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# A ROBUST EXPERIMENT DESIGN FOR THE INVESTIGATION OF NON-IDEAL COMPRESSIBLE-FLUID FLOW EFFECTS

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This paper presents the design process of a converging-diverging nozzle expected to operate with a siloxane MM flow in a highly Non-Ideal regime. The goal is to extend the database of experimental results that may be used to validate a Computational Fluid Dynamics solver in the Non-Ideal regime. In particular, the value of the static pressure and of the Mach number are expected to be measured at selected locations within the domain. The Method of Characteristics (MOC) is used to design a set of possible nozzle layouts which are suitable for the observation of a non-monotonic Mach number trend throughout a supersonic expansion. To verify that the nozzle design process satisfies the given requirements, the Non-Ideal CFD solver embedded in the SU2 open-source suite [1, 2] is employed. In particular, the NICFD CFD solver is used to carry out a sensitivity analysis to assess the expected behavior for every nozzle from the design set. The sensitivity analysis takes into account the aleatory uncertainties that necessarily affect the nominal operating conditions. The most robust nozzle layout, with respect of the considered uncertainties, is then chosen among a set of different options. The selected nozzle will be eventually employed within an experimental test rig to collect measurements of Non-Ideal flows.

## REFERENCES

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