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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFGSC)

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26 OCT 2015

Mr. John Greenewald
[REDACTED]
[REDACTED]

Dear Mr. Greenewald

This is the Air Force Nuclear Weapons Center's response to your Freedom of Information Act (FOIA) appeal, Case No. 2015-00120-A, received by the FOIA Office, Kirtland AFB, on 22 May 2015. The appeal seeks a Final Report, no. AFRL -RV-PS-TR-2008-1026, entitled "Situation Awareness and Decision Support System for Defensive Counterspace", 10 Apr 08, which was denied in entirety on 15 May 2015. Upon reconsideration, your appeal is partially granted and the responsive document is attached, partially redacted under the legal authority set forth below.

Exemption 3 of the FOIA mandates the withholding of information prohibited from disclosure by another statute. 5 U.S.C. 552(b)(3). Exemption (b)(3) applies to certain technical data privileged from disclosure under 10 USC 130 and 22 USC 2778(e) (Arms Export Control Act). Accordingly, such protected information has been properly redacted from the report. The authority for this exemption is the U.S. Code, Title 5, Section 552(b)(3) and Department of Defense (DoD) Regulation 5400.7-R_AFMAN 33-302, paragraph C3.2.1.3. See also Colonial Trading Corp. v. Dep't of the Navy, 735 F. Supp. 429, 431 (D.D.C. 1990).

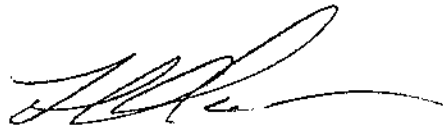
Exemption 4 of the FOIA protects from disclosure two broad categories of information: (1) trade secrets, and (2) financial and/or commercial information. 5 U.S.C. 552(b)(4). Financial and commercial information which meet three criteria are subject to protection from disclosure under Exemption 4 if the following factors exist with respect to the information: (1) commercial or financial in nature, and; (2) obtained from a person, and; (3) privileged or confidential. 5 U.S.C. 552(b)(4). The responsive report has been partially redacted to withhold proprietary commercial information of the submitter. The authority for this exemption is the U.S. Code, Title 5, Section 552(b)(4) and DoD Regulation 5400.7-R_AFMAN 33-302, 21 Oct 10, paragraph C3.2.1.5.

Exemption 6 of the FOIA permits the government to withhold all information about individuals in "personnel and medical files and similar files" when the disclosure of such information "would constitute a clearly unwarranted invasion of personal privacy." 5 U.S.C. 552(b)(6). This statute protects from disclosure names, signatures, and other personal information of non-public individuals for privacy purposes. The responsive report has been redacted to withhold private information of certain individuals, as noted. The authority for this exemption is the U.S. Code,

Title 5, Section 552(b)(6) and DoD Regulation 5400.7-R_AFMAN 33-302, 21 Oct 10, paragraph C3.2.1.8.

You have the right to challenge the agency's action in a lawsuit filed in federal court. You may file your suit in a federal district court in any of the following places: where you reside; where you have your principle place of business (if any); in the District of Columbia; or where the records are located if they are not located in the District of Columbia. You have six years from the date of this final decision to file a suit under the FOIA.

Sincerely

A handwritten signature in black ink, appearing to read 'L. Kawane', with a long horizontal flourish extending to the right.

LANCE K. KAWANE, Colonel, USAF
Vice Commander

Attachment:

Final Report, AFRL -RV-PS-TR-2008-1026 (partially redacted)

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Situation Awareness and Decision Support System for Defensive Counterspace

Dr. Christopher Bowman and Duane DeSieno

**Data Fusion & Neural Networks
1643 Hemlock Way
Broomfield, CO 80020**

10 April 2008

Final Report

~~Distribution authorized to U.S. Government agencies only, Proprietary Information; 10 Apr 08. Other requests for this document shall be referred to AFRL/RVSV, 3550 Aberdeen Avenue SE, Kirtland AFB, NM 87117-5776.~~

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(b)(6)

Program Manager

(b)(6)

Deputy Chief, Spacecraft Technology Division
Space Vehicles Directorate

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13. SUPPLEMENTARY NOTES This report is published in the interest of scientific and technical information exchange. The established procedures for editing reports were not followed for this technical report.					
14. ABSTRACT The fundamental deficiency with operational automated situation assessment and response software systems is that in too many cases they deliver the answer to the problem they were designed to solve rather than the current mission context problem. What the AF needs is a context assessment (CA) capability that interprets the situation assessment and response outputs using all the available current mission contextual knowledge. This DF&NN SBIR Phase 1 effort is the first to provide a technical architecture for the development of Context Assessment (CA) and SSA Context Concurrency Management software. CA software provides an interpretation (i.e., explanation and evaluation) of the Data Fusion & Resource Management (DF&RM) system outputs based upon the current mission context data base. As such CA improves the user situation awareness and the utility of his supporting DF&RM system. (b)(3):10 U.S.C 130 (b)(3):10 U.S.C 130 (b)(3):10 U.S.C 130 DF&NN has developed the Historical Abnormality Viewer (HAV) to support CA and the SASMmer Automated Process Resource Management software to manage the abnormality detections so as to incorporate the mission CA understanding provided by HAV.					
15. SUBJECT TERMS Context Assessment, Dual Node Network Technical Architecture, Data Fusion & Resource Management, Space Situation Awareness, Defensive Counter Space, Process Management, SSA Context Concurrency Management, SBIR					
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Table of Contents

Chapter 1—Executive Summary	1
Chapter 2-- Introduction	
2.1 SSA/DCS Background	4
2.2 Scope and Relationship of this Work	5
2.3 Engineering Guidelines Plan for this Work.....	11
Chapter 3—Methods, Assumptions, and Procedures	
3.1 The SSA/DCS Context Assessment Development Methodology	14
3.2 The DCS Resource Management Development Methodology	22
3.3 The Context Concurrency Management Development Methodology.....	29
Chapter 4—Results and Discussions	
4.1 Abnormality Report Historical Context Information Generation	34
4.2 Historical Abnormality Visualization (HAV) Context Assessment Tools.....	35
4.3 Automated Fusion Process Management (PM) Tools.....	45
Chapter 5—Conclusions	48
Chapter 6—Recommendations	50
Appendix	55
Bibliography	67
List of Acronyms	69

Chapter 1

EXECUTIVE SUMMARY

The fundamental deficiency with operational automated situation assessment and response software systems is that in too many cases they deliver the answer to the problem they were designed to solve rather than the current mission context problem. What the AF needs is a context assessment (CA) capability that interprets the situation assessment and response outputs using all the available current mission contextual knowledge.

This DF&NN SBIR Phase 1 effort is the first to provide a technical architecture for the development of Context Assessment (CA) software for Data Fusion & Resource Management (DF&RM) systems. CA software provides an interpretation (i.e., explanation and evaluation) of the DF&RM system outputs based upon the current mission context data base. As such CA improves the user situation awareness and the utility of his supporting DF&RM system. (b)(3):10 U.S.C 130

(b)(3):10 U.S.C 130 CA enables the incorporation of the full mission contextual understanding with legacy DF&RM system capabilities via Context Concurrency Management functions as consistency assessment enables distributed SSA Adjudication Management (i.e., SSA change directives and advisements).

Context assessment requires existing DF or RM system outputs and mission contextual knowledge to estimate their concurrence. Context Assessment is a level 4 fusion Process Assessment function within the Dual Node Network (DNN) DF&RM technical architecture formulation. The CA software development engineering methodology calls for CA role optimization followed by CA component (i.e., node) network optimization. The succeeding CA node optimization provides improved situation relationship and mission impact understanding by accomplishing the following DNN CA fusion node functions (i.e., common referencing, data association, and state estimation):

1. Interpreting the multiple fusion level output states (e.g., Consistent Operating Pictures (COP's)) within the reference frame and vernacular of the available mission context.
2. Associating these common referenced COP's with the *relevant* available mission context
3. Estimating the Measures of Concurrence (MOC's) (e.g., consistency) and performance of the COP's with their relevant context

The resulting context assessment estimates are then applied by the user or by automated resource management functions to respond to the current situation. Context assessment is an on-line extension of the traditional off-line process performance assessment where the context states replace the typically unavailable on-line truth state estimates over time that are used off-line by performance assessment. However since mission context data can be provided on-line, CA level 4 fusion nodes can be interlaced within the full SSA fusion node network to provide improved SSA. This can be done for SSA by enabling recognition of historical space system abnormality patterns that provide a new way to interpret the current SSA fusion outputs (i.e., to provide a user paradigm shift for SSA interpretation). In addition, CA can provide the basis for improved performance assessment (e.g., better track-to-truth association and suitable Measures of Effectiveness (MOE) & Measures of Performance (MOP) estimates). CA is expected to require management of its processing within the fusion node network to adapt its performance to mission conditions that enable improved SSA in the user's 'understanding gap' between his SSA stimulation and his response.

The context assessment capability developed in this Phase 1 SBIR effort provides visualization of historical data relevant to the current situation. The DF&NN context assessment visualization tools

(e.g., the Historical Activity Viewer (HAV)) are driven by DF&NN newly developed versions of the satellite subsystem and measurand abnormality report files output by AbNet. [AbNet is the code that incorporates the trained neural networks to enable it to detect and classify abnormalities in streaming inputs (e.g., state-of-health data).] The resulting analyst contextual awareness is then applied when the analyst runs the DF&NN SASMiner process management tools to include Auto OET. These tools enable the analyst to manage the data mining and on-line abnormality detection processes to achieve better SSA.

As DF&RM tools are delivered there will be an increased need to create an automated performance assessment capability that will be a component of the larger AFRL Situation Awareness and Response Testbed (SART). (b)(3):10 U.S.C 130

(b)(3):10 U.S.C 130 Specific near term tasks in priority order that DF&NN is recommending for its follow-on Ph 2 effort is to deliver software designs and code implementations into the AFRL SSA & DCS environment (e.g., for Situation Awareness Fusion Integrated Research Environment (SAFIRE) in the following six research areas:

1. The DF&NN team will design and develop a situation Context Assessment (CA) fusion network and nodes for the baseline JSARS/SAFIRE SSA/DCS system defined by AFRL
2. The DF&NN team will develop the Situation Awareness and Response Testbed (SART) framework, quantitative metrics, and performance assessment software applied to the JSARS L0, L1, and L2 fusion test articles.
3. The DF&NN team will design and develop SSA/DCS decision aids [such as space asset coordination and de-confliction, space asset objective management, ISRE request prioritization, and SSA/DCS reporting] and the necessary operator visualization such as a thin-client data fusion User-Defined Operational Picture (UDOP).
4. (b)(3):10 U.S.C 130
5. The DF&NN team will develop L0/1/2 JSARS/SAFIRE fusion process management of selected JSARS and SAFIRE SSA fusion nodes. Process management will use context assessments from above as needed to improve the SSA process performance.
6. The DF&NN team will design and develop SSA adjudication management capabilities to proactively and rapidly (e.g., automatically) maintain consistency of the SSA across sites.

Research in data mining to support each of these DF&RM functions for both ground and flight-based DF&RM capabilities is needed. To get operational feedback and insure relevance of the delivered software tools, the above capabilities should be evaluated in AFRL experiments and then operational prototype demonstrations. In summary, the DF&NN technical approach to a significant improvement in adaptive response management is to first formulate and provide methodologies to solve the SSA context assessment problem. Context assessment tools have been implemented in this Phase 1 effort for level 0 fusion outputs. Further improvement can occur by applying this same strategy to level 1 and level 2 fusion outputs during Phase 2.

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List of Acronyms

Air Force Research Laboratory (AFRL)

(b)(3):10 U.S.C 130

Broad Area Announcement (BAA)

Charles River Associates (CRA)

Combatant Commander (COCOM)

Consistency Assessment & Adjudication Management (CAAM)

Context Assessment (CA)

Context Concurrency Management (CCM)

Dual Node Network (DNN)

Data Fusion & Neural Networks (DF&NN)

Data Fusion & Resource Management (DF&RM)

(b)(3):10 U.S.C 130

DoD Architecture Framework (DODAF)

Essential Elements of Information (EEI)

General Purpose (GP) Catalog

Historical Activity Viewer (HAV)

Independent Component Analysis (ICA)

Interface Control Documents (ICD)

(b)(3):10 U.S.C 130

Intelligent Software Solutions (ISS)

Intelligence, Surveillance, and Reconnaissance (ISR)

JSpOC Situation Awareness & Response System (JSARS)

Java Messaging Service (JMS)

Joint Space Operations Center (JSpOC)

Level 0/1/2/3 (L0/1/2/3)

Measures of Concurrence (MOC's)

Measures of Effectiveness (MOE's)

Measures of Performance (MOP's)

Multiple Hypothesis Testing (MHT)

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Performance Assessment (PA)

Prioritized Needs (PN)

Process Management (PM)

(b)(3):10 U.S.C 130

Resource Command Messages (RCM's)

Responsive Space Testbed (RST)

Root Mean Squared (RMS)

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Satellite Threat Evaluation Environment for DCS (STEED)

Secret Internet Protocol Network (SIPRNet)

Situation Awareness and Decision Support System (SADSS)

Situation Awareness and Response Testbed (SART)

Situation Awareness Fusion Integrated Research Environment (SAFIRE)

Special Purpose (SP) Catalog

Space Environmental Effects Fusion System (SEEFS)

Space Situational Awareness (SSA)

(b)(3):10 U.S.C 130

State Of Health (SOH)

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Systems Under Test (SUTs)

The Design Knowledge Corporation (TDKC)

Two Line Element (TLE)

User-Defined Operational Picture (UDOP)

Web Ontology Language (OWL)

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