

Review of: "Aerodynamic Design and Performance Analysis of Mars Ascent Vehicles"

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Potential competing interests: No potential competing interests to declare.

The authors compared various geometric shapes of Mars-launched vehicles. While I found the research potentially beneficial for both computational and theoretical approaches, the manuscript is presented in a lengthy format. I feel that the current manuscript resembles a dissertation more than an academic paper. Here are my comments:

1. The abstract is poorly written. Some sentences from the results and methods sections are mixed, making it hard to understand the research focus of this paper.
2. Introduction, page 7: Remove the reference at the end of the introduction section. Please check the entire manuscript carefully as there are many reference errors.
3. Research objectives: It is unclear why the authors performed this study. Since the authors wrote, "The reentry process...are typically designed with a streamlined shape to minimize air resistance, thereby reducing the drag coefficient," in the introduction, it appears there have been similar studies. It would be better to provide a brief review of previous research and highlight their research gap. Also, it would be better to move the description of geometries to the methodology section.
4. Methodology, page 12: The first sentence is unfinished.
5. Page 14, equation 3-8: Why did the authors choose the Sutherland model for viscosity?
6. Page 16, turbulence model, "Table 1 summarizes the closed parameters in the turbulence model and their standard default values": Table 1?
7. Page 20, Boundary condition: Figure 9 is unclear in describing the boundary conditions. It is difficult to understand where the inlet, outlet, symmetry, etc., are in that figure. Also, please provide the distances from the object to the inlet and outlet. From the current figure, it seems that the inlets are right in front of the object.
8. The authors claimed from the beginning that temperature is important for hypersonic vehicles, so why did you use an isothermal wall of 300 K?
9. Post-processing: I don't think this section is necessary.
10. Which CFD software did the author use? Tecplot is an analysis tool for post-processing, not simulation. Also, what were the settings for the inlet and outlet conditions?
11. A mesh independence test is required. Please add it. Also, what is the wall y^+ value? And how many boundary layers are applied near the wall?
12. Table 3: Please correct the Mach number; it appears as 5.9 and 7, rather than 5.97.
13. There is no discussion for Figures 12 and 13.

14. Figures 14-24: How did the authors achieve the separate results for laminar and turbulent flows? Are these results from two different simulations or from one simulation? If two, then what is the significance of conducting a separate simulation for laminar flow? At hypersonic, flow is not fully laminar.
15. More references need to be added.