

Common Risk Analysis Tool Kit Development

As required by NPR 8715.5; *Range Safety Program*, each range operation (launch or flight) shall undergo a range safety analysis to establish any design or operational constraints needed to control risk to persons and property. To accomplish this task, each NASA center has developed analysis tools to estimate risk associated with different hazards. Risk models currently used by the centers were mostly developed by Range Safety support contractors according to their particular technical expertise and based on specific center requirements and/or concerns. Some of the existing models have had peer review but have not been subjected to an extensive validation and verification program. Most of the models also lack well defined configuration management requirements and user training programs.

Purpose and Goal of Common Tool Kit Development

The purpose of the common tool kit development is an attempt to better manage public safety risk models used by NASA and to consolidate development efforts and requirements for proper validation and verification and configuration management. The goal is to develop a suite of accepted models under formal configuration management and make them available to all centers. Training and certification on performing hazard analysis using the models, including the associated physics and acceptable risk levels, will be required. This effort should minimize duplication of development effort and provide ranges with expanded capability when necessary to evaluate new hazards. It will also somewhat standardize the analysis process and ultimately make analysts well versed in a particular type of hazard analysis available to other centers.

Developing a Toolbench

With larger and more varied launch programs being introduced, such as expendable launch vehicles, reusable launch vehicles, reentry vehicles, and in particular the Constellation program (see right), greater emphasis is being placed on risk management and the use of rigorously validated and verified risk models.



In 2007, the Constellation Program funded a task to develop an updated debris risk analysis tool. The task is intended to evaluate the current suite of Space Shuttle/expendable launch vehicle launch area and overflight debris risk models and their associated sub-models to determine how they can be improved and integrated into a government owned and operated risk analysis tool.

The “toolbench” will have an open systems architecture that will provide economies in upgrading hardware, modifying existing models, interfacing new models when new or enhanced capabilities are required, and sharing physics and data modules between risk models. The toolbench will be managed with formal processes for verification, validation and acceptance, and configuration management and user training/certification. A requirements document, outlining modeling capabilities, validation and acceptance, and configuration management has been completed.

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Initial Focus

Evaluations of existing capabilities and proposals on both system architecture and new physics model development will begin in early 2008. Although initial development will focus on supporting ARES 1 debris risk analysis at the Eastern Range, plans are to expand toolkit capability to include other hazards (such as toxics and distant focusing overpressure), other launch vehicles (expendable launch vehicles), unmanned aerial vehicles, other phases of flight (descent), and other centers and ranges.

