

MISSILE DEFENSE AGENCY (MDA)
11.B Small Business Technology Transfer (STTR)
Proposal Submission Instructions

INTRODUCTION

The MDA STTR Program is implemented, administrated, and managed by the MDA SBIR/STTR Program Management Office (PMO), located within the Advanced Technology (DV) Directorate. Specific questions pertaining to the administration of the MDA STTR Program should be submitted to:

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MDA/DVB
Bldg 5222, Martin Road
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Additional information on the MDA SBIR/STTR Program can be found on the MDA SBIR/STTR home page at <http://www.mdasbir.com>. Information regarding the MDA mission and programs can be found at <http://www.mda.mil>.

Proposals not conforming to the terms of this Solicitation will not be considered. MDA reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality will be funded. Only Government personnel will evaluate proposals.

Questions about STTR and Solicitation Topics

Refer to Section 1.5 of the DoD Program Solicitation at www.dodsbir.net/solicitation.

Federally Funded Research and Development Centers (FFRDCs) and Support Contractors

The offeror's attention is directed to the fact that non-Government advisors to the Government may review and provide support in proposal evaluations during source selection. Non-government advisors may have access to the offeror's proposals, may be utilized to review proposals, and may provide comments and recommendations to the Government's decision makers. These advisors will not establish final assessments of risk and will not rate or rank offeror's proposals. They are also expressly prohibited from competing for MDA SBIR or STTR awards in the SBIR/STTR topics they review and/or on which they provide comments on to the Government.

All advisors are required to comply with procurement integrity laws. Non-Government technical consultants/experts will not have access to proposals that are labeled by their proposers as "Government Only." Pursuant to [FAR 9.505-4](#), the MDA contracts with these organizations include a clause which requires them to (1) protect the offerors' information from unauthorized use or disclosure for as long as it remains proprietary and (2) refrain from using the information for any purpose other than that for which it was furnished. In addition, MDA requires the employees of those support contractors that provide technical analysis to the SBIR/STTR Program to execute non-disclosure agreements. These agreements will remain on file with the MDA SBIR/STTR PMO.

Non-Government advisors will be authorized access to only those portions of the proposal data and discussions that are necessary to enable them to perform their respective duties. In accomplishing their duties related to the source selection process, employees of the aforementioned organizations may require access to proprietary information contained in the offerors' proposals.

Conflicts of Interest

Refer to Section 1.4 of the DoD solicitation at www.dodsbir.net/solicitation.

PHASE I GUIDELINES

MDA intends for the Phase I effort to determine the merit and technical feasibility of the concept. Only UNCLASSIFIED proposals will be entertained. Phase I proposals may be submitted for a base amount not to exceed \$100,000 and a base period of six months. A list of the topics currently eligible for proposal submission is included below, followed by full topic descriptions. These are the only topics for which proposals will be accepted at this time. The topics originated from the MDA Programs and are directly linked to their core research and development requirements.

Please ensure the mailing address, e-mail address, and point of contact (Corporate Official) listed in the proposal are current and accurate. MDA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission.

USE OF FOREIGN NATIONALS

See Section 2.4 of the DoD Solicitation for the definition of a Foreign National (also known as Foreign Persons.)

ALL offerors proposing to use foreign nationals MUST disclose this information regardless of whether the topic is subject to ITAR restrictions. See Section 3.5, b., (8) of the DoD Solicitation for required information.

Proposals submitted with a foreign national listed will be subject to security review during the contract negotiation process (if selected for award). If the security review disqualifies a foreign national from participating in the proposed work, the contractor may propose a suitable replacement. In the event a proposed foreign person is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

ITAR RESTRICTIONS

The technology within some MDA topics is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. You must ensure that your firm complies with all applicable ITAR provisions. Please refer to the following URL for additional information: <http://www.pmdtc.state.gov/compliance/index.html>.

Proposals submitted to ITAR restricted topics will be subject to security review during the contract negotiation process (if selected for award). In the event a firm is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

PHASE I PROPOSAL SUBMISSION

The DoD SBIR/STTR Proposal Submission system (available at <http://www.dodsbir.net/submission>) will lead you through the preparation and submission of your proposal. Read the front section of the DoD solicitation, including [Section 3.5](#), for detailed instructions on proposal format and program requirements. Proposals not conforming to the terms of this solicitation will not be considered.

MAXIMUM PAGE LIMIT FOR MDA IS 20 PAGES

Any pages submitted beyond the 20-page limit, will not be evaluated. Your cost proposal and Company Commercialization Report DO NOT count toward your maximum page limit. Proposal

coversheets, which will be added electronically by the DoD submission site as page 1 and page 2, DO count toward your maximum page limit.

PHASE I PROPOSAL SUBMISSION CHECKLIST

*All of the following criteria must be met or your proposal will be **REJECTED**.*

___1. The following have been submitted electronically through the DoD submission site by 6 a.m. (ET) 28 September 2011.

- ___ a. DoD Proposal Cover Sheet
- ___ b. Technical Proposal (**DOES NOT EXCEED 20 PAGES**): *Any pages submitted beyond this will not be evaluated. Your cost proposal and Company Commercialization Report DO NOT count toward your maximum page limit. Proposal Coversheets DO count toward your maximum page limit.*
- ___ c. If proposing to use foreign nationals; identify the foreign national(s) you expect to be involved on this project, **the type of visa or work permit under which they are performing**, country of origin and level of involvement.
- ___ d. DoD Company Commercialization Report (required even if your firm has no prior SBIRs).
- ___ e. Cost Proposal (**Online cost proposal form is REQUIRED by MDA**)

MDA PROPOSAL EVALUATIONS

MDA will utilize the Phase I Evaluation criteria in [Section 4.2](#) of the DoD solicitation in assessing and selecting for award those proposals offering the best value to the Government.

MDA will use the Phase II Evaluation criteria in [Section 4.3](#) of the DoD solicitation in inviting, assessing and selecting for award those proposals offering the best value to the Government. In the Phase II Evaluations, Criterion C is more important than Criteria A and B, individually. Criteria A and B are of equal importance.

In Phase I and Phase II, firms with a Commercialization Achievement Index (CAI) at or below the 20th percentile will be penalized in accordance with DoD [Section 3.5d](#).

When combined, the stated evaluation criteria are significantly more important than cost or price. Where technical evaluations are essentially equal in merit, cost or price to the government will be considered in determining the successful offeror.

It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Technical reviewers will base their conclusions on information contained in the proposal and their personal knowledge. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained or referenced in the proposal and will count toward the applicable page limit.

Qualified advocacy letters will count towards the proposal page limit and will be evaluated towards criterion C. Advocacy letters are not required for Phase I or Phase II. Consistent with Section 3-209 of

DoD 5500.7-R, Joint Ethics Regulation, which as a general rule prohibits endorsement and preferential treatment of a non-federal entity, product, service or enterprise by DoD or DoD employees in their official capacities, letters from government personnel will NOT be considered during the evaluation process.

A qualified advocacy letter is from a relevant commercial procuring organization(s) working with MDA, articulating their pull for the technology (i.e., what BMDS need the technology supports and why it is important to fund it), and possible commitment to provide additional funding and/or insert the technology in their acquisition/sustainment program. This letter should be included as the last page of your technical upload. Advocacy letters which are faxed or e-mailed separately will NOT be considered.

INFORMATION ON PROPOSAL STATUS

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Coversheet will be notified by e-mail regarding proposal selection or non-selection. If your proposal is tentatively selected to receive an MDA award, the PI and CO will receive a single notification. If your proposal is not selected for an MDA award, the PI and CO may receive up to two messages. The first message will provide notification that your proposal has not been selected for an MDA award and provide information regarding the ability to request a proposal debriefing. The second message will contain debrief status information (if requested), or information regarding the debrief request. **Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the proposal number and topic number referenced.**

IMPORTANT: We anticipate having all the proposals evaluated and Phase I selection and non-selection notifications distributed in the December 2011 timeframe. All questions concerning the evaluation and selection process should be directed to the MDA SBIR/STTR PMO.

All communication from the MDA SBIR/STTR PMO will originate from the sbirsttr@mda.mil e-mail address. Please white-list this address in your company's spam filters to ensure timely receipt of communications from our office.

MDA SUBMISSION OF FINAL REPORTS

All final reports will be submitted in accordance with the Contract Data Requirements List (CDRL) of the resulting contract. Refer to [Section 5.3](#) of the DoD Solicitation for additional requirements.

PHASE II GUIDELINES

This Solicitation solicits Phase I proposals. For Phase II, no separate solicitation will be issued and no unsolicited proposals will be accepted. Only firms that were awarded Phase I contracts, and have successfully completed their Phase I efforts, may be invited to submit a Phase II proposal. MDA makes no commitments to any offeror for the invitation of a Phase II proposal. Phase II is the prototype/demonstration of the technology that was found feasible in Phase I. Only those successful Phase I efforts that are **invited** to submit a Phase II proposal will be eligible to submit a Phase II proposal. MDA does encourage, but does not require, partnership and outside investment as part of discussions with MDA sponsors for potential Phase II invitation. Invitations to submit a Phase II proposal will be made by the MDA SBIR/STTR PMO.

Please Note: You may only propose up to the total cost for which you are invited. Contract structure for the Phase II contract is at the discretion of the contracting officer after negotiations with the small business.

The MDA SBIR/STTR PMO does not provide “debriefs” for firms who were not invited to submit a Phase II proposal.

PHASE II PROPOSAL SUBMISSION

Follow Phase II proposal instructions described in Section 3.0 of the Program Solicitation at www.dodsbir.net/solicitation and specific instructions provided in the Phase II invitation. Invitations for Phase II proposals are generally issued at or near the Phase I contract completion, with the Phase II proposals generally due one month later. In accordance with SBA policy, MDA reserves the right to negotiate mutually acceptable Phase II proposal submission dates with the Phase I awardees, accomplish proposal reviews expeditiously, and proceed with Phase II awards. If you have been invited to submit a Phase II proposal, please see the MDA SBIR/STTR Web site <http://www.mdasbir.com> for further instructions.

MDA FAST TRACK DATES AND REQUIREMENTS

Introduction: For more detailed information and guidance regarding the DoD Fast Track Program, please refer to [Section 4.5](#) of the solicitation and the Web site links provide there. MDA’s Phase II Fast Track Program is focused on transition of technology. The Fast Track Program provides matching SBIR/STTR funds to eligible firms that attract investment funds from a DoD acquisition program, a non-SBIR/non-STTR government program or private sector investments. Phase II awards under Fast Track will be for \$750,000 maximum, unless specified by the Director, MDA SBIR/STTR Programs.

- For companies that have never received a Phase II SBIR/STTR award from DoD or any other federal agency, the minimum matching rate is .25 cents for every SBIR/STTR dollar. (For example, if such a company receives interim and Phase II SBIR funding that totals \$750,000, it must obtain matching funds from the investor of \$187,500.)
- For all other companies, the minimum matching rate is 1 dollar for every SBIR dollar. (For example, if such a company receives interim and Phase II SBIR/STTR funding that totals \$750,000, it must obtain matching funds from the investor of \$750,000.)

Submission: The complete Fast Track application along with completed transition questions (see note below) must be received by MDA within 120 days from the Phase I award date. Your complete Phase II proposal must be received by MDA within 30 days of receiving approval (see section entitled “Application Assessments” herein for further information). Any Fast Track applications or proposals not meeting this deadline may be declined. All Fast Track applications and required information must have a complete electronic submission. The DoD Electronic Submission Web site www.dodsbir.net/submission/SignIn.asp will lead you through the process for submitting your application and technical proposal electronically. Each of these documents is submitted separately through the Web site.

Firms who wish to submit a Fast Track Application to MDA MUST utilize the MDA Fast Track Application Template available at <http://www.mdasbir.com> (or by writing sbirsttr@mda.mil). Failure to follow these instructions may result in automatic rejection of your application.

Firms who have applied for Fast Track and are not selected may still be eligible to compete for a regular Phase II in the MDA SBIR/STTR Program.

Current guidance and instructions may be found at <http://www.mdasbir.com>.

MDA SBIR/STTR PHASE II TRANSITION PROGRAM

Introduction: To encourage transition of SBIR and STTR projects into the BMDS, the MDA’s Phase II Transition Program provides matching SBIR and STTR funds to expand an existing Phase II contract that attracts investment funds from a DoD acquisition program, a non-SBIR/non-STTR government program or private sector investments. The Phase II Transition Program allows for an existing Phase II SBIR or STTR contract to be extended for up to one year per Phase II Transition application, to perform additional research and development. Phase II Transition matching funds will be provided on a one-for-one basis up to a maximum amount of \$500,000 of SBIR or STTR funds in accordance with DoD Phase II Enhancement policy at [Section 4.6](#) of the DoD Solicitation. Phase II Transition funding can only be applied to an active DoD Phase II SBIR or STTR contract.

The funds provided by the DoD acquisition program or a non-SBIR/non-STTR government program may be obligated on the Phase II contract as a modification prior to or concurrent with the modification adding MDA SBIR or STTR funds, OR may be obligated under a separate contract. Private sector funds must be from an “outside investor” which may include such entities as another company or an investor. It does not include the owners or family members, or affiliates of the small business (13 CFR 121.103).

Background: It is important that all technology development programs in MDA map to a BMDS improvement and, after a period of development and maturity, are transitionable to targeted BMDS end users. End user is defined as the element, component or product manager to which it is intended to transition the technology. Because of this, it is important that your Phase II contract be at or approaching a Technology Readiness Level of either 5 or 6.

Current guidance and instructions may be found at <http://www.mdasbir.com>.

2011 PHASE I KEY DATES (PROJECTION)

11.B Solicitation Pre-release.....	July 28 – August 28, 2011
11.B Solicitation Opens	August 29 – September 28, 2011
Phase I Evaluations.....	October – November 2011*
Selection and Non-Selection Notifications Distributed.....	December – 2011*
Contract Award Goal.....	February 2012*

Phase II Transition Program Solicitation is *generally* announced via <http://www.mdasbir.com> in the March/April timeframe.

*This information is listed for GENERAL REFERENCE ONLY at the time of publication of this solicitation. This date is subject to update/change.

MDA STTR 11.B Topic Index

MDA11-T003	Intelligent Adaptive Needs Characterization for M&S Systems Engineering
MDA11-T004	Dual S & C-Band Telemetry Transmitter System for Missile Testing

MDA STTR 11.B Topic Descriptions

MDA11-T003

TITLE: Intelligent Adaptive Needs Characterization for M&S Systems Engineering

TECHNOLOGY AREAS: Information Systems, Electronics

ACQUISITION PROGRAM: Modeling and Simulation

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: This topic seeks to provide MDA M&S systems engineers with a tool that will intelligently assist them in the first phase of the systems engineering process: Understanding the needs of the stakeholder. The MDA Directorate of Engineering, Simulation Architecture (MDA/DESA) desires a tool that combines advanced semantics analysis techniques, inferential engines and adaptive/evolutionary algorithms to decrease the time required, increase the quality of the output, and decrease the number of repeated iterations of this phase of systems engineering. Based upon a semantic analysis of an initial stakeholder need description, the tool should infer possible relationships with previously collected stakeholder needs, existing solution architecture documentation, technical vernacular dictionaries, and other related material and then identify potential issues and prompt systems engineers with additional questions to clarify and expand upon the stakeholder's need description. This should be an iterative process until the need statement meets acceptability criteria for clarity, characterization, and validity. This tool's inferential engine should continuously learn from previous interactions with the same stakeholder and other stakeholders, questions generated by the system engineers, and feedback on need statements during functional requirements analysis.

DESCRIPTION: The MDA Directorate of Engineering, Simulation Architecture (MDA/DESA) collects and analyzes M&S needs for all system-level M&S uses from all stakeholders, both internal and external to MDA. Each collected need generally requires many hours of discussions with the stakeholder to translate the original expressed need into a fundamental need statement with sufficient context and detail for the M&S systems engineering team to begin developing requirements. Numerous follow-up discussions are common.

The output of this systems engineering phase is referred to as the software scope in software engineering textbooks. It includes context (how the described need fits into the larger use), functional objectives (what function is to be performed), informational objectives (what customer-visible data objects will be produced) and performance objectives (how well the capability needs to perform to meet the need). Additionally, some characterization of the need relative to the M&S should be made (is it a model/simuland, data management, external interface, user interface, core functionality, supporting tools, or pervasive need) and its priority should be made. This output is then used in the next phase of the systems engineering process to develop "build-to" requirements.

For a variety of reasons, original expressed needs generally have at least one of several common recurring problems that must be resolved:

- Stated in overly general terms: The stakeholder's concept is often defined only in their sub-conscious. Semantic analysis should help spot overly general phrasing and prompt questions to help define clear objectives and constraints.
- Stated through a specific expressed solution: Often the stakeholder states how they believe their need can be achieved instead of stating their actual need. Their proposed solution at best unnecessarily constrains possible solutions and sometimes may not actually address their real unstated need. Semantic analysis should help spot these cases and prompt questions to determine their real underlying need.

- Words/phrases with ambiguous definition: How a stakeholder uses a word or phrase is often different than the understanding of the systems engineering teams and developers. The tool should look for possible differences in vernacular, catalog known differences, and prompt questions leading to clearly defined terms in the need statements.
- Overly restrictive scope: A stakeholder may express a need to model a specific capability of a single real-system, but their real need is to model that capability for all similar real-systems. Semantic analysis should look for overly specific need phrasing and prompt questions to determine the more general need.
- No expressed performance levels: Stakeholders often provide no information on what is a sufficient minimum capability to fulfill the need. This lack should be spotted and questions prompted to develop specific performance criteria through either direct statement or indirect reference.
- Un-reasonable performance levels: Unknowledgeable stakeholders often request un-needed or perfect performance rather than determining their real needs. Semantic analysis should identify phrasing that indicative of unreasonable performance.
- No expression of priority: The stakeholders provide no information on their needs relative importance to their other needs. This lack should be spotted and questions prompted to determine priority.

PHASE I:

- Analyze the nature of the first phase of systems engineering, collecting and understanding stakeholder needs, as applied to MDA's modeling and simulation enterprise.
- Identify techniques that can be developed into tools to assist systems engineers in working with the stakeholders to characterize their real needs.
- Develop a detailed concept description and long-term development plan.
- Prototype appropriate tools/tool components.

PHASE II:

- Develop the tools to an initial capability level.
- Test the developed tools through use by the 1 or more MDA/DESA systems engineers conducting interchanges with stakeholders.
- Improve systems based on test feedback (iterate as needed).
- Demonstrate capability to other high-level systems engineering teams for evaluation.

PHASE III:

- Field full capability to MDA/DESA.
- Field full capability to MDA/DESA.
- Make further improvements based on feedback and return-on-investment.
- Transition tool to other MDA systems engineering organizations (MDA/DE and Elements), DoD acquisition organizations (service program offices and labs), and Commercial engineering firms (software, aerospace, automotive, etc).

COMMERCIALIZATION: Working with stakeholders (customers) to determine their needs is a fundamental effort for any systems engineering team, especially for iterative development efforts such as any software project, military or commercial. An adaptive inferential expert-system that adapts to a system engineer's specific topical area of work and assists them in questioning their stakeholders and documenting the results in a form that can be easily decomposed into requirements would be of great assistance to all systems engineering teams, big or small, military

or commercial. The potential users would be any government agency or company that develops requirements from expressed customer needs. This is essentially all engineering organizations.

REFERENCES:

1. Systems Engineering and Analysis, 3rd Edition, Benjamin S. Blanchard, Wolter J. Fabrycky, Prentice Hall International Series in Industrial and Systems Engineering.
2. Software Engineering, a Practitioner's Approach, 5th Edition, Roger S. Pressman, McGraw Hill.
3. "Ballistic Missile Defense Review," Office of the U. S. Secretary of Defense, February 2010. Available via internet at <http://www.defense.gov/bmdr/>.

KEYWORDS: Systems Engineering, Software Engineering, Artificial Intelligence, Expert Systems, Inference Engines, Semantic Analysis, Adaptive Algorithms, Evolutionary Algorithms

MDA11-T004

TITLE: Dual S & C-Band Telemetry Transmitter System for Missile Testing

TECHNOLOGY AREAS: Sensors, Weapons

OBJECTIVE: To produce a dual band telemetry system consisting of a transmitter, antenna cables, and possibly a combiner to replace current S-band telemetry systems on missile defense interceptors and associated test target vehicles. The proposer will consider form, fit, and function as design constraints and will design, integrate, and produce a prototype (in the Phase II) for an advanced dual band telemetry system.

DESCRIPTION: As commercial demand for wireless bandwidth has grown, the military anticipates increased pressure to use more restricted or alternate frequency bands. There is a need for an additional 1500-2000 MHz of bandwidth over the next 10-20 years as the government prepares to transition 500 MHz over to the wireless industry as an initial increment. Given the precedent of reallocating bandwidth to meet this initial 500 MHz of bandwidth, the spectrum is now subject to future wireless industry requirements. New spectrum has been reallocated by the WRC-07 to telemetry use and utilization of which is the subject of this STTR topic.

TECHNICAL REQUIREMENTS: In this topic solicitation, MDA seeks solutions for telemetry systems which provide support for a dual S and C band telemetry system (S-Band selectable from 2200-2400 MHz and C-Band selectable from 4400-4950 MHz and 5091-5250 MHz). A 10 watt output transmitter with both PCM/FM and SOQPSK modulation modes as a minimum is required. The transmitter is to be no larger than 2 in X 3 in X 1 in, survive and operate in the vacuum of space, Temp – 35C to + 85C, acceleration 100 g 3 axes. Shock and vibration environments are negotiable because of shock mounting techniques. The offeror should assume that the dual band telemetry system will utilize the S-Band transmitting frequency spectrum for range safety requirements (GPS tracking and other missile parameters) and the C-Band transmitting frequency spectrum for MDA performance data. All range safety data (GPS receiver data and specific performance parameters) should remain in S-Band and missile performance data should be in C band. The proposer is to assume that the integrated dual S/C Band transmitter system will operate simultaneously in two bands throughout missile flight. Power conversion efficiency must be emphasized in missile applications. MDA will host a coordination and requirements review with the selected company to finalize design requirements and requirements, and determine the best missile to use for an integrated flight test for Phase III. This decision will be made on the basis of best host platform for the integrated dual band design considering available electrical power, space available, and telemetry stream to be collected.

PHASE I: In the Phase I project, successful offerors will develop a dual band system concept and preliminary design. MDA will assist in providing design space constraints drawn from anticipated system performance capability needs. The proposer will utilize these requirements to design a new unitary dual S/C band transmitter that considers form, fit, and function of the S-Band transmitters that it will replace.

PHASE II: The contractor will fabricate and test the prototype telemetry system of Phase I. This telemetry system will be certified to the appropriate missile flight environments and its parameters will be fully characterized.

PHASE III: This prototype telemetry transmitter system will be installed in a missile and flight tested. The transmitter will be powered, connected to missile onboard data, and will transmit data to the ground. The data will be collected and evaluated by MDA.

COMMERCIALIZATION: The contractor will pursue commercialization of the various technologies developed in Phase II for potential commercial uses in such diverse fields as flight qualification and flight testing.

REFERENCES:

- 1) "Ballistic Missile Defense Review," Office of the U. S. Secretary of Defense, February 2010. Available via internet at <http://www.defense.gov/bmdr/>
- 2) Quasonix C-Band Transmitter Data available via the internet at <http://www.quasonix.com/desktopdefault.aspx?tabid=107>
- 3) L-3 Telemetry East ST-5000C Transmitter Data available via the internet at <http://telemetryproducts.com/products/product/ST-5000%20Transmitter>
- 4) Teletronics Technology Corporation C-Band Transmitter Data available via the internet at http://www.ttcdas.com/products/rf_products/product_title.php?product_id=3
- 5) Clarification information from TPOC for Topic MDA11-T004, uploaded in SITIS 9/15/11.

KEYWORDS: TELEMETRY, C-BAND, S-BAND, MISSILE, FLIGHT TEST