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Effect of Surface Roughness on Mach Reflection

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It has long been believed that the oblique shock reflection is a self-similar phenomenon, and the analysis have been based on this assumption so far. However, recently non-self-similar behavior of oblique shock reflection has been observed under atmospheric pressure conditions. There are two possible reasons for the non-self-similarity: transport properties (viscosity or thermal conductivity) and surface roughness, both of which bring characteristic length into the system, and break the self-similarity. In the present paper, the effects of surface roughness and transport properties have been compared experimentally for Mach reflection. The surface roughness was given by pasting a piece of sand paper (#60 and #240) on the model surface. The results were compared with those for smooth surfaces. As the effect of surface roughness turned out to be small compared with viscosity effect, it was concluded that the effect of transport properties is dominant in the non-self-similar phenomena.

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