Repair prioritization for a service support contractor

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Service support contractors for high-value equipment, such as aircraft, increasingly support performance-based contracting (PBC) strategies, under which contracts are designed to “optimize system readiness" allowing for a purchaser who “obtains a comprehensive performance package, not individual parts, transactions, or spares [and] repairs actions"

One of the key decisions facing such a contractor is determining, in real time, which failed components to induct into repair, given that multiple components can be repaired with a common pool of workforce and resources

Given the desire of PBC approaches to optimize system readiness, the impact of any individual component failure or repair should be stated in terms of its effect on aircraft availability

Assuming that once a repair is started, it cannot be interrupted (and thus must run to completion), it might be preferable to defer the induction of failed low-priority component, in the event that a failed higher-priority component might require repair in the future.

- This could apply in instances where the repair of the low-priority component requires a long-time duration.
- Alternatively, if the budget available for repairs is nearly exhausted, it might be preferable to defer repair of the low-priority component to a future budget period

The main analytic challenges are (1) the future failure of components is unknown, (2) the actual repair time for components is unknown, (3) the relative “priority” of any given component, in terms of its effect on aircraft availability, is dynamic and cannot be readily specified a priori.

One approach to address these uncertainties is to model the repair enterprise as a stochastic system. Given the extremely strong desire to avoid high values of unavailable aircraft, instead of making decisions based on an expected future availability, we propose to make decisions based on a conditional value-at-risk (CVaR) measure of aircraft availability.

The objective of this research will be to develop optimization models that identify a repair versus defer decision for each failed component, on a rolling horizon, such that aircraft availability CVaR is maximized, subject to constraints on repair capacity and repair budget. We will have the opportunity to work on real data from the US aeronautical industry.

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Internship duration: 5 or 6 months

Student skills: algorithmic and programming, problem-solving, autonomy, curiosity, English.