Improving Platoon Situation Awareness with Unmanned Sensor Technology C-049

CCRTS San Diego
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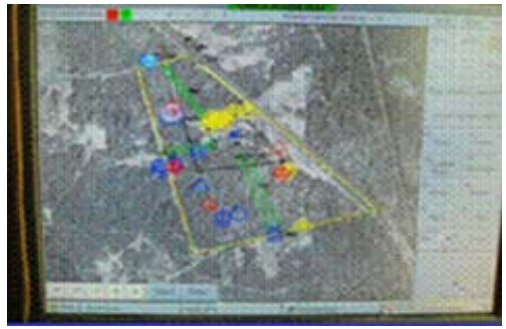
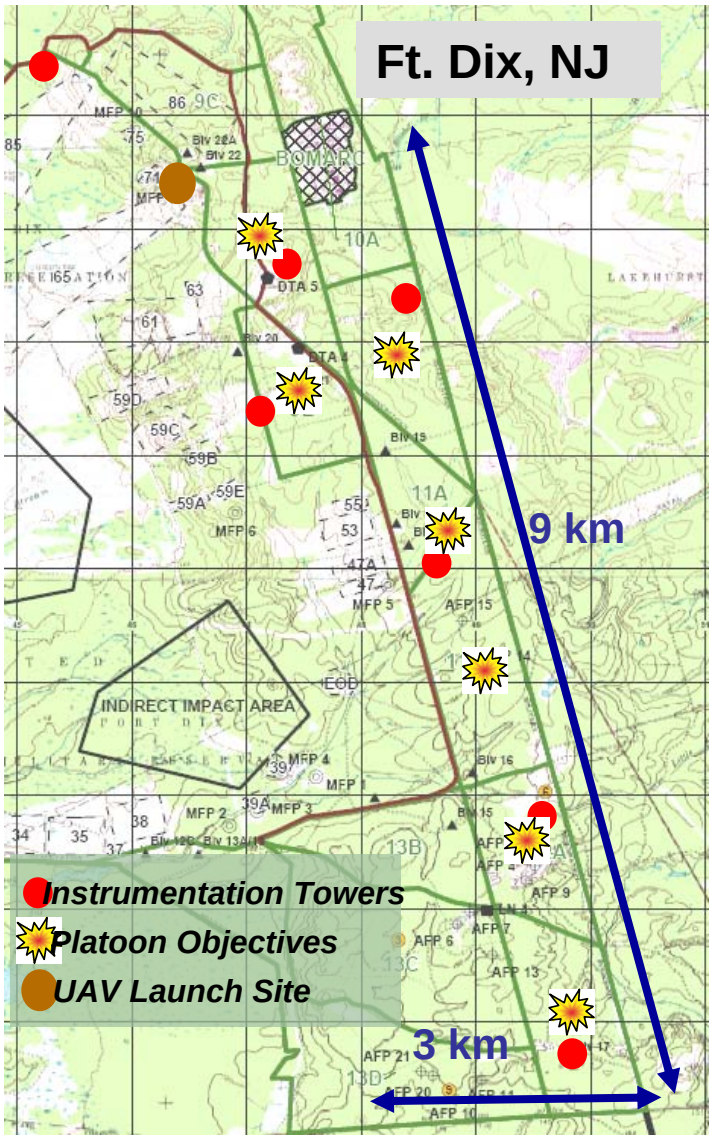
The Unmanned Sensor Suite



Platoon operated against an unscripted OPFOR

- Buster UAV
- Textron Unmanned Ground Sensors
- Small Unmanned Ground Vehicles
- Digitized Battle Command System: FBCB2
  - In vehicles
  - On tablets for dismounts

C4ISR On The Move Testbed



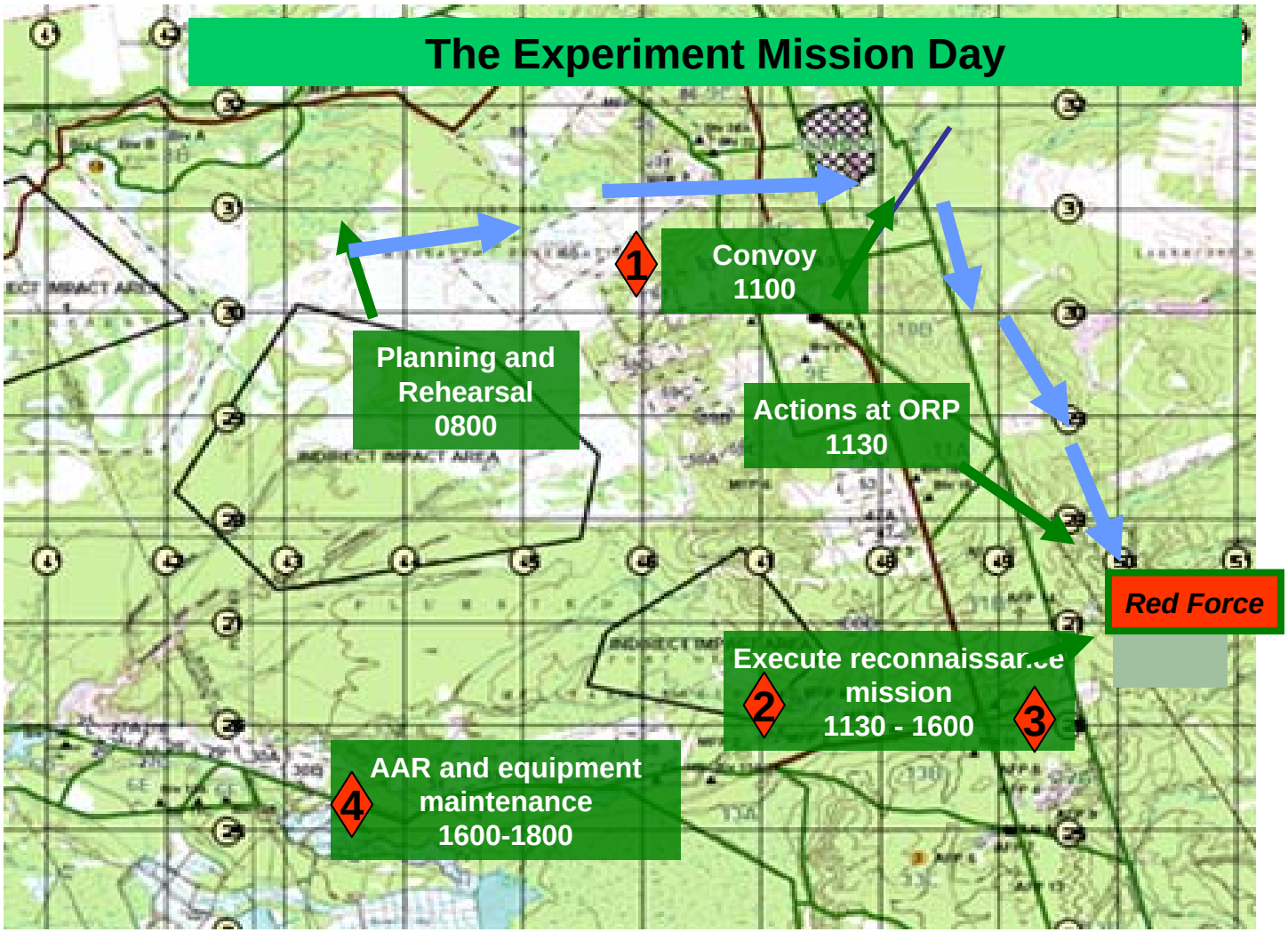
Objective: Determine the impact of C4ISR technologies on platoon Situation Awareness (SA)

Results inform the Future Combat System (FCS) community

Field experiment occurring annually

C4ISR Testbed a stable range at Dix with instrumented vehicles, network architecture, and data storage capability

Procedures



Survey Administration

Conditions

Base Case

- 2 Platoons
  - 30 NJ ARNG Soldiers
- 3 Vehicles/Platoon
  - Platoon Leader
  - Platoon Sergeant
  - Robotics NCO
- FBCB2 used only in vehicles
- No UAVs, UGVs used
- Unmanned Sensors used
- 3 day period

Advanced Case

- 2 Platoons
  - 30 NJ ARNG Soldiers
- 3 Vehicles / Platoon
  - Platoon Leader
  - Platoon Sergeant
  - Robotics NCO
- FBCB2 used both in vehicles and on PC tablets for dismounts
- UAV, UGV used
- Unmanned Ground Sensors used
- 5 day period

Robotics NCO used in both cases

Data Collection

- Demographics
- Situation Awareness Global Assessment Technique (Endsley, 2000)
  - 11 questions
  - Cover spectrum of SA levels
    - Level 1 Perception (what is happening)
    - Level 2 Comprehension (what does it mean)
    - Level 3 Projection (what will happen in future)
  - Map notations
    - Blue vehicles and dismounts
    - Red vehicles and dismounts
  - Administered 4 times per mission
    - After training before leaving for site
    - Twice during the mission
    - Immediately upon mission completion
  - Scored based upon ground truth recordings of actual Blue/Red locations in Testbed data base

Demographic Force Comparisons

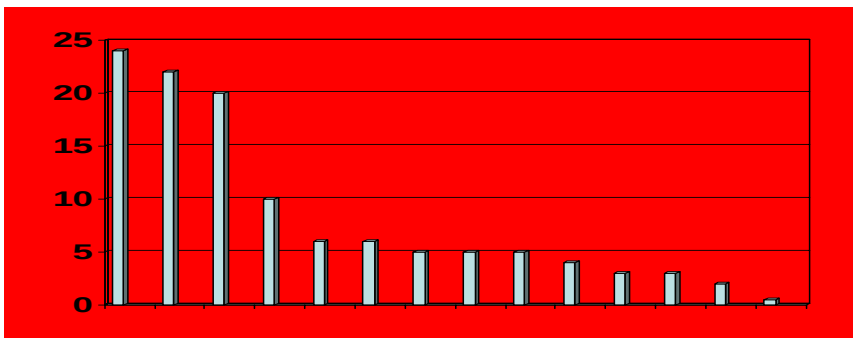
Blue Force: NJ ARNG (30)

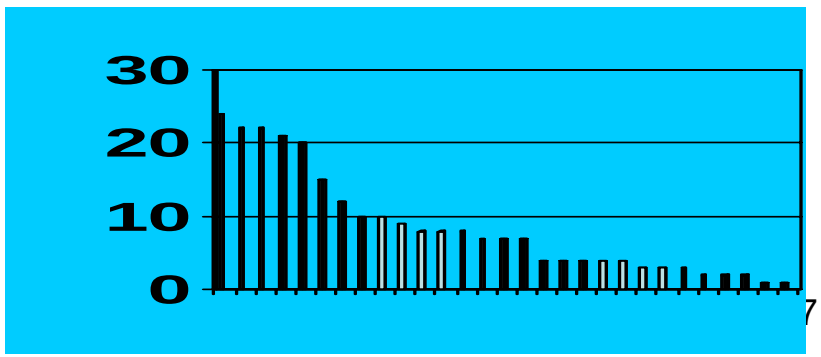
OPFOR: Goldbelt Eagle Contractor (34 [minus drivers])

Experience: Blue Force had, on average, 9 years of military experience, compared to OPFOR average of 3.4 years. Of the OPFOR with military experience, most reported Army backgrounds (71%).

Deployment experience: 87% of Blue Force had deployed at least once, compared to 24% of OPFOR. Deployment experience was spread in BlueFor, and concentrated among a few in OPFOR.

Military Experience Comparisons





Daily Transcript Analysis

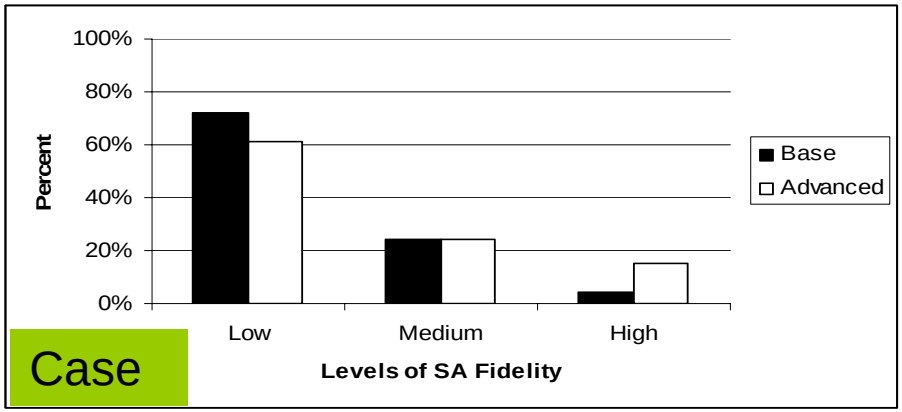
Category	Messages	Example
Equipment Breakdowns		
• Radio communications	25	*"Today was a challenge for communications (vegetated area). 3rd squad could hear everyone, no one could hear them. 1st squad comms were intermittent at best."*
• FBCB2 vehicle	6	*"FBCB2 screen keeps cutting out, possibly due to heat from engine."*
• FBCB2 tablet	10	*"I have tablet out, but can't send information. When I put the pen on the screen it is 4 to 5 inches to the left of where I need to mark, the cursor moves in its own direction."*
• UAV	9	• *Engineers trying unsuccessfully to open UAV spot report images, believe it is a technical failure.* • *Images on spot report are blurred to point of being unrecognizable*
• SUGV	1	*When using SUGV, it was within 50 meters of target vehicle, but didn't detect due to constraints of sensor movement.*
• UGS	1	*PL is advised to look at UGS field. Opens one image (takes 13 seconds). Opens second image (takes 17 seconds). PL misinterprets retreating OPFOR vehicles as reinforcing force. Time pressure and lack of regular monitoring of UGS field led to confusion with images.*
User problems		
• Dismounted reports to leaders	10	*"Any 2nd squad element, this is Platoon Leader, somebody get me a sit rep." [from 2nd squad]: "Standby." "I need a sit rep from anyone. Who's next in that chain of command? Squad 1, is there anyone left alive in that unit?"*
• Use of subordinate team leaders	8	*Platoon leader stops RNCO from downloading UAV images because it is interfering with his attempts to download and view. Lack of task management.*
FBCB2 interface		
• Spot reports	15	*All squads are sending spot reports to PL from their tablets.*
• Free text	4	*PL sends priority information requirements report to Company Commander in free text.*
• Opening images	6	*Images take a long time to open, often will not open at all.*

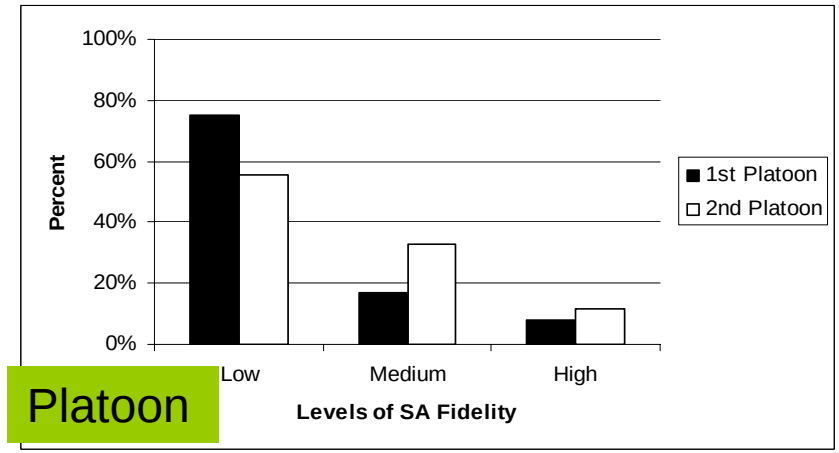
Roles & Responsibilities

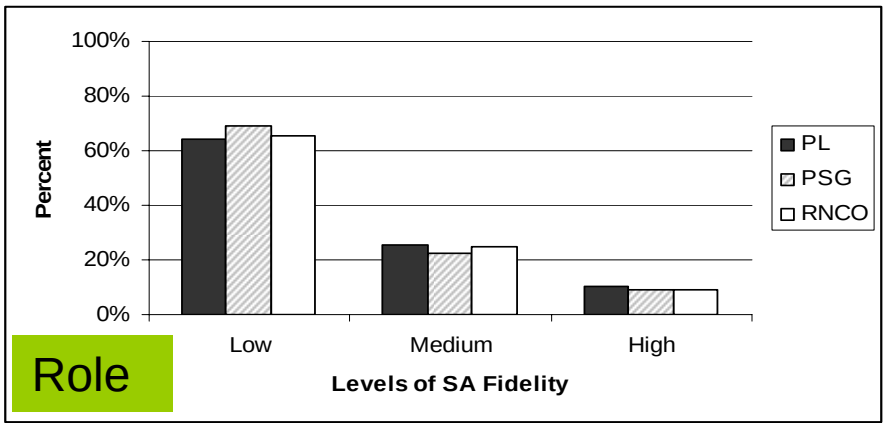
- Platoons operated independently
- Leaders had difficulty switching between tasks (FBCB2 and sensor images)
- FBCB2 Blue Force Tracking became a cognitive tunnel for one PL
- PLs did not effectively utilize RNCO
- No one was responsible for coordinating unmanned sensors
- Examples of sensor image problems
  - Are vehicles reinforcing or retreating?
  - Where is the UAV? Does the UAV know our location?

SA Scoring: Completeness

- Completeness of answers (Fidelity)
- Scores by Case, Role, Platoon







SA Scoring: Accuracy

	SA Fidelity Rating		
SA Accuracy Scores	**Low Fidelity** *N* (%)	**Medium Fidelity** *N* (%)	**High Fidelity** *N* (%)
1.00	1 (17%)	3 (50%)	2 (33%)
0.75	1 (20%)	2 (40%)	2 (40%)
0.50	1 (11%)	8 (89%)	0 –
0.25	0 –	5 (100%)	0 –
0.00	18 (69%)	3 (12%)	5 (19%)

- How accurate are the locations of Blue and Red and activity descriptions?
- Most SA surveys had 0 or very low accuracy ratings
- A few low fidelity ratings were accurate (few map annotations but accurate)
- Five high fidelity surveys had 0 accuracy ratings

Accuracy scores based on SME evaluation of errors in meters of map annotations and accuracy of answers

Conclusions

- No noticeable differences between Blue and Red Force demographics
- Network connectivity a sporadic but pervasive problem that impacted radio communications and image transmission
- SA among all roles was generally very low
- SA of Blue was aided in advanced case by blue force tracker capability of FBCB2
- Use of unmanned systems extracts a cognitive and physical cost to platoons

2006 Study Plans

- Robotics NCO task analysis
  - Coordination & Control of unmanned assets
  - Coordination of unmanned air systems to provide NLOS network connections
- SAGAT queries in 30 minute intervals of all Soldiers by embedded data collectors
- Scripted OPFOR
- Increased emphasis on pre-experiment training in Tactics, Techniques, and Procedures

Questions?