

Simulation of combustion by cold air injection in a generic scramjet model in the H2K blow down facility

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In this study, a full “nose to tail” scramjet configuration (Figure 1) was tested at Mach 7 in the H2K blow down facility in Cologne. In order to simulate the pressure rise in the combustor additional air was injected via a strut and two wall injectors within the combustor. To ensure starting of the scramjet the inlet was equipped with a moveable cowl, which allows different internal contraction rates. In this extensive parameter study the influence of additional air pressure, cowl position, angle of attack, Reynolds number and wall temperature ratio were studied. It could be shown that the scramjet could handle mean static pressure rises in the combustion chamber up to 4 times compared to the case without additional air injection. For comparisons the strut injector was removed and the up and downstream flow structure showed significant influence on starting behavior and shock structures. Reynolds number and wall temperature ratio variation showed a only a minor influence on the flow structure in the investigated parameter range while the angle of attack variation showed a good agreement with previous experiments of the inlet. The test itself proves the capability of the H2K wind tunnel to characterize a flight model of a scramjet without geometrical scaling.

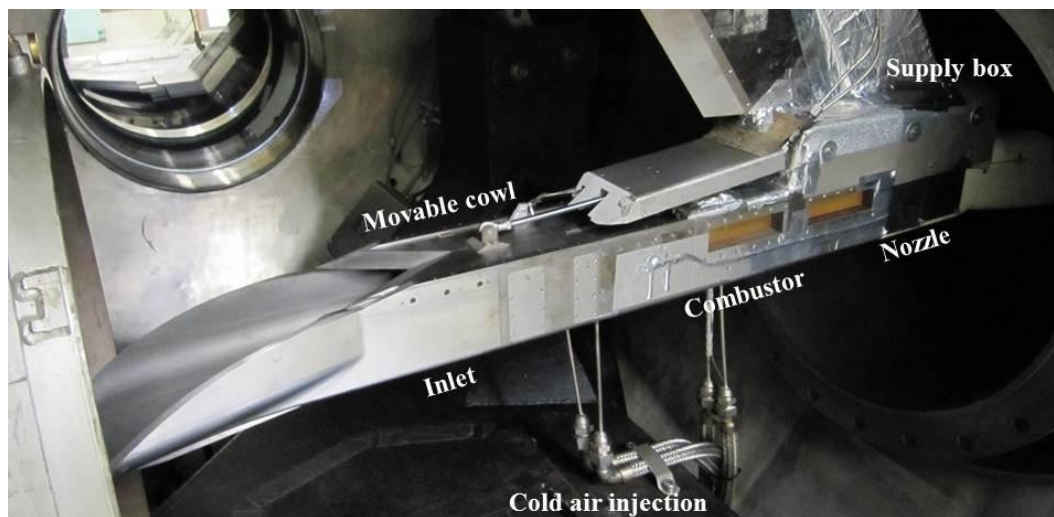


Figure 1: Experimental setup of the scramjet in the H2K wind tunnel