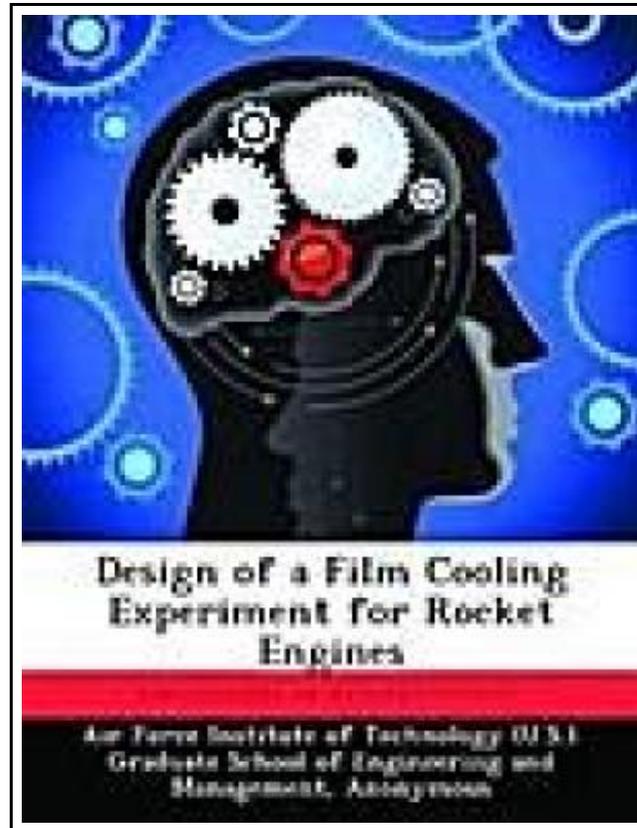


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DESIGN OF A FILM COOLING EXPERIMENT FOR ROCKET ENGINES



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Biblioscholar Sep 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x9 mm. This item is printed on demand - Print on Demand Neuware - The Film Cooling Rig (FCR) is a new test rig at the Air Force Institute of Technology (AFIT) to study film cooling for rocket engine applications. The original researcher designed, built, and then utilized the FCR to study radial curvature effects on film cooling for a non-combustion environment. This effort modified the FCR by adding propane-air combustion. Modular stainless steel test sections were produced to allow study of various curvatures and coolant injection angles. A pre-mixed burner was designed and built to deliver main flow mass flow rates necessary to produce blowing ratios as low as 0.5. A water cooling system was designed for the entire FCR, but only implemented for the curved test sections. Instrumentation in this system allows calculation of the average heat flux to the test section. Once the necessary FCR and lab modifications were accomplished, the operating range of the FCR was developed and tested using infrared thermography. Surface temperature measurements near the cooling hole showed no cooling effect for 13 major test configurations, and many more minor variations. The lack of cooling was caused by inadequate spreading of the burner flow to the test section wall. Without the necessary main flow momentum across the test section wall, the coolant flow did not turn and adhere to the wall. Instead, it jetted into the main flow without cooling the wall as expected. Recommendations included modifications to the existing rig to correct the main flow issue, along with a completely new FCR design incorporating the lessons learned from this research to produce a simpler, more effective rig. The new design allows the laser and infrared diagnostics of the first rig without the manufacturing complications that...



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