

AAE 4660 Aeropropulsion Systems
Computer Project #1
Fall 2009
Due: October 26, 2009

Ideal Turbojet Performance Analysis

A turbojet engine is designed for a supersonic interceptor. At the first state, analyses are conducted to examine the ideal engine performance for such a mission. The objective of this assignment is to determine the variation of performance curves with the design parameters and flight conditions.

Flight Mach Number (M_0) : 2

Turbine stagnation temperature ratio τ_λ : 7

Atmospheric air temperature: 222.2 K

$c_p = 1004.9$ J/(K kg)

$h_{PR} = 4.4194 \times 10^7$ J/kg

$\gamma = 1.4$

- (1) Determine ST (specific thrust) (Ns/kg), TSFC (thrust specific fuel consumption) (mg/Ns), η_p , and η_{th} for π_c from 5 to 60.
- (2) If the compressor pressure ratio $\pi_c = 30$, determine TSFC (mg/Ns) for flight Mach number from 0.1 to 2.5.
- (3) If a new thermal resistant material can be found such that the turbine inlet temperature (τ_λ) can be increased, for $\pi_c = 20$, determine ST and TSFC for τ_λ ranging from 5 to 9.

Discuss the changes of the performance parameters as they related to the mechanisms of the turbine engines.

Validation Point :

For (1) with $\pi_c=5$, ST=651.4 Ns/kg, TSFC=32.2 mg/Ns, $\eta_p=0.647$, $\eta_{th}=0.649$.

REPORT FORMAT

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ABSTRACT

(<200 words. Summary of goal, approach, results and conclusions)

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INTRODUCTION

(background, literature review, motivation, goal, objectives)

**** (The Body of the Report) ****

RESULTS AND DISCUSSION

{Tables}

{Figures}

CONCLUSIONS

(Summary of accomplishments versus objectives, main results, recommendations)

ACKNOWLEDGEMENTS

REFERENCES

(Not bibliography, but only as cited in the text. Traceable and specific)

APPENDICES

Please also visit websites, similar to the following, for technical report writing.

<http://www.nutsandboltsguide.com/apa.html>