SUDM

US Marine Corps
Small Unit Decision Making

January 2011 Workshop Final Report

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Contents

Acronyms

ACMC	Assistant Commandant of the Marine Corps
CARS	Cognitive And Relational Skills
CBA	Capabilities Based Assessment
CCM	Coaching, Counseling, and Mentoring
DC M&RA	Deputy Commandant for Manpower and Reserve Affairs
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership/Education, Personnel, and Facilities
ECO	Enhanced Company Operations
FLC	Formal Learning Centers
FYDP	Future Years Defense Plan
LVC	Live, Virtual, and Constructive
LVC-TE	Live, Virtual, and Constructive Training and Education
MAGTF	Marine Air Ground Task Force
M&RA	Manpower and Reserve Affairs
MCV&S	*Marine Corps Vision & Strategy 2025*
MILCON	Military Contract
M&RA	Manpower and Reserve Affairs
MOJL	Military On-The-Job Learning
POM	Program Objective Memorandum
SME	Subject Matter Expert
SUDM	Small Unit Decision Making
T&E	Training and Education
USMC	United States Marine Corps

Executive Summary

"…this discussion about decision making. I think it's critical and I think it's probably, you could argue, the critical enabler for small unit leadership and I think small unit leadership is the critical enabler for success of the MAGTF."

—General Joseph J. Dunford, Assistant Commandant of the Marine Corps
Remarks from the 2011 Marine Corps Small Unit Decision Making Workshop

The United States Marine Corps (USMC) Small Unit Decision Making (SUDM) Workshop was conducted on 12-13 January 2011 to support the *Marine Corps Vision & Strategy 2025* effort to "improve the ability of small unit leaders across the MAGTF to improve their intuitive ability to assess, decide, and act while operating in a more decentralized manner" (*Implementation Planning Guidance*, p. 9).

Figure 0.1. Asst. Commandant Dunford at the workshop

Keynote Speakers

The Assistant Commandant of the Marine Corps, General Joseph J. Dunford (Figure 0.1), and Lieutenant General Richard C. Zilmer (Ret.) provided the opening keynote addresses for the workshop. Both men suggested that many high-performing small unit leaders can be found. However, they argued that there is a need to replicate these areas of excellence service-wide and to more systematically support small unit leader development.

General Dunford recognized the extraordinary sense of urgency and strong mandate to affect in-stitutional change with regard to small unit leader development. Yet, he also recognized that successful implementation will require ruthless leadership from the top and adequate resourcing. Finally, General Dunford emphasized that the SUDM effort was not simply a strategic vision; instead, small unit cognitive development has become one of today's most important operational requirements.

From a similar perspective, LtGen Zilmer highlighted that the Marine Corps has monitored Marines' decisions for years, and while most Marines have performed superbly, they have done so *despite* well-intentioned efforts by the USMC to deliberately engender decision-making skills. LtGen Zilmer called for changes in small unit leader development, and as the former Deputy Commandant for Manpower and Reserve Affairs (DC M&RA), he recognized that attainment of this vision would likely require changes to the traditional, enlisted manpower model.

SUDM Core Competencies

At the workshop, the participants discussed the requirements and techniques for developing, improving, sustaining, and assessing small unit leaders' decision-making abilities across the Marine Air Ground Task Force (MAGTF). These discussions surrounded five core competencies associated with complex decision-making in time-compressed and ill-defined situations. Identified through preplanning meetings and refined through workshop discussions, the five core competencies are:

- Adaptability
- Sensemaking

- Problem-Solving
- Metacognition
- Attention Control

This workshop was not designed to identify every possible cognitive, emotional, and social competency associated with military decision making. Instead, participants focused on breaking down these five core competencies into manageable sets of subskills (dubbed "Cognitive And Relational Skills" or CARS), articulating training and education requirements for them, and discussing potential ways forward for engendering these capacities in tomorrow's small unit leaders.

SUDM Purpose and Philosophy

The SUDM initiative's goal is to accelerate the acquisition of expertise at the small unit level by systematically emphasizing the five core competencies (described above), integrating more deliberate practice with them, and employing research-supported instructional techniques to better facilitate development of them. Essentially, the initiative seeks to leverage components of the successful Marine Officer model for the enlisted ranks. The initiative's premise is that small unit leaders must learn to "condition" their cognitive, emotional, and social skills as intensely as they do their physical skills. To achieve this, the Marine Corps must develop the institutional recognition, policies, and infrastructure to better promote small unit decision making as an integral technical and tactical proficiency.

Workshop Purpose

The January 2011 workshop focused on identifying tools, techniques, and procedures to support the SUDM goals. More specifically, the workshop included expert panels, during which well-established cognitive researchers described their thoughts on the challenge, and the workshop involved breakout groups where the researchers and other workshop attendees discussed SUDM principles and ways to achieve the initiative's vision.

In addition to these discussions, the working groups produced outcome briefs on initial recommendations, relevant instructional strategies, and viable assessment approaches. Each participant also completed several surveys, and the results from these provide additional recommended instructional strategies and assessments. Data from the surveys, breakout session dialogues, and working group outbriefs were consolidated and analyzed to establish the Workshop Participant Recommendations. Table 0.1 summarizes the most prevalent, collective recommendations from the workshop.

Timeframe	Actions
Near-Term Now–2012	• Develop instructional tools and support systems to reinforce instructional techniques • Improve scenario-based instructional design and after action review processes • Mentor and coach daily at all levels • Conduct Capabilities Based Assessment (DOTMLPF) • Establish MCV&S Task 1 Assessment Plan and document the status quo baseline
Mid-Term 2013–2017	• Establish multiple budget line numbers (i.e., POMs) dedicated to human performance • Establish aligned and interdependent leadership and professional development doctrines • Conduct regular institutional assessments to evaluate appropriateness and effectiveness • Define domain-specific critical incidents across each mastery continuum • Maintain momentum for implementation from the top down
Far-Term 2018–2025	• Implement MCV&S Task 1 Strategic Communications Plan • Institutionalize deliberate practice and performance mastery learning culture • Codify cognitive development and readiness into Marine Corps ethos and lexicon • Revise Military Occupational Specialty Road Maps to incorporate cognitive aspects • Integrate cognitive competencies and decision-making constructs throughout LVC-TE

Table 0.1. Workshop Participant Recommendations Summary

Chapter 1: SUDM Initiative

The SUDM initiative seeks to "improve the ability of small unit leaders across the MAGTF to improve their intuitive ability to assess, decide, and act while operating in a more decentralized manner" (*Implementation Planning Guidance*, p. 9). This vision derives directly from the *Marine Corps Vision & Strategy (MCV&S) 2025* (see Figure 1.1).

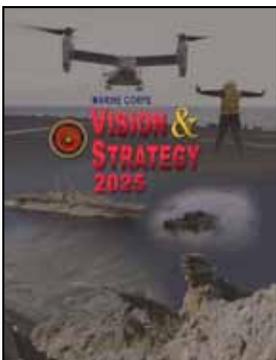## Marine Corps Vision & Strategy 2025

Figure 1.1. MCV&S 2025

In the *MCV&S 2025*, the Commandant emphasizes the importance of small unit leaders and their decision-making abilities. He writes, "Marines at all levels must be prepared to excel in ambiguous and dangerous conditions, operate from a commander's intent, and with minimal direct supervision" (p. 14). He calls on the training and education community to "prepare Marines for complex conditions and to counter the unexpected" and help small unit leaders develop their abilities to "make sound decisions… in an increasingly complex environment while potentially operating in a decentralized manner" (p.14).

The corresponding *Implementation Planning Guidance* document provides additional details on the decision-making abilities of small unit leaders. The Plan's Task 1, in particular, highlights experts' decision-making abilities, the experiences that their expertise relies upon, and their capacities to recognize, associate, and make sense of complex cues.

The SUDM initiative's aim is to reliably engender these expert capacities in small unit leaders. Essentially, the initiative seeks to leverage components of the successful Marine Officer training and education model and apply them to the enlisted ranks. However, attempts to merely replicate the experiences of the officers and other decision-making experts will be too time-consuming, labor intensive, and expensive. Thus, the goal is to *accelerate* the acquisition of expertise at the small unit level by integrating more deliberate practice, novel instructional techniques, and greater use of live, virtual, and constructive simulations throughout the training and education continuum.

More specifically, in accordance with the *Implementation Planning Guidance* report, the SUDM initiative seeks to examine:

1. Virtual and physical methods for developing unfamiliar training environment, physical and virtual that expose junior leaders to uncertainty, fog, and friction.

2. Training devices and systems that enhance our ability to immerse Marines in time-constrained scenarios that closely replicate combat situations.

3. Methods to share training venues that include ethical decision-making and evolving complex environments.

4. Professional Military Education initiatives that will enhance the junior leader's ability to more effectively operate and lead in complex environments with hybrid threats.

Blending "Training" and "Education"

Often, the military community considers *training* to be a procedurally focused activity in which psychomotor, task-specific skills are introduced and improved. Corresponding military training documents, such as USMC Training and Readiness (T&R) Manuals, emphasize behaviorally focused Tasks, Conditions, and Standards (T-C-S) as training performance goals. In short, *training* generally connotes that the trainees are *doing* some task, that the task is directly relevant to some operational duty, and that once a certain minimum standard of performance is achieved, formal training is completed.

In contrast, the term *education* often implies that more abstract cognitive, emotional, or social knowledge, skills, and attitudes (KSAs) are being learned. In military communities, the term *education* often connotes the acquisition of knowledge that transcends various activities (i.e., does not simply support completion of one specific task). Educationally focused learning objectives are often considered "ambiguous" in nature (although, in practice, such "intangibles" can be reliably taught and measured), and they may be emphasized throughout a Marine's career.

One of the SUDM initiative's goals is to seamlessly blend educational goals into the training of more traditional, more procedural psychomotor tasks—especially for NCO trainees. This blending must be done in a way that facilitates instruction of both the traditional psychomotor tasks as well as the more "intangible" cognitive, emotional, and relational tasks. It must be carried out in a way that creates shared understanding of both the immediately apparent features and the underlying facets of a task or concept. Additionally, it should be accomplished in a way that allows development of instructional resources, including explicit descriptions of appropriate instructional strategies, assessments, and scenarios.

As part of this shift towards blended small unit leaders' training and education, the Marine Corps will need to de-emphasize the industrial training model that focuses on throughput and minimum "competence." Instead, the institution will need to embrace a more holistic professional development model that focuses first on increasing levels of mastery, over and above time-on-task or throughput. The new model also must expand the traditional psychomotor (behavior-focused) Task-Condition-and-Standard approach to include requirements and descriptions for cognitive (decisions) and affective (emotions) aspects.

This new blended professional development approach will rely upon active involvement at all levels of the service. Marines across the echelons must engage in cognitive and affective self-reflection and ongoing self-improvement. Junior leaders must continue to demonstrate Values Based Leadership and hone their coaching and mentoring skills, and personnel from the formal learning centers must continue to improve upon their Train-the-Trainer (T3) courses. This should better equip Marines to develop SUDM competencies within their own personnel and help engender the "teacher-scholar" leadership philosophy discussed by General John A. Lejeune. Ultimately, doctrine must be developed to support this model and to formally institutionalize decision-making competencies into Marine Corps requirements.

SUDM Core Competencies

In order for Marines to employ intuitive decision-making and complex problem-solving skills, they must possess a range of cognitive, emotional, and socials competencies. Five critical SUDM competencies were identified by a panel of academic researchers working with Training and Education Command (TECOM) representatives at a meeting held in November 2010. The five *original* competencies were adaptability, sensemaking, problem-solving, metacognition, and team/unit development (i.e., teamwork skills).

However, at the January 2011 Workshop, participants decided to replace the team/unit development competency with "attentional control." Still, the competencies, their subskills, and many of their related instructional and assessment techniques are

Competencies	Learning Outcome
Adaptability	Adjust attitudes, emotions, neurophysiology, and actions to detected change
Sensemaking	Estimate situations in given operational environments
Problem Solving	Evaluate the adequacy of generated options and/or choices
Metacognition	Using strategies to monitor/self-regulate learning and cognition
Attention Control	Deploy sustain, targeted attention on a chosen target

Table 1.1. SUDM core competencies and succinct descriptions of their related learning outcomes

Figure 1.2. Small group discussion at January Workshop

applicable at both the individual and collective levels; as such, teamwork skills remain viable, but they are now interwoven across the other competencies. Thus, the *current* list of core competencies is:

- Adaptability
- Sensemaking
- Problem-Solving
- Metacognition
- Attention Control

(See also Table 1.1.) Certainly other cognitive, affective, and social skills support effective decision-making; however, focusing on these five core competencies allows the initiative to concentrate on a smaller, more manageable number of factors.

At the January 2011 Workshop, participants focused on breaking down these skills, articulating training and education requirements for them, and discussing potential ways forward for engendering these capacities in tomorrow's small unit leaders (see Figure 1.2). Details of these products are offered in the next chapter.

Recommendations from Behavioral Science

Pertaining to small unit decision-making, bridging behavioral science and theory into actionable practice is among the greatest challenges the Marine Corps faces. Although not perfect, the behavioral sciences associated with human performance, learning, instructional design, and decision making have matured significantly over the last 25 years. There is qualitative and quantitative evidence that this science works; that is, certain learning strategies reliably support more effective and efficient development and

assessment of decision making, and particular observation and feedback techniques predictively allow instructors to enhance student's decision-making development processes.

Already, there are areas of excellence throughout the Marine Corps that offer training and education on the SUDM core competencies. One of the goals of the SUDM initiative is to better link these best practices to their scientific and theoretical underpinnings and then challenge the institution, as a whole, to employ these science-supported best-of-breed interventions deliberately and consistently across the Marine Corps training and education continuum.

Deliberate Instruction for Small Unit Leaders

Small unit leadership has always been a cornerstone of the Marine Corps, and many top performing small unit leaders already demonstrate excellent decision-making, coaching, and mentoring skills. However, the best small unit decision makers have developed their cognitive capabilities without the benefit of deliberate institution-wide support. Therefore, the Marine Corps is seeking to better support small unit leaders by providing them with the most effective and efficient professional development process possible.

The training and education community's goal is to provide Marines with a set of tools that reliably enhances small unit leaders' decision-making skills. Enhancing their cognitive skills increases Marines' readiness and their ability to accomplish the multitude of missions that may be assigned to small units in current and future operating environments.

This approach has three mutually supporting components:

1. *Meaningful Experience:* Increase Marines' repository of meaningful experience through a host of live, virtual, and constructive training and education interventions. Meaningful experiences are ones that specifically help a Marine recognize patterns and build stronger mental models.

2. *Focused Feedback:* Restructure and emphasize Marine Corps counseling, coaching, and mentoring (CCM). These leadership engage-

ment initiatives include refinements to the Marine Corps' after action review (AAR) format and greater utilization of cognitively focused instructional delivery techniques.

3. *Cognitive and Relational Skills:* Establish the requirements, standards, and techniques to formally develop a core set of cognitive and relational skills that support a Marine's ability to assess, decide and act in a more decentralized manner.

These collective efforts will enrich Marines' mental models, help them develop more efficient cognitive processes, and teach Marines how to *learn* like experts so they can maximize their experiences.

Deliberately Framing Experience

Many small unit leaders already demonstrate effective decision-making skills; often, these skills are acquired through operational experience. However, it is risky to assume that all Marine Corps small unit leaders receive sufficient, structured experience through such on-the-job training (OJT) and "discovery" leadership development. As currently implemented, these methodologies are not consistent.

Instead of relying upon unstructured OJT, Marines need to be given *deliberate* opportunities to exercise their decision-making skills, and instructors/leaders need to explicitly draw out the applicable learning points of each experience. Thus, to effectively develop small unit leaders' decision-making skills, the Marine Corps must provide its small unit leaders an integrated instructional framework that deliberately focuses their experiences and develops the psychomotor, cognitive, relational, and social skills they need to get the most out of each experience.

Mastery Learning Philosophy

Dr. K Anders Ericsson, Florida State University, estimates that 90–95 percent of students can learn to a mastery level, *if* they are given enough time and appropriate instruction. Mastery learning theory suggests that instructional interventions should focus on different learners' *mastery* of the same material.

Learners who do not satisfactorily complete a topic/task should be given additional instruction until they are successful, and learners who master the topic early should engage in enrichment activities.

In mastery learning, the amount of time and type of instructional activities may vary from student to student, but the outcome performance levels remain constant. This approach differs from common instructional models in which all learners are given the same amount of time and, often, the same instructional interventions and their achievement levels are allowed to vary.

Mastery learning includes many elements of successful mentoring and coaching. Mastery learning requires well-prepared instructors who have a vast "toolkit" that includes a wide variety of instructional techniques and materials for remediation (see Block & Burns, 1976, for a review).

Figure 1.3. Dr. Gary Klein

Deliberate Performance

Currently, a vast majority of Marines' professional development occurs while assigned to the Operating Forces. Ideally, these on-the-job experiences would maximize learning opportunities and be supplemented with structured CCM. This can be achieved with an appropriate combination of deliberate performance and deliberate practice.

According to Dr. Gary Klein (see Figure 1.3), MacroCognition, LLC, *deliberate performance* uses job and life situations as opportunities for learning. Deliberate performance is similar to military on-the-job training (MOJT), except that just-in-time MOJT

"If the Marine Corps really wants to implement the organizational changes required to improve its small-unit leaders' ability to make intuitive, complex decisions, it is going to take more than a workshop. It is going to take more than a series of workshops. It is going to take a concerted effort to maintain the mandate, access, resources, partnerships, and science."

—Dr. Eduardo Salas

usually focuses on particular skills and procedures (e.g., explicit declarative and procedural knowledge), whereas deliberate performance focuses on building the tacit knowledge and intuitive expertise associated with extensive job experience.

A deliberate performance focus emphasizes higher-level patterns, principles, and associations employed by more experienced individuals in their occupational specialty. An individual can build tacit knowledge by systematically predicting what will happen in work situations. If their predictions are incorrect, attempts are made to understand the reasoning and rationale behind them.

CCM conducted by leaders will also provide Marines an opportunity to learn from decisions made by their leaders. This is particularly powerful when discussions emphasize *why* decisions were made and *what cues* were identified. Anomalies, inconsistencies, and changes are assessed as to how they affected the outcome/decision. Through deliberate performance exercises, Marines can become reflective practitioners. Deliberate performance exercises also can improve Marines' performance and continuously increase their levels of mastery.

Deliberate Practice

Deliberate practice refers to a set of instructional activities explicitly designed to improve performance by encouraging individuals to constantly strive to master objectives just beyond their current level of competence. Deliberate practice relies upon accurate and immediate feedback, and individuals engaging in deliberate practice must have opportunities for reflec-

tion and chances to repeat the same and similar tasks until mastery is achieved.

Not all experiences (i.e., practice/training) are equal, and simply performing tasks repetitively can actually lead to degradation of skills, while training something incorrectly can reinforce bad habits. In contrast, *deliberate* practice has been found to account for individual differences among the world's best athletes, chess players, surgeons, and other professionals (Ericsson, 2006). In other words, deliberate versus ad hoc practice and experience can "make the difference" when it comes to the development of expertise.

Deliberate practice principles have also been shown to successfully increase academic learning performance (Deslauriers, Schelew, & Wieman, 2011) to increase Air Force pilots' ability to handle emergency situations during regular missions (McKinney & Davis, 2004), and to be the most effective method for training warfighters and their group leaders in all the branches of the military (Ericsson, 2009).

Most current examples of deliberate practice involve decision making by individuals in dynamic situations, such as soccer players deciding what to do when presented a video sequence of a game (Ward, & Williams, 2003), medical doctors acquiring skill to diagnose X-rays in pediatrics (Pusic, Pecaric, & Boutis, 2011), or chess players having to make decisions during a chess game (Charness, Tuffiash, Krampe, Reingold, & Vasyukova, 2005). How deliberate practice has been developed to support training for cognitive readiness is described in a recent chapter (see Ericsson, in press).

Five Keys to Implementation Success

Dr. Eduardo Salas, University of Central Florida, has 25 years of experience working with the Department of Defense (see Figure 1.4). From these, he identified a number of factors that influence the success of projects like SUDM. If the Marine Corps is going to truly improve the ability of its small unit leaders across the MAGTF to intuitively assess, decide, and act while operating in a more decentralized manner, it will have to change the way it professionally develops (trains and educates) its most junior Marines. That is, sustainable, organizational change is required, and
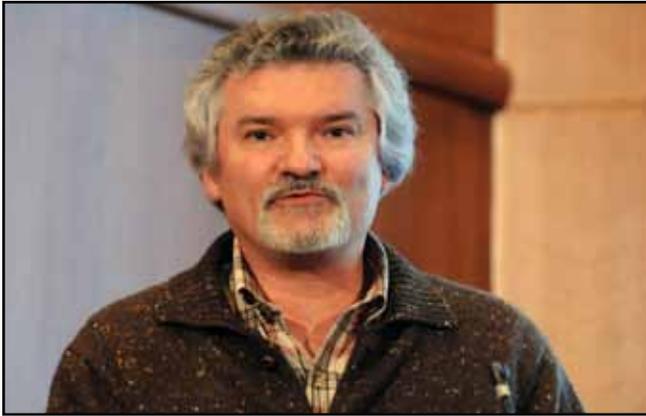
Figure 1.4. Dr. Eduardo Salas

the success of this organizational change relies heavily upon the following five factors.

1. Mandate

Initiatives, like SUDM, require a strong institutional mandate. Engaged leadership must provide sustained support over many years, and a leader or group of leaders must champion the effort. Without such a mandate and ongoing active support, the initiative could fade away after three to five years. Additionally, while a mandate must come from the top, a mandate must also come from the bottom. That is, both Marine Corps leaders and small unit personnel must "buy-in" to the initiative.

2. Resources (Money and Manpower)

One of the biggest indicators of a real mandate is resource allocation. When the leadership allocates sufficient resources or redirects resources from one initiative to another (especially during resource-constrained periods), it sends a strong message that reverberates throughout the organization. Allocation of resources indicates the seriousness of a commitment. For the SUDM initiative, specifically, time, effort, and monetary resources have already been invested, but dedicated Program Objective Memorandum (POM) funding and personnel assignment/tasking in the out-years will be a strong indicator of the strength of the leadership's mandate.

3. Access

Participants in any successful initiative need access to relevant Subject Matter Experts (SMEs). This means that Marines need access to behavioral scientists *and* that behavioral scientists require access to operational Marine SMEs. Such access will support the development of actionable research-based tools, techniques, and technologies that can be readily applied by Marines to engender meaningful and sustained performance improvement. In other words, this partnership will enable theoretical science in be translated into practical programs of instruction, courseware, effective scenario-based training, and so on. However, Marines must be active participants in this development process so that the change is internalized, the products are useful, and the solutions can be easily implemented. Otherwise, the initiative runs the risk of remaining too scientifically focused or of the uniformed military community not developing ownership of the effort.

4. Partnership

Partnerships among SMEs, scientists, sponsors, and the leaders at the Pentagon will help drive institutional change. The SUDM initiative has the beginnings of such a partnership, but it needs to continue to grow the stakeholders' involvement.

5. Science-Driven

Scientific evidence is compelling, and it is important to present qualitative and quantitative data that verify and validate the effectiveness of new efforts, like the SUDM initiative. A program must be able to demonstrate its success, if it is going to survive in a resource-constrained fiscal environment. Development of a meaningful, science-driven assessment plan is critical to sustaining an effort (as well as mutually supporting the improvement process). The SUDM initiative is currently planning an assessment pilot for 2012 to help address this factor.

Chapter 2: Summary of Workshop Presentations

This chapter summarizes presentations, out-briefs, and keynote addresses from the 12–13 January 2011 SUDM Workshop, conducted at the General Alfred M. Gray Marine Corps Research Center in Quantico, Virginia. This interdisciplinary workshop was hosted by Training and Education Command (TECOM).

Ninety-nine attendees from across the training and education community participated in the workshop (see Annex B). The audience comprised a blend of civilian and active duty Marines, and most of the military attendees were officers.

The goal of the workshop was to begin development of a holistic instructional framework that articulates a systematic strategy for reliably engendering effective adaptive decision-making skills in small unit leaders. Towards this end, participants discussed critical decision-making skills, as well as appropriate instructional methods and assessment tools for developing these skills across the MAGTF.

General Dunford Keynote

General Joseph J. Dunford, Assistant Commandant of the Marine Corps (ACMC), offered the opening keynote address (see Figure 2.1). He stated that small-unit decision making is part of the broader effort to improve USMC junior leaders, and he emphasized that it is one of the Commandant's four priorities (see the *Commandant's Planning Guidance*, 2010). The effort to develop Marine small-unit leaders, he stressed, was no longer just a future vision—it is one of today's operational requirements. Additionally, the ACMC expressed that he is personally vested in the initiative and feels a sense of urgency to realize the SUDM vision.

Figure 2.1. General Dunford

"…and so I think the challenge for us is to figure out, through a combination of training, a combination of education and a combination of what I call a maturation process of the noncommissioned officers, how we institutionalize the kind of intuitive and recognitional decision-making that we know is absolutely critical to operate—not, again, in the future, but today."

—General Joseph J. Dunford

General Dunford reflected that the operational tempo of contemporary conflicts condenses eight or nine years' worth of very specific experience into a single four-year tour of duty. But, he stated, he feared that the Marine Corps has not institutionalized that experience into its professional development model. General Dunford asked how the Marine Corps could get equal levels of experience from a four-year peacetime tour of duty. The ACMC also emphasized that the Marine Corps needs to establish an understanding of when and why the professional development process works (or fails to work), so that it can be reliably replicated more often. That is, institutionally, the Marine Corps needs to develop a coherent and implementable framework to select, train, educate, and mature its non-commissioned officers (NCO) over time.

Finally, General Dunford remarked that this vision will require "ruthless leadership" from the top, coupled with a ground swell from the bottom up. It will take General Officers and senior enlisted to successfully implement. This process will demand institutional change, and it may require adjustments to the existing USMC manpower and training progression models. The General recognized that these changes may cause consternation, but, he argued, the Marines need a more coherent framework and professional development roadmap for small unit leaders. He likened this effort as commensurate with implementation of maneuver warfare and officer Professional Military Education (PME) in the late

1980s and 1990s. In other words, he recognized the innovative potential of the SUDM vision.

LtGen Zilmer (Ret.) Keynote

LtGen Richard C. Zilmer, USMC (Ret.), the former Deputy Commandant for Manpower and Reserve Affairs (DC M&RA), presented a keynote address on the first day of the conference, as well as closing remarks on the final day (see Figure 2.2). As the senior retired Marine participant during the workshop, LtGen Zilmer asserted that the institutional change for SUDM must start in the Marine Corps schoolhouses. The ideas generated in the Formal Schools in Quantico, Virginia are the seeds that eventually germinate throughout the Marine Corps.

Figure 2.2. LtGen Zilmer (Ret.)

LtGen Zilmer cautioned, however, that about 60 percent of the Marine Corps is under the age of 25, and about 73 percent of the Marine Corps are Sergeants and below. Any effort to affect major institutional change will have to start here and start at a very junior level.

The LtGen also commented that the Marine Corps has been monitoring the way Marines make decisions for years, and while most Marines have performed superbly, they have done so *despite* well-intentioned efforts by the USMC to deliberately engender decision-making skills. In other words, the Marine Corps has recognized cognitive readiness development as a capability gap. The Service has not consistently or sufficiently empowered its small unit leaders, and it has not given them the tools to operate as effectively as they could—in garrison or on the battlefield.

Then, he assured workshop participants that General Dunford's presence indicated institutional commitment to this effort. LtGen Zilmer suggested that the Commandant, Assistant Commandant, and

Sergeant Major of the Marine Corps are not interested in admiring the problem much longer.

LtGen Zilmer Closing Comments

During his closing comments, LtGen Zilmer recommended the Executive Off-Site (EOS) be incorporated into the socialization plan. He pointed out how important it would be to have all of the three- and four-star generals vested in the effort.

He also suggested it should start during Entry Level Training (ELT) and continue throughout a Marine's career progression. It has to be inculcated into the very essence of what it means to be a Marine, i.e., the way the Marine Corps "does business." As the former Deputy Commandant for Manpower and Reserve Affairs (DC M&RA), LtGen Zilmer recognized that attainment of this vision would likely require changes to the traditional, enlisted manpower model, but he argued that such a change should be considered.

Finally, LtGen Zilmer emphasized that today's Marines are better, smarter, and faster than they have ever been. Their qualifications and accomplishments are exceptional; they can handle this responsibility. There are 18-, 19-, and 20-year old "Strategic Marines" at a very junior level out there today, faced with some huge responsibilities. They are making these sorts of time-compressed, ill-defined, complex decisions right now. It is the leadership's responsibility to give them the focus, framework, and resources to successfully make those critical decisions.

Workshop Facilitator, LtCol Lucas

Lieutenant Colonel David W. Lucas, SUDM Workshop Facilitator, presented the overview of the Marine Corps implementation strategy, saying that expertise and contextual experience are key enablers to improved naturalistic decision making (see Figure 2.3). The *MCV&S 2025* Task 1 Implementation

Figure 2.3. LtCol Lucas

Plan (as described in Chapter 1) focuses on how experts obtain meaningful experience as well as how they learn to recognize and associate specific internal and external cues.

Mr. Bearor Closing Comments

Senior Executive Service (SES) Jeffery Bearor, Executive Deputy, TECOM closed the workshop (see Figure 2.4). He explained that this effort was focused on trying to give young Marines the tools to make better decisions, so that they can meet the challenges of contemporary and future Marine Corps operations. Mr. Bearor stated that the institution owes it to small unit leaders to develop an effective and efficient professional development continuum, one part of which is the SUDM initiative.

Figure 2.4. Mr. Bearor

As highlighted by Mr. Bearor, the Marine Corps will have to implement this initiative carefully. The institution cannot languish about on implementing the results of the SUDM Workshop, but that should not imply that this will be a spasmodic effort. Small unit leader development, he predicted, will become the standard operating approach of the future Marine Corps—it will be "how we do business."

"It is up to us," he urged the audience, as the systemic trainers and educators of the Marine Corps to "make sure we give that Marine every opportunity to succeed and to come home safely."

Expert Panel 1: Decision-Making Competencies and CARS

Members – Dr. Gary Klein, Dr. Eduardo Salas, Dr. K. Anders Ericsson, Dr. Rose Mueller-Hanson, Dr. Elizabeth Stanley, Dr. Sae Schatz, and Dr. David Fautua (Moderator)

The first expert panel, and complementary breakout

Invited Expert Panelists

Dr. K. Anders Ericsson
Dr. David T. Fautua
Dr. Joan Johnston
Dr. Gary Klein
Dr. David Kobus
Dr. Rose Mueller-Hanson
Mr. William A. Ross
Dr. Eduardo Salas
Dr. Sae Schatz
Dr. Elizabeth Stanley

Figure 2.5. Expert panel. Dr. K. Anders Ericsson in the foreground, with Dr. Eduardo Salas sitting behind him. Dr. David Fautua stands at the podium.

group, focused on the five core competencies and their related cognitive and relational subskills. Dr. Gary Klein and Dr. Rose Mueller-Hanson provocatively opened the first expert panel by questioning the basic premise that there are generalized cognitive skills that can predictably be developed to speed domain-specific decision-making abilities. *What do we mean by cognitive competencies? What is the difference between a competency and ability?*

Dr. Elizabeth Stanley argued that "attentional control" (the ability to put attention on something you have deliberately chosen to focus on; recognize you put it on that thing; sustain your attention there; and then tolerate that thing that you are sustaining attention on even if it is unpleasant) should be added to the CARS list. She offered that attentional control is a foundational ability for each of the competencies in the proposed matrix (Annex C). In this light,

Dr. Stanley suggested that attentional control may be more important to prevent bad decisions than it is to make good decisions.

Dr. Sae Schatz presented the idea that "sensemaking" (the notion of making sense out of your experiences or giving them meaning) can be developed and measured. She suggested that the ability to "make sense" of a situation or environmental cues equates to the "orient phase" of the military community's OODA Loop.

Dr. Eduardo Salas suggested the scientific community had generated a set of competencies (knowledge, skills, and attitudes [KSA]) that are relevant to effective team decision making over the last 20 years, some of which were on the proposed CARS list and others were not.

Dr. K. Anders Ericsson pointed out that his research has shown that true experts spend an extraordinary amount of time studying and reflecting on concepts, competencies and skills just beyond their current understanding and ability (see Figure 2.5). He also discussed how important it would be to identify what makes some Marines better decision makers than others on the front end of the effort. Dr. Ericsson asked the audience to think about what differentiates a unit that consistently performs better or routinely makes better decisions. Replication of these identified "differentiators" should lie at the foundation of any deliberate effort to accelerate the development of expertise.

Almost universally, in the end, the panel agreed "learning by doing" had to be an important component of the initiative. Marines must exercise their minds and bodies regularly, if they expect to positively change their cognitive readiness and performance. The presenters advocated that it is the cumulative effect of deliberate training, focusing on the factors that make a difference in small unit decision making, that will begin to create positive changes.

Expert Panel 2: Intuitive Decision-Making Instructional and Assessment Techniques

Members – Dr. Gary Klein, Dr. Eduardo Salas, Dr. Joan Johnston, Dr. Rose Mueller-Hanson, Dr. Elizabeth Stanley, Dr. Sae Schatz, and Dr. David Fautua (Moderator)

The second expert panel, and corresponding breakout session, were designed to explore the best ways to instruct (train and educate) and assess decision-making skills and subskills. The expert panel introduced several issues associated with accelerating the acquisition of expertise.

Dr. Klein suggested that Marines can and should view their job-related experiences as learning opportunities. He asked rhetorically: How many potential lessons are lost (i.e., not learned) because people do not engage in on-the-job learning? What resources, including time, are squandered because people do not know how to have that kind of dialogue or how to share their tacit knowledge?

To maximize learning experiences, Dr. Klein asserted, Marines must continue to improve at every opportunity. Part of the formal schools' responsibility is to instill the skills for small unit leaders to purposefully develop and assess their Marines on a daily basis. If Marines are allowed to just "do their jobs," their actual learning curve flattens out and in some cases actually reverses, leading to declines in overall performance.

Dr. Schatz introduced the notion that learning can be accelerated. She explained that Scenario-Based Instruction (SBI), or the notion of presenting systematic events before a learner(s) in a story form to enable certain decisions and cognitive skills to be practiced, is one of the most effective and efficient instructional strategies for developing higher-order thinking.

She explained that the sequencing of these scenarios, along with other instructional activities, was critical. Similarly, timely and focused feedback is key to accelerated learning. This feedback allows the learner to purposefully reflect on what was considered and done in relation to others considered to have a higher level of mastery.

Dr. Stanley suggested that deliberate practice could be injected into work situations once a basic foundational skill has been established. These practice and performance situations have to be placed in

a scenario-based context in order for the learner to properly "file" the experience into their mental repository of experiences.

Dr. Stanley also described *mindfulness exercises*, which involve developing attentional control and awareness. This awareness is a source of the learning acceleration the rest of the panelists described.

Dr. Mueller-Hanson explained how certain instructional and assessment techniques have been proven to deepen understanding and foster the habits of mind necessary for complex decision making. For instance, small unit leaders need the ability to mentally simulate (predict) what may happen (consequences) when their situational assessment or sensemaking proves inaccurate.

Finally, Dr. Joan Johnston and Dr. Salas presented several examples of techniques for developing and assessing team decision making. These techniques were also built around the SBI approach to learning.

Breakout Session 1: CARS

Workshop participants and academic facilitators divided into five breakout groups, each of which focused on one of the predefined (original) CARS (see Figure 2.6). In the first working group, panelists discussed the Cognitive and Relational Skills Matrix (see Annex C), and the questions presented during the first expert panel facilitated an exchange of ideas regarding the meaning of cognitive competency and cognitive readiness.

Although there were still questions on the specific CARS, participants almost universally saw value in developing the decision-making skills of Marine Corps small unit leaders. Yet, participants believed the attributes, competencies, and skills need to be operationalized in order to be useful. That is, establishment of clearly defined requirements and standards will be imperative for effective and efficient small unit leader professional development. The message from the participants was clear and concise—the SUDM effort should clearly codify the cognitive skills, organize them into a limited number of categories, and devise standards for developing and demonstrating competency.

Do the Marines already do this?

The working groups had an interesting exchange about the degree to which the Marine Corps already develops cognitive competencies. Some participants strongly believed the Marine Corps already develops these skills, but that these instructional interventions varied greatly amongst different domains, ranks, and specialties. This position suggested the Marine Corps already develops good decision makers and only a slight shift in emphasis may be needed to focus the efforts.

On the other hand, other participants argued that to say the Marine Corps already develops this capacity could close the organization off to making the cultural change necessary for improving small unit leader development. These participants suggested that there are serious deficits in cognitive readiness development in the Marine Corps and that the Fleet needs to better institutionalize cognitive readiness at the small unit level.

These participants also argued that while some Marines may demonstrate sound decision making at work, their behavioral "acting out" during off-duty activities (e.g., adrenaline-seeking behaviors, alcohol or substance abuse, domestic violence) suggests that the Fleet Marine Force needs additional skills to help regulate "the whole Marine" and not just the field Marine. Both "camps" generally agreed, in the end, that the Marine Corps is currently not doing an adequate job developing the process of regulating emo-
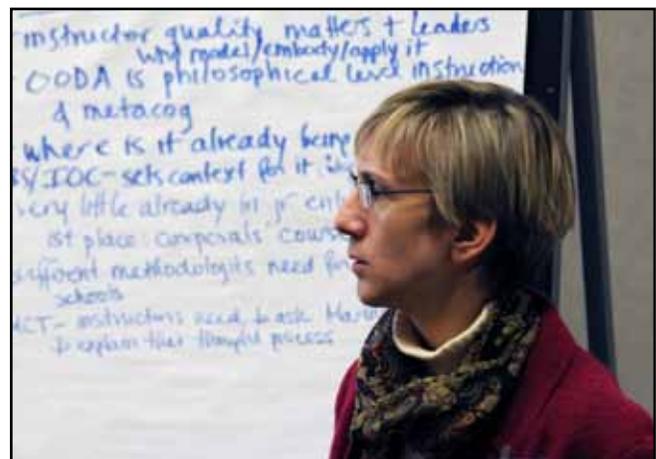

Figure 2.6. Dr. Elizabeth Stanley co-facilitates one of the breakout groups.

tions, regulating the stress response, and the process of making ethical decisions.

Additionally, even in places where decision-making training is relatively robust, there are areas for improvement. Thus, the workshop participants agreed that a first step is examining what is being done well and where there are gaps in decision-making training so that additional instructional resources and techniques can address the identified gaps.

Unit/Team Cognitive Development

The Unit/Team Cognitive Development working group recommended a change to the name of their competency to "shared task accomplishment" with a separate list of CARS. Team decision making is more than the aggregate of individual decision-making abilities (i.e., "taskwork"). Instead, team competencies, team skills, team stress management skills, and team decision skills involve a distinct set of "teamwork" competencies.

Dr. Salas and Dr. Joan Johnston facilitated this working group. In it, they discussed the critical requirement for teams to have clearly defined and articulated roles and responsibilities. Mutual trust amongst the team members is built on shared mental models and an understanding of each person's commitment and competence. Dr. Salas elaborated on the research findings supporting competencies / skills required for effective team decision-making, suggesting that it involves:

1. Cooperation
2. Coordination
3. Communication
4. Coaching
5. Cognition
6. Conflict
7. Culture
8. Context

Breakout Session 2: Instructional Approaches

Creating Opportunities to Make Decisions

Collectively the workshop participants opined that if the Marine Corps is going to develop these more

Figure 2.7. Working group participants discuss SUDM principles and challenges.

Figure 2.8. Working group participants complete individual surveys. These results are in Chapter 3.

abstract and challenging higher-order thinking skills, it needs to give Marines well-timed, meaningful experiences purposefully designed to develop them (see Figures 2.7 and 2.8). They proposed this would be especially true as the current operational tempo slows down. Marines have to be afforded opportunities to make decisions, and many of the active duty military participants adamantly expressed that while small-unit leaders are empowered (out of necessity) during combat operations, their responsibilities are taken away once they return to garrison.

Several discussions asked whether the operating forces have enough time available for this type of cognitive development and higher-order thinking. Since reflectively incorporating the "why" and "how" behind a leader's decision making process is important to the accelerated growth, time must be allocated for post-execution review, debrief, and reflection.

Many of the active duty military personnel also cautioned that there are times when Marines must automatically follow orders without question. They were concerned that it would be difficult to balance

such discipline with the development of critical and creative thinking.

Authentic, Instructionally Sound Scenarios

To help develop the appropriate balance of discipline and decision making, and to do so in a reasonable (i.e., accelerated) time frame, participants suggested that the service will need to incorporate many more authentic, instructionally sound scenarios. These training and education experiences should focus on the development of robust mental libraries of experience (i.e., schema or "file folders"), which in turn, bolster development of cognitive and relational skills.

Traditionally, the Marine Corps has emphasized development of small unit leaders who are able to execute procedural knowledge (e.g., checklists and standard operating procedures) with some level of automaticity. However, the Marine Corps' instructional strategies are migrating from part-task development to accelerated performance in the whole-task environment, and as such, it will be important to identify critical incidents (scenarios/stories) within each domain that—when previewed, delivered, and debriefed appropriately—will result in efficient mastery.

Training vs. Education

Some of the working groups discussed how the Marine Corps should integrate formal school instruction with the training and education that takes place in the operating forces. Participants suggested that "education" teaches how to think, perceive, and make decisions while "training" teaches what to think and do to make decisions. However, others believed this was an artificial differentiation and that both components of learning (i.e., how to think and what to think) need to be couched within the context of how to learn.

Participants suggested that if the Marine Corps aspires to accelerate the acquisition of expertise, instructional interventions must be fully integrated. Marines will be required to take ownership of their learning. Some participants suggested the Department of Defense's collective efforts to "train" everyone for every specific situation is stifling the Operat-

ing Forces. This approach, they asserted, is ineffective and inefficient. Others suggested this approach keeps Marines from moving beyond procedural knowledge and that they will never be able to reach the depth of understanding and mastery required for making intuitive decisions.

Measuring Success

The participants reached consensus regarding the need for assessment. In order for any performance improvement project to have sustained success, it must quantitatively and qualitatively measure progress. Measurements have to be process-oriented as well as outcomes-based, and return on investment must also be considered.

Breakout Session 3: Anticipated Effects on the Marine Corps

Return on Investment

Participants agreed this approach would require integrated development and execution between TECOM, M&RA, and the Operating Forces. Over time, the formal schools' efforts to teach, mentor, and coach their students to deeper levels of understanding should cross-pollinate throughout the Operating Forces, and ultimately, the Marine Corps should gain more awareness of, and insight into, its professional development processes.

Measurement of these processes will allow the Marine Corps to reduce performance variation and systematically improve the Marines' ability to make intuitive, complex decisions—in garrison and on the battlefield. These assessments will allow the Marine Corps to make and fiscally defend informed, data-driven process decisions regarding human performance enhancement initiatives.

As with any organizational change effort, identification of the requirements, standards and assessment techniques (data requirements) is critical and directly supports return on investment assessments. Each of the five working groups saw tremendous value in the Marine Corps establishing leadership and professional development doctrinal publications.

Chapter 3: Workshop Participant Recommendations

The January 2011 SUDM workshop focused on identifying tools, techniques, and procedures to support the SUDM initiative. The workshop involved breakout groups where the researchers and other workshop attendees discussed SUDM principles and ways to achieve the initiative's vision. The working groups produced outcome briefs on initial recommendations, relevant instructional strategies, and viable assessment approaches. Each participant also completed several surveys, and the results from these provide additional recommended instructional strategies and assessments. This chapter describes the data from the surveys, breakout session dialogues, and working group out-briefs. Table 3.1 (repeated from the Executive Summary) summarizes the most prevalent, collective recommendations from the workshop.

General Observations

Workshop participants generally agreed that to truly institutionalize enhanced cognitive development for small unit leaders, the Marine Corps will have to invest at least five to ten years, and successfully achieving the SUDM vision will likely require a cultural shift. It will require a transformation in the way the Marine Corps develops its leaders. The groups agreed that the SUDM vision cannot be achieved with quick-fix solutions, like providing more checklists or developing more briefing slides. Sustainable performance improvement will require relentless implementation of a multi-faceted and focused plan.

There is always a competition for time. Workshop participants voiced concerns that if this initiative is too prescriptive or too focused on abstract cognitive skills, then small unit leaders will not have the time they need to personally develop the skills or help engender them in their Marines.

Some participants believed the Marine Corps should break away from prescribed institutionalized training and let the junior officers and Marines learn how to assess their unit's needs. However, these participants worried that the Marine Corps has a generation of junior officers and NCOs who have limited experience with developing training plans or schedules. For instance, Pre-Deployment Training Packages (PTPs) are prepackaged and prescribed to small unit leaders; although doctrine requires small unit leaders to think on their feet, this responsibility and the related skills are not as emphasized in regard to unit training and education.

Timeframe	Actions
Near-Term Now–2012	• Develop instructional tools and support systems to reinforce instructional techniques • Improve scenario-based instructional design and after action review processes • Mentor and coach daily at all levels • Conduct Capabilities Based Assessment (DOTMLPF) • Establish MCV&S Task 1 Assessment Plan and document the status quo baseline
Mid-Term 2013–2017	• Establish multiple budget line numbers (i.e., POMs) dedicated to human performance • Establish aligned and interdependent leadership and professional development doctrines • Conduct regular institutional assessments to evaluate appropriateness and effectiveness • Define domain-specific critical incidents across each mastery continuum • Maintain momentum for implementation from the top down
Far-Term 2018–2025	• Implement MCV&S Task 1 Strategic Communications Plan • Institutionalize deliberate practice and performance mastery learning culture • Codify cognitive development and readiness into Marine Corps ethos and lexicon • Revise Military Occupational Specialty Road Maps to incorporate cognitive aspects • Integrate cognitive competencies and decision-making constructs throughout LVC-TE

Table 0.1. Workshop Participant Recommendations Summary

Some workshop attendees commented that instruction in the schoolhouses should be presented by the best and brightest instructors. They should naturally foster mentoring and coaching relationships, inspire learners to become teacher scholars, improve learners' motivation, and help model high-quality cognitively focused instructional approaches. This approach has been validated by the Recruit Depots, The Basic School, and many officer courses. The present challenge is to reliably institutionalize such best practices throughout the Marine Corps—especially at the NCO level. To achieve this vision, participants described a variety of near-, mid-, and long-term recommendations, which are offered below. The following subsections reflect recommendations from workshop participants. TECOM is actively investigating the appropriateness and feasibility of the suggestions.

Near-Term Recommendations

The near-term efforts should create buy-in from Marine stakeholders, and quickly illuminate the value of the more extensive investments in improving Marines' ability to make complex decisions.

Instructional Tools and Support

In the near-term, the professional development community should create/improve upon instructional tools and support systems for cognitive and relational skills development. In particular, improvements in scenario-based instructional design and AAR processes are appropriate near-term focus areas. These instructional interventions help individuals and collective units move from conscious to unconscious action (i.e., from step-by-step procedural understanding to automatic competence). Once the individual reaches this level of automaticity or establishes a mature, subconscious mental model, intuitive thought and decision making starts to take place. Reflection and awareness are at the heart of these interventions.

If the Marine Corps can package these techniques correctly, their impact could be felt rapidly. Changes in specific curricula could then be made at local levels—more quickly and less expensively. However, the effectiveness of this approach relies upon Marines, particularly small unit leaders, reliably possessing effective SUDM coaching and mentoring skills.

Mentoring and Coaching

Helping Marines learn how to coach and mentor people, outside the context of a formal prescriptive counseling program, is important for developing expertise. With very little cost, the Marine Corps would be able to teach its small unit leaders how to guide and facilitate a discussion, explain their decision-making processes and rationales to their units, and help their personnel get the most out of deliberate performance and practice opportunities. These efforts would enable small unit leaders to better articulate and share their experiences, with the ultimate goal of helping small unit leaders consistently embody General Lejeune's Teacher-Scholar leadership philosophy.

Every Marine, especially Sergeants and above, has a requirement to "develop subordinates" through mentorship. Commanders have to be held accountable for implementation within their units. Leaders have to be held responsible for engendering SUDM competencies in the same way they are responsible for their units' fitness reports.

Capabilities Based Assessment

To assess SUDM's impact, a Capabilities Based Assessment (CBA), using the Doctrine, Organization, Training, Materiel, Leadership/Education, Personnel, and Facilities (DOTMLPF) rubric, will be needed. However, the assessment cannot be focused on fighting the last war; the organizational vision seeks to prepare the Marine Corps to be the ideal middle weight force of the future and capable of assuming full spectrum warfare.

There is a host of working groups, study panels, and operational planning teams looking at a lot of the pieces related to the same issues. It is recommended that these efforts are coordinated and integrated. The POM cycle, especially when it comes to military contract (MILCON) projects, can take years to establish. As such, it is recommended that a DOTMLPF CBA analysis be conducted as soon as possible.

Comprehensive, Multilevel Assessment Plan

A comprehensive and multilevel *MCV&S* Task 1 Assessment Plan (decision making and expertise) is also warranted, examining both institutional implementation as well as immediate outcomes from formal programs of instruction. Baseline data should be established so future assessments can document progress of specific implementation efforts, and near-term efforts ought to create operational space for the mid- and long-term goals to get established. Finally, a group should be established to manage these implementation efforts and analyze the assessment data.

Mid-Term Recommendations

Mid-term goals should emphasize prioritization and streamlining of service-level requirements; this includes formal development of doctrine, ongoing assessment programs, and, of course, resourcing requirements. The Marine Corps has to be careful it does not revert back to the traditional small unit development model, and in so doing, lose the institutional knowledge gains made over the last decade.

Adequately Resource the Effort

To move the SUDM initiative from vision to reality, the Marine Corps will need to establish appropriate budget lines, specifically dedicated to small unit leader human performance improvement.

Manpower Policy. Successful implementation of the SUDM vision will likely necessitate changes in the manpower model. However, manpower policies and process changes will be challenging, and may represent a substantial obstacle for the initiative. Manpower issues may include the time dedicated to small unit leader development, assignment of small unit leaders as well as critical B-Billets (like instructors), and alternations to the promotion policy.

The revised manpower model must be more flexible and responsive. It ought to align the recruitment, retention, promotion, advancement, and recognition policies with the revised professional development model to include MOS and billet eligibility, qualification and certification. The new enlisted manpower model should line up more closely with the Marine Officer model.

Develop Doctrines

Leadership Policy and Doctrine. The Marine Corps should codify its leadership doctrine (i.e., draft a new MCDP Marine Corps Leadership, revise MCWP Leading Marines, and draft a new MCWP Marine Corps Professional Development Model). Further, as mentioned above, the stages of professional development and responsibility should be tied to performance and mastery vice time and vacancies.

The new doctrine should clearly define small unit leader roles and responsibilities (e.g., be teachers-scholars, engage in coaching and mentoring, develop subordinates, lead subordinates, and ensure well-being of subordinates). This would align the professional development model with the performance evaluation system.

Training and Education Policy and Doctrine. Similarly, workshop participants recommended the Marine Corps develop a doctrinal capstone document (MCDP) that codifies and explains the mastery, experiential, and reflective learning concepts in very clear, non-academic language. The Marine Corps is known world-wide for being great trainers, but the process has not been well codified beyond entry level training and officer PME. Without a stable professional development process, the Marine Corps cannot predictably change the outcomes or performance of small unit leaders.

The Marine Corps should consciously develop and foster a "learning organization" culture through the establishment of fully integrated training and education continua that extend beyond the formal schoolhouses. To achieve this, mechanisms ought to be developed to share, debate, codify and institutionalize best practices, and Marines should be expected and enabled to learn and teach continuously.

Through establishment of new, aligned and interdependent leadership and professional development doctrines, the Marine Corps can increase the transfer

of these competencies to the operational environment and Marines can maximize learning on a daily basis. Additional instructional tools and support systems should be developed to reinforce implementation of the approved techniques.

Conduct Institutional Assessments

Institutional assessment data should be used to evaluate the appropriateness and effectiveness of the instructional interventions intended to improve small unit decision making. Ongoing impact assessments and return-on-investment analyses must be built into the implementation plan, from this mid-term stage.

Define Domain-Specific Critical Incidents

One key to decision-making instruction is the development of appropriate instructional scenarios. As such, Marines should be given proven tools and techniques to communicate SUDM critical incidents to their personnel. Additionally, small unit leaders need to have corresponding, easy-to-use instructional development guides, delivery recommendations, and evaluation approaches for the scenarios.

Ruthlessly Imposed Implementation (Mandate)

As General Dunford addressed in his opening comments: in the end, the Marine Corps is a "benevolent dictatorship." Marines will do what the Commandant and their commanders expect them to do. They will value what their leaders value. Yet, even if the Commandant fully supports these initiatives, it will be years before they become ingrained in the culture, and without continuous emphasis of buy-in across the full implementation timeline, the impetus for organizational change may become shaky.

Historical data suggest that this type of educational reform will take seven to ten years to implement. Ironically, this is about how long it will take

new Marines to become SNCOs and officers to reach the field grade ranks. It is also the amount of time it takes battalion/squadron commanders to reach the general officer ranks. In order for this initiative to succeed, the Marine Corps should anticipate and counter resistance, and SUDM leaders should help individuals overcome their reluctance to change, as necessary.

Long-Term Recommendations

Long-term recommendations emphasize promulgation of the decision-making development initiative. Participants recommended that the Marine Corps establish mechanisms to ensure Marines at all levels know about this strategic vision and that the Marine Corps establishes a multi-faceted, semi-formal strategic communication plan, from the top down, to facilitate this. Institutional change of this magnitude, participants cautioned, requires adequate preparation and shaping.

A consistent message ought to be disseminated to all ranks in CMC/ACMC/SMMC speeches, promulgated in public media (e.g., professional journals, *MairneTimes*), and discussed in the formal schools and operational advisory group conferences. There should also be an open dialogue (partnership) established between the academic community and the operating forces.

Finally, Marines—particularly small unit leaders—should take ownership of these changes. Their input should shape the implementation strategy, and the implementation approach should be refined over time based upon their input. Not only would it be naive to think that this effort will be perfect immediately, workshop participants cautioned, but implementation without involvement from small unit leaders would be inconsistent with the initiative's message (i.e., empowerment of small unit leaders).

References

Block, J. H. & Burns, R. B. (1976). Mastery learning. *Review of Research in Education, 4*, 3-49.

Charness, N., Tuffiash, M. I., Krampe, R., Reingold, E. & Vasyukova E. (2005). The role of deliberate practice in chess expertise. *Applied Cognitive Psychology, 19*, 151-165.

Deslauriers, L., Schelew, E., & Wieman, C. (2011). Improved learning in a large-enrollment physics class. *Science, 332*(6031), 862-864.

Ericsson, K. A. (Ed.) (2009). *Development of professional expertise: Toward measurement of expert performance and design of optimal learning environments.* Cambridge, UK: Cambridge University Press.

Ericsson, K. A. (in press). Adaptive expertise & cognitive readiness: A perspective from the expert-performance approach. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness.* Houten, the Netherlands: Springer.

Fadde, P. J. & Klein, G. A. (2010). Deliberate performance: accelerating expertise in natural settings. *Performance Improvement, 49*(9), 5-14.

McKinney, E. H., & Davis, K. J. (2004). Effects of deliberate practice on crisis decision performance. *Human Factors, 45*, 436-444.

Pusic, M; Pecaric, M., & Boutis, K. (2011). How much practice is enough? Using learning curves to assess the deliberate practice of radiograph interpretation. *Academic Medicine, 86*, 731-736.

Ward, P., & Williams, A.M. (2003). Perceptual and cognitive skill development in soccer: The multidimensional nature of expert performance. *Journal of Sport and Exercise Psychology, 25*, 1, 93-111.

Annex A: Workshop Agenda

Day 1 (Wednesday, 12 January 2011)

0700-0800   Check-in / Registration and Continental Breakfast

0800-0810   Welcome / Keynote Introduction

0810-0845   Keynote Speaker: Gen Joseph F. Dunford (ACMC)
Presentation and Q&A

0845-0900   BREAK

0900-0915   Complexities of the Modern Battlefield: LtGen Richard C. Zilmer, USMC (Ret)

0915-0945   Small Unit Decision Making Workshop Overview: LtCol David W. Lucas, USMC

0945-1030   Performance-based Expertise: Dr. K. Anders Ericsson

1030-1045   Five Requirements for Task 1 Implementation Success: Dr. Eduardo Salas

1045-1100   BREAK

1100-1230   Expert Panel Discussion #1 with Q&A
Topic: Decision Making Skill Development Background Information
Moderator: Dr. David T. Fautua
Members: Dr. Gary Klein, Dr. Eduardo Salas, Dr. K. Anders Ericsson,
Dr. Rose Mueller-Hanson, Dr. Elizabeth Stanley, and Dr. Sae Schatz

1230-1330   LUNCH

1330-1630   Breakout Session #1 – Deeping Understanding of Assigned Learning Area
(WG Leads – Klein, Salas/Johnston, Ericsson/Stanley, Mueller-Hanson, and Fautua/Schatz)

1630-1700   Day 1 Wrap Up / Day 2 Preview: LtCol David W. Lucas, USMC and WG Leads

1700-2100   Optional No-Host Social (Globe & Laurel Restaurant)

Day 2 (Thursday, 13 January 2011)

0700-0730	Continental Breakfast
0730-0745	Day 2 Overview and Deliverables: LtCol David W. Lucas, USMC
0745-0900	Expert Panel Discussion #2 with Q&A Topic: Intuitive Decision Making Instruction in the Marine Corps Moderator: Dr. David T. Fautua Members: Dr. Gary Klein, Dr. Eduardo Salas, Dr. Joan Johnston, Dr. Rose Mueller-Hanson, Dr. Elizabeth Stanley, and Dr. Sae Schatz
0900-1130	Breakout Session #2 – Methods of Instruction and Assessment (WG Leads – Klein, Salas/Johnston, Ericsson/Stanley, Mueller-Hanson, and Fautua/Schatz)
1100-1200	LUNCH
1130-1330	Breakout Session #3 – Anticipated Effects on the Marine Corps (WG Leads – Klein, Salas/Johnston, Ericsson/Stanley, Mueller-Hanson, and Fautua/Schatz)
1330-1400	Building Toward Implementation Presentation: Dr. David Kobus and Mr. William A. Ross
1400-1415	BREAK
1415-1530	WG Out-briefs: WG Leads (Klein, Salas, Stanley, Mueller-Hanson, and Schatz)
1530-1600	Open Discussion
1600-1630	Integrated Decision Making Instruction: LtGen Richard C. Zilmer, USMC (Ret)
1630-1650	Closing Comments: Mr. Jeffery Bearor, SES (Executive Deputy, TECOM)
1650-1700	Workshop Wrap Up: LtCol David W. Lucas, USMC

Annex B: Participants

99 total participants

Gen Joseph Dunford	LtGen Richard Zilmer (Ret)	BGen Thomas Murray
Mr. Jeffery Bearor (SES)	Mr. Marion Cain	Col Dennis Judge (Ret)
Dr. David Adesnik	Ms. Susan Akers	Dr. Ami Bolton
LCDR Maurice Buford, PhD	MSgt David Byrd	Mr. Ed Chamberlain
Dr. Anna Cianciolo	MGySgt Robert Crable	Maj Jeffrey Davis
Mr. John DeForest	LtCol Tim Devlin	MSgt Bonnie Diaz
Maj Pete Doughty	Mr. David Dunfee	Dr. K. Anders Ericsson
Dr. David Fautua	Dr. Kerry Fosher	Dr. Jared Freeman
SgtMaj John Gilstrap	Mr. Robert Grillo	Dr. Bruce Gudmundsson
Maj DK Han	Dr. Rita Hilton	LtCol Thomas Hobbs
LtCol Todd Hunt (Ret)	Dr. Rebecca Johnson	Dr. Robert Johnson
Dr. Joan Johnston	Dr. Susan Johnston	Dr. Sherrie Jones
Maj Tim Kao	Maj John Keppeler (Ret)	Dr. Gary Klein
Maj Kenn Knarr (Ret)	Dr. David Kobus	LTC Yean Kong (Singapore)
Dr. Brian Lande	Col Clarke Lethin (Ret)	LtCol David Lucas
Dr. Dwight Lyons	LtCol Shawn Mansfield, DM	Maj Dennis Martino
Maj Don Mathes (Ret)	Dr. Laura Militello	Mr. Brian Moon
Dr. Rose Mueller-Hanson	Dr. Denise Nicholson	Dr. Margaret Nolan
Dr. Erica Palmer	LtCol Fritz Pfeiffer	Ms. Jenni Phillips
Maj Ryan Prince	Dr. Karol Ross	Mr. Bill Ross
Dr. Eduardo Salas	Mr. John Schaldach	Dr. Sae Schatz
Capt Richard Schroff	Dr. Alan Schwarts	Ms. Sondra Singleton
Dr. Alan Spiker	Mr. Jason Spitaletta	Dr. Liz Stanley
MGySgt Stewart Stout	Dr. Roy Stripling	SgtMaj James Talley (Ret)
LTC Ray Tembreull	Dr. Ted Thomas	Dr. Frank Tortorello
Dr. Paolo Tripodi	Capt James Turner	Dr. James Van Zummeren
Dr. Kendy Vierling	Dr. Alex Walker	Maj Andrew Warren
COLl Ben Wash	CWO5 Stuart White II (Ret)	Mr. Jason Williams
Dr. Jerre Wilson	LtCol Robert Wineinger (Ret)	LtCol Bill Wishchmeyer
LtCol Ken Wolf (Ret)	Col Chris Woodbridge	Dr. Michael Woodman
Dr. Steven Zaccaro		
SSgt Mat Hutcheson	Capt Josh Phares	Mr. Gary Kollmorgen
Mr. Brett Weipert	Mr. Antonio Smith	Mr. Dick Dunnivan
SgtMaj Bill Skiles	Capt Eric Swanson	

Annex C: Cognitive And Relational Skills (CARS)

The skills listed below were compiled from the initial strawman products, preliminary session deliverables, expert panel presentations and discussions, working group discussions, working group out-briefs and collective survey data. The lists are not representative of every response. The lists are in alphabetical order and not as they were necessarily ranked during the out-briefs and in the survey data.

COMPETENCY	INSTRUCTIONAL GOALS	COGNITIVE AND RELATIONAL SKILLS
Sensemaking	Assess operational environments (estimate the situation).	After Action Review Skills Ambiguity Tolerance Analytical Reasoning/Judgment Anomaly Detection Change Detection Coaching Skills Cognitive Flexibility Contrast Sensitivity Counseling Skills Emotional Acuity/Perception Facilitation Skills Mental Imagery Mental Simulation Mentoring Skills Organizational Skill Pattern Matching Pattern Recognition Perspective Taking (C3) Resilience Self-awareness Self-monitoring Self-reflection Sensory Acuity/Perception Situational Assessment Spatial Cognition Vigilance
Problem Solving	Evaluate the adequacy of generated options and /or choices.	
Adaptability	Detect change and adjust attitudes, emotions, neurophysiology and actions.	
Metacognition	Use strategies to monitor/self-regulate learning and cognition.	
Attentional Control	Deploy sustain, targeted attention on a chosen target	

Annex D: Instructional Techniques Matrix

To facilitate preparation, presentation, and working group discussions, workshop participants were provided a preliminary list of instructional techniques as a common reference point. A multi-page detailed Instructional Techniques Matrix with associated descriptors and citations was developed by University of Central Florida (Jennifer Vogel-Walcutt, Ph.D., et al.).

The results below are a compilation of the working groups' out-briefs and survey results. The lists are not representative of every response; merely what was briefed and which ones clearly separated on the survey questions 1 through 3. The lists are in alphabetical order and not as they were necessarily ranked during the out briefs and in the survey data. The results have been divided up and presented by the respective cognitive competency working groups.

Sensemaking	
Out-Brief	**Survey Results**
Active Listening	After Action Reviews/Debriefs
Critical Incident Critiques/Analysis	Causal Analysis
Critical Thinking/Planning Exercises	Critical Incident Analysis
Cross-training	Crystal Ball Exercises
Crystal Ball Exercises	Decision Making Games/Exercises
Decision Making Exercises with coaching on biases	Premortem Exercises
Guided Discussions with "Garden Path" scenarios	Role Playing Scenarios
Incremental Decision Making/Think Aloud	Tactical Decision Simulations
Memory/Cue Recognition Drills (Kim's Game)	Visualization
Micro-expression Training (combat profiling)	
Mindfulness Training Exercises	
Role Playing Exercises	
Schema Production Drills	
Tactical Decision Games with perception scenarios	
Visualization Drills	
What if scenarios	

Problem Solving	
Out-Brief	**Survey Results**
After Action Reviews/Debriefs	After Action Reviews/Debriefs
Critical Incidents Critiques/Analysis	Coaching Scenarios
Coaching Scenarios	Decision Making Games/Exercises
Decision Making Games, Critiques, Exercises	Facilitated Discussions
Mentoring Scenarios	Guided Discussions
Tactical Decision Scenarios	Mentoring Scenarios
	Tactical Decision Simulations
	Visualization

Adaptability	
Out-Brief	**Survey Results**
After Action Reviews with built-in reflection Case-based Reasoning (wicked problems) Critical Incident Critiques/Analysis Crystal Ball Hypothesis Testing/Estimates Mental Simulations Mindfulness Organizational Rehearsals (team-based and integrated into METT-TSL) Premortem Exercises	After Action Reviews/Debriefs Casual Analysis Critical Incident Critiques Crystal Ball Decision Making Games/Exercises Facilitated Discussion Mindfulness Premortem Exercises Reflection Exercises Tactical Decision Scenarios Visualization

Metacognition (MC)	
Out-Brief	**Survey Results**
After Action Reviews Decision Games (group) Decision Simulations (individual) Dissecting Failures Analysis Reflection Exercises Guided Discussions Mindfulness Exercises	After Action Reviews/Debriefs Causal Analysis Critical Incident Analysis Decision Making Games/Exercises Guided Discussions Mindfulness Exercises Planning Exercises Reflection Exercises Tactical Decision Scenarios

Unit/Team Cognitive Development	
Out-Brief	**Survey Results**
After Action Reviews Scenario-based Training	After Action Reviews/Debriefs Coaching Scenarios Decision Making Games/Exercises Facilitated Discussions Guided Discussions Role Playing Exercises Tactical Decision Scenarios

* No information was collected during the workshop for the "attention control" competency.
This will be a follow up effort by TECOM.