A Review of Flow Control for Shock-Wave/Boundary-Layer Interactions (SWBLIs) in Hypersonic Flows

(Keynote Lecture)

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Abstract

Maintained high-speed flight, especially at supersonic and hypersonic speeds in the atmosphere have been well-known to present a persevering challenge to vigorous aerospace vehicle design. SWBLIs or Shock-Wave/Boundary-Layer Interactions-dominated flows and some critical aerothermodynamic phenomena such as transition to turbulence, large heat transfer rates, high-temperature gas chemistry effects, are among the many issues having particular importance in high-speed flight. The importance of SWBLIs phenomenon, as in Figure 1, is still an extensive research topic to improve the understanding due to its complexities. The other critical aspect of its understanding is the development of flow control for SWBLIs. This aspect has received relatively little attention and not as well documented, especially in hypersonic flows and, therefore, the fundamental understanding of the phenomenon is still poorly understood.

The focus of the paper is **A Review of Flow Control for Shock-Wave/Boundary-Layer Interactions in Hypersonic Flows**. The objective of the research is to improve the understanding of fundamental physics and mechanism of flow control for SWBLIs phenomenon. The outcome of the paper is that it will present a research overview in in support of generating affordable, rapid and robust aerospace design tool/method for flight test vehicle. The proposed work will also be a part of wider SWBLIs research to generate a Database of SWBLIs, to assist the design of future experiment and code development and their integration.

Keywords: Flow Control, SWBLIs, Hypersonic Flows

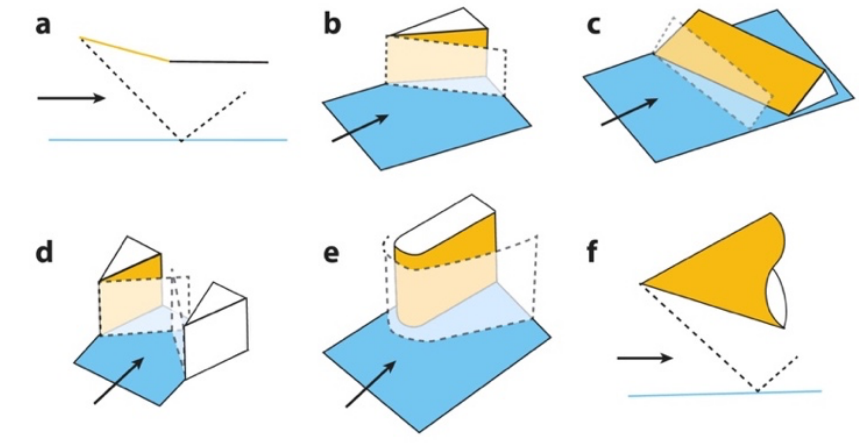

Figure 1. 2-D and 3-D SWBLIs (Gaitonde and Adler, 2023)

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