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Numerical and Experimental Investigation on Coaxial Configuration Propulsion System for Hypersonic Aircraft

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Coaxial engine configuration is a commonly used in propulsion systems to combine two or more cycles; it has been already applied on the SR 71 Blackbird engine to combine a turbine based engine along with a ramjet engine, and at hypersonic flight it is proposed to combine an air breathing rocket engine along with a ram jet engine as can be seen in the SABRE (Synergistic Air-Breathing Rocket Engine), as can be noted when investigating the Hypersonic propulsion problem the exhaust flow condition will nearly always be a highly underexpanded gas flow due to the need of relatively high pressure and temperature to accelerate the engine gas flow to a sufficient flow velocity that will create the difference of momentum needed to propel the vehicle through the Hypersonic flight, and due to the limitation in an engine cross-sectional area that will limit the expansion of the exhaust air, for that reason the use of the common exhaust channel in the coaxial engine configuration have the possibility to improve the performance by allowing the exhaust flows to further expand when working as a single or dual operational mode.

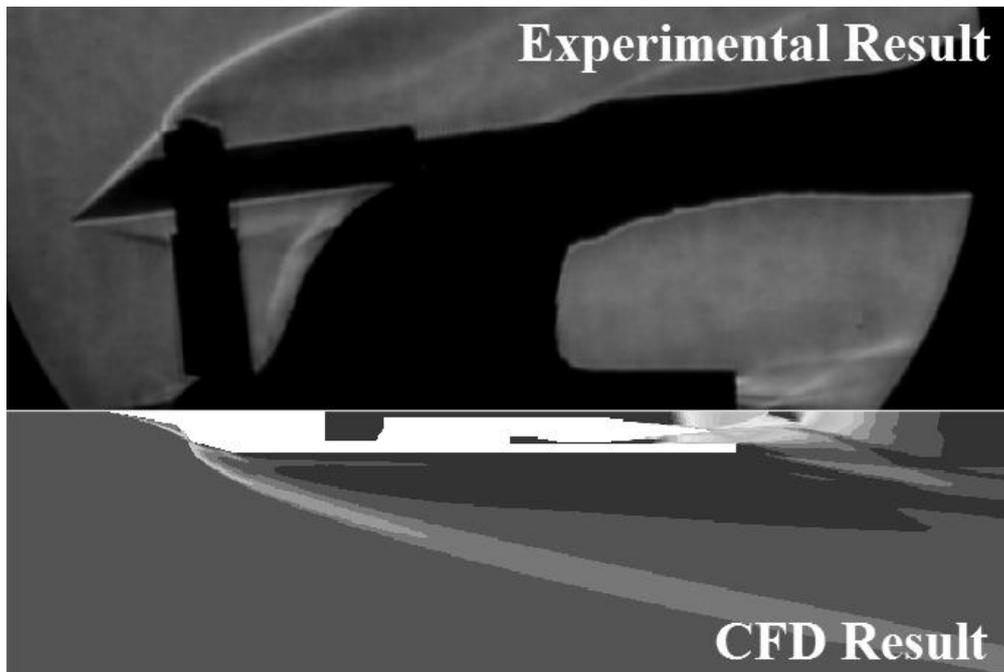


Figure 1. CFD Result compared to Experimental Results .