

SPACE SYSTEMS SYMPOSIUM (D1)
Interactive Presentations (IP)

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LAUNCH:A MODEL BASED SYSTEMS ENGINEERING PLATFORM FOR RAPID
COLLABORATION ON NASA LAUNCH-FLIGHT SYSTEM INTEGRATION LAUNCH**Abstract**

The process of launching a spacecraft safely into orbit or beyond is complex. The flight system design must iterate with the launch system to ensure the numerous analyses and tests are completed successfully and that the Launch-Flight system will function in unison. The launch architecture, product development and operations systems must work together to ensure resourceful, timely and cost-effective products. The current process of data analysis and integration relies heavily on traditional documents and technical interchange meetings. The Launch Systems Engineering team at NASA's Jet Propulsion Laboratory has developed a unified platform for launch systems data exchange using model-based systems engineering (MBSE). MBSE is a systems engineering methodology which simplifies complex systems by breaking down the architecture into elements and interconnecting them with relationships that define both function and behavior. The LSE group has created a model of launch vehicles, launch sites and other launch-related information such as functions and behaviors for teams involved in mission planning, flight system design and mission implementation phases of project to utilize. Users are able to explore and connect to data sets, view technical details about their components, compare capabilities and features, and link that data dynamically to their projects to perform further parametric analysis, design and operations. The Open MBEE (Model Based Engineering Environment) architecture provides a complete open source tool set in the Engineering Modeling System (EMS). The framework features a backend model-management tool and a front-end web-based interface allowing engineers to access and connect to repository data. Open MBEE combines the design metrics of Systems Modelling Language (SysML) with the graphical documentation created using EMS. Coupling extensive information related to mission parameters and launch systems configurations from launch expertise at JPL with supplier provided data, systems engineers have developed a comprehensive database of launch systems that includes the Space Launch System (SLS), Evolved Expendable Launch Vehicles (EELV), Venture class rockets and even secondary launch systems. LSE developers have built custom software extensions to integrate these components in an end-to-end launch systems constraints modeling platform. These constraints enable automatic property based requirement generation and verification and validation sequences. The Launch platform enables system engineers improved development and execution of the integration tasks required during the formulation and execution of a mission.