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A reduced order model for store separation in high speed flow NICHOLAS PETERS, JOHN EKATERINARIS, Embry-Riddle Aeronautical University — Store separation from aircraft and spacecraft has historically been a critical issue for the aerospace industry. Given the severity of the problem much effort has been spent on the topic. Yet, the process for identifying potential failures is a resource intensive and iterative process. A potential remedy for reducing iterations in this process is the implementation of an active controller for use during separation. The objective of this study is to design such a controller, using a reduced ordered model (ROM) for the flow around an external store undergoing separation. A combination of computational fluid dynamic (CFD) solvers, fun3D and Ansys Fluent, is employed to obtain flow fields around the vehicle and the store. Preliminary validation of the numerical results is initially carried out. Representative cases of store separation are obtained next. Proper Orthogonal Decomposition (POD) and Dynamic Mode Decomposition (DMD) are used to obtain leading modes that will be used to reconstruct a ROM of the flow field. These models will be compared with the objective of seeing which method better represents the numerical solution to the problem at different flow speeds with and without the presence of shock waves. The ROM will then be used to construct the controller.

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