13th ICCRTS: C2 for Complex Endeavors

"Using NATO Human View Products to improve
Defense Support to Civil Authority (DSCA)"

Civil-Military Endeavors (Topic 10)

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Abstract

In this paper, we first provide background information about the four key phases of an interagency response to a crisis situation. This section introduces the concept of interagency crisis response and explains the ideal conditions under which crisis situations can be improved as well as the potential problems associated with each response phase. Second, we introduce Defense Support to Civil Authority (DSCA) and discuss the reasons that military-civilian operations in crisis scenarios can be especially problematic. Third, we describe the results from DSCA events during the FORCEnet Sea Trial experiments, also known as Trident Warrior (TW), in 2006 and 2007 and provide recommendations for improving interagency collaboration. Finally, we introduce the NATO Human View Architecture as a unique tool to support and align our DSCA recommendations and facilitate improvements in military-civilian collaboration.

Keywords: military-civilian operations, Defense Support to Civil Authority (DSCA), NATO Human View Products

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INTRODUCTION

In this paper, we first provide background information about the four key phases of an interagency response to a crisis situation. Interagency crisis response is the focus of this paper; specifically, we are interested in the various ways military and civilian command and control structures can be improved to support civilian operations in a crisis scenario. The first section introduces the concept of interagency crisis response and explains the ideal conditions under which crisis situations can be improved as well as the potential problems associated with each response phase. Next, we introduce Defense Support to Civil Authority (DSCA) and discuss the reasons that military-civilian operations in crisis scenarios can be especially problematic. Due to the historically common themes among crisis response scenarios and the cultures of military and civilian command structures, progress on crisis tasking is often thwarted when multiple, conflicting processes are executed.

Then, we introduce and describe the results and recommendations from DSCA events during two FORCEnet Sea Trial experiments, also known as Trident Warrior (TW), for improving interagency collaboration. Based on these results, we were able to highlight the various operations with greatest vulnerability to misinterpretation, delayed responding, and even failure of the joint collaborative mission. Lastly, we introduce the NATO Human View Architecture as a unique tool to support and align our DSCA recommendations and facilitate improvements in military-civilian collaboration. This final section incorporates the suggestions from our TW results into the more usable Human View format so that they can be easily compared to future, or "ideal," processes that could be implemented in future TW scenarios.

SECTION 1

Four key phases of interagency response to crises

The central tenet of disaster relief is that a catastrophic situation has occurred where many lives and assets are threatened and some immediate, effective response is needed. In addition, disasters are termed as such when the local resources available to provide an effective response fall significantly short of that which is required. Crises, disasters, and emergency situations requiring immediate response are generally handled by Incident Command (IC) centers that mobilize to provide organization and tasking assistance during the event. Incidents typically include two or more organizations or sub-organizations, each with its own command structure, that respond to the crisis as one unified IC center (for example with police and fire). In some cases, the interagency response type known as Defense Support to Civil Authority (DSCA; reviewed in detail in Section 2), is enacted, where military command structures provide key support and resources to civilian authorities (Dourandish et al., 2007).

A centralized IC center for any crisis is often called upon to assemble a hierarchy and direct events surrounding the incident in a planned, methodical way. Not all incidents can progress in a manner outlined by a prescribed plan, but it is generally acknowledged that having a series of steps in place to handle a crisis is an effective means of operation. Based on prior research and knowledge of common interagency responses to crises situations, the following response phases

were developed. These phases represent those commonly followed when IC centers are created and employed.

1. Pre-event planning and monitoring.

The pre-event planning and monitoring phase includes planning for information sharing and stand-up of the crisis organization as well as monitoring of daily activities (as separate organizations or as organizational subsets). The sub-phases of planning and monitoring are usually distinct in time; however, they are grouped together as foundational functions that have large impact on the ability of diverse organizations to work together.

- The goals for pre-event planning are to set up a partnership between organizations, agree on tasking for situational contingencies, agree on business practices for triggers and information sharing, and train staff to ingrain procedures among separate organizations' personnel.

- During the monitoring sub-phase, information gathered by separate organizations is shared and synthesized so that a trigger for a crisis can be readily acknowledged when or if it occurs. In particular, patterns of separate events that lead to a triggering event are continuously monitored, as with Intelligence Analysis[1], and appropriate actions are taken when a crisis situation is recognized. Sometimes, however, crises develop very slowly and the actual onset is subtle (versus a cataclysmic occurrence); this situation is much more difficult to detect and monitor effectively.

The needs commonly associated with this phase are collaboration between parties (both face-to-face and distributed), a mechanism to share information regarding daily activities for pattern recognition at a supra-organization level, and information sharing of relevant data and technology to enable pattern and trigger recognition.

The potential problems during this phase are when an incident occurs that requires a multi-organizational response, and no foundation is in place to guide the collaborative effort or data from the separate organizations is not made available for data mining and pattern recognition.

2. Trigger for crisis organization and re-alignment to focus on crisis roles.

The second phase in multi-organizational crisis response begins when the trigger for a crisis is recognized. At this time, a re-alignment of the appropriate organization(s) and enlistment of the predetermined IC center is necessary and expected. This signifies a critical point in the crisis response timeline because the joint crisis organization is engaged and becomes operational. The efficiency of movement within this phase is dependent, in part, on the level of pre-event planning and on compliance of the separate organizations with a pre-determined plan. In terms of DSCA, the bulk of military-civilian collaboration occurs in this phase and the next. The goals of phase two are to alert the separate organizations that a crisis situation has occurred where the required response is beyond the capabilities of a single organization, have the separate organizations respond to the situation as part of a cooperative multi-organizational effort, temporarily modify organizational hierarchies to accommodate a multi-organizational chain of command, broaden communication networks (both infrastructure and personnel), and switch to communication technology specifically designated for use during crisis situations.

[1] Performed by groups such as a Central Intelligence Unit (CIU) of a police department, or the Naval Criminal Investigative Service (NCIS).

The pertinent needs for this phase are communications technology to issue the trigger alert and guidance on who to alert, guidance regarding roles and tasking for the effort, willingness of separate organizations to assume appropriate positions within the modified chain of command of the joint organization, willingness of separate organizations to contribute and pool their resources, and ability to communicate with other responders via mobile networks.

The potential problems during this phase are that some of the organizations who should be involved are not contacted, or that some organizations retain their separate goals and objectives even during the crisis situation, either because of perceived loss of autonomy or because the roles and appropriate actions are unclear. According to crisis response expert Louise Comfort, under the worst conditions in a crisis, the existing organizational rules and procedures obstruct the flexibility required for self-organization and hinder innovative actions by experienced managers. "Rapid mobilization of response personnel, equipment, supplies and assistance following a major [event] represents a set of complex, inter-organizational tasks that tests the existing policies and capacity of public institutions" (Comfort, Working Paper: 2000-2005; p. 1). In these situations, the tension between the need to establish administrative control through known rules and procedures and the need for self-organizing processes in response to dynamic conditions is apparent. The former is most frequently achieved through vertical coordination and the latter through lateral coordination. Finding the appropriate balance between the two types of actions in disaster operations is a critical task for disaster managers (Comfort, Working Paper: 2000-2005; p. 2).

3. Progress on crisis tasks and re-tasking as necessary.

The third phase includes correspondence between the field respondents and crisis command staff to share updates and information from activities. The field reports and data from external sources is gathered during this phase and synthesized across all responding parties to be distributed to organization leads. Crisis command staff may need to re-task resources or personnel to respond to changes in the situation, especially when/if the crisis expands. The goals of this phase are to establish two-way correspondence between respondents in the field and crisis decision makers at the IC. They need the ability to share updates, synthesize field reports and data from external sources and distribute to organization leads, alert other agencies of the situation progress, and re-task resources as necessary.

The needs of phase three are centralized and robust communication lines, a communication protocol that is understood by personnel at all levels, access to appropriate technology, information sharing of relevant data and technology to enable pattern recognition, dedicated managers of the information flow, a protocol for decision-making (centralized vs. decentralized), and clear lines and bounds of authority for responders in the field.

The potential problems of this phase are numerous and include overloaded or out-of-commission communication lines, field responders not providing situation updates, situation updates being received by only a subset of decision makers, inaccessible information from separate responders or sites, insufficient authority for field responders to take initiative when required activities deviate from assignments or they become immobilized by uncertainty, decision-makers not re-tasking personnel or resources appropriately, and field responders not recognizing the authority of personnel who are re-tasking them. The major concern for this aspect of crisis response is that the first responders will be ill-equipped or otherwise unable to effectively and efficiently take action in response to the disaster. The theoretical problem is decision-making under conditions of uncertainty, a common theme in Louise Comfort's work.

The managers who are tasked with responding to crises are often faced with situations they have never seen before, and must work with people they have never met before, all with different training, all stressed, and all with legal liability for life and property (Glembocki, 1996). The concept of self-organization in the mitigation of risk and mobilization of response to disaster depends upon the design and implementation of a sociotechnical system that integrates the technical capacity of information technology with organizational design and communication processes among major actors in a community response system (Comfort, 1999). Furthermore, Comfort states following the Chichi, Taiwan earthquake of 1999:

"Mobilizing inter-organizational response to disaster can be achieved most effectively by facilitating processes of self organization and lateral coordination among response organizations within the legal policies of administrative direction and control. This complex set of tasks requires an appropriate information infrastructure to facilitate the search, exchange and feedback of information among the participating response organizations" (Comfort, Working Paper: 2000-2005; p. 16).

4. Conclusion of crisis tasking, resumption of separate structures, and summary of lessons.

The fourth and final phase is when the joint crisis response organizations divide into their separate entities and resume their normal hierarchies and daily activities. The crisis tasking is concluded and the separate organizational structures take form again. A summary of the lessons learned is developed and distributed in this phase as well. The goals of this phase are to conclude the tasking associated with resolving the situation, resume separate organizational daily activities in a timely manner, analyze the response events that occurred, and modify crisis response plans as necessary.

The needs of this phase are communication with decision-makers, a record of outcomes correlated to situational needs, and willingness of the separate organizations to critically evaluate their actions during the events.

The potential problems in this final phase are that the respondents are overwhelmed and cannot complete tasking, or organizational resources are so depleted that regular functioning cannot effectively resume. A summary of the events that take place in this phase is important for organizations to learn from crisis situations. In fact, communities that experience major disaster usually engage in a period of review and reflection to determine the factors contributing to the event. The purpose of such review and reflection, ostensibly, is to learn from the event, in order that factors contributing to the damage can be changed to lessen the likelihood of recurring disaster (Comfort & Sungu, Working Paper: 2001-2005; p. 1).

SECTION 2

What is DSCA and why is it problematic?

DSCA is based on the notion that military services can help support civil authorities when their resources are overtaxed during a crisis incident. However, military and civilian crisis response operations include a number of unique characteristics that make these joint operations particularly challenging (Dourandish, Zumel, & Manno, 2007). One major structural difference

between military and civilian emergency response is that the former is primarily a support mechanism devised to manage multiple tactical operations in the context of a larger strategic objective, while the latter is a functional mechanism devised to maintain authority by emphasizing distributed decision-making in the context of a single incident. Furthermore, the literature is replete with examples of military C2 operations succeeding with "swift, efficient, and cost-effective" victories while civilian C2 operations succeed with a "full realization of the democratic process" (Dourandish et al., 2007, p. 4; see also Comfort, 2000; Denning, 2006; Klinger & Klein, 1999; Sturm, 2007).

The characteristics of military and civilian operations inherently promote a misalignment between these two forces. For one, military C2 operations are structured, tightly fixed, hierarchical environments where concepts such as command change at different levels of hierarchy (Dourandish et al., 2007). The actual definition of success in military operations is largely based on defeating an enemy by attacking that enemy's strategy and changing behavior. On the other hand, civilian C2 operations contain an implied chain of command but no formal overarching hierarchy, and it is typically reinforced through financial bonds, treaties, lawsuits, bureaucratic controls, or umbrella organizations created for a specific purpose (Dourandish et al., 2007). While efficiency is desired in civilian C2, it is sometimes overshadowed by the need to encourage debate and collaboration as well as ensure equal participation and treatment. At present, both military and civilian C2 structures are framed in such a way that crisis operations generally take longer than is acceptable for effective response to disaster scenarios (Dourandish et al., 2007). Oftentimes, the subtle demarcation between commanding and supporting activities is the source of many conflicts in DSCA operations.

To begin to address these issues, DSCA was formally studied in a mock scenario during an annual, FORCEnet Sea Trial experiment sponsored by Naval Network Warfare Command (NETWARCOM). FORCEnet ventures to provide distributed combat forces with interoperable networks, sensors and equipment. The Trident Warrior (TW) experiment is intended to provide "Speed to Capability" of improved FORCEnet command and control warfighting functionality to the fleet. The goals of TW scenarios are to provide a venue for rapid fielding of improved capabilities with supporting Tactics, Techniques and Procedures (TTPs).

FORCEnet is based on the theory of Network Centric Warfare and Operations through an architectural framework for Naval Warfare which integrates warriors, sensors, networks, command and control, platforms and weapons into a networked, distributed combat force, scalable across the spectrum of conflict from seabed to space and sea to land (Antanitus, 2003). Warfighting in the 21st Century requires a dynamic and interoperable force composition. FORCEnet encourages military operations to exploit every source of data, leverage the available resources, provide shared situation awareness and understanding, support dominant speed of command, permit precise and synchronized execution of events, and allow for agility and flexibility within operations. Figure 1, below, shows an example of the intricacy of FORCEnet operations.

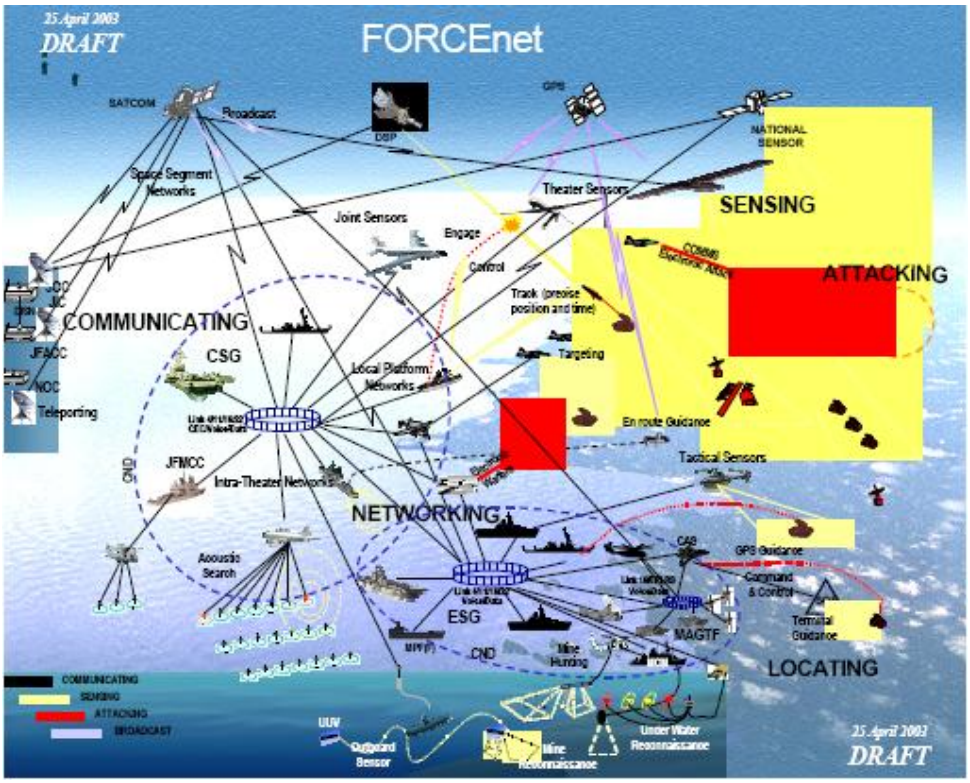

Figure 1. FORCEnet operations

TW experiments integrate stand-alone systems and efforts to achieve substantially enhanced capability, demonstration of these capabilities in both laboratory and operational environments, and evaluation of their effectiveness. One focal effort of TW experiments in 2006 and 2007 was DSCA. This tasking area was defined by the National Response Plan (NRP) as:

"DSCA refers to Department of Defense (DoD) support provided by Federal military forces, DoD Civilians and contract personnel, and DoD agencies and components, in response to requests for assistance during domestic incidents to include terrorist threats or attacks, major disasters, and other emergencies" (U.S. Dept. of Homeland Security, 2005).

Importantly, the NRP does not describe how these disparate agencies will be tasked to work together or what communication systems and processes will be utilized to produce results. In the past, military and civilian forces have been responsible for determining their own collaboration processes and networks, which have failed to produce effective and time-sensitive support to the operational mission. The evidence from the last two years of TW exercises has accentuated the need for more formal, compatible processes and products for military and civilian use during crises.

SECTION 3

DSCA Results from Trident Warrior

DSCA was specifically tested in TW-06 and TW-07 operational scenarios. More than eighteen military, federal, civilian, and coalition organizations collaborated on four vignettes involving DSCA during the 2006 TW experiment. The organizations operated from numerous distributed locations and exchanged information via an unclassified common operational picture tool and collaborated via a chat tool. Execution of the DSCA scenario demonstrated that hastily formed social networks require both a structural and a procedural foundation. Adherence to standard operating procedures is important to allow agencies to reach acceptable performance levels quickly as they react to a dynamic situation. Agencies need the ability to maintain acceptable performance levels for their respective organizations during interagency operations, using their organic systems while at the same time participating in the collaborative environment. The TW results showed that agency representatives were well versed in their own plans and resources; however, they had limited awareness of others'. Indications from self-report, chat logs and interviews were that participants at most nodes did not achieve adequate situation awareness. In addition, in crisis situations the military is brought in to support civilian operations but oftentimes there is no pre-determined tasking or rules of engagement for the military officials to follow. Civilians have established plans of action, but these plans do not include the tasking and support command of the military agencies. Military agencies need to know what to do in order to help civilians at each level of alert, for how long, and to whom they will report – before the crisis begins.

When the interests of multiple agencies intersect due to a crisis situation that requires coordinated monitoring and/or response, these agencies need a common collaboration environment. The environment should be accessible by all participants; this includes the technological interoperability that FORCEnet can provide, as well as openness of information flow. The ability to connect and converse with personnel in specific roles was shown to be an essential need. The ability to have a geographic reference to locations of targets, incident sites, resources, and response sites was also judged to be very valuable.

In the TW scenarios, distributed agencies were able to organize quickly and operate as an interdependent and interoperable social network, although no large gains were seen over their current operating conditions. The chat tools and Wiki blogs that were used in both years performed poorly with multiple users attempting input at the same time. Limited connectivity and slow system response, lack of role-based information, unfamiliar terms and map symbols, and ambiguous or conflicting organizational roles all interfered with the distributed team's combined effectiveness. A common naming convention for relaying information on chat and Wiki could have benefited collaboration.

Participants in TW strongly advocated for adoption of the standard naming conventions of the National Incident Management System (NIMS) for roles within the collaboration environment. The NRP, which directs collaborative response by military and civilian organizations, and NIMS, which support this collaboration, currently do not factor in the rapid fusion of the two fundamentally different organizational models or the politics associated with a unified control

and support structure. Additionally, the use of the NIMS naming conventions and protocol is not widely adopted across military C2, leading to communication difficulties among the agencies.

Collaborators need the ability to move seamlessly between technologies and modes of communication that are most relevant to the situation. Civilian organizations collaborate on a system called WebEOC but a similar, collaborative environment is not available across military-civilian boundaries. A recurring problem with the TW DSCA exercises was that the military could not share certain information across the boundary of the ".mil" environment because the civilian systems could not accommodate it. A visual reference of a common operating picture (COP) with user-requested data layers was judged by participants and observers to be valuable for achieving situation assessment of a multi-agency crisis response. Allowing common access to all participants was seen as the key factor in the achievement of success for this objective.

Releasability of sensitive information across civilian and military agencies was found to be a huge deterrent to establishing a common operating picture and shared awareness. Law enforcement sensitive information as well as military classified information needs to be shared across organizational boundaries in crisis situations, without spending valuable time declassifying or desensitizing it beforehand. To accommodate this, the tools and naming conventions that are employed in crisis situations need to anticipate sensitive data issues and ensure that common collaborative space is secure and standardized so that official information sharing is not impeded. Procedures need to be created and tested to switch back and forth between classified and unclassified environments when required. Also, TW results suggest that collaborative tools be designed to support methods that validate the credibility of information sources. Internal work processes must be developed to support the release of authorized information to other agencies in an expeditious manner.

DSCA Recommendations from Trident Warrior

Four broad categories of recommendations for improving DSCA were developed based on the TW-06 and TW-07 DSCA results.

1. Organizational Structure

Tactics, Techniques and Procedures (TTPs) for coordination between military and civilian agencies need to be developed in order to coordinate activities, including thresholds and triggers for situational entry into a common collaborative DSCA environment, procedures for use of technology, and policies for information releasability. Staff should be appointed to initiate participation in the common collaborative DSCA environment when appropriate. A process to stand up DSCA resources (personnel and material) must also be developed.

2. C2: Command & Control

Activities with federal and civilian agencies must be coordinated and synchronized, while retaining lines of authority in the respective agencies. Federal and civilian agencies in the common collaborative DSCA environment need to be apprised of planned actions within their jurisdictions. Allocation of liaison staff to work with operational personnel during active incidents is necessary. Combined training exercises of federal and civilian agencies need to be conducted, using reliable technologies that will actually be implemented in real-world events, so that connectivity and system response times can be tested.

3. Communications

An unclassified, web-based collaboration environment (outside of the '.mil' environment) should be created that is accessible and supportable by all participating agencies. Adherence to National Incident Management System (NIMS) roles for incident command is needed to facilitate identification of appropriate personnel and to establish communications. Specifically, DoD agencies should adhere to the NIMS roles already used by most civilian agencies to facilitate the identification of appropriate personnel and establishment of communications. Policies and procedures need to be developed to allow near real-time releasability for information necessary to coordinate an interagency response in the unclassified environment. Standard communications methods for use by both federal and civil authorities need to be adopted, as necessary and feasible to conduct C2, at an adequate, descriptive level of specificity so that one's role can be understood. Figure 2, below, shows an example of communications terminology from the NIMS Incident Command System training series (NIMS, 1994).

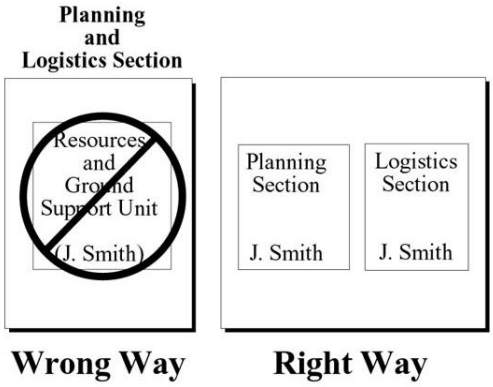

Figure 2: Example Communications Terminology Formats

4. Situation Awareness

An unclassified, web-based common operational picture (COP) needs to be provided that includes reference to procedures, guidance and expertise for sources of information. Standard symbology that is recognized by federal and civilian authorities needs to be implemented. Clear and easy access to pedigrees and date/time stamps of shared information needs to be provided. A means to identify and access expertise that is required but not resident in participating agencies needs to be provided.

SECTION 4

The NATO Human View (HV) Architecture

One of the major lessons from the TW-06 and TW-07 exercises was that military and civilian entities operate quite differently. However, these entities must support one another and engender compatible work processes in order to jointly respond to crisis situations in a successful manner.

Architecture frameworks provide one way to view joint military and civilian command and control operations. Products developed as part of architecture frameworks are graphical, textual, and tabular descriptions of a system. One such framework, the Department of Defense Architecture Framework (DoDAF) defines different perspectives or "views" that logically combine to describe system architecture with complex integration and interoperability challenges (NATO, Human View Workshop, September 2007). At present, DoDAF products define attributes of operations (OV), systems (SV) and technical standards (TV). This leaves a gap in the set of attributes by overlooking the human contribution within the schema. Since 2004, there have been a variety of attempts at representing humans in the operational view by including the human roles and activities within the system. The NATO Human View Workshop convened in September, 2007 to propose a cross-national list of products that characterize the Human View (HV). These products are:

HV – A: Concept

1. Pictorial depictions of the human component in system
2. Indications of where human-system interactions may occur
3. Textual descriptions of the overall human component in system

HV – B: Constraints

1. Projected manpower needs
2. Career progression and skills/knowledge required
3. Personnel by rank and job in each establishment
4. Health hazards from design features and operating characteristics
5. Human characteristics and limitations
6. Personnel policy and HR issues

HV – C: Functions

1. Operational activities decomposed to set of tasks
2. Task-to-role assignment matrix
3. System interface design requirements

HV – D: Roles

1. Human responsibilities, authority, competency, and multiplicity

HV – E: Human Network

1. Groupings or teams including physical proximity of roles and virtual roles
2. Team interactions, cohesiveness, performance impacts, and dependencies
3. Information flow within and between teams

HV – F: Training

1. Training resource availability and suitability
2. Risk imposed by future operational and system demands
3. Cost and maturity of training options
4. Impacts of alternative systems and capability designs on training requirements

5. Training required to obtain necessary knowledge, skills and ability to support career progression
6. Differentiation of basic, intermediate, or advanced job training; operational versus systems specific training; and individual versus team training

HV – G: Metrics

1. Human factors value definitions
2. Human performance metrics (what is to be measured)
3. Target values (what quantifiable value is acceptable)
4. Human function to metrics mapping
5. Value definition links
6. Value to design element mapping
7. Methods of compliance

HV – H: Human Dynamics

1. States and state changes (organizational / team structure or function / role assignments)
2. Conditions of triggering events or situations (critical, frequent, typical scenarios under certain operational constraints and time factors)
3. Time units (timeline with defined mission phases and sequence of consecutive tasks)
4. Observed or predicted performance measures (workload, decision speed, collaboration style, trust in another's intent, and quality of shared awareness and implicit communication)

The overall purpose of the human view is to capture the human requirements of the system and advise human interactions within the system. It is our contention that the human view could be employed to model military and civilian interactions during a crisis scenario in order to support future DSCA activities. In particular, the DSCA exercises that occur in TW-08 could be tailored to correspond to certain human view products, which would provide more rigorous and precise operating scenarios for military-civilian cooperation. Of the human view products defined above, HV – C (Functions), HV – D (Roles), and HV – E (Human Network) appear to be immediately applicable to DSCA operations.

NATO HV as a means to improve military-civilian collaboration

To utilize the human view for improving military-civilian operations, we reflected back on the results and recommendations from the TW-06 and TW-07 DSCA exercises. The actual structures and interactions from the DSCA exercise results formed the basis of our *current* products, and the recommendations formed the basis of our *future* products. Points of disparity between the way it is and the way it should be then form the basis for changes to be made in future DSCA operations.

1. Functions: Task to Role Assignment Matrix (HV-C)

The DSCA recommendations revealed four distinct areas of military support to civil authority. The first, organizational structure, covered development of standard techniques and procedures to enter into collaborative environments and a formal process for standing up resources when appropriate. This area involves processes that would be reflected well in a human view showing the Functions (HV-C) of both the military and civilian participants in a Task to Role Assignment

Matrix. The human-related functions in a task responsibility matrix could be depicted graphically for quick reference when a crisis situation occurs. The time saved by having all of the roles and functions for DSCA depicted on one human view would be invaluable for military and civilian participants responding to a crisis. As alluded to earlier, the differences between commanding and supporting activities between military and civilian operations are often a source of conflicts (Dourandish et al., 2007). This human view perspective could alleviate some of the burden placed on DSCA responders due to following separate standard operating procedures (SOPs). Examples of two Task-to-Role Assignment Matrices are shown as Appendices A & B: a *current* matrix from the DSCA results, and a *future* DSCA matrix based on the four key phases of interagency response.

2. Human Network: Team Interactions (HV-E)

The second area of recommendation from the TW exercises was command and control (C2). This section emphasized the importance of lines of authority, apprising respective authorities of planned activities and training responders. According to the human view perspective, Human Networks (HV-E) could address these concerns. This view captures the human-to-human communication patterns that occur as a result of ad hoc or deliberate team formation, especially teams distributed across time and space. The human sub view depicting Team Interactions would be beneficial in outlining the team interactions, cohesiveness, performance impacts, and dependencies for the responders. The Team Interactions HV could be utilized in the pre-event planning stage to prepare first responders for a crisis situation before one occurs. A human view network showing role groupings, physical proximities, types of interaction and team dependencies may be very advantageous for DSCA command and control activities. An example of *current* and *future* DSCA Team Interactions Matrices are shown as Appendices C & D. The *current* view depicts the common collaborative environment— the enactment of shared technology for joint collaboration was prescribed for the experiment versus being allowed to emerge. In the *future* depiction, the agency proposed to lead the task of 'enacting the shared technology' (from HV-C) – the Department of Homeland Security – is shown in the coordinating position.

3. Human Roles (HV-D)

Third, communications was identified as a large area for improvement in the TW exercises. Specifically, the recommendations made within this area were to: provide a common, unclassified, web-based, collaborative environment for both military and civilian operants, adhere to NIMS roles to help distinguish personnel and establish communication, increase the releasability of information needed to coordinate interagency response, and adapt to communications methods used by federal and civil authorities alike. Clearly, these recommendations covered a broad range of communications issues. Therefore, the primary human view that would be appropriate to handle these various recommendations is the HV-D representing the system's Human Roles. This view could outline each participant's title, team, role, and authority, using a common NIMS naming convention for quick identification. All of the communication processes in DSCA would gain from having visual human view illustrations such as this. An example of an observed, or *current*, Human Roles Matrix from chat logs during the TW experiments is shown as Appendix E; there was no direction for naming conventions; therefore it was difficult to know 'who' was in the chat rooms. A *future* DSCA Human Roles

Matrix is shown as Appendix F, with examples for identifiers that could be used with chat and other communications systems.

4. Human Network: Information Flow (HV-E)

The fourth area, situation awareness, recommended supplying military and civilian entities with an unclassified, web-based COP, standardizing symbology that can be recognized by both authorities, and providing access to more aspects of shared information among the participants. The Information Flow sub view of HV-E portrays this area of recommendation quite well. This human view is particularly useful in combining features of several views in order to portray dynamic aspects of states, traits, configurations and performance parameters in communicating enterprise behavior. Maintaining an Information Flow HV would provide a readily-accessible and accurate COP for promoting shared situation awareness. Further, this Information Flow HV corresponds to the third phase of interagency response to crises mentioned previously, which includes correspondence between the field respondents and crisis command staff to share updates and information from activities. An example of a *future* DSCA Information Flow Matrix by the four key phases is shown as Appendix G. No *current* Information Flow Matrix was included, as artificialities within the experiment precluded the occurrence of many of the information flow types.

CONCLUSION

Four NATO Human View diagrams were prepared to show the architecture of an interagency system to support DSCA. These diagrams depict future and, where appropriate, observed relationships and interactions for four key phases of DSCA. The diagrams that were prepared were chosen from a comprehensive product list as being most appropriate to depict areas of recommendation that ensued from two experimental DSCA events. The diagrams are:

- HV-C3 Task-to-role assignment matrix (*current* and *future* – Appendices A & B)
- HV-D Human roles matrix (*current* and *future* – Appendices E & F)
- HV-E2 Team interactions matrix (*current* and *future* – Appendices C & D)
- HV-E3 Information flow matrix (*future* only – Appendix G)

For this paper both *current* and *future* diagrams were prepared concurrently, with future diagrams representing ideal states described by the recommendations. However, we recommend that *future* diagrams be prepared to express an ideal system prior to the creation or implementation of the actual system. Metrics to evaluate the system could be tied to each diagram, and data could be collected to support those metrics during initial or test implementation of the system. For example, for the 'Task-to-role' area in a DSCA event, it might be most useful to collect data about (1) participants' knowledge of which agencies had primary and support responsibility for each of the key tasks, and (2) the extent to which those responsibilities were carried out.

Further development and adaptation of these HV diagrams is needed to tailor each to the specific circumstances that are faced by other types of joint command and control structures. Civilian agencies should be especially interested in creating human views that express their particular

needs during crisis scenarios. By definition, in DSCA the military is in a supporting role that requires guidance and direction from the civilian entities during an interagency response to a crisis. The NATO Human View diagrams provide an excellent mechanism to incorporate the human contributions to a system in formats that allow for ease of visualization of key points. They provide standard yet flexible reference materials for system developers and other stakeholders.

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Appendix A: Current Task-to-Role Assignment Matrix (HV-C3) from DSCA Experiments

Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
1. Pre-Event Planning and Monitoring					
Collaboration on daily activities and threat levels		✓		✓	✓
Continuous monitoring of patterns of separate events that lead to a triggering event (as with Intel Analysis)		✓		✓	✓
2. Trigger for crisis organization and re-alignment to focus on crisis roles					
Trigger of crisis incident	(TW experimental / white cell)				
Acknowledgement of threat message or crisis	S	S		S	P
Request for support from military C2				P	S
Confirmation of request for support from military					P
Organizational re-alignment to focus on crisis roles	not observed	S		not observed	P
Activation of joint Incident Command Center structure	not observed	not observed		not observed	not observed
Enactment of shared technology for joint collaboration	minimal	S		P	P
Broadening of communication networks to include multiple command hierarchies	not observed	S		P	P
Collaboration on roles, naming conventions, and C2 hierarchies	not observed	not observed		not observed	not observed
Elevation of threat levels as appropriate		S		P	S

Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
Confirmation of threat level elevation					P
Monitoring of changes to threat situation	S	S		P	P
3. Progress on crisis tasks and re-tasking as necessary					
Response to crisis incident (including implementing safety measures, assessing hazards, supporting recovery efforts, and triaging victims)	S	P		S	P
Two-way correspondence between respondents in the field and crisis decision makers for sharing updates	not observed	P		not observed	P
Synthesis of field reports and external data for the command staff and organization leads	not observed	not observed		S	not observed
Acknowledgement of updated threat information	not observed	P		P	not observed
Dissemination of situation progress alerts and re-tasking resources as necessary	not observed	P		P	S
4. Conclusion of crisis tasking, resumption of separate structures, and summary of lessons					
Conclude crisis tasking	P	P		P	P
Resume separate organizational activities	P	P		P	P
Analyze the response events that occurred and modify crisis response plans as necessary	(TW experimental / white cell)				

Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
Communicate with decision-makers to reach consensus on outcomes and critically evaluate actions during the crisis events	P	P		P	P
Develop and distribute a summary of the lessons learned	(TW experimental / white cell)				
P = Primary Responsibility S = Support Responsibility					

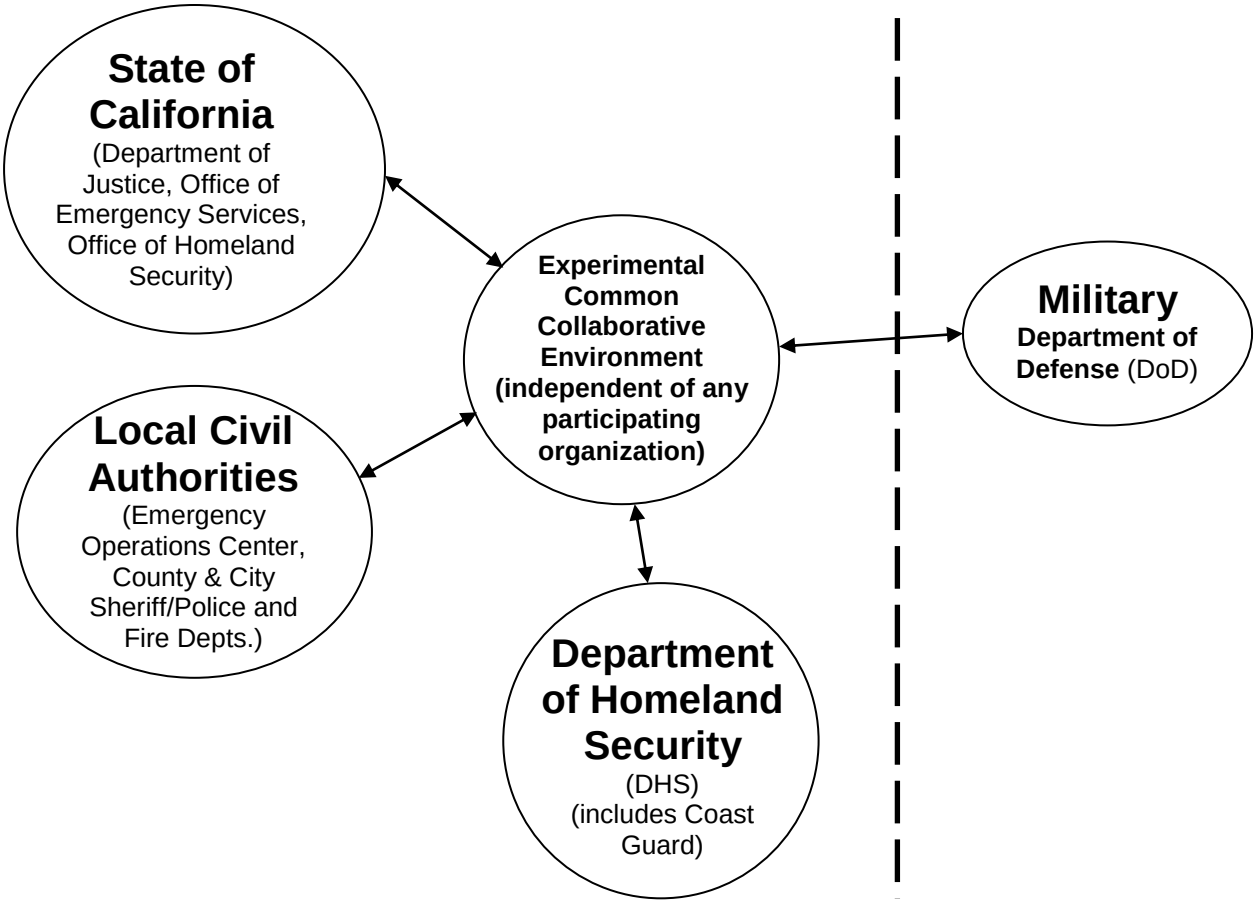
Appendix B: Future Task-to-Role Assignment Matrix (HV-C3) for DSCA Events

Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
1. Pre-Event Planning and Monitoring					
Collaboration on daily activities and threat levels	✓	✓	✓	✓	✓
Continuous monitoring of patterns of separate events that lead to a triggering event (as with Intel Analysis)	✓	✓	✓	✓	✓
2. Trigger for crisis organization and re-alignment to focus on crisis roles					
Trigger of crisis incident	P	P	S	P	S
Acknowledgement of threat message or crisis					P
Request for support from military C2				P	S
Confirmation of request for support from military					P
Organizational re-alignment to focus on crisis roles	P	S	S	P	P
Activation of joint Incident Command Center structure	P	S	S	P	P
Enactment of shared technology for joint collaboration	P	S	S	P	P
Broadening of communication networks to include multiple command hierarchies	P	S	S	P	P
Collaboration on roles, naming conventions, and C2 hierarchies	P	P	S	P	P
Elevation of threat levels as appropriate				P	S
Confirmation of threat level elevation					P

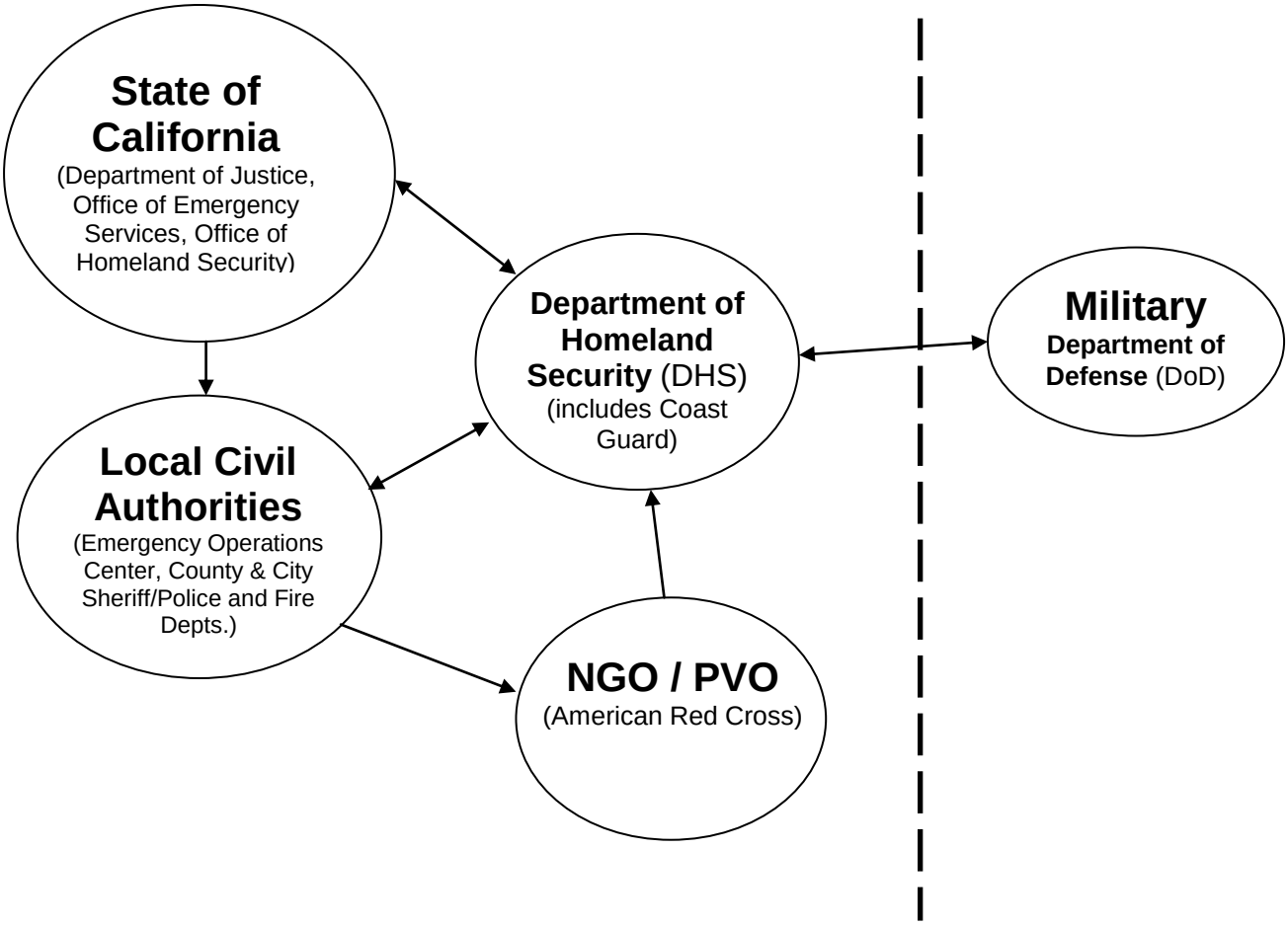
Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
Monitoring of changes to threat situation	S	S	S	P	P
3. Progress on crisis tasks and re-tasking as necessary					
Response to crisis incident (including implementing safety measures, assessing hazards, supporting recovery efforts, and triaging victims)	S	P	S	S	S
Two-way correspondence between respondents in the field and crisis decision makers for sharing updates	S	P	S	S	P
Synthesis of field reports and external data for the command staff and organization leads	S	P	S	S	S
Acknowledgement of updated threat information	P				P
Dissemination of situation progress alerts and re-tasking resources as necessary	P	P		P	S
4. Conclusion of crisis tasking, resumption of separate structures, and summary of lessons					
Conclude crisis tasking	P	P	S	P	P
Resume separate organizational activities	P	P	S	P	P
Analyze the response events that occurred and modify crisis response plans as necessary	P	P	S	P	P
Communicate with decision-makers to reach consensus on outcomes and critically evaluate actions during the crisis events	P	P	S	P	P

Tasks	Responsible Entity				
	Civilian				Military
	State of California (Department of Justice, Office of Emergency Services, Office of Homeland Security)	**Local Civil Authorities** (Emergency Operations Center, County & City Sheriff/Police and Fire Depts.)	**NGO/PVO** (e.g., American Red Cross)	**Department of Homeland Security** (DHS) – includes Coast Guard	**Department of Defense** (DoD)
Develop and distribute a summary of the lessons learned	P	S	S	P	S
P = Primary Responsibility S = Support Responsibility					

Appendix C: Current Team Interactions Matrix (HV-E2) from DSCA Experiments



Appendix D: Future Team Interactions Matrix (HV-E2) for DSCA Events



Appendix E: Current Human Roles Matrix (HV-D) from DSCA Experiments **(personal information removed from this example)**

Name	Title/Rank	Role during TW (should correspond to ICS role)	Agency Role (home agency)
Jane Doe	PWCS		Cutter Manager
John Doe			Special Agent
John Smith	CAPT	White Cell	
Jane Smith	LCPO		

Appendix F: Future Human Roles Matrix (HV-D) for DSCA Events

Organizational Level		Title	Communications Identification Examples
1	Incident Command	Incident Commander	
	• Incident Commander		A. Doe Incident Cdr
	• Deputy Incident Commander		K. Smith Dep Cdr
2	Command Staff	Officer	
	• Safety Officer		R. Kelly Safety Officer
	• Liaison Officer		P. Butter Liaison Officer
	• Information Officer		J. Kerry Info Officer
3	General Staff	Chief	
	• Operations Chief		C. Doe Ops Chief
	• Planning Chief		J. Smith Planning Chief
	• Logistics Chief		J. Smith Log Chief
	• Finance/Administration Chief		L. Taylor Finance Chief
4	Branch	Director	
	• e.g. Air Operations Branch Director		E. Bug Air Ops Dir
5	Division / Group	Supervisor	
	• e.g. Air Tactical Group Supervisor		Y. Wu Air Tac Supv
	• e.g. Air Support Group Supervisor		D. Frost Air Support Supv
6	Unit	Coordinator	
	• e.g. Helicopter Coordinator		G. Wells Helo Coord
	• e.g. Air Tanker / Fixed Wing Coordinator		H. Hill Tanker Coord
7	Strike Team / Task Force	Leader	
	• e.g. Strike Team Alpha Leader		T. Smith ST Alpha Lead
8	Unit / Strike Team / Task Force Member	Member	
	• e.g. Strike Team Alpha Member		J. Stone ST Alpha Member

Appendix G: Future Information Flow (HV-E3) for DSCA Events