

## **Controller Design for D-SEND#2**

D-SEND#2 is a project to demonstrate a low sonic boom aerodynamic design concept. In this project, an unpowered test vehicle is lifted to an altitude of 30km by a balloon from which it then separates. After separation, the vehicle's on-board flight control computer selects a target Boom Measurement System (BMS) according to the separation point. The vehicle then autonomously flies to the selected BMS and establishes prescribed sonic boom measurement flight conditions. The design of the GNC system for D-SEND#2 project is exceptionally challenging since 1) there is no nominal trajectory, 2) there is only limited control available to meet the requirements, 3) the required test conditions are difficult to achieve, and 4) the flight envelope is quite wide. The dynamic inversion method and time-scale separation technique are applied to deal with these problems. This paper describes the D-SEND#2 control system design in detail and the results of its evaluation by numerical simulations.