NASA SBIR 2015 Phase I Solicitation

S5.04 Integrated Science Mission Modeling

Lead Center: JPL

Participating Center(s): GSFC

NASA seeks innovative systems modeling methods and tools to:Â

- Define, design, develop and execute future science missions, by developing and utilizing advanced methods and tools that empower more comprehensive, broader, and deeper system and subsystem modeling, while enabling these models to be developed earlier in the lifecycle. The capabilities should also allow for easier integration of disparate model types and be compatible with current agile design processes.
- Enable disciplined system analysis for the design of future missions, including modeling of decision support for those missions and integrated models of technical and programmatic aspects of future missions. Such models might also be made useful to evaluate technology alternatives and impacts, science valuation methods, and programmatic and/or architectural trades.

Specific areas of interest are listed below. Proposers are encouraged to address more than one of these areas with an approach that emphasizes integration with others on the list:

- Conceptual phase models that assist design teams to develop, populate, and visualize very broad, multidimensional trade spaces; methods for characterizing and selecting optimum candidates from those trade spaces, particularly at the architectural level. There is specific interest in models that are able to easily compare architectural variants of systems.
- Models of function or behavior of complex systems, at either the system or subsystem level. Such models should be capable of eliciting numerically accurate and robust estimates of system performance given appropriate environments and activity timelines, and could be tailored:
    - To support design efforts at early- to mid-phase.
    - To support verification and testing of systems that cannot be performed on actual as built systems.
    - To support the development of operational mission scenarios and the investigation and troubleshooting of on-orbit anomalies. As an example, the list of potential future missions includes a flagship UV-optical-IR, 10-m class space telescope with demanding performance requirements (e.g., milli-arcsecond pointing, picometer wavefront stability) driven by the goal to detect and characterize Earth-like exoplanets.
    - Hi-fidelity performance models of remote sensing instruments that can easily be integrated with spacecraft and telescope models to form system-level performance models.
    - Target models (e.g., phenomenological or geophysical models) that represent planetary surfaces, interiors, atmospheres, etc. and associated tools and methods that allow them to be integrated into system design models and processes such that instrument responses can be simulated and used to influence design. These models may be algorithmic or numeric, but they should be useful to

designers wishing to optimize systemsâ€™ remote sensing of those planets.
- Modeling of failure modes and/or other risk mechanisms that enable meaningful assessment of performance, cost and schedule risk.Â