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Digital Insights:

Taxiway Design and Pavement Optimization in the Tanajib Airport Expansion Project

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ABSTRACT

As part of the ongoing development under the Tanajib Airport Expansion Project, the taxiway system has been strategically designed to support safe, efficient, and future-ready aircraft movement. This article highlights the key aspects of taxiway planning and pavement ptimization tailored to the site's operational goals and environmental conditions. Focus areas include geometric layout, pavement design standards, aircraft movement efficiency, and integration with adjacent airside facilities. The design approach aims to reduce taxi delays, support long-term structural integrity, and comply with international standards such as ICAO Annex 14 and FAA Advisory Circulars. Once implemented, the optimized taxiway network will play a central role in enabling seamless airside operations and supporting the airport's expanded capacity. This paper not only examines the design principles involved but also reflects on sitespecific decision-making processes and their alignment with long-term operational strategy.Through careful coordination across disciplines, the taxiway system is being developed to ensure long-term functionality and integration with future airside expansions.

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INTRODUCTION

Taxiway infrastructure is fundamental to the functionality of any airside system, serving as the primary link between runways, aprons, and terminal areas. In the context of the Tanajib Airport Expansion Project, the taxiway network has been meticulously planned to accommodate a range of fixed-wing aircraft, optimize ground movement, and ensure safe aircraft routing in all weathe conditions... The development of the taxiway infrastructure has also considered factors such as aircraft fuel burn during taxi operations, gate allocation strategies, and alignment with apron traffic rules. Furthermore, special emphasis was placed on incorporating lessons learned from similar airport expansions in the region to mitigate delays and reduce lifecycle costs.

SYSTEM OVERVIEW

The taxiway system in Tanajib Airport is designed to support smooth and efficient aircraft movements between the runway and apron areas. The layout incorporates a full parallel taxiway aligned with the main runway... The taxiway routes have been cross-coordinated with utility corridors, including stormwater, communications, and power duct banks. These considerations are critical to avoiding future conflicts during utility upgrades or maintenance. Additionally, the system includes pavement shoulders to protect against blast erosion and accommodate occasional vehicular access.

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DESIGN COMPONENTS

1. Pavement Structure Design
The pavement was designed following FAA Advisory Circular 6-5320/150 and incorporates a flexible pavement system...

2. Geometric Standards
The taxiway centerline radius, edge safety margin, and fillet transitions were modeled using software-based simulations...

3. Lighting and Signage Interface
The taxiway system will be integrated with airfield lighting and signage packages...

4. Stormwater Provisions
Proper grading was applied to ensure surface runoff flows toward the airfield stormwater system...

5. Pavement Joints and Surface Treatments
Surface texture and longitudinal/transverse joint patterns were selected to balance surface friction and minimize water retention. Longitudinal joints are aligned with aircraft traffic paths to avoid uneven wear. Grooving and friction tests are planned prior to commissioning to ensure compliance with braking performance standards.

PERFORMANCE AND BENEFITS

Operational Efficiency
The planned layout minimizes taxiing time and runway occupancy...
Safety and Standardization
By aligning with ICAO and FAA specifications, the system ensures safe wingtip clearances...
Maintainability
Material selection and structural thicknesses were determined with lifecycle costs in mind...
Scalability
The layout includes provisions for future parallel taxiways...
Environmental Considerations
The layout and grading reduce environmental impact by directing runoff to designated treatment zones. Noise and emissions are also minimized due to reduced taxi times. The lighting systems, when installed, will use LED fixtures that reduce energy demands and improve night-time visibility.

CHALLENGES AND CONSIDERATIONS

Subgrade Variability: Geotechnical investigations revealed variations in soil bearing capacity.

Construction Interface with Utilities: Routing of airfield utilities such as electrical ducts and drainage lines had to be carefully coordinated.

Hot Mix Asphalt (HMA) Quality Control: Given the coastal environment and high-temperature exposure.

Safety During Phased Handover: As segments of the taxiway system come online, operational risk management will be essential.

Stakeholder Coordination: The design and review process required close coordination with airfield operations teams, safety auditors, and utility engineers. Regular technical interface meetings were held to resolve conflicts in design assumptions and ensure alignment with regulatory inspection criteria.

CONCLUSION

The taxiway system within the Tanajib Airport Expansion Project is a foundational element of the airport's long-term operational strategy. The lessons gained during the design phase offer valuable insights into managing airfield geometry, construction phasing, and performance optimization. The project team continues to monitor emerging trends in airside development to inform future upgrades and ensure adaptability to evolving aviation demands.