

Splashdown Visualization of Spent Stages

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The state of the art for many Earth-to-orbit trajectory analysis toolsets used at NASA is somewhat dated in terms of the languages they are written in and their user interfaces. Many of these programs are written in languages like Fortran or C that are no longer considered modern in the technology industry, and are command-line based without any means of interpreting the data outputs. This presentation is meant to demonstrate a specific use case for a newly developed web app that visualizes the output data for one of these tools. Specifically, one key usage is to investigate and validate launches for notional multi-stage vehicle concepts to various non-standard high-inclination orbits. Some NASA requirements dictate that trajectories be designed such that no surviving debris lands closer than 200 nautical miles (nm) from foreign landmasses or 27 nm from the continental United States, therefore validating re-entry locations of spent stages is an integral part of the launch planning process. In addition, at programmatic levels it can prove insightful and clarifying for the decision-making process to enhance the technical results of numerical simulations with visualizations. The intent with this tool is to provide the mission analyst and program level management with an intuitive and clear grasp of key information on possible mission scenarios either departing from or arriving at Earth, and in the future, the moon or Mars as well. The software tool was developed with an agile development approach and utilizes the latest frameworks and technologies. The front end uses the React JavaScript library for making a state of the art frontend and a backend based on the Django Python framework for handling data using Python's powerful and free scientific libraries. In addition, the CesiumJS open-source library is key for visualizing these end-to-end trajectories on a high-resolution Earth model. The presentation will demonstrate the current capability and tested use cases.

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