This thesis is an experimental and numerical full-coverage film cooling study. The objective of this work is the quantification of local heat transfer augmentation and adiabatic film cooling effectiveness for five full-coverage film cooling geometries. Experimental data was acquired with a scientific grade CCD camera, where images are taken over the heat transfer surface, which is painted with a temperature sensitive paint. The CFD component of this study served to evaluate how well the $v^2-f$ turbulence model predicted film cooling effectiveness throughout the array, as compared with experimental data. Levels of laterally averaged effectiveness approach values of approximately $\bar{\eta}=0.2$. In the presence of a favorable pressure gradient (FPG), the effectiveness values are not significantly affected on the average. Locally, however; the FPG cases result in a more level profile in the stream-wise direction due the blowing ratio varying locally throughout the array. In both cases, the compound angle shift causes a decrease in film cooling effectiveness. The levels of heat transfer augmentation maintain level values of $h/h_0=1.2$. There is no effect of compound angle shift on heat transfer augmentation observed. The presence of a favorable pressure gradient does not impact heat transfer augmentation.

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The public is welcome to attend.