RED ZONES:

Improving the Enemy Ground Force Situation Display in Digital Battle Command and Control Systems

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Problem:

How can the U.S. military improve the display of enemy ground activity in its digital battle command and control systems?

Background:

- Advances in force tracking technology

- Near-real time monitoring with accurate positioning data

- Red force tracking not at same level of fidelity as blue force tracking

Proposal:

Instead of point locations, use zones to display projected enemy locations and activity in digital battle command and control systems for the ground combat environment

An Unprecedented View of the Battlefield

• Force XXI Battle Command Brigade & Below – Blue Force Tracking (FBCB2-BFT) in Operation IRAQI FREEDOM

• Blue force tracking – the process of reporting, displaying, and monitoring the positions and status of friendly forces

• BFT provided unparalleled level of accuracy in displaying locations of friendly forces (the "blue picture")
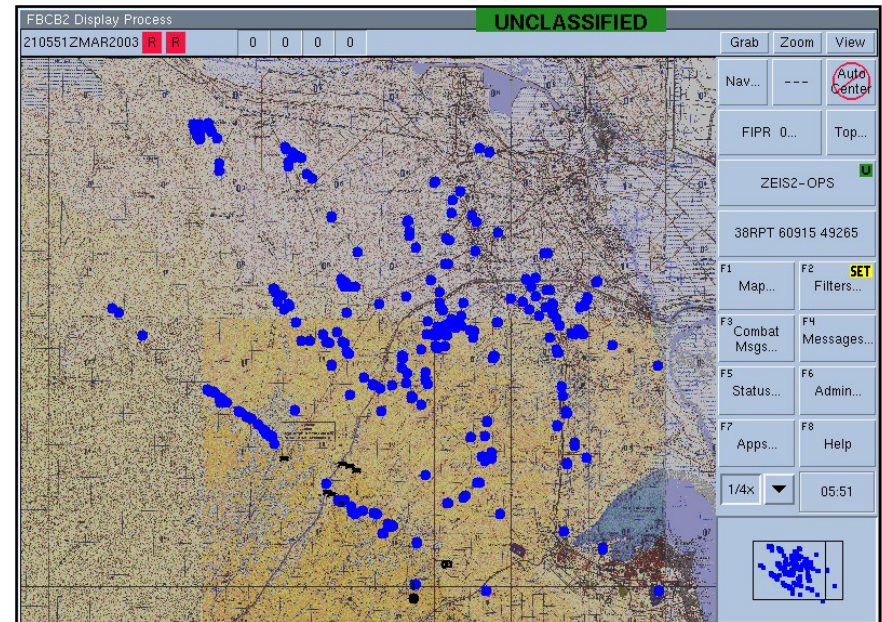
Using Blue Force Tracking to View Enemy Locations

• BFT did not provide an accurate display of the locations of enemy forces (the "red picture")

• Enemy vehicles not fitted with same equipment as friendly forces to broadcast locations

• Enemy vehicle locations determined from battlefield reports and other intelligence sources

• Red force tracking – the process of reporting, displaying, and monitoring the positions and status of friendly forces

• BFT was not specifically designed for red force tracking but has a capability to display reported enemy locations
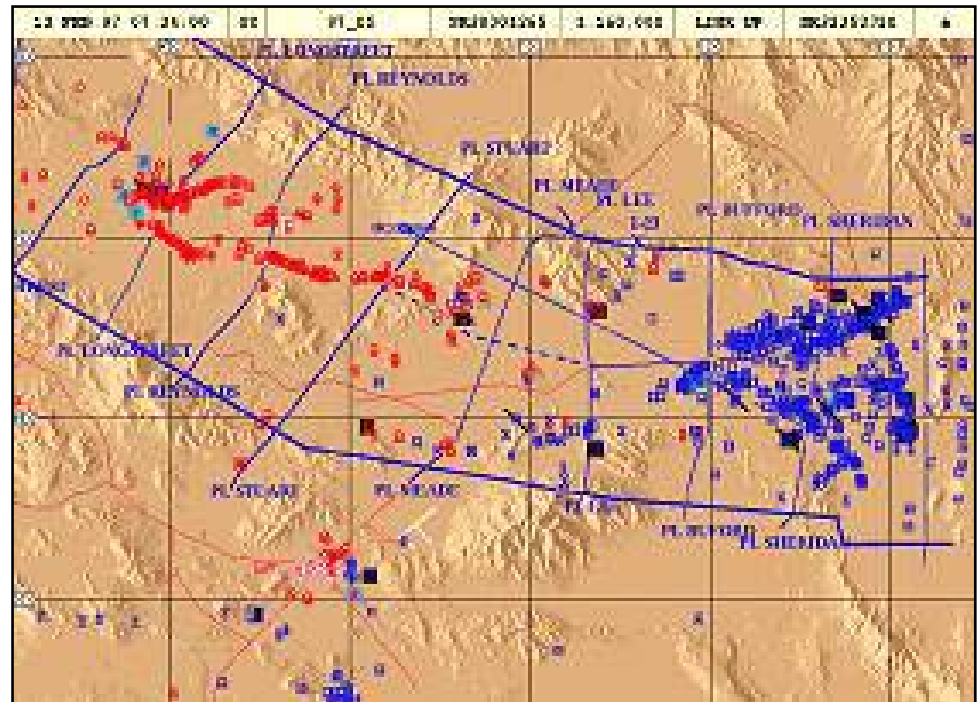
Improving Red Force Tracking: Current Approaches

• Current emphasis on improving red force tracking is in collection and integration

• Sensor proliferation – increase the number and types of battlefield sensors to increase chances of detecting enemy (improve collection)

• Sensor integration – connect sensors directly to the shooters to immediately send enemy reports to the warfighters to enable rapid action (improve integration)

Another Approach: Immediate Spatial Analysis

• Improve upon reports already received: on-demand, immediate analysis of reported enemy locations conducted by the warfighter using spatial analysis tools

• Circular line-of-sight tool – display a stationary enemy's battlespace

• Movement projection model – project possible locations based on last reported location

The Contemporary and Future Operational Environment

• Potential adversaries not likely to engage U.S. military forces in symmetric and conventional force-on-force warfare

• Adversaries likely to operate in small units and formations dispersed over complex/urban terrain

• Goal is to degrade/negate U.S. advantages of remote collection, precision targeting, and stand-off weapons

• Focus for proposed use of spatial analysis tools is on enemy ground vehicles

Displaying the Enemy's Battlespace

- Observation / sensing range
- Direct-fire range
} BATTLE SPACE

SCALE
0 1 2 3
Kilometers

• Battlespace – the three-dimensional area in which an individual soldier or vehicle can acquire enemy forces and influence them with effective fires.

• Displaying battlespace in BFT not an automatic process – a location must be selected and circular line of sight tool activated
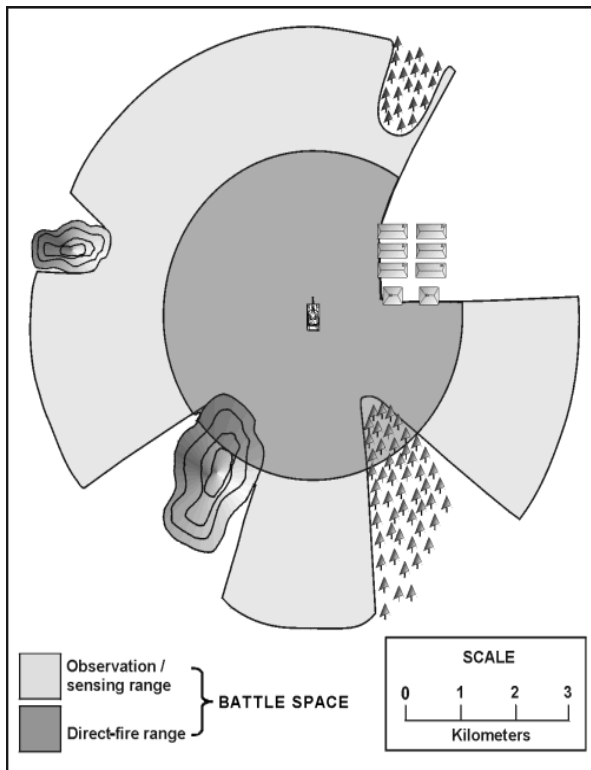
• Unmarked areas can be seen

• Marked areas cannot be seen

• Circular line-of-sight tool displays enemy vehicle's direct-fire range of its battlespace
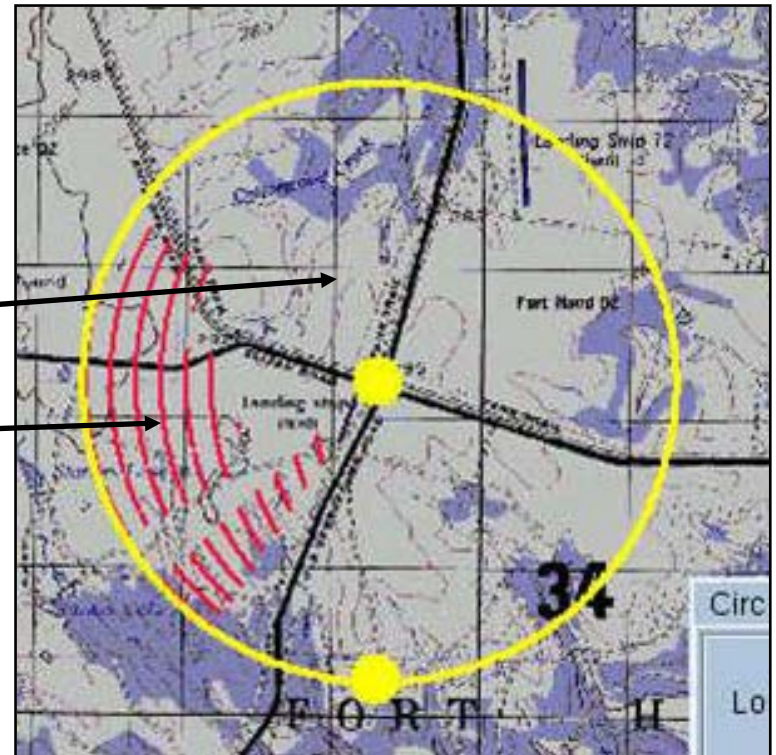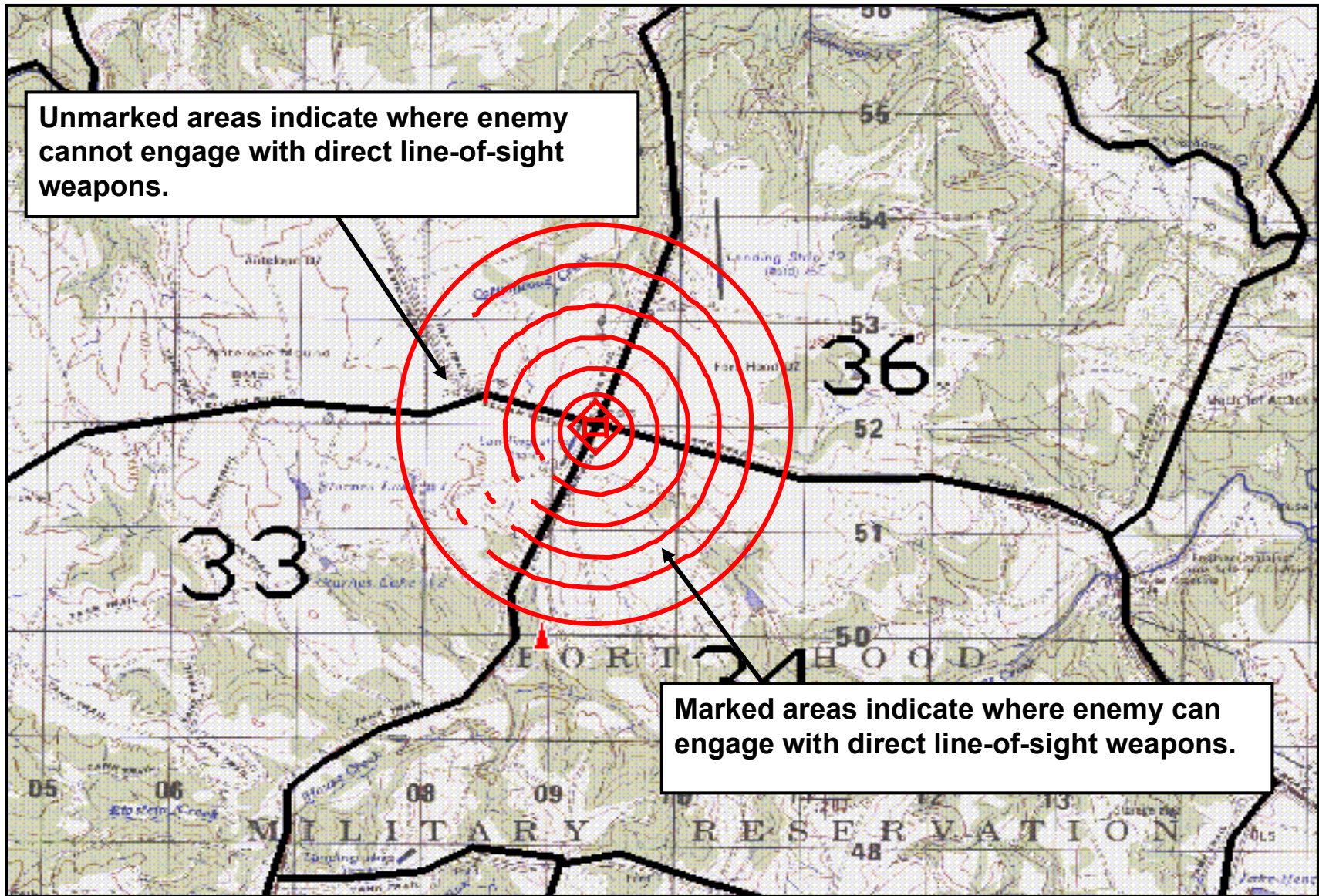
Proposed Display for Enemy Direct-Fire Battlespace

Locating an Elusive Enemy with Movement Projection Models

• One of the greatest challenges in red force tracking is updating the location of a moving enemy after losing contact

• Use movement projection models to take information about enemy's last known location and extrapolate possible locations.

Storm Tracking

• Weather forecasters use track areas to depict locations that lie in the potential paths of storms

• A track area displays the areas that lie in the probable paths that a storm could take from its current position
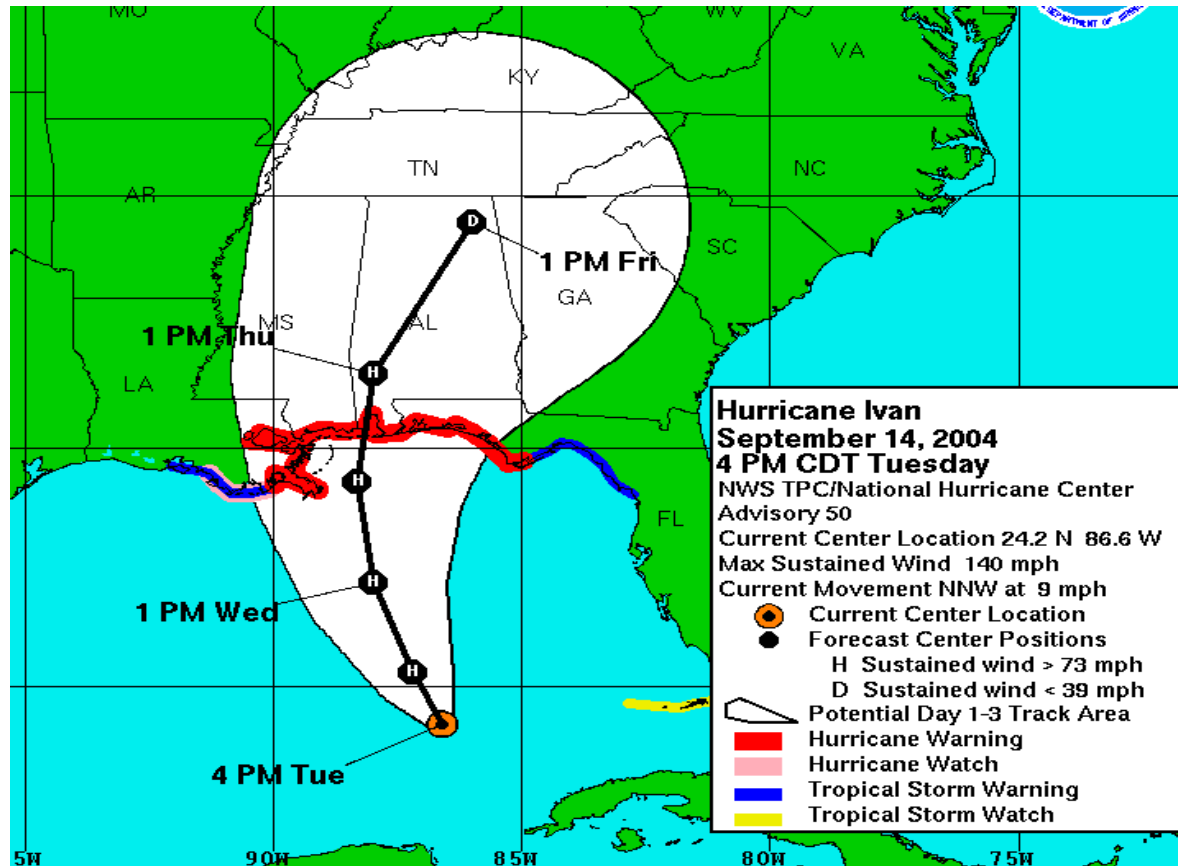
Areas of Uncertainty

• U.S. Navy uses movement projection models called Areas of Uncertainty in surface warfare to attack enemy ships that are beyond line of sight

• An Area of Uncertainty (AOU) is an ellipse that has a high probability of containing a target, but its exact location is uncertain and is continuously changing

• A sea-launched cruise missile to focuses its seeker within the expanding AOU to search for the target
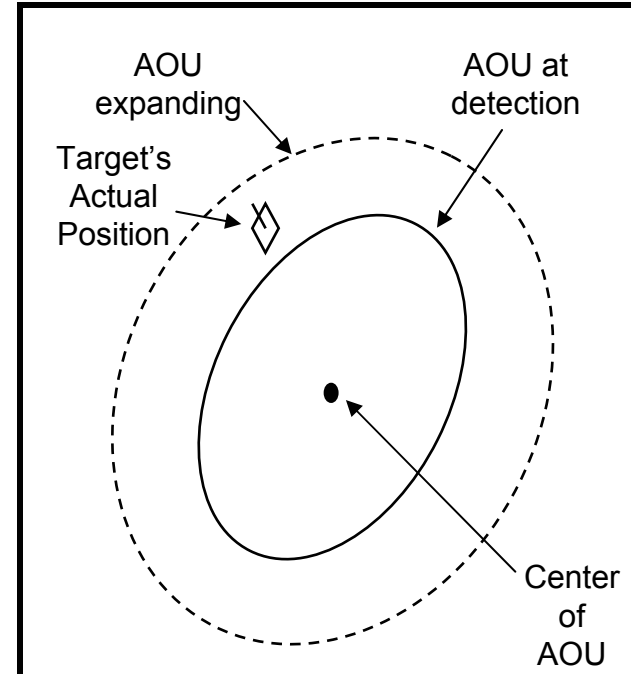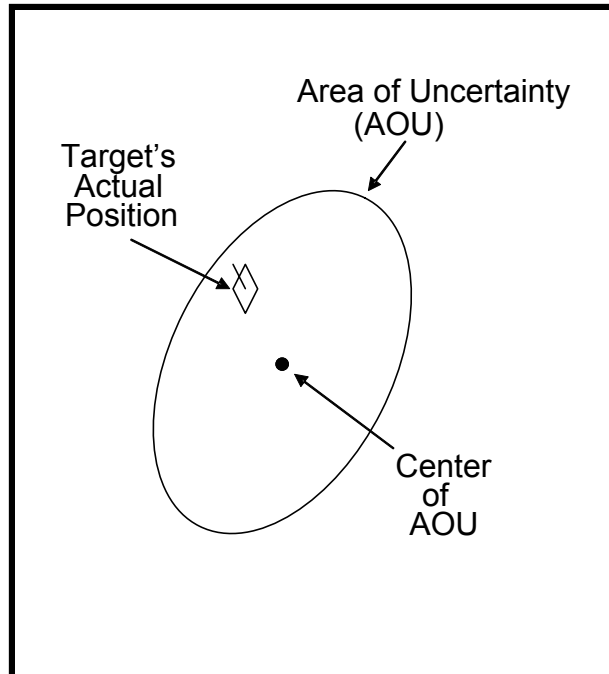
Distinguishing Projection and Prediction

- Prediction implies a sense of certainty of what will happen

- Projection provides possible outcomes of what may happen
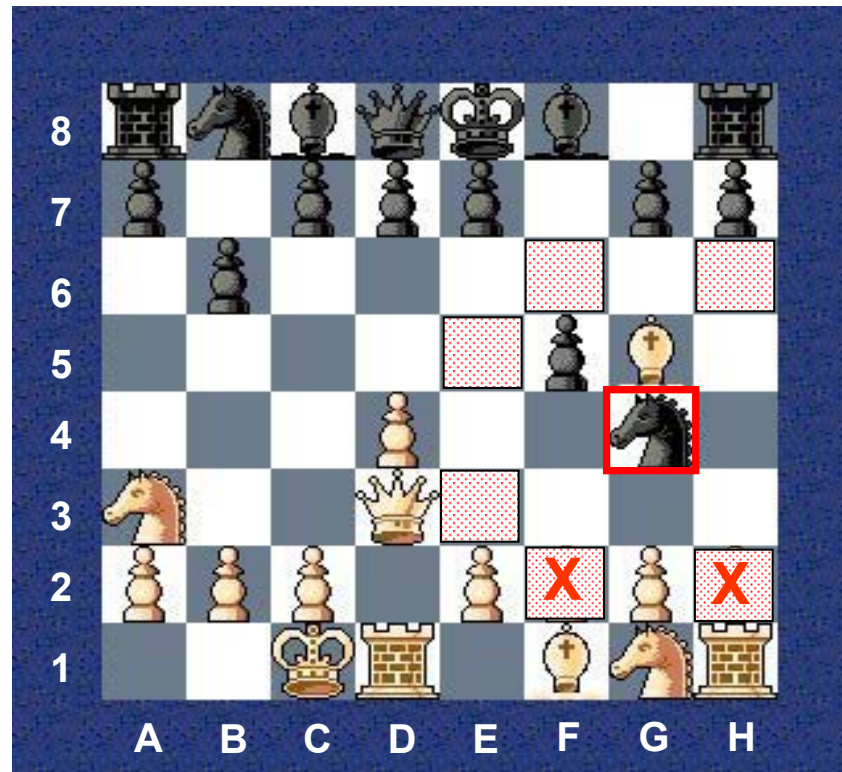
Squares in red are possible moves that the black knight chess piece can make. White pawns marked with an "X" indicate that the black knight can capture these pieces.

Movement Projection for Enemy Vehicles

• A movement projection model for enemy vehicles can display the probable area that an enemy vehicle **can** be located based on its last known location

• Projection is displayed by a polygon defined by the enemy's last reported location, difficulty of the terrain, and a specified time.
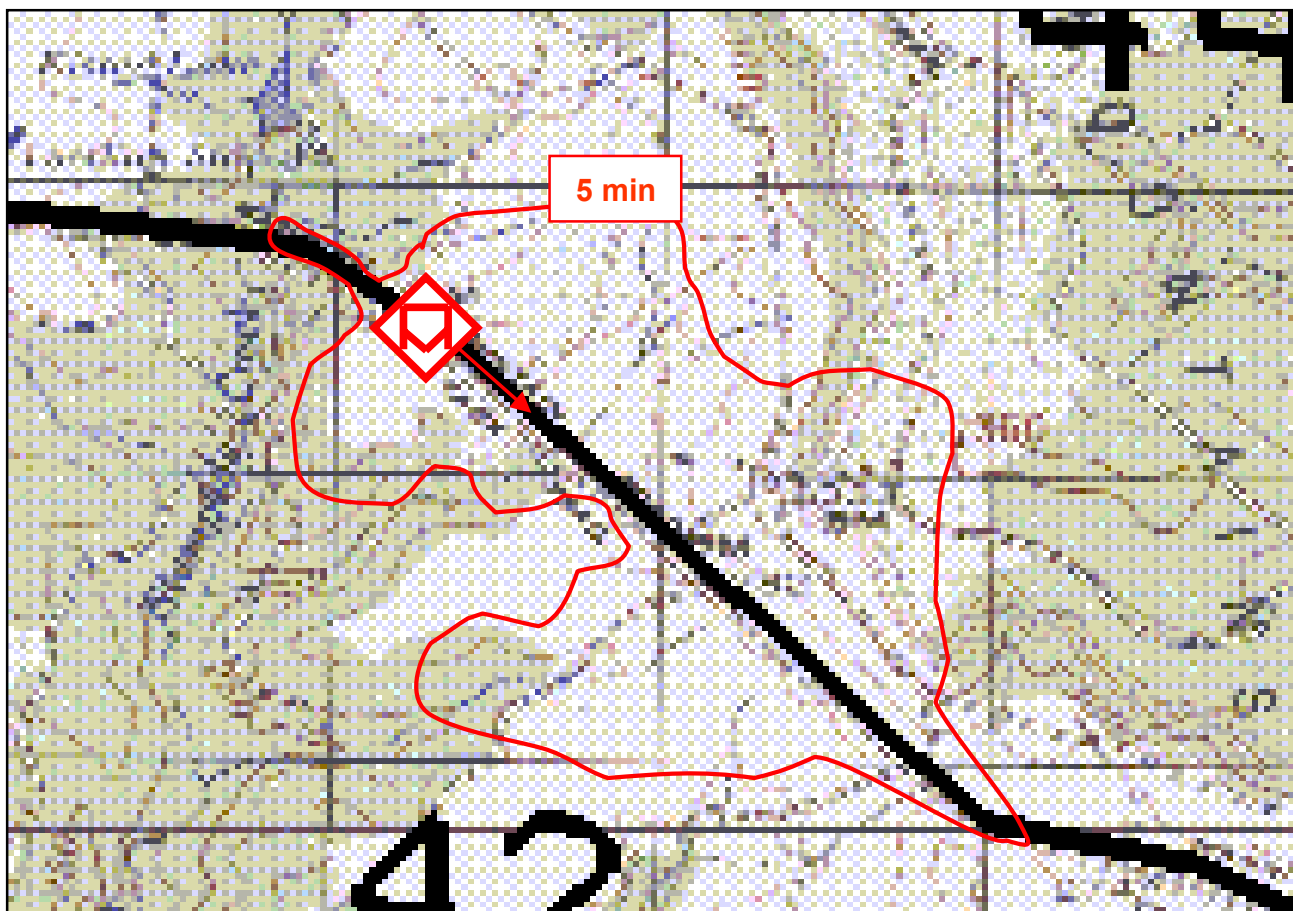
Movement Projection for Enemy Vehicles: An Alternate Presentation

- An expedient solution to overcome lack of detailed terrain data is to use an ellipse

- Not an accurate assessment, but provides a visualization of a moving enemy

- Serves as an area of uncertainty for the warfighter to focus attention
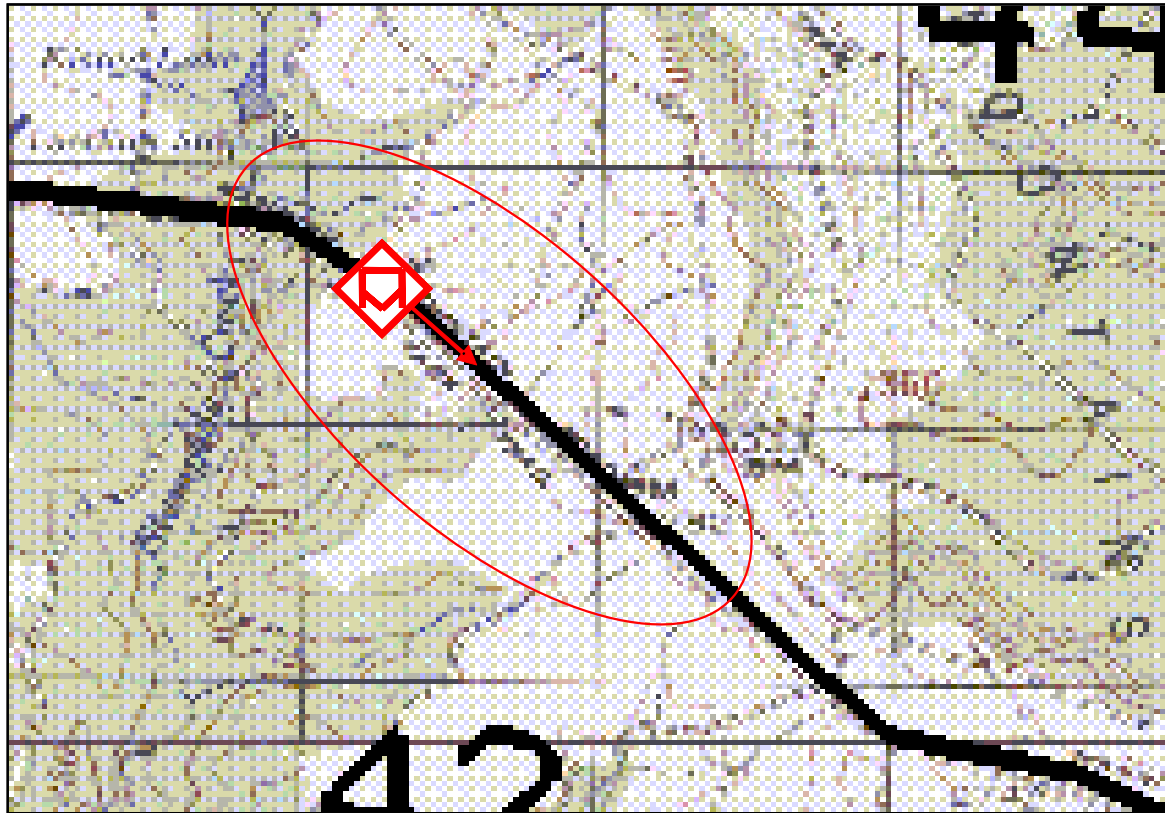
Viewing the Enemy Situation Display: Zones vs. Points

"All the significant breakthroughs were breaks in the old ways of thinking."

Attributed to Thomas S. Kuhn, author of *The Structure of Scientific Revolutions*

• Current digital battle command and control systems display both friendly and enemy forces as point symbols to indicate a specific location on the ground

• Point symbols imply a sense of certainty about location

• Use of point symbols can be misleading for representing a moving enemy if the point locations are not constantly updated

• The use of area symbols can display probable enemy locations

• "Red zone" is a non-doctrinal term that describes an enemy's battlespace, particularly the battlespace that the enemy can immediately observe and fire

• Use of red zones to depict enemy locations instead of point locations is another perspective to view the enemy situation display
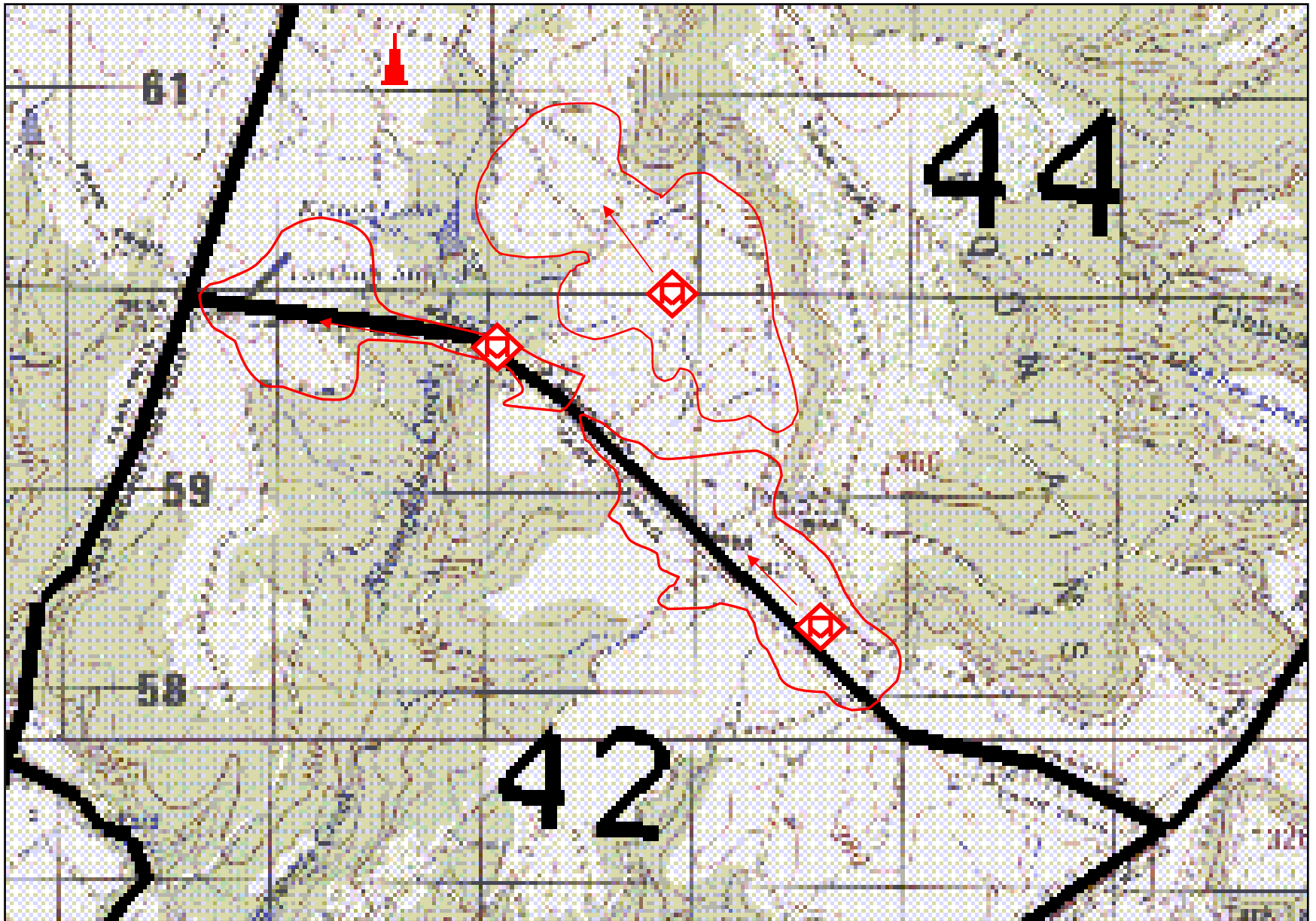
Red Zones

Implementation and its Challenges

• Technology to provide spatial analysis tools in digital battle command and control systems is available, but cannot be readily implemented due to hardware and software limitations

• Commercial Joint Mapping Toolkit (C/JTMK) can provide some capabilities described but not fully developed

• Greatest challenges are data availability, data storage, and customization

• Terrain data must be available for areas of operation; many areas of the world not prepared as detailed terrain data

• Terrain data requires huge computer disk storage space – terrabytes; should terrain data reside in combat platforms or in a remote server?

• Spatial analysis tools must be customized for the warfighter's use; must be easy to use, intuitive, and programmable for specific warfighter's needs

<u>Summary</u>

• The use of spatial analysis tools in digital battle command and control systems will improve the warfighter's view of the enemy ground situation display

• The circular line-of-sight tool displays a stationary enemy's battlespace

• The movement projection model displays probable locations of a moving enemy as an area symbol

• The areas created from these spatial analysis tools are "red zones"

• While red zones do not display exact locations, they focus on areas of likely enemy locations and activity

• Technology is the easy part to implement; even harder is changing a mindset to view enemy locations as areas rather than as points