

Two-Page Annotated Bibliography Template

Summarize

Reference Document Examined:	Bartz, D.R., "Turbulent boundary layer heat transfer from fast accelerating flow of rocket exhaust gases and heated air." NASA CR-62615, December 1, 1963
Reviewer:	Veronica Loomis
Source of Document:	Canvas
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Electronic File Name:	ref_Bartz.pdf

Summary of Paper:

It is important to know heat transfer and boundary layer development within the combustion chamber and nozzle of an engine. Many advancements are being made that are increasing the pressures and temperatures of the gases within the engine, which makes it more crucial to understand the fluxes that occur within. This problem is by no means solved yet, however there is a lot of analysis and experimentation that is ongoing to try and get a better grasp of it. There are many components that go into this analysis with their own constraints, so it is important to gather those and understand what the expectations are.

B. Assess:

Important Facts from Document:

1. Recent advancements have seen engines with chamber pressures reaching 1000 lb/in² and it's not unlikely that these will double in the future.
2. More energetic propellants being developed are driving up gas temperatures to roughly 8000°F.
3. It is becoming increasingly more important to know about heat transfer and boundary-layer development in combustion chambers and nozzles.
4. It is difficult to characterize these since free stream flow cannot be successfully described in terms of steady, average, 1-D flow variables.
5. There are three unique characteristics to the thrust chamber: rapid establishment of steady flow, high heat fluxes, and a sharp axial gradient of heat flux.

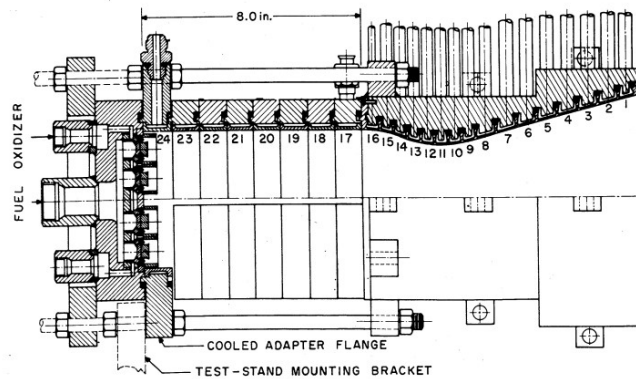
Key Figure from Document:

Figure 28: Since fluxes are high, the thrust chamber is divided into axially short segment lengths which are individually cooled.

Important Relationships among Parameters Described in the Paper:

1. Overdesigned wall protection led to excessive pressure drops and weight, or a shift towards lower performance.
2. A sharp axial gradient of heat flux creates a requirement for very localized measurements.

C. Reflect

This paper was interesting to read since it's a very real example of how this field of study is still ongoing and there is plenty more research to be done into it. Technology is always advancing and it is very important for the math and designs to stay up to date as well.