Overcoming the Challenges of Aircraft Engine Maintenance and Repair

SHARE:

skip to content

The planning of spare engines and engine parts is a challenging and important task for airlines to seamlessly support flying and engine repair operations. Engines are expensive and critical assets that make this problem important from the financial and operational perspectives. In this talk, we present an application of a simulation-based approach utilized for planning the ownership level of spare engines and engine parts required to achieve a target service level or out-of-service (OTS) aircraft performance metrics.

Our application considers both single and multi-location settings as well as two levels of modeling: a higher level where the repairable components are the engines as a whole, and a lower level that focuses on the repair of the individual engine parts. Simulation is used in this application because it provides the flexibility to model complex features of the engine repair process that include, among other items, different engine and parts repair time probabilistic distributions, capacity constraints, borrowing of parts and spare engines, scrapping procedures, and engine harvesting processes. Our team has also derived closed-form formulations that can be utilized under specific operational conditions to provide fast calculations. This application represents a step forward towards a more accurate and reliable approach to estimate the ownership requirements to support American Airlines' engine maintenance operations and to supersede previous procedures which involved manual calculations prone to errors and unable to consider the inherent variability of the repair processes.

When compared with previous manual methodologies, results obtained by using the application have demonstrated that substantial savings in engine parts investment can be obtained, some in the range of millions of dollars. Currently, software implementations of this application are being utilized by different business units within the Technical Operations (Tech Ops) organization in American Airlines for the planning of ownership requirements of four different engine types and its parts. The positive acceptance and use of our approach has also facilitated the extension of this application to other key assets such as auxiliary power units. Overall, our application encompasses three types of analytics.

First, on the descriptive side, our application processes large sets of historical repair data to extract the parameters that represent key aspects of the repair processes, e.g., repair times, scrapping rates, repair probabilities, which are needed to run the simulation models. These parameters also provide valuable insight into the current performance

of the repair process. Second, on the predictive area, this application provides estimations of the required level spare engines and parts ownership based on forecasted demand of repairs. Finally, on the prescriptive side, our application can be used in what-if scenarios to suggest the spare ownership level based on different targets on service level and OTS performance metrics.

Moreover, this application has demonstrated to be a valuable decision support tool for other important operational problems related to the availability of spare engines and parts. In this talk we present several simulation case studies that serve to illustrate the versatility of our application and how it has been utilized in real-life operational scenarios for spare engines and parts planning.

↓ skip to content ↓

Related Content

2015 IAAA Videos (/Resource-Center/Video-Library/Chauvet-Award-Videos/2015-IAAA-Videos)

Intelligent Surgical Scheduling System (winner)

Analytics for an Online Retailer: Demand forecasting and Price Optimization at Rue La La

Simulation Approach for Aircraft Spare Engines & Engine Part Planning

Chauvet Award Videos (/Resource-Center/Video-Library/Chauvet-Award-Videos)

University of Arkansas (/Meetings-Conferences/INFORMS-Conference-Calendar/Past-Events/List-of-Available-Speakers-Program/University-of-Arkansas-at-Little-Rock)

INFORMS Conference on Busi
Articles/February-Volume-42-N

Donald Gross (/Explore/Histor
Gallery/Donald-Gross)

The 16th International Conference on Automated Planning and Scheduling (/Meetings-Conferences/INFORMS-Conference-Calendar/Past-Events/The-16th-International-Conference-on-Automated-Planning-and-Scheduling)

Tuesday, Jun 6 — Saturday, Jun 10

The English Lake District, Cumbria, U.K.

Donald Gross was the 38th President of
Engineering at George Mason University
The George Washington University, reti
a First Lieutenant, US Army Signal Corp
Refining Company from 1961-65.

(/)

The Institute for Operations Research and the Management Sciences

5521 Research Park Drive, Suite 200
Catonsville, MD 21228 USA

phone 1 443-757-3500 (tel:4437573500)

phone 2 800-4INFORMS (800-446-3676) (tel:8004463676)

fax 443-757-3515

email informs@informs.org (mailto:informs@informs.org)

Discover INFORMS (/Discover)
Explore OR & Analytics (/Explore)
Get Involved (/Get-Involved)
Impact (/Impact)
Join Us (https://online.informs.org/informsssa/informsmempubssarenew.choose?p_cust_id=1234)

Recognizing Excellence (/Recognizing-Excellence)
Professional Development (/Professional-Development)
Resource Center (/Resource-Center)
Meetings & Conferences (/Meetings-Conferences)
Publications (/Publications)
About INFORMS (/About-INFORMS)
Communities (/Communities)

PubsOnLine (http://pubsonline.informs.org)
2018 Analytics Conference (http://meetings2.informs.org/wordpress/analytics2018/)
Certified Analytics Professional (http://certifiedanalytics.org/about.php)
Career Center (http://careercenter.informs.org/)
INFORMS Connect (http://connect.informs.org)

Terms of Use (/About-INFORMS/Terms-and-Conditions) | Contact INFORMS (/About-INFORMS/Contact-Us) | Sitemap (/About-INFORMS/Sitemap)

Twitter
Follow INFORMS on: (https://twitter.com/INFORMS)
Facebook
(https://www.facebook.com/INFORMSpage/)
LinkedIn
(https://www.linkedin.com/company/informs_2)