Technical Supplement
For
System-of-Systems Controlled Environment Test Infrastructure (SCETI)

1. Scope.

This Technical Supplement describes the Army's needs as implemented through the System-of-Systems Controlled Environment Test Infrastructure (SCETI), which will improve the test capability for degraded visual environment (DVE) sensor assemblies.

The requirement for SCETI is driven by planned DVE Brownout Rotorcraft Enhancement System (BORES) test events projected to take place in late fiscal year 2021 at Redstone Test Center (RTC). This test will require the ability to place a sensor assembly into emulated flight through a dust storm which will be generated using existing RTC capabilities. The SCETI effort will begin by creating this emulated flight capability and the ability to measure, control, and record this testing from a test control center at RTC's Test Area 3 (TA-3). Upon successful delivery of a prototype solution to RTC, the Government has an objective to deliver an enhanced instrumentation suite, to an open-air flight test range at Yuma Test Center (YTC), for measurement of dust DVE conditions. This capability will complement and be interchangeable with the dust measurement instrumentation implemented at RTC TA-3.

SCETI is an instrumentation system to test aircraft sensor assemblies to verify their functionality when exposed to DVE conditions. The capability will create a limited area of controllable, physically induced, and natural DVE environments through which individual or aggregate DVE sensors and systems can be moved, emulating relevant aircraft flight dynamics such that operational system performance can be evaluated. SCETI capability must be able to interface with RTC test networks to enable pilot-in-the-loop interaction and control of the DVE by Government-developed pilot software through a modular interface to produce results that are comparable to open air sensor performance flight test. The capability will be reconfigurable to enable simultaneous testing of multiple aircraft sensors while minimizing cost and risk compared to traditional open air flight testing.

The primary capabilities of SCETI include the following objectives:

a. Emulated Flight Capability – provide emulated flight to the system under test (SUT), allowing the sensor system to move through simulated DVE conditions for test without the risks inherent to on-aircraft flight testing.

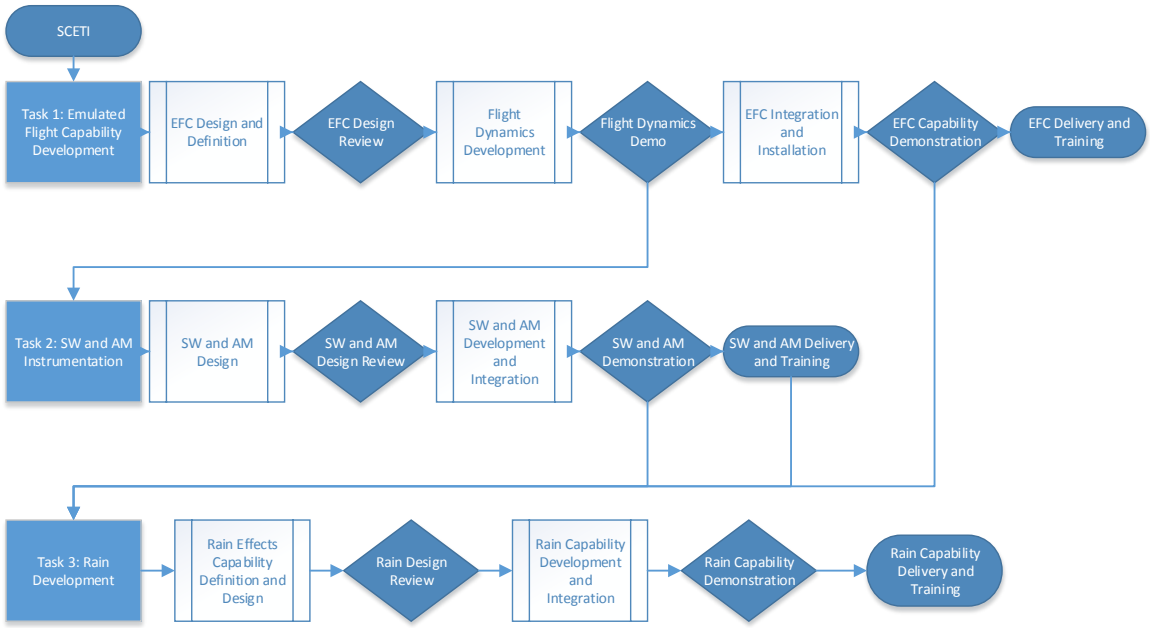
b. Atmospheric Effects Development (AED) Capability – SCETI subsystems which generate operationally relevant DVE conditions to test the SUT's functionality. The Government desires a rain development capability to be integrated into

SCETI, along with integration of a Government provided dust generation capability.

c. Atmospheric Measurement (AM) Capability – SCETI subsystems which characterize the atmospheric conditions the SUT is exposed to during testing. The Government desires the ability to characterize the DVE dust and rain conditions generated by the AED capability or occurring naturally at the test range.

SCETI will be operated from a Government-provided Test Control Center (TCC) using the RTC/Aircraft Survivability Equipment (ASE) Architecture for Test and Evaluation of Hostile Fire (RATH), an architecture developed at RTC based on the Test/Training Enabling Architecture (TENA). The Governemnt will provide RATH information to the Vendor for development of command and control software. Web resources for information on TENA are provided in the references section.

The Government's current concept for SCETI's task and milestone flow is depicted in the figure below. The Vendor should propose any modifications required by their own schedule.



1.1 Background.

As the Army and Department of Defense (DoD) develop new systems to aid aircrews to be able to fly in DVE conditions these new systems have to be tested. Hardware and software-in-the-loop simulations using spectral specific weather models do not exist. Currently, the only way to test these new systems is to conduct costly, higher risk open

air flight testing in the actual DVE conditions. However, a test program relying solely on flight in naturally occurring DVE conditions will greatly increase test schedule and cost, and ultimately lead to verifying system functionality in only a subset of the desired DVE conditions.

A significant shortfall exists in DVE testing, specifically the lack of capability to test new DVE sensors in emulated flight, under controlled DVE conditions. SCETI aims to address this shortfall by developing a multi-functional instrumentation test capability that will expose the DVE SUT to controlled, repeatable, and realistic DVE conditions.

2. SCETI System Characteristics

The following section defines the characteristics that SCETI development must consider in the creation of the Vendor's solution. The Vendor is encouraged to pursue any design that achieves these characteristics.

2.1 General Characteristics

2.1.1 Operating Environment

All systems with the exception of computer hardware within the TCC will operate outdoors in temperatures and weather conditions typical to Redstone Arsenal year round.

2.1.2 Available Footprint

The emulated flight and AM capabilities will be installed within an area 1000' long by 400' wide at Redstone Arsenal. Any system designed for this effort must fit within the identified area.

2.1.3 Support Personnel

The SCETI system will support test events with four or fewer operators at a time.

2.1.4 Automation

The SCETI system and its subsystems will be automated to the maximum extent possible, including automated test execution and reconfiguration of subsystems.

2.2 Emulated Flight Characteristics

The emulated flight capability provides emulated flight characteristics to the DVE SUT of interest at RTC, allowing for testing of DVE sensor assemblies without attaching the sensors to an aircraft. The SCETI will be used by RTC to test multiple sensor assemblies which may exist now or may still be in development upon delivery of the system. All Emulated Flight Characteristics are to be developed during Task 1.

2.2.1 Flight Dynamics Support Characteristics

The portion of the emulated flight capability to which the SUT is directly connected is expected to provide the rotational dynamics of a helicopter in flight to the SUT. The capability to provide these flight dynamics will be developed and demonstrated during Task 1 Stage 2, prior to full fabrication and integration of the emulated flight capability.

2.2.1.1 Sensor Assembly Modularity

The emulated flight capability will be capable of being reconfigured to physically mount and connect different sensor assemblies (one SUT at a time).

2.2.1.2 Sensor Assembly Support

During test events, the emulated flight capability will be used to mount, support, and provide all identified emulated flight characteristics to sensor assemblies that weigh up to at least 175 lbs, with an objective to be able to support SUTs that weigh up to 250 lbs. The payload structure dimensions will be derived by the Vendor's design and structural analysis for this technology.

2.2.1.3 Sensor Assembly Interface

The emulated flight capability will provide an optical connection with a bandwidth of at least 10 Gbps or up to 100 Gbps between the mounted sensor assembly and the TCC to allow for real time operation of and data collection from the DVE SUT. The fiber optic link will be used to support MIL-STD-1553 data bus, ARINC 429, Ethernet, and serial communication messages to the TCC with sensor data and command and control (C2) data transfer information.

2.2.1.4 Emulated Flight Capability Control

The emulated flight capability will be able to move the SUT Sensor Assembly in response to commands from the TCC. These commands may be generated in real-time by an operator within the TCC, in pre-recorded flight plans, or generated by a Time Space Position Information (TSPI) stream passed through the TCC over RTC test networks.

2.2.1.5 Sensor Assembly Rotational Motion

To emulate the flight characteristics of the rotorcraft the sensor assemblies are designed for, the emulated flight capability will provide roll, pitch, and yaw rotation to the sensor assembly payload. There are three axes of rotation for the payload. For the pitch axis, the payload should be able to rotate at least 20 degrees from the horizontal in either direction, and for the roll axis the payload should be able to roll 10 degrees from the horizontal. For the yaw axis, the payload should be able to rotate at least 180 degrees from the forward direction, with an objective to be able to provide continuous rotation.

2.2.1.5.1 Rotational Accuracy

The emulated flight capability will provide rotational accuracy within at least +/- 5 degrees of the commanded position for roll, pitch, and yaw with an objective of within 1 degree. If a tradeoff is required between accuracy of rotation and degree of rotation, accuracy is to be given priority.

2.2.1.6 Witness Camera

A high-definition color camera will be mounted with the sensor assembly whose feed will be displayed in real-time on a monitor in the TCC.

2.2.2 Sensor Assembly Translational Motion

The emulated flight capability will be able to move the payload and mounted sensor assembly horizontally and vertically throughout the motion volume except as prohibited by pre-defined exclusion zones. These exclusion zones should be modifiable within SCETI software as required to prevent collisions.

2.2.2.1 Translational Accuracy

When in emulated flight, the emulated flight capability should place the sensor assembly within two feet root-sum-squared (RSS) of the commanded position, with an objective to increase the accuracy to within 0.5 feet RSS. When considering tradeoffs, accuracy is considered to be more important than velocity.

2.2.2.2 Translational Repeatability

The emulated flight capability will provide translational repeatability within at least 4 feet RSS with an objective of within 2 feet RSS.

2.2.2.3 Position Reporting Accuracy

The emulated flight capability will be able to measure and report to the TCC the position (x, y, and z) of the sensor assembly to within 0.1 feet of the actual position.

2.2.2.4 Translational Velocities

The emulated flight capability will provide horizontal velocities of up to 34 ft./s and vertical velocities of up to 5 ft./s. As stated above, this is considered less important than accuracy.

2.2.2.5 Velocity Reporting

The emulated flight capability will be able to measure and report to the TCC the velocities of the sensor assembly to within 2 ft./s.

2.2.3 Emulated Flight Capability Response Time

All commands provided to the emulated flight capability will be processed and reported within no more than 10 ms.

2.2.4 Sensor Assembly Power

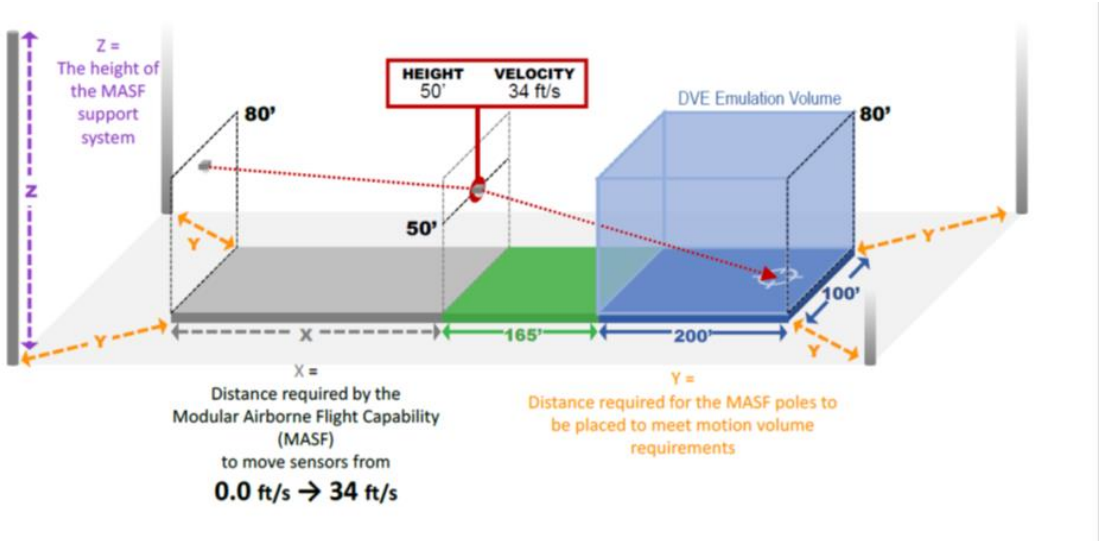
Sensor assemblies mounted to the emulated flight capability will be provided power up to 2kW at 28 VDC, with an objective to additionally be able to provide 115 VAC at 60 and/or 400 Hz. This power may be allocated from the power supply to the emulated flight capability overall or be generated by a dedicated power system for the SUT.

2.2.5 Health and Status

The emulated flight capability will report its health and status to the TCC for monitoring and troubleshooting within 10 ms.

2.2.6 Emulated Flight Capability Motion Volume

The emulated flight capability will be able to move the mounted SUT through a volume that is at least 80 feet high, and 100 feet wide. The volume will also have a length of 365 + x feet, as indicated below. The proposed length x will be a sufficient length to accelerate the SUT from rest to its maximum required speed. Once it reaches its full speed, the SUT will be decelerated to a stop within the remaining 365 feet. An example of the operational scenario, including variables to be defined, is depicted below.



2.2.7 Payload Alternate Mounting

In some scenarios, the Government needs to be able to mount the emulated flight capability payload to a separate structure provided by the Government which is at least 80' high while providing the same power and rotational control.

2.3 Atmospheric Measurement Capability Characteristics

SCETI will use a suite of instrumentation as its AM capbility to characterize the atmospheric conditions within the test area during test events as defined in the DVE Taxonomy Study. When testing a SUT using the full SCETI capability, the instrumentation will be placed next to or within the DVE Volume (the blue volume identified in the figure above) as required to characterize the environment within that volume and report back to the TCC. Data collected by the AM capability will be used to verify that conditions generated were the conditions desired for SUT testing, and to characterize conditions during times in which no artificial DVEs are generated. Instrumentation will be procured as part of Task 2.

2.3.1 Atmospheric Effects Measurement Reporting

SCETI AM capabilities will report atmospheric conditions to the TCC over the existing range fiber network for display and recording.

2.3.2 Instrumentation Transportability

Instrumentation must be individually hand-portable and transportable in ground vehicles to support testing at outdoor locations away from the primary SCETI installation.

2.3.3 Instrumentation Stand-Alone Mode

Instrumentation should have a stand-alone mode able to measure, display, and record atmospheric parameters without connecting to the TCC, to include associated laptops for the instrumentation delivered to YTC.

2.3.4 General Atmospheric Measurement Characteristics

For all testing, the AM instrumentation should include the ability to report ambient meteorological data including wind speed, wind direction, temperature and humidity.

2.3.5 Rain Condition Measurement Characteristics

Instrumentation should measure operationally relevant characteristics of DVE rain conditions as reported in the DVE Taxonomy Study. Relevant characteristics to characterize DVE rain conditions include liquid water content, rainfall intensity, raindrop size distribution, and total raindrop concentration.

2.3.6 Dust Condition Measurement Characteristics

Instrumentation will measure operationally relevant characteristics of DVE dust conditions, to include dust cloud densities and dust particle size distribution. Instrumentation should be able to measure dust cloud densities up to 0.175 g/m3.

2.4 Software Characteristics

SCETI should utilize the RATH software as the core of all test control and monitoring functionality from the TCC. Software development will take place as part of Task 2 in support of Tasks 1 and 3.

2.4.1 Subsystem Software Interfaces

Plugins to the RATH software for specific SCETI subsystems should be developed as part of the SCETI effort. These plugins will be delivered with the associated capabilities after demonstration.

2.4.2 Cybersecurity

The RTC S6 will maintain responsibility for Risk Management Framework (RMF) compliance, and will work with the Vendor to ensure any system which connects to RTC networks is in compliance with RMF and Cybersecurity standards.

2.4.3 Health and Status Monitoring

SCETI software should monitor and report on the health and status of all TCC equipment and connected SCETI subsystems.

2.4.4 Test Profile Preparation

SCETI software should provide the ability for SCETI operators to prepare and configure pre-defined test profiles for operation of SCETI subsystems, to include pre-defined TSPI streams for the emulated flight capability.

2.4.5 System Calibration, Routine Maintenance and Troubleshooting

SCETI should provide test operators with a built-in test capability to support calibration, maintenance and troubleshooting of SCETI and SCETI subsystems.

2.4.6 Data Storage

SCETI should be able to store data on a Government-provided server capable of storing up to at least 3 days of test results data with an objective of storing up to 14 days of data in a RATH-compatible database.

2.4.7 SUT-Specific Equipment

SCETI should provide the capability for RTC customers to incorporate SUT-specific computer equipment for processing data from and providing command and control information to the sensor assembly during test events.

2.5 Rain Effects Capability Characteristics

SCETI will provide operationally relevant rain DVE conditions on location at RTC. The rain generated will match conditions described within the provided rain DVE Taxonomy

Study, to include rain intensity and raindrop size distribution characteristics. The rain generated will be able to match the description of multiple rain scenarios from moderate to heavy rain up to the 95th percentile of heavy rain identified in Table 5 on page 13 of the study provided with this document and identified in the Reference Documents section.

2.5.1 Rain Volume

SCETI will provide rain DVE conditions over a volume that is at least 80 feet high, 100 feet wide and 200 feet long, which will be co-located with the motion volume.

2.5.2 Rain Duration

Generated rain DVE conditions will last long enough to support test durations of at least 10 minutes or up to 15 minutes.

2.5.3 Rain Effects Capability Reset

The Government desire is that within 15 minutes of completing a test, test operators will be able to reset the rain effects capability and have it ready for the next test event.

3. Government Provisions

The following will be provided for this effort by the Government.

3.1 Location

The SCETI will be installed on TA-3 at Redstone Arsenal. Site preparation will be performed by the Government, and SCETI will use the existing fiber network installed at TA-3. The area intended is a grassy field which may partially flood in heavy rain. Raised concrete platforms will be provided as necessary to mitigate this issue.

3.2 Infrastructure

3.2.1 Power

TA-3 has an existing site infrastructure with 3 phase 208V power connections for use by SCETI.

3.2.2 Data

TA-3 has an existing site fiber network the SCETI will connect to.

3.2.3 Water

The Redstone Arsenal Department of Public Works will install water connections for the rain development capability, including water storage capable of delivering at least 100 gallons per minute. Specific size of the connection will be made available to the Vendor prior to Task 3, but may range between 2.5” and 5” in diameter.

A water catchment will be constructed beneath the rain volume by the Department of Public Works.

3.3 TCC

The Government will develop a TCC in a building on TA-3, including all hardware, operating systems and the RATH core software required for operating SCETI. The Vendor will be provided access to the TCC for integration of SCETI subsystems. The TCC will include an Inter-Range Instrumentation Group format time reference with a precision and accuracy of 1.0 microsecond or better. The time reference will also include a date code with year. The reference will be provided to all SCETI elements utilizing time information to ensure synchronicity of operation and data collection.

4. Project Management, Schedule and Phasing.

4.1 Program Management.

The Vendor should accomplish all planning and execution of program management activities to ensure that the technical and programmatic requirements of this Agreement are accomplished in accordance with best commercial practices. A monthly technical report of accomplishments will be required to be submitted to the Government, with contents to be determined by the integrated product team. The Vendor should identify and document the prototype system in detail to support design evaluation and system lifecycle support in a configuration controlled baseline. At decision reviews, the baseline is considered to be locked, and after this point concurrence of the Government is required to make changes to the baseline.

4.1.1 Management Reviews.

4.1.1.1 Start of Work Meeting.

The Vendor should host an initial meeting within 30 calendar days after award, in order to agree on key metrics and processes to be used during the project.

4.1.1.2 Integrated Product Team Meetings.

The Vendor should establish and maintain regular communication with the Government team (both formal and informal) so that plan deviations are known, assessed, and resolved in a timely manner.

4.2 Projects Tasks, Stages and Milestones.

The SCETI Effort is divided into three tasks which are further subdivided into stages. Each development stage will conclude with a decision review which must be successfully completed prior to initiating the next stage of development. Stages identified within each task below are merely the Government's current estimate of what

is expected to complete SCETI development and vendors are encouraged to propose alternative stages, as appropriate, which are unique to their solution. Each task is associated with a specific section of this document, but the General Characteristics section should be considered during all design activities.

4.2.1 Task 1: Emulated Flight Capability Development.

During Task 1, the Vendor will design and develop the emulated flight capability for SCETI according to the characteristics identified in the Emulated Flight Characteristics section of this document. Emulated flight capability development is anticipated to take place in three stages: design, payload development and demonstration, and an integrated capability demonstration.

4.2.1.1 Stage 1: Emulated Flight Capability Definition and Design

The main objective of Task 1, Stage 1 is to verify that the proposed method of providing the emulated flight capability is achievable and risks are acceptable to the Government. If design and development is necessary, the Vendor will generate system definition and design documentation, including the hardware and software interface information required for operating the emulated flight capability both independently and from the TCC. The Vendor should perform all engineering, structural analysis, safety analysis and supportability analysis required to provide a complete and functional emulated flight capability.

4.2.1.1.1 Decision Review 1: Emulated Flight Capability Design Review.

The Emulated Flight Capability Design Review is a technical assessment conducted by the SCETI Integrated Product Team (IPT) to ensure the build-to system, subsystem and software designs for the emulated flight capability are complete, supportable, and trace to all supportable system characteristics defined for the capability and associated software. If not all characteristics identified in this document are supportable, the design review is the decision point for tradeoffs between characteristics.

Prior to entering the design review, the Vendor should provide to the Government a read-ahead package describing:

- System and subsystem design considerations and how they trace to characteristics in this technical supplement
- Hardware and software interfaces
- Technical, cost, schedule and safety risks alongside mitigation plans for addressing these risks
- Review of key metrics as agreed to in the Start of Work meeting

The Government will assess the completeness and appropriateness of aforementioned documentation during the design review to determine if development can proceed to Stage 2: Flight Dynamics Development.

4.2.1.2 Stage 2: Flight Dynamics Development

In Task 1, Stage 2, the Vendor's objective is to manufacture and demonstrate the capability to provide emulated flight dynamics as identified and described in the Flight Dynamics Support Characteristics subsection of the Emulated Flight Characteristics section. These characteristics include maneuverability (roll, pitch, and yaw rotation) with a SUT physically connected. The Government will provide a representative SUT sensor to assist in the development during this stage. Successful demonstration of the flight dynamics with Government witnesses will be completed prior to integration of the complete emulated flight capability at TA-3. The Vendor will develop a demonstration plan linked for execution of the Flight Dynamics Demonstration.

The Government's rationale for including this stage is the perceived difficulty in providing rotational dynamics to the SUT. Emulating the flight dynamics of a helicopter alongside a sensor that may be capable of freely rotating itself introduces two independently rotating joints without a steady support structure for leverage, according to the potential solutions the Government has reviewed. This stage will be used to assess the capability of the Vendor's solution to provide these required flight dynamics and characterize any limitations of the system prior to implementation at TA-3.

4.2.1.2.1 Decision Review 2: Flight Dynamics Demonstration.

Prior to demonstration of flight dynamics capability, a readiness review will take place to verify:

- Evidence from Vendor testing that the demonstration is likely to be successful
- The demonstration plan
- Any changes from the build-to design documentation approved at Decision Review 1

The Government will assess the readiness of the system to proceed to demonstration. The payload demonstration will be conducted at the Vendor's facility with Government witnesses.

4.2.1.3 Stage 3: Emulated Flight Capability Integration and Installation.

During Task 1, Stage 3, the Vendor's primary objectives include:

- Building and installation of the full emulated flight capability at TA-3.
- Integration of the emulated flight capability with the command and control software developed under Task 2.
- Verifation that all systems are installed without impacting RTC's safety guidelines and regulations. All site structures must comply with aviation safety guidelines.

In support of the demonstration, the Vendor is expected to update the demonstration plan from Stage 2 to include operation of the full emulated flight capability from the TCC. The Vendor will develop an operation and maintenance manual for all capabilities

delivered in this phase. Any approved changes to the build-to design from Stage 1 will be documented in an as-built design.

4.2.1.3.1 Decision Review 3: Emulated Flight Capability Demonstration and Training.

This Decision Review is potentially concurrent with Decision Review 2 of Task 2. (Decision Review 2: Software and AM Capability Demonstration and Training)

Prior to demonstration of the emulated flight capability, a readiness review will be completed. During this readiness review, the Government and Vendor will verify:

- Evidence from Vendor testing that the demonstration is likely to be successful
- The demonstration plan
- The Operation and Mainenance Manual
- As-built design of the emulated flight capability
- The safety assessment report and any new safety risks identified since Stage 1

The demonstration will be conducted at TA-3 with Government witnesses and executed in accordance with the demonstration plan. Upon successful completion of the demonstration, the Vendor will provide training on the operation of the emulated flight capability to Government personnel using the operation and maintenance manuals.

4.2.2 Task 2: Software and AM Instrumentation Integration

During Task 2, the Vendor will develop the RATH-based command and control software for the emulated flight capability and AM instrumentation. The Vendor will identify and propose AM instrumentation to provide the characteristics identified in the Atmospheric Effects Measurement Capability Characteristics and Software Characteristics sections of this document. Task 2 is anticipated to consist of 2 stages: design and integration.

4.2.2.1 Stage 1: Software and AM Design

During Task 2, Stage 1, the Vendor will develop software design documentation for the SCETI command and control software required to operate the emulated flight capability and AM instrumentation from the SCETI TCC. In addition, the Vendor will review the rain taxonomy referenced at the end of the Technical Supplement and define instrumentation systems to meet the AM capability. Documentation developed in this stage will be used by the Government to verify the proposed design is capable of providing the described characteristics of the control software and AM instrumentation. Support documentation should include a traceability matrix identifying how design characteristics provide the capabilities requested by the Government.

4.2.2.1.1 Decision Review 1: Software and AM Design Review

During the Software and AM Design Review the Government will assess that software design documentation is complete, supportable, and traces to the characteristics

described in this document. In addition, the Government will verify the Vendor recommended AM instrumentation is appropriate for integration into SCETI.

Prior to entering the design review, the Vendor should provide to the Government a read-ahead package describing:

- System and subsystem design considerations and how they trace to characteristics in this technical supplement
- Hardware and software interfaces
- Technical, cost, schedule and safety risks alongside mitigation plans for addressing these risks
- Recommended instrumentation and estimated quantities of instrumentation required to provide full coverage to the test areas at both RTC and YTC. The identified instrumentation and quantities shall be reviewed and concurred with by the IPT. The Government may authorize procurement of either a partial or full amount of the recommended quantities from this list for procurement during Task 2, Stage 2
- Review of key metrics as agreed to in the Start of Work meeting

The Government will assess the completeness and appropriateness of all documentation during the Software and AM Design Review.

4.2.2.2 Stage 2: Software and AM Development and Integration.

During Task 2, Stage 2, the Vendor's primary objectives include:

- Develop and integrate the emulated flight capability and AM control software at TA-3.
- Procure and integrate AM instrumentation at the SCETI site on TA-3.
- Procure complementary AM dust instrumentation for delivery to YTC.

The Vendor will incorporate planning for demonstration of the software and AM capabilities into the emulated flight capability demonstration plan identified in Task 1, Stage 3. The Vendor will update the SCETI operation and maintenance manual for all capabilities delivered in this stage. Any approved changes to the build-to design from Stage 1 will be documented in an as-built design.

4.2.2.2.1 Decision Review 2: Software and AM Capability Demonstration and Training.

Prior to demonstration of the software and AM capabilities, a readiness review will be completed. During this readiness review, the Government and Vendor will review:

- Evidence from Vendor testing that the demonstration is likely to be successful
- The demonstration plan to ensure that all capabilities are sufficiently exercised at the demonstration
- The Operation and Mainenance Manual
- An as-built design of the software and AM capabilities.

The Government will assess the readiness level to proceed to demonstration. Once all documentation reviews and support actions are completed the Vendor technical team will be authorized to proceed with the demonstration. The demonstration will be conducted at TA-3 with Government witnesses and executed in accordance with the demonstration plan. Upon successful completion of the demonstration, the Vendor will provide training on the operation of the emulated flight capability to Government personnel using the operation and maintenance manuals.

4.2.3 Task 3: Rain Development

During Task 3, the Vendor will design and develop a rain generation system to provide the characteristics identified in the Rain Effects Capability Characteristics section. Task 3 will take place in 2 stages: design and integration.

4.2.3.1 Stage 1: Rain Effects Capability Definition and Design

The main objective of Task 3, Stage 1 is to verify that the proposed method of providing the rain effects is achievable and risks are acceptable to the Government. During Rain Effects Capability Definition and Design, the Vendor will generate system definition and design documentation for the rain capability, including the hardware and software interface information required for operating the capability from the TCC. Documentation developed in this stage will be used by the Government to verify the proposed design matches the identified characteristics of the rain effects capability and should include a traceability matrix identifying how design provides the capabilities requested by the Government.

4.2.3.1.1 Decision Review 1: Rain Design Review

The Rain Design Review is a technical assessment conducted to ensure the build-to system, subsystem and software designs for the rain effects capability are complete, supportable, and trace to all supportable system characteristics defined for the rain effects capability and associated software. If not all characteristics identified in this document are supportable, the design review is the decision point for tradeoffs between characteristics.

Prior to entering the design review, the Vendor should provide to the Government a read-ahead package describing:

- System and subsystem design considerations and how they trace to characteristics in this technical supplement
- Hardware and software interfaces
- Technical, cost, schedule and safety risks alongside mitigation plans for addressing these risks
- Review of key metrics as agreed to in the Start of Work meeting

The Government will assess the completeness and appropriateness of aforementioned documents during the Rain Design review to determine if development can proceed to development and integration.

4.2.3.2 Stage 2: Rain Capability Development and Integration

During Task 3, Stage 2, the Vendor's primary tasks include:

- Build and integrate the rain development capability at TA-3.
- Procure additional instrumentation if required.
- Develop the required software for operation of the rain development capability and integrate into the TCC.

In support of demonstration of the rain effects capability, the Vendor will develop a demonstration plan linked to the traceability matrix which includes full exercise of all SCETI capabilities to include the emulated flight capability and rain-specific instrumentation within the rain effects developed by the rain effects capability. The Vendor will update the operation and maintenance manual for all capabilities delivered in this stage. Any approved changes to the build-to design from Stage 1 will be documented in the as-built design.

4.2.3.2.1 Decision Review 2: Rain Effects Capability Demonstration

Prior to demonstration of the rain effects capability, a readiness review will be completed. During this readiness review, the Government and Vendor will review:

- Evidence from Vendor testing that the demonstration is likely to be successful
- The demonstration plan to ensure that all required capabilities are sufficiently exercised at the demonstration
- The Operation and Mainenance Manual
- An as-built design of the integrated Phase II capabilities
- The safety assessment report and any new safety risks identified since Stage 1

After this readiness review has been recognized as complete by the Government, the integrated demonstration of the rain effects capability with the emulated flight capability and instrumentation will be completed at TA-3 in accordance with the demonstration plan. Upon successful completion of the demonstration, the Vendor will provide training on the operation of the rain effects capability, instrumentation and associated software to operators at TA-3 using the operation and maintenance manual. The Government will not accept delivery until the capabilities have been successfully demonstrated and training has been completed.

5. Reference Documents.

Documents included in this section are included as suggested resources for the Vendor in developing SCETI. These and any other Government documents identified and requested by the Vendor may be provided to the Vendor as appropriate.

5.1 Department of Defense Standards.

MIL-STD-1553	Rev. B with Change Notice 4, Aircraft Internal Time Division Command/Response Multiplex Data Bus, Jan 1996.

5.2 Availability of Department of Defense Standards.

Copies are available on the WWW at URL: https://assist.dla.mil/online/start/

5.3 Department of Defense Instructions.

DoDI 8510.01	Risk Management Framework

5.4 Availability of Department of Defense Instructions.

Copies are available on the WWW at URL: https://assist.dla.mil/online/start

5.5 Other Government Documents, Drawings, and Publications.

Taxonomy Study	AMRDEC, RTC, NASA, UAH, A Rain Taxonomy For DVE Mitigation
TENA ARD 2016-11	The Test and Training Enabling Architecture – Architecture Reference Document

5.6 Availability of Other Government Documents and Publications.

Copies of the above documents except TENA ARD 2016-11 are available at Army Contracting Command - Orlando, ATTN: SCETI Contract Specialist, 12211 Science Dr., Orlando, FL 32826-3224

TENA ARD 2016-11 and subsequent updates to TENA may be found at the official TENA website: https://www.tena-sda.org/display/TENAintro/Home.