



Human Factors in Combat ID Workshop

Training Strategies to Mitigate Expectancy-Induced Response Bias in Combat Identification: A Research Agenda

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Objective

Training mitigations that address stress-induced emotional and cognitive factors that introduce biases and expectancies that undermine CID.



CID Definition

Combat Identification (CID) is the process of attaining an accurate characterization of detected objects (friendly, enemy or neutral) throughout the Joint battlespace.

Combat Identification is a function of Situation Awareness (SA) and Target Identification (TI):

$$CID = f(SA, TI)$$

Fratricide

Fratricide is the employment of friendly weapons and munitions with the intent to kill the enemy or destroy his equipment or facilities, which results in unforeseen and unintentional death or injury to friendly personnel”

U.S. Army’s Training and Doctrine Command (TRADOC) Fratricide Action Plan
(US Department of the Army, 1993, p.1).



Fratricide Rates

- From World War II, Korea, Vietnam, and the Gulf War, analysts concluded that about **fifteen percent** of U.S. casualties were the result of fratricide. Army study, 1998
- First Gulf War - 35 of 146 U.S. combat deaths — **about a quarter** — were the result of fratricide. In Afghanistan, **three out of a total of four Americans** have now been killed by friendly fire .

Fratricide and Friction
Perfection in war.

By Mackubin Thomas Owens, professor
of strategy and force planning at the
Naval War College



Fratricide Rates

- Most of the 20th century conflicts demonstrate a consistent fratricide rate of **10-15 percent**
- National Training Center, Joint Readiness Training Center, Combat Maneuver Training Center - **Five to Eight Times previously acknowledged rate.**
 - » Piercing the Fog of War Surrounding Fratricide: The Synergy of History, Technology, and Behavioral Research
 - » ARMY WAR COLL CARLISLE BARRACKS PA
 - » **Personal Author(s)** : Steinweg, Kenneth K. ; Bowman, Stephen

Fratricide Rates

- Fratricide caused over **30 percent** of all aircraft losses during the 1973 Israeli-Egyptian War (Paige, 1994).
- The Office of Technology Assessment agreed (with Steinweg) that **past rates of fratricide were systematically and substantially underestimated.**

(Office of Technology Assessment, 1995, p. 1).



World War I	Besecker Diary (Europe)	10% Wounded in Action (WIA)
World War II	Hopkins, New Georgia Burma Bougainville Study	14% Total Casualties 14% Total Casualties 12% WIA 16% Killed in Action (KIA)
Korea	25th Infantry Division	7% Casualties
Vietnam	WEDMET (autopsy) WEDMET (autopsy) WEDMET Hawkins	14% KIA (rifle) 11% KIA (fragments) 11% Casualties 14% Casualties
Just Cause	U.S. Department of Defense	5-12% WIA 13% KIA
Desert Storm	U.S. Department of Defense	15% WIA 24% KIA

Can Fratricide Rates Be Reduced?

- It has been argued that fratricide is one of the inescapable costs of war
- But just as causal analysis studies of human error have produced insights and effected design/organizational improvements to reduce accidents, studies of the human factors underlying CID errors can reduce friendly fire incidents.

Primary Causes of Fratricide

U.S. Army's Center for Army Lessons Learned (CALL) cites:

- Poor situational awareness
- Combat identification failures
- Weapons errors
- Contributing factors include
 - Anxiety
 - Confusion
 - Bad weather
 - Inadequate preparation
 - Leader fatigue.



Wilson et al. (2007) HF Study

- To accomplish tasks on the battlefield requires cognitive processes, performed as a collective effort that requires *shared cognition*
- When shared cognition “fails,” the incidence of fratricide increases.



Taxonomy of Behavioral Markers for Fratricide

- **Communication**
 - Information exchange
 - Phraseology
 - Closed-loop communication
- **Coordination**
 - Shared mental models
 - Mutual performance monitoring
 - Back up behavior
 - Adaptability



Taxonomy of Behavioral Markers for Fratricide

- **Cooperation**
 - Team orientation
 - Collective efficacy
 - Mutual trust
 - Team cohesion



Role of Emotion, Stress and Cognition

- Emotions influence our perceptions and they bias our beliefs
- They influence our decisions and in large measure guide how people adapt their behavior to the physical and social environment
- Military training developers are well advised to incorporate an emotional element into training to elicit the strong emotions soldiers will feel on the battlefield.

Emotion and Affective State

- Affective states influence what people attend to and how they interpret what they see
- Anxiety impairs cognitive performance by diverting mental resources toward task-irrelevant information that relates to the perceived threat
- Emotions also influence what people remember about an event, or details just before or after an event that elicits strong emotions.

Effects of Stress

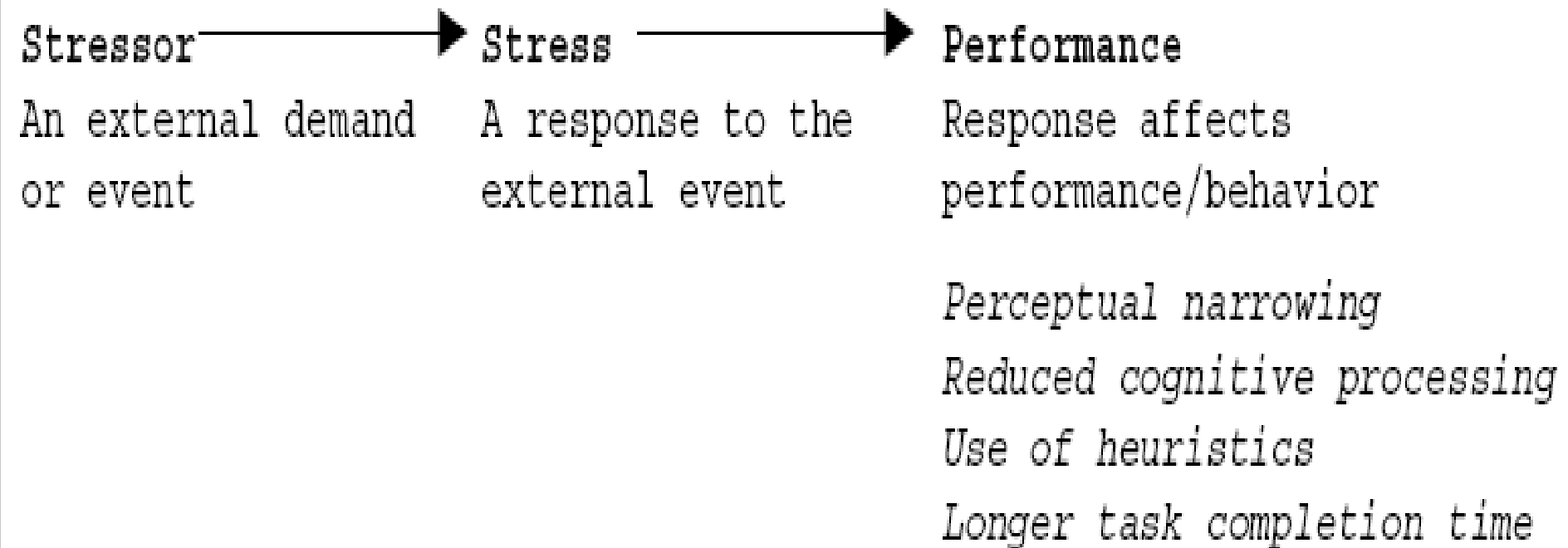


Figure . Performance effects of stress. (from Kavanagh, 2005; p. 3)

Effects of Learning

- Well-learned tasks more resistant to effects of stress. Extended practice:
 - helps commit knowledge to long term memory
 - aids retrieval
 - facilitates automaticity and proceduralization of tasks
- But:
 - There is a tendency for people under stress to “fall-back” to early-learned behavior, even less efficient or more error prone behavior than more recently-learned strategies

Stress During Learning

High stress during learning tends to degrade an individual's ability to learn. Implication for instructional strategies:

- Use a phased approach with an initial learning phase under minimum stress, followed by gradual increasing exposure to stress more consistent with real-world conditions.
- Stress inoculation training attempts to immunize an individual from reacting negatively to stress exposure.
- Through successive approximations, the learner builds a sense of positive expectancy and outcome and a greater sense of mastery and confidence
- This approach also helps to habituate the individual to anxiety-producing stimuli.

Cognitive Biases

- We tend to see what we expect to see...
- Selective perception
- Biased decisions
 - Confirmation bias
 - Irrational escalation



Implications for CID Training

- Training should provide extended practice, promoting more persistent memory and easier retrieval, and to encourage automaticity and the proceduralization of tasks to make them more resistant to the effects of stress.
- Team training should focus on strategies for maintaining group cohesion and coordination, mitigating the tendency for team members to revert to an individual perspective and lose shared situational awareness.
- Training should exercise the execution of cognitive tasks by both individuals and groups.

Scenario Construction

- CID training scenarios should include complex/dynamic threats that reflect the uncertainties of the real world—scenarios that force trainees to operate without perfect information and that incorporate surprises that challenge preconceptions or assumptions.



Scenario Construction (cont.)

- CID training scenarios should be designed to encourage the habit of testing one's assumptions to produce more adaptive, resilient CID performance in the face of uncertainty.



Major Challenges

- Enhance awareness of the effects of stress on cognitive performance
 - Exercise the execution of cognitive tasks, individual and group decision making (maintaining shared situation awareness) under conditions of stress that are comparable to operational environments
- Ultimate aim is to reduce human errors associated with CID.

To More Realistically Accommodate Stress Factors:

- Training strategies should incorporate an emotional element into training to elicit the strong emotions soldiers will feel on the battlefield.
- A phased approach should be used, beginning with minimum stress and building up to stress levels more consistent with real-world conditions.

Training Requirements to Address Cognitive Biases in CID

- Enhance *awareness* of the effects of stress on cognitive performance—such as tunneling and flawed decision making strategies that ignore information
- Teach coping strategies to moderate these effects.
- Design training to make it as explicit as possible what might happen to skill and knowledge under stress on the battlefield.
- Train awareness of cognitive biases and practices for managing these biases.



Training Requirements to Address Cognitive Biases in CID (cont.)

- Emphasize habits of testing assumptions and moving beyond traditional reactive behaviors to train techniques for more adaptive, resilient CID performance in the face of uncertainty.



Summary of Recommendations

- Training must deal with stress and cognitive biases
- Training should provide extended practice, proceduralization of tasks to make them more resistant to stress
- Training to enhance awareness of cognitive bias.

Summary of Recommendations

- Focus on group cohesion and coordination
- Training should reflect complex/dynamic threats
- Training should emphasize habits of testing assumptions and moving beyond traditional behaviors.

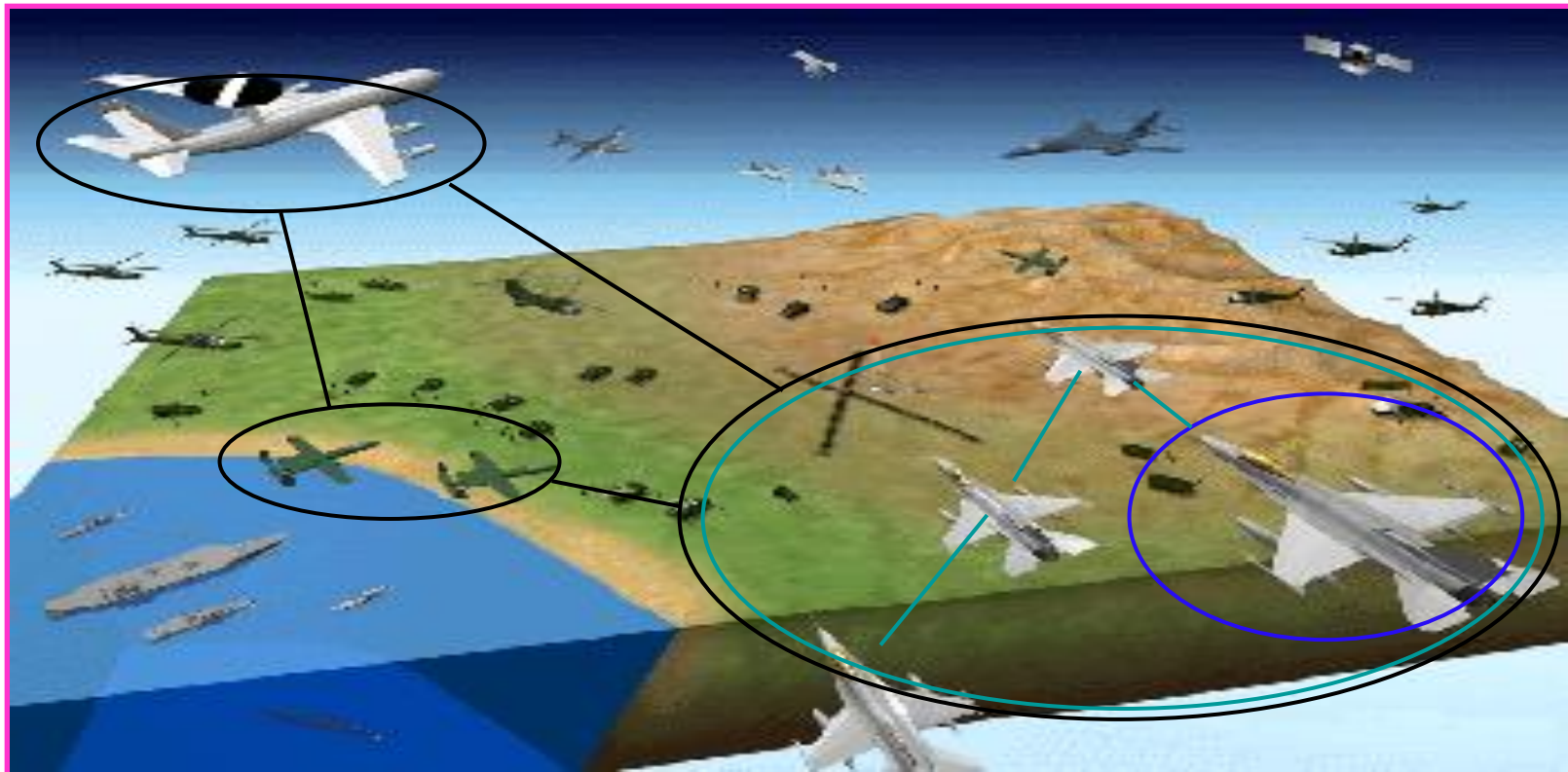


CID Training Research Challenges

- Examine possible effects on decision making performance while warfighters are expending limited cognitive resources trying to “manage” their emotions.
- Assess whether systems like Blue Force Tracker can improve the warfighter’s expectancy of the stimuli they are likely to see.

Blue Force Tracker

- Digital communications system which provides situational awareness for all levels of command on the battlefield.



Research Challenges (cont.)

- Research is needed to further understand the effects of cognitive bias in combat settings.
 - Define stress factors that exacerbate cognitive bias.
 - Define aspects of cognitive bias that most strongly apply to combat settings.

Research Challenges (cont.)

- Determine whether it is possible to mitigate stress-related cognitive bias through better and/or more training.
 - Does more training mitigate effects of stress on cognitive bias?
 - What training methods and technologies can best be used to mitigate cognitive bias?

Research Challenges (cont.)

- Determine whether anecdotal reports of friendly fire incidents should be trusted by researchers who are investigating cognitive bias in combat.



Conclusion

- We have advocated training approaches that emphasize cognitive/affective management skills to help reduce effects of stress on cognitive processes, and thereby favorably impact CID
- There is much research to be done to devise effective training strategies to meet these objectives.

Conclusion (cont.)

If we continue to limit our CID training objectives to core competency/skill development issues, then we risk building false confidence in those abilities while failing to meet our most critical challenges in protecting our forces from friendly fire incidents.

