



S²MARTS Project 20-05: Hardware in the Loop (HWIL)

Request for Solutions (RFS) Questions & Answers | Posted 09 June 2020

1. **Question:** Can the government clarify the operational scenarios and environments for which system and system subcomponent testing simulations must be created: For example, will hypersonic simulations include the end-to-end environmental effects and operating conditions for 1) air launched, 2) sea launched and 3) ICBM launched hypersonic vehicles? Will the effects simulations address both scramjet and glide vehicles? Will the effects simulations include all possible small satellite orbital regimes including e.g., LEO, MEO, HEO, and GEO? Will the simulations be required to address the variable radiation effects on satellites depending on orbital regime? Will it address the variable parameters of launch vibration for small satellites e.g., rideshare on Falcon 9 (heavy lift) versus direct insertion on Rocket Lab Electron (small rocket) given that one ask is for vibrational testing?

Response: The hypersonic weapon system and environment modeling is for systems launched from a ground-based launcher since that is the Army Mission, but SMDC is interested in the other areas. Both the scramjet and glide vehicles are of interest. Since SMDC mission is space, all possible small satellite orbital regimes including e.g., LEO, MEO, HEO, and GEO is of interest. Simulated operational environments should reflect the atmospheric, temperature, and radiation environments for any type of system called out in the RFS. Vibration environments experienced by a system under test within the testbed should be replicable.

2. **Question:** The request seems to emphasize hypersonic weapons HIL testing and makes very little mention of small satellite testing; can the government clarify the difference in emphasis (if any) placed on hypersonics, missile defense solutions, directed energy, avs, small satellites? During evaluation, will proposed test simulation capabilities development be weighted higher if they address hypersonic weapons and lower if they address small satellites? Said another way, is there a difference in how emerging technologies are weighted in terms of importance?

Response: The HWIL will be multi-faceted but the hypersonic weapons HIL testing will be the main focus. The evaluation will be weighted based on the emphasis of the hypersonic weapons HIL.

3. **Question:** Where the RFS talks about employing replicable and modular simulated environments, will all these be physical based simulations of actual components in a physical lab or do you envision plugging hardware prototypes into a cyber range and then validating/attacking their operating systems from an information warfare perspective?

Response: The modular design intent of the testbed requires that physical components in an HWIL configuration be interchangeable with digital modules within the testbed.

4. **Question:** Can the government clarify whether the environment is meant to emulate missile defense solutions, directed energy, and small satellites as a system of virtual machines or is this RFS intended to simulate and model physical components and affects with resulting data analysis?

Response: The level of simulation of the operational environment should be commensurate with the instantiation of the component within the testbed. Digital representations of systems, subsystems, or components should operate within digitally simulated environments. Physical hardware components within an HWIL testbed configuration should operate within physical environments providing the stimulus an operational system would.

5. **Question:** If the Government is only focused on simulations and models, will there be a follow-on or different RFS for a cyber environment that emulates the components and data that were simulated and modeled?

Response: The government will address cyber environment in the future as more threats are identified. The contractor can propose a solution to the cyber environment in this RFS.

6. **Question:** Is the work to be conducted on an already existing platform, such as the Prototype Integration Facility (PIF) contract already in place in Huntsville, AL?

Response: It is anticipated that the work will be performed on an USASMDC platform; however, the contractor can propose a platform to conduct the work.

7. **Question:** Are the models, as referenced in Phase 2, intended to be hardware, software or a combination of both? Are there any standard interfaces for which these models must be designed to interface? Does the Gov't intend to provide models for inclusion in the test bed, or is the expectation that they be "home grown"?

Response: Phase 2's testbed end state is intended to be digital representations of systems across the SMDC portfolio. The models resident within the testbed should interface with the common simulation framework designed in Phases 1 and 2. There will be some ground-up development of M&S, some adaptation of existing M&S, and some direct integration of M&S. While it is not expected that high fidelity M&S of all SMDC portfolio systems be "home grown", the government provides no commitment to supply models and simulations.

8. **Question:** Phase 3 mentions simulating command and control (C&C) aspects of the system: 1) do current systems exist from which to emulate design, or is this a new effort? 2) is there any expectation of interfacing/networking with existing government C&C systems?

Response: There are several command and control systems across the SMDC portfolio but a new C&C may be required. System requirements, system design documents, and general system information will be provided to the selected performer if existing C&C system is selected.

9. **Question:** Using a high energy laser (HEL) as an advanced concept example, the success criteria section offers the following example hosted models, '...beam control, power management, thermal management, and models of laser...'; is there a scenario where a HEL would be exercised as a more complete system (such as HEL connected to a 'range in a box') or is it anticipated that testing/simulation would be more granular and without requiring laser fire?

Response: The level of simulation/HWIL required for each system, subsystem, or component under test will depend upon the test objectives developed as part of this prototype development. The proposer should identify what testing is required (HEL connected to a range in a box, etc.) to validate the test objectives.

10. Question: The RFS requires that the contractor have cleared personnel and facilities at the SECRET level, but also indicates that all documentation is anticipated at the Distribution D level; is the classification of the testbed anticipated at the SECRET level?

Response: Yes. The testbed is anticipated to be at the SECRET level.

11. Question: Do subcontractors require all security clearance requirements stated in Section 8?

Response: Subcontractors that develop tools that contain no classified data are not required to have a security clearance.

12. Question: Will the Govt allow inclusion of a table of contents and/or acronym list in our response to increase ease of evaluation and not apply those against the page count limit?

Response: All acronyms should be spelled out the first time they are introduced. The inclusion of a table of content and/or acronym list will not apply against the page count limit.

13. Question: Under Phase 1 Descriptions, Looking for the meaning of “aggregation” in terms of the SMDC related portfolio. By “aggregation,” is SMDC looking for a design of an infrastructure to integrate existing SMDC portfolio tools and models?

Response: Yes; however, the contractor can propose a new design infrastructure.

14. Question: Under the Phase 2 Description, the description seems to differentiate between the “Family of Systems Architecture and test environment” and a “system architecture and technology testing ecosystem.” Can you explain the difference between these two things? Is the “Family of Systems Architecture and test environment” the TAT framework and is the “system architecture and technology testing ecosystem” the integrated weapon system and technology tools/models that are integrated?

Response: "Family of Systems Architecture and testing environment" refers to the TAT simulation framework and aggregated M&S of SMDC portfolio systems. "System architecture and technology testing ecosystem" refers to the HWIL TAT prototype as a whole.

15. Question: Under Phase 2 Deliverables, does the “completion” of high-fidelity models mean creating new models for all the sub components in the 8 month timeframe or is it an integration effort of existing tools?

Response: It is not expected that high fidelity M&S of all SMDC portfolio systems be completed from scratch by the completion of Phase 2. It is expected there will be some ground-up development of M&S, some adaptation of existing M&S, and some direct integration of M&S. While it is not expected that high fidelity M&S of all SMDC portfolio systems be developed, the government provides no commitment to supply models and simulations.