



NASA SBIR 2009 Phase I Solicitation

X1.02 Reliable Software for Exploration Systems

Lead Center: ARC

Participating Center(s): JPL, LaRC

This subtopic seeks to develop software engineering technologies that enable engineers to cost-effectively develop and maintain NASA mission-critical software systems. Particular emphasis will be on software engineering technologies applicable to the high levels of reliability needed for human-rated space vehicles. A key requirement is that proposals address the usability of software engineering technologies by NASA (including contractors) and not specialists. In addition to traditional capabilities, such as GNC (guidance, navigation, and control) or C&DH (command and data handling), new capabilities are under development: integrated vehicle health management, autonomous vehicle-centered operations, automated mission operations, and further out - mixed human-robotic teams to accomplish mission objectives. Mission phases that can be addressed include not only the software life-cycle (requirement engineering through verification and validation) but also upstream activities (e.g., mission planning that incorporates trade-space for software-based capabilities) and post-deployment (e.g., new approaches for computing fault tolerance, rapid reconfiguration, and certification of mission-critical software systems). Specific software engineering tools and methods are sought in the following areas:

- Automated software generation methods from engineering models that are highly reliable;
- Scalable verification technology for complex mission software, e.g., model-checking technology that addresses the 'state explosion' problem and static-analysis technology that addresses mission-critical properties at the system level;
- Automated testing that ensures coverage targeted both at the system level and software level, such as model-based testing where test-case generation and test monitoring are done automatically from system-level models;
- Technology for calibrating software-based simulators against high-fidelity hardware-in-the-loop test-beds to achieve dependable test coverage;
- Technology for verifying and validating autonomy capabilities including intelligent execution systems, model-based diagnosis, and Integrated Systems Health Management (ISHM);
- Methods and tools for development and validation of autonomic software systems (systems that are self protecting and self healing).

