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FEM-based verification and structural optimization of an aircraft cargo loading platform

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This document presents the FEM analyses for the verification and structural optimization of a 10 m × 2.5 m cargo loading platform designed for pallets in transport aircraft. Originally conceived in aluminium, the platform was evaluated for steel construction to meet enhanced load requirements. The analysis considered the most critical loading scenarios, including four fully loaded pallets (~18,000 kg) and lateral wind at 100 km/h. FEM simulations were used to assess stress distributions, identify critical regions and evaluate structural performance. Design improvements were implemented, such as optimized cross-sections of key profiles, geometric modifications and removal of non-critical profiles, hence reducing the number of welded components and simplifying production. These modifications enhanced structural stiffness and safety while ensuring a robust and manufacturable configuration. This study demonstrates the effectiveness of FEM in guiding material substitution and structural optimization of aerospace ground support equipment.

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