## **Investigation of Bridging Method to Predict Rarefied Aerodynamics**

## of Lift Body

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## Abstract.

The applicability of two typical bridge function methods for the calculation of lift body aerodynamic characteristics is studied by analyzing the X37B lift body aerodynamics in transitional regime between free molecular and continuum flows. of The sensitivity of limit Kn number and the character length in bridge function method on predicting lift body aerodynamics is discussed. The different bridge function coefficients are reconstructed based on numerical results using the least squares optimization method, and especially, a new method of predicting moment coefficient for lift body is developed. The results show that the limit Kn number and the character length have a great influence on the aerodynamics. The results predicted by sin squre bridge function are in good agreement with the numerical results when the limit Kn numbers are 10<sup>-3</sup> for continuum flow regime and 10 for free molecular regime respectively. The EXP bridge function method mainly depends on free stream Kn, and the definition of the reference length directly affects the empirical coefficient of the prediction formula. The method developed in this paper can predict the aerodynamic characteristics of the lift body shape well, and the extended EXP bridge function has a good result in predicting the aerodynamic moment of the lift body.

**Keywords:** Rarefied; Bridging function; Aerodynamic characteristics; Least square method