

Abstract

Aviation life support systems (ALSS) represent a life-critical domain within naval aviation, yet components frequently exhibit a time to reliably replenish (TRR) variance greater than 1.0, signifying severe maintenance delays. The purpose of this research is to create a quantitative framework to identify the primary drivers contributing to these TRR overruns. Employing a mixed-methods approach, this study analyzed a 37-month dataset from February 2023 to February 2026, consisting of 2,888 Maintenance Action Forms (MAFs) from the Naval Aviation Logistics Command Management Information System (NALCOMIS) intermediate maintenance activity (IMA) at the Fleet Readiness Center Mid-Atlantic (FRCMA) detachment in Norfolk. The results indicate that inadequate supply chains (awaiting parts) and internal work center backlogs (awaiting maintenance) are the most significant bottlenecks across all analyzed parachute assemblies. The study concludes that systemic delays are fueled by a combination of supply chain constraints, internal process friction, and outdated administrative standards. To reduce TRR and enhance fleet readiness, this study recommends establishing data-driven pre-expended bins (PEB), re-baselining specific TRR task standards, and implementing a lean-inspired tiered workload management system.

Methods



- Employed a mixed-methods approach to assess TRR overruns at FRCMA Detachment Norfolk.
- Analyzed a 37-month historical dataset (February 2023 to February 2026) of 2,888 MAFs from NALCOMIS IMA.
- Evaluated six parachute assemblies (A/P28S-32(v)1, A/P28S-32(v)2, A/P28S-32(v)6, NB-6, NB-8, and A/P22P-20), calculating TRR variance to identify the most delayed components.
- Deconstructed the top ten highest-TRR MAFs for each assembly, tracking time spent in specific job status codes to pinpoint root causes.

Results & Impact

- Data Integrity: A blanket 156-day TRR standard masks delays in lower-time repairs. Therefore, the calculated TRR variance is a conservative, lower-bound estimate of true process inefficiencies.
- Supply Chain Inefficiency: Awaiting parts (AWP) is the primary driver of delay, accounting for up to 65% of downtime in complex assets like the A/P22P-20.
- Internal Process Friction: Awaiting maintenance (AWM) backlogs (M3) and non-operational support equipment (M2) frequently increase the standard repair time.
- Administrative/Funding Bottlenecks: Legacy, low-volume systems experience severe delays awaiting maintenance funding (M9).
- Impact/Recommendations: Reducing TRR requires a multi-faceted approach. Recommendations include establishing data-driven PEBs, re-baselining specific TRR task standards, and implementing a lean-inspired tiered workload management system.

Future Research

- Conduct a 5–10-year study to identify long-term TRR trends, seasonality, and the impact of major fleet-wide events.
- Perform qualitative analysis (e.g., anonymous interviews) to understand human factors and cultural reasons behind internal backlogs and procedural workarounds.
- Broaden the scope of analysis to other ALSS work centers, FRC divisions and FRC sites to determine if bottlenecks are localized or enterprise-wide.
- Apply predictive modeling using historical data to forecast expected TRR and proactively allocate resources.