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Coolant Design System for Liquid Propellant Aerospike Engines[1]
MIRANDA MCCONNELL, Tennessee Technological University, RICHARD BRANAM, The University of Alabama — Liquid propellant rocket engines burn at incredibly high temperatures making it difficult to design an effective coolant system. These particular engines prove to be extremely useful by powering the rocket with a variable thrust that is ideal for space travel. When combined with aerospike engine nozzles, which provide maximum thrust efficiency, this class of rockets offers a promising future for rocketry. In order to troubleshoot the problems that high combustion chamber temperatures pose, this research took a computational approach to heat analysis. Chambers milled into the combustion chamber walls, lined by a copper cover, were tested for their efficiency in cooling the hot copper wall. Various aspect ratios and coolants were explored for the maximum wall temperature by developing our own MATLAB code. The code uses a nodal temperature analysis with conduction and convection equations and assumes no internal heat generation. This heat transfer research will show oxygen is a better coolant than water, and higher aspect ratios are less efficient at cooling.

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