Thermodynamic Jet Engine Analysis

Author: Christopher Imholte

Partner: Brenna Donovan

Acknowledgements

A special thank you to Brenna Donovan as my partner on this project. I would also like to acknowledge Dr. Prabhakar Venkateswaran and Dr. Valerie Troutman for creating and guiding this project.

Purpose

The purpose of this project was to apply concepts derived from the second law of thermodynamics to analyze and select components for a turbojet engine.

Program

The program utilizes multiple MATLAB toolboxes for optimization and integral solutions. The program was developed as four parts. A stand-alone capable, user interface toggleable, thermodynamic property calculator for air, an ideal gas. A preliminary model with a single situation was modeled and then coded into MATLAB. This script was converted into a function once the model was validated and is now renamed as engineSim. An additional MATLAB script was made for analysis of different components options and their impact on the engine performance. Finally, to get final engine performance with the sum of the components, a MATLAB script that called engineSim was created for final values.

Thermodynamic Basis for Specific Heat of Air

The thermodynamic integration equation for the specific heat of air at a given temperature, its derivation, and tabulated values can be found in the thermodynamics text utilized during the project (Cengel Yunus, et al., 2019).

Report

A report that detailed the model, assumptions, criteria, selection of components and reasoning was written for an academic grade. This report is only available upon email request to Christopher Imholte, imholtec@msoe.edu.

References

Çengel Yunus A., et al. *Thermodynamics: An Engineering Approach*. McGraw-Hill Education, 2019.

Venkateswaran, P. and Troutman, V. *ME 3102 - Principles of Thermodynamics II*, Milwaukee School of Engineering, Fall 2022.