



# Methodological Evaluation of Transport Maintenance Depot Systems in Senegal: A Randomized Field Trial on System Reliability

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## Abstract

Transport maintenance depots (TMDs) in Senegal are critical for ensuring aircraft reliability and operational readiness. However, their effectiveness varies significantly across different TMD systems. A mixed-method approach combining quantitative data from performance metrics and qualitative interviews with personnel was employed. A random sample of TMDs within Senegalese airspace was selected, and a randomized field trial design was utilised to measure system reliability. Statistical models were used to analyse the data. In this study, we found that while some TMD systems exhibited high system reliability (95% confidence interval), others showed variability in performance metrics such as aircraft downtime reduction by 20% over a six-month period. The findings suggest that consistent training and standardised procedures could enhance the reliability of Senegalese TMDs, leading to improved operational efficiency and reduced maintenance costs. Implementing robust training programmes for maintenance personnel and establishing clear standards for operations can significantly improve the system reliability observed in this study. The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \varepsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *African geography, randomized trials, maintenance systems, reliability analysis, engineering methodology, statistical methods, quality control*

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