

Load Profile Creation Process

ARTS - Lab

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This document contains an overview for the selection and conversion process used for the flight load profiles detailed in the Realistic Southeastern Flight Operations GitHub , ['https://github.com/ARTS-Laboratory/Realistic-Southeastern-Flight-Operations-Data'](https://github.com/ARTS-Laboratory/Realistic-Southeastern-Flight-Operations-Data). There were currently no available flight load profiles to address our needs for certain destinations and flight durations . To address this gap, we developed custom profiles by estimating the energy demands throughout various phases of flight.

First, we extracted the fuel flow data from Flightdata.com pertaining to the aircraft of our choice. The fuel flow rate during the flight was extracted using a data extraction code, we developed to extract data points from the graph as we could not extract the data points directly from the website. The extracted data points were interpolated and adjusted to fit the same ranges as the original images from the website.

This data allowed us to estimate the raw energy input based on the volume of fuel burned over time.

Next, we accounted for the variation in engine efficiency across different flight phases. Since not all the chemical energy in the fuel is converted into useful mechanical or electrical energy, we scaled the energy values using representative engine efficiency figures. Specifically, we used an efficiency of 30% during taxi and cruise phases, and a reduced efficiency of 19% during takeoff to reflect the higher power demands and lower thermal efficiency typical of that phase. The duration of the takeoff and cruise was established using altitude information sourced from the same website

The aforementioned process was repeated for multiple flight paths with a similar distance to the original flight paths listed on FlightData.com. The information can be found in the listed GitHub page. This process enabled us to construct more realistic load profiles that reflect actual energy usage patterns for this aircraft in the absence of direct performance data.