A conjugate heat transfer analysis will be carried out to simulate an 89 kN thrust chamber hydrogen cooling channel, to determine the feasibility of adding turbulators to the combustion chamber cooling channels at various parameters such as angle, pitch, and height of the turbulator. An existing regeneratively cooled chamber environment is simulated and used as a baseline case to be compared against. The new design includes using ribbed turbulators or delta wedges in the cooling channels to increase the heat transfer on the channel hot wall (wall adjacent to the hot gas wall) and on the two channel sidewalls. With a higher heat transfer coefficient, the sidewalls behave like fins for heat transfer and participate more in the overall heat transfer process in the channel. Efficient rib and wedge geometries are chosen based on previous investigations. A conjugate heat transfer analysis is performed using a straight duct with the rib and wedge geometries included, with boundary conditions similar to those found in the combustion chamber, to provide thermal hydraulic performance data at numerous turbulator configurations. The baseline channel's maximum hot wall temperature is the target maximum hot wall temperature that is desired to be reduced. The goal is to reduce the hot gas side wall temperature at a minimal cost in pressure drop.

Major: Mechanical Engineering

Educational Career:
Bachelor's of Mechanical Engineering, BS, 2016, University of Central Florida

Committee in Charge:
Jayanta Kapat, Chair, Mechanical & Aerospace Engineering
Seetha Raghavan, Mechanical & Aerospace Engineering
Ranajay Ghosh, Mechanical & Aerospace Engineering

Approved for distribution by Jayanta Kapat, Committee Chair, on June 21, 2018.

The public is welcome to attend.