712CD

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Original title on 712 A/B: A Doctrine-Based Ontology of Situational Awareness for Small Combat Unit Tactical Operations

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WORKING GROUP:	7 – ISR & Intelligence Analysis	**DEMONSTRATION:**	
COMPOSITE GROUP:		**POSTER:**	
SPECIAL SESSION 1:		**TUTORIAL:**	
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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
01 JUN 2007	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
A Doctrine-Based Ontology of Situational Awareness for Small Combat Unit Tactical Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **SAIC 5400 N. Shawnee Rd, Suite 201 Alexandria, VA 22312**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
See also ADM202526. Military Operations Research Society Symposium (75th) Held in Annapolis, Maryland on June 12-14, 2007, The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**UU**	**11**	

Soldier Dominance Through Innovation

A Doctrine-Based Ontology of Situational Awareness for Small Combat Unit Tactical Operations

Novel, Broadened Concept of "SA"

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Standard concept of SA: SA is not defined in the Ground Soldier System Capabilities Description Document, although it seems to be conceived as essentially "Geospatial Data Services" combined with "Friendly Location Tracking" with a Graphic User Interface (GUI) design implementation.

FCS O&O concept of SA (adapted from work by Dr. Mica Endsley):

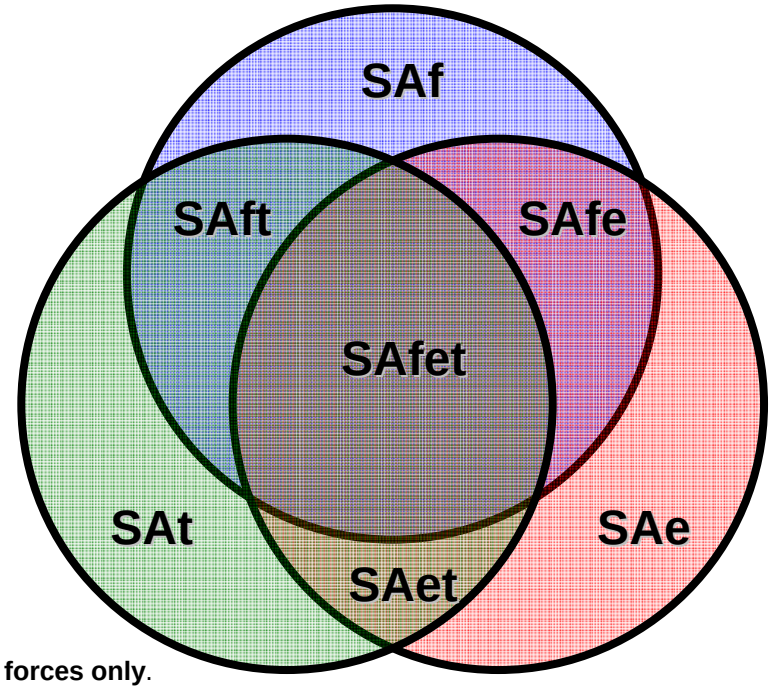
- The state being aware of everything that is happening around oneself and the relative importance of everything observed - a constantly evolving picture of the state of the environment.
- SA is a Leader's state of knowledge or mental model of the situation around him. SA is important for effective decision making and performance in combat- a complex and dynamic environment requiring human control.
- A general, widely applicable definition describes SA as "*the **perception** of the elements in the environment within a volume of time and space, the **comprehension** of their meaning and the **projection** of their status in the near future*."

(SOURCE: Dr. Mica Endsley, pp 97-101, "Design and evaluation for situation awareness enhancement," proceedings of the Human Factors Society 32nd Annual Meeting, Human Factors Society, Santa Monica, CA, 1988).

Seven SA Classes

- Situational Awareness is classified by variables representing Friendly, Enemy, and Terrain factors

- Classes of SA Particles are formed as expressions by single or combined variables



1. **SAf:** A ***simple*** class representing pieces of knowledge relevant to **Friendly forces only**.
2. **SAe:** A ***simple*** class representing pieces of knowledge relevant to **Enemy forces only**.
3. **SAt:** A ***simple*** class representing pieces of knowledge relevant to aspects of **Terrain only**. "Terrain" includes weather & visibility factors.
4. **SAft:** A ***complex*** class representing pieces of knowledge relevant to the relationship between **Friendly forces** and their surrounding **terrain**.
5. **SAet:** A ***complex*** class representing pieces of knowledge relevant to the relationship between **Enemy forces** and their surrounding **terrain**.
6. **SAfe:** A ***complex*** class representing pieces of knowledge relevant to the relationship between **Friendly forces** and **Enemy forces**, independent of aspects of Terrain.
7. **SAfet:** The ***most complex*** class representing pieces of knowledge relevant to the relationship between **Friendly forces**, **Enemy forces**, and aspects of **Terrain**.

Three SA Levels

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SA Level-1: "Situational Awareness": Perceiving critical SA Particles in the environment; composed of disaggregate elements of information, in other words, raw input.

SA Level-2: "Situational Understanding": Comprehending what those critical SA Particles mean, particularly when integrated together in relation to the decision maker's goals; the earliest level of gaining situational understanding; achieved when the individual combines, interprets, stores, and retains the information; includes integrating information received and then determining the relationship between those pieces of information and the relevance of the individual pieces to the desired end state.

SA Level-3: "Situational Forecasting": Projecting what will happen with those critical SA Particles in the near future; reached by using **Comprehension** to project possible future events and to anticipate their outcomes.

(SOURCE: Adapted from FCS O&O paragraph 4.6.2.4 and work by Dr. Mica Endsley).

SA Particles

- A basic unit of "Situational Awareness”
- The particle is the smallest discrete amount of SA useful to Rifle Platoon, Squad, and/or Fire Team Leaders during close combat operations
- Each particle is of 1 of the 7 classes and 1 of the 3 levels
- All particles are traceable to FM & ARTEP 7-8 and STP 11B Skill Levels 2-4
- For a recent MAPEX a “Fire & Maneuver” SA Particle List contained 119 discrete particles

Example SA Particles

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Ammunition Casualty & Equipment (ACE) Status
Assault Element Status (Assault Position established/pending/other)
Assault Position (last covered & concealed Position before assault objective(s))
Camouflage Status
Casualty Treatment Requirement
Collect Enemy Combat Information Feasibility
Element Interval Requirement (pre-contact)
Enemy Contact Probability
Enemy Cover & Concealment
Enemy Fixed Status
Enemy Flanks
Enemy Observation & Fields of Fire
Enemy Position
Enemy Strength
Enemy Suppressed Status
Enemy Vulnerability to Assault (Assault Element is/is not able to continue to advance without undue risks)
Enemy Vulnerability to Suppression
Friendly Fire Accuracy
Friendly Fire Volume
Friendly Morale Loss
Friendly Observation & Fields of Fire
Friendly Position
Friendly Strength
Friendly Strength Loss - KIA
Friendly Strength Loss - MIA
Friendly Strength Loss - WIA

Example Use of SA Particles

PURPOSE: Investigate and assess Situational Awareness needs of small-unit Infantry leaders in the context of infantry fire & maneuver tactics and capabilities of the FFW system to meet those needs.

CONCEPT: Military subject-matter experts assume roles within a rifle platoon in a MOUT operation, wargame it collaboratively, and provide feedback about information needs and the potential for FFW equipment to meet those needs. Online survey is used to collect responses.

APPROACH: Pay particular attention to what tasks are Most Important and what are Most Difficult in terms of Situational Awareness of the Enemy (SA_E), Terrain (SA_T), and Friendly forces (SA_F). Use a "Brief, Wargame, Discuss, Survey" cycle of events.

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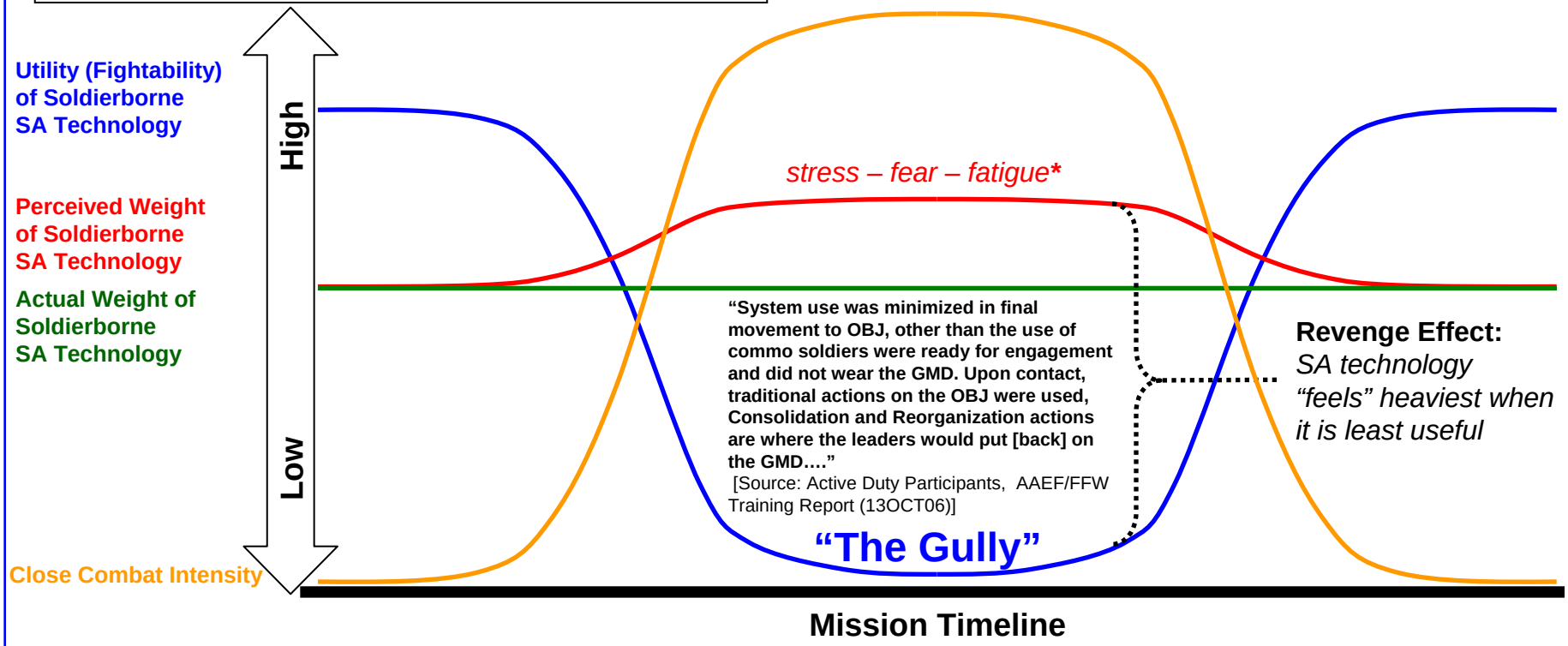
From Science to Solutions™

Working Hypothesis – "SA Gullying"

Indication: Disuse of Soldierborne SA Technology

Causation:

- *Unfightable* interfaces (GUIs): users ignore SA Particles
- *Lack of time* to process some SA Particles



* Source: S.L.A. Marshall, "The Soldier Load and the Mobility of a Nation," 1950

Context & Modality Assessment

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If an SA Particle is rated as **highly important** and **difficult to operate with** during a particular segment of the vignette, survey respondents will be asked for their opinions on ***Context*** & ***Modality***

- **Context Awareness -** Respondents will be asked to assume SA Particles could be delivered by computer devices that have information about the circumstances under which they operate, can react accordingly, and may try to make assumptions about the user's current situation.

- **Interface Modalities** – Respondents will be asked to assume a Soldier (User) Interface *could* communicate useful SA to the human senses in multiple modes.

HAPTIC modes which interface with the user by the sense of **touch** by applying forces, vibrations and/or motions to the user. The Infantryman's eyes continue to scan his sector.

VISUAL modes which interfaces with the user by the sense of **sight**, usually through a Graphic User Interface (GUI).

AURAL modes which interfaces with the user by the sense of **hearing**, usually through voice or tone signals. The Infantryman's eyes continue to scan his sector.

Methodology

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"Brief, Wargame, Discuss, Survey" Process

- Day One: 14 Gamesteps of Squad/Fire Team focused Hasty Attack
- Day Two: 14 Gamesteps of Platoon focused Deliberate Attack
- Day Three: System Evaluations

Data Objective

- Each Gamestep Survey = 5 x representative SA Particles (by SA class, SA level & Skill Level)
- 14 Gamesteps x 5 SA Particles = 70 investigated SA Particles
- Repeat for two different tactical contexts: hasty vs. deliberate attack

MAPEX IV 1-hour Block:

1. Gamestep (15 minutes of wargaming)
2. Survey Session (10 minutes)
3. Repeat (25 minutes total)
4. Break (10 minutes)