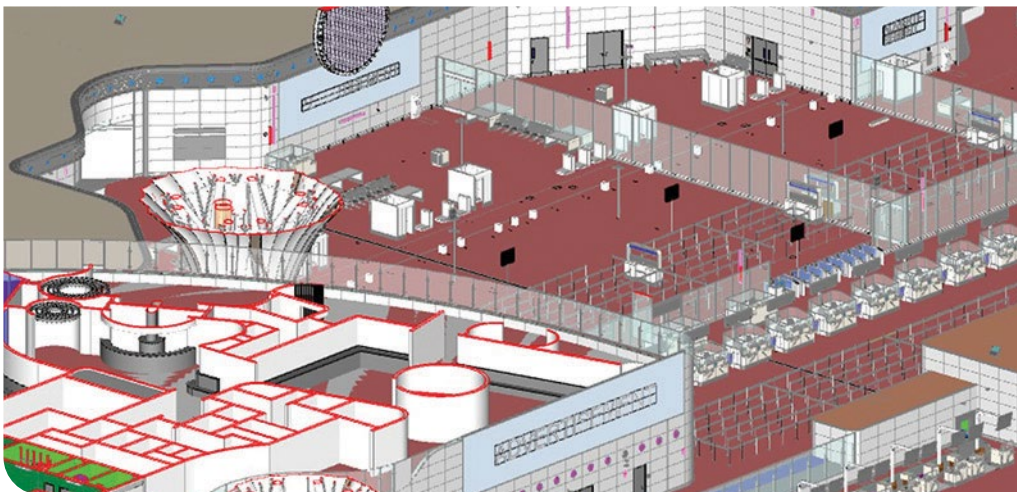
Managing large-scale integration projects requires addressing complex technical challenges to deliver robust, fully integrated communication infrastructure.

One of the most significant challenges in this project involved integrating multiple mission-critical systems within a rapidly evolving airport construction environment where construction, MEP services, ICT infrastructure, and operational requirements were all evolving in parallel. Pyramid addressed these challenges through detailed simulations, iterative design optimisation, comprehensive interface testing, phased commissioning strategies, and close coordination with the client, L&T Construction, consultants, and specialist contractors.

Airport terminals also present some of the most challenging acoustic environments due to large open volumes,

reflective surfaces, high ceilings, fluctuating passenger densities, and constantly changing ambient noise levels. To address these challenges, Pyramid adopted a simulation-driven design methodology utilising extensive EASE modelling and acoustic simulations. These simulations enabled the engineering team to optimise loudspeaker positioning, coverage patterns, beam-steering strategies, and Speech Transmission Index (STI) performance across various terminal zones.

Another key challenge was managing the interfaces between the PAVA system and airport subsystems such as AFAS,



Design and BIM: Pyramid Technologies works with extensive EASE modelling and simulation at NMIAL during design and integration to ensure clear and intelligible communication

FAS, BMS, VoIP, and the Active Communication Network, while ensuring seamless interoperability and the high level of redundancy expected of a life-safety system. These challenges were overcome through detailed engineering, rigorous simulation studies, continuous stakeholder collaboration, comprehensive interface testing, and phased commissioning.

MISSION-CRITICAL VISUALISATION FOR AIRPORT OPERATIONS

The video wall infrastructure at NMIAL was designed around the operational requirements of individual control rooms rather than implementing a uniform display strategy across the airport. While the Airport Operations Control Centre (AOCC) features a high-resolution LED video wall for large-format operational visualisation, the remaining command centres utilise professional-grade narrow-bezel LCD video walls, each engineered to support its specific operational function.

The key design considerations for the control room included display size, pixel pitch, viewing distance, ambient lighting conditions, image uniformity, colour accuracy, 24x7 reliability, and redundancy to ensure each display solution was tailored to its control room environment, and operators could visualise multiple live data sources simultaneously while maintaining excellent readability, situational awareness, and long-term operational reliability.

Furthermore, catering to the content management and processing platform, the team ensured the video wall systems allow operators to display and manage multiple live sources including airport operational systems, CCTV, AODB-driven information, Building Management Systems (BMS), and network monitoring platforms on a single video wall. Operators can now dynamically switch layouts, resize windows, prioritize critical information, and create customized display presets in real time, ensuring that the video wall systems adapt seamlessly to both routine airport operations and emergency situations.

CENTRALISED CONTROL AND INTELLIGENT PRIORITISATION

At the core of the deployment lies a resilient network infrastructure that enables both the PAVA and video wall systems to



In picture: Pyramid's technical team during pre-installation briefing sessions for the NMIAL project

operate as centrally managed platforms, delivering multiple types of information simultaneously.

The PAVA system uses intelligent zoning and priority management to deliver targeted announcements only to the areas where they are required. Routine boarding calls, gate changes, and flight announcements generated through the Automated Flight Announcement System (AFAS) are broadcast only to the relevant passenger zones, while background music continues uninterrupted in unaffected areas. In the event of an emergency, the PAVA system automatically overrides lower-priority announcements and broadcasts evacuation or safety messages to predefined zones across the entire terminal.

Within the airport's command and control centre, the **Planar LED and LG video wall systems** provide operators with a consolidated real-time operational view by integrating information from multiple airport platforms, including AODB-driven operational data, CCTV, Building Management Systems (BMS), baggage handling systems, and ICT monitoring platforms, enabling operators to rapidly assess situations, coordinate responses, and make informed decisions during both routine operations and emergency scenarios.

This distributed IP architecture with centralised management simplifies system administration while enhancing operational resilience, situational awareness, and communication effectiveness throughout the airport ecosystem.

A MILESTONE IN INDIA'S INFRASTRUCTURE JOURNEY

The project was executed in phases aligned with the overall construction and commissioning schedule of Navi Mumbai

International Airport. Pyramid completed the scope required for domestic terminal operations ahead of the airport's inauguration by the Hon'ble Prime Minister of India, **Shri Narendra Modi**, on October 8, 2025, and the commencement of commercial domestic operations on December 25, 2025.

For Pyramid Technologies, NMIAL represents a natural progression in its journey of delivering complex, mission-critical technology solutions for some of India's most significant infrastructure

projects. Building on experience gained through landmark projects such as the **Statue of Unity**, **Yashobhoomi Convention Centre**, and **Kempegowda International Airport Terminal 2**, the company continues to strengthen its expertise in delivering mission-critical communication and integrated operational solutions across aviation, transportation, and public infrastructure sectors.

Emphasising on the successful integration, **Ajay Parwaney**, Director, Pyramid Technologies, stated, "For us, the biggest achievement isn't just completing the project, it's actually seeing the airport operating with the systems we've delivered. That's what makes all the engineering, coordination, and hard work worthwhile."

CONCLUSION

As India's infrastructure landscape undergoes rapid transformation, projects like Navi Mumbai International Airport showcase how integrated communication ecosystems have become foundational to delivering safe, efficient, and future-ready public infrastructure.

Projects of this scale transcend engineering achievements and serve as platforms for innovation, knowledge advancement, and cultivating long-term partnerships that shape industry standards. The insights and experience gained through NMIAL have significantly enhanced Pyramid's capabilities in delivering complex, integrated technology solutions, reinforcing its dedication to supporting India's infrastructure evolution. As India continues building world-class facilities, the role of robust, intelligent communication systems will only grow more critical in ensuring seamless operations and exceptional user experiences.