



LASER WARNING RECEIVER (LWR)
EFFECTIVENESS ANALYSIS (PHASE I)

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S U D

1. BACKGROUND. The Combat Vehicle Survivability Assessment Cell (CVSAC) conducted a study to identify the potential survivability impact of installing an LWR on an armored vehicle. The CVSAC used Groundwars, a force-on-force stochastic computer model developed and maintained by AMSAA, to analyze the benefits accruing from an "ideal" LWR capable of providing precise direction to a threat laser source. AMSAA has reviewed and concurred with CVSAC's methodology and analysis results.

2. ASSUMPTIONS/SET-UP. This analysis considered a one-on-one scenario in which Red and Blue tanks attacked and defended. During the attack, the tank (Red or Blue) was fully exposed; during the defense, the tank was in hull-defilade. There were 2000 repetitions of this scenario made during this analysis. During each model run, Red was assumed to have already acquired Blue. The effectiveness of the Blue tank when equipped with an LWR was compared to a basecase in which no LWR was present.

3. RESULTS. Laser Warning Receivers provide early warning of impending threat engagements. An LWR capable of locating a threat laser source to the degree needed to cue a main gun engagement benefits the Blue tank during both the attack and the defense. The LWR's greatest impact on Blue tank survivability is at ranges greater than 2500 meters. The LWR's impact on Blue survivability is not as great at ranges in which Red tanks have a high probability of achieving first round kills against Blue tanks. At close range, the LWR competes with other tank target acquisition systems.

4. THE WAY AHEAD. This analysis suggests that an LWR's ability to locate threat laser sources and cue tank main gun engagements will provide a significant improvement to a tank's survivability and lethality. Follow-on analyses will:

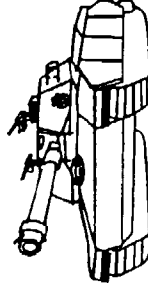
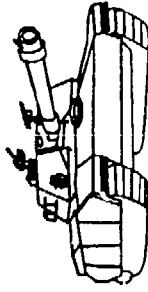
- a. Examine the sensitivity of the LWR's benefits as a function of direction of arrival accuracy; and
- b. Assess the impact of linking the LWR with other countermeasures.

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Laser Warning Receiver Effectiveness Analysis (I)

27 January 1992



Combat Vehicle Survivability Assessment Cell

PEO ASM / USATACOM

Warren, Michigan

PURPOSE

- Analyze the effectiveness of a Laser Warning Receiver (LWR) providing "precision location" where the LWR cues a Blue main gun engagement.



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Analysis Tool

Groundwars Combat Model

- Stochastic combat model in which both sides have homogeneous forces totalling 20 or less
- All attackers begin the simulation separated by the same distance from each defender
- Statistically simulated terrain
- Round type (KE, ATGM, Fire & Forget), firing cycle times, accuracy, and probability of kill are all explicitly modelled
- Game ends at a pre-determined range, or when a side is dead or all out of ammo

SCENARIO

- The analysis was performed in a one-on-one scenario beginning with the Red tank having acquired the Blue tank and preparing to fire. The Blue tank must search for and kill the Red tank before being killed.

METHODOLOGY

- Reviewed by AMSAA
- One-on-one scenario
- Only Blue has LWR
- LWR is always on
- When game begins red has immediate detection of Blue
- LWR provides “precision location” of the Red tank - i.e. LWR cues a Blue main gun engagement

METHODOLOGY

(CONT.)

- Engagements begun at ranges of 500, 1000, 1500, 2000, and 2500 meters
- Tanks are always in Line-of-Sight
- CV-CPOA Attack Distribution
- Engagement continues until one or both tanks is killed (firepower kill or better)
- LWR modelled using existing Groundwars code for pinpoint detection: effectiveness = 90%
- Red tank is given extremely powerful optics to assure it has first detection

BLUE VS. RED ASSUMPTIONS

BLUE

Future Main Battle Tank

Kinetic Energy (KE)

Thermal sensor

no jockeying in defense

RED

Future Main Battle Tank

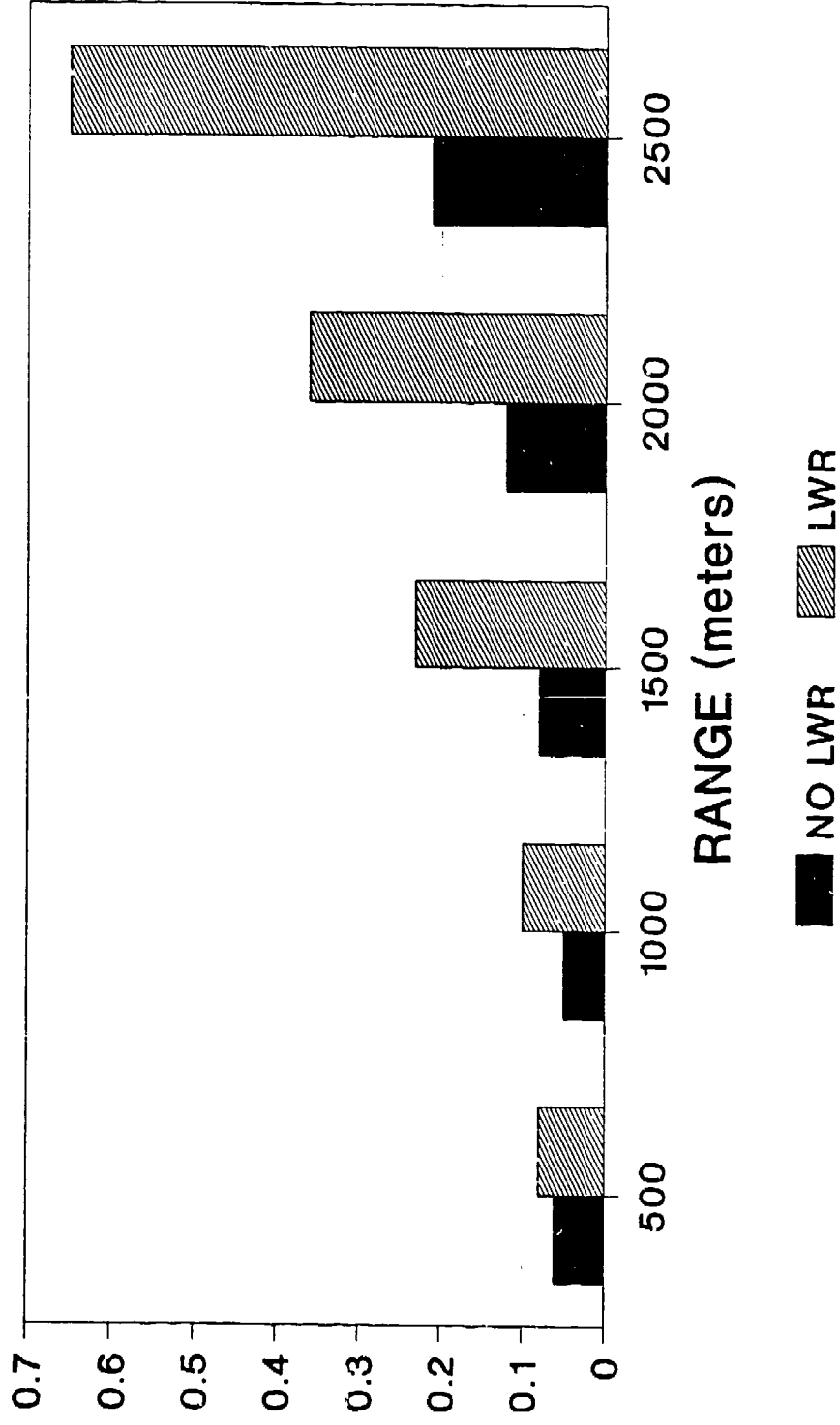
Kinetic Energy (KE)

Visual sensor (altered)

no jockeying in defense

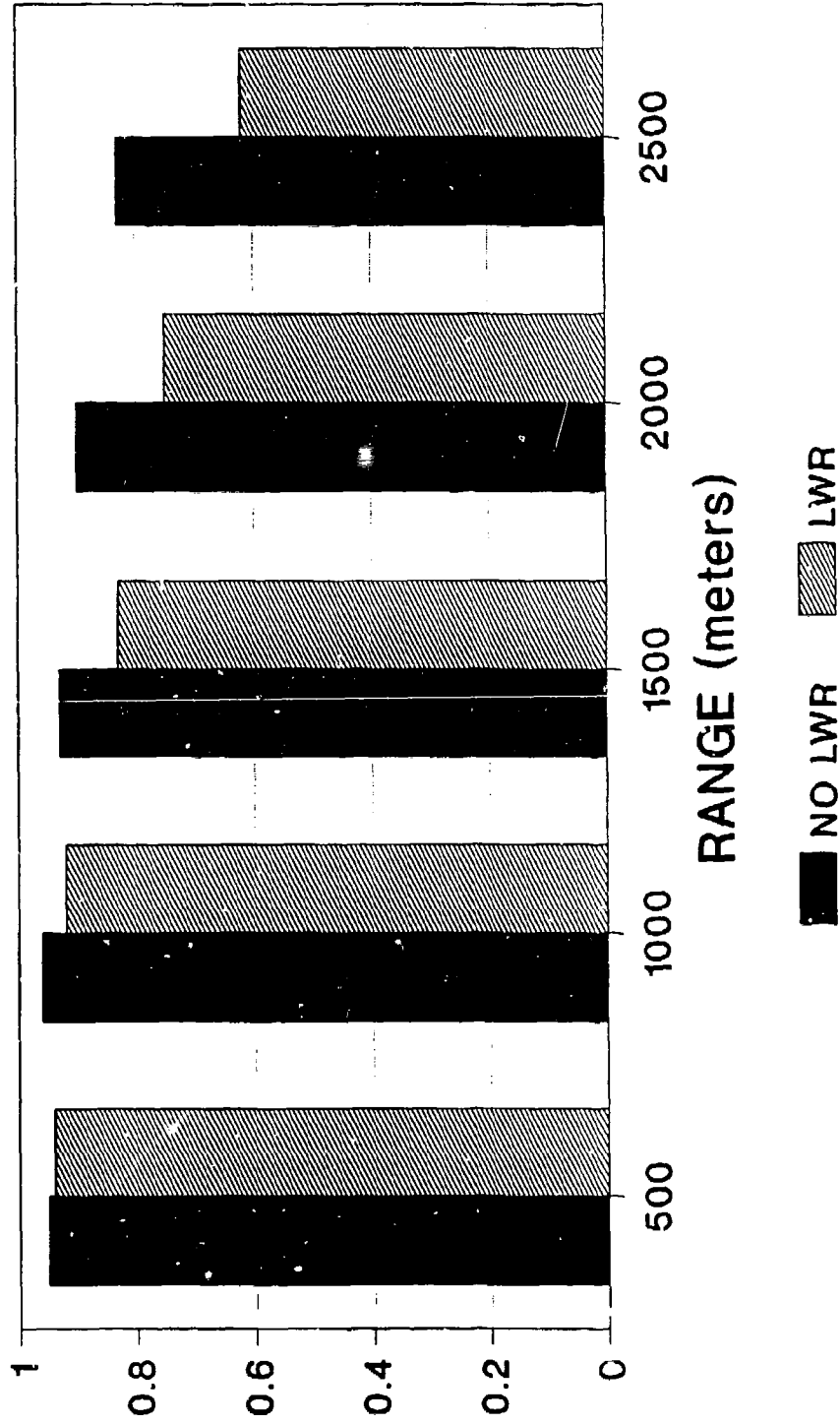
RESULTS

BLUE ATTACK EXCHANGE RATIO



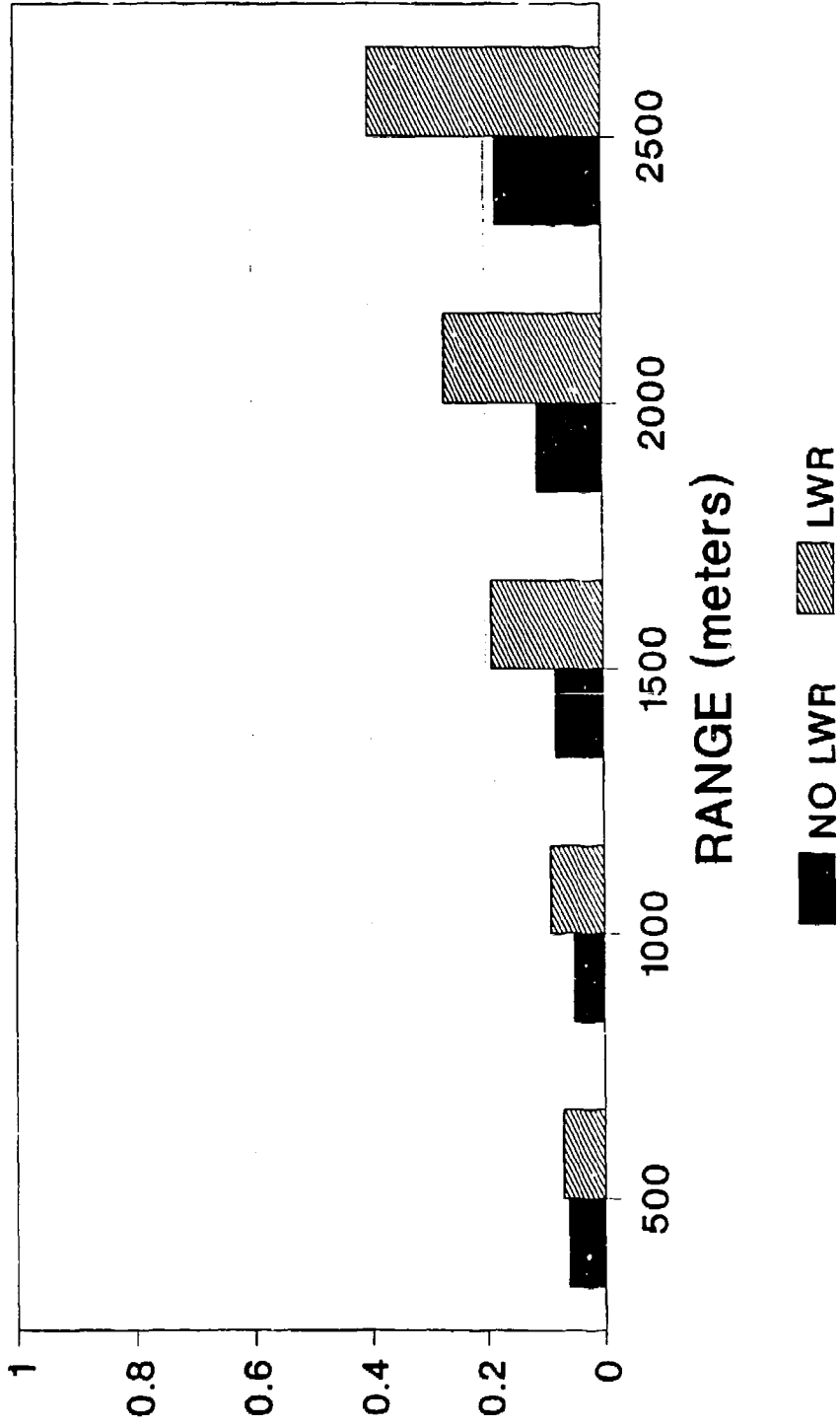
BLUE ATTACK

AVERAGE # BLUE DEAD



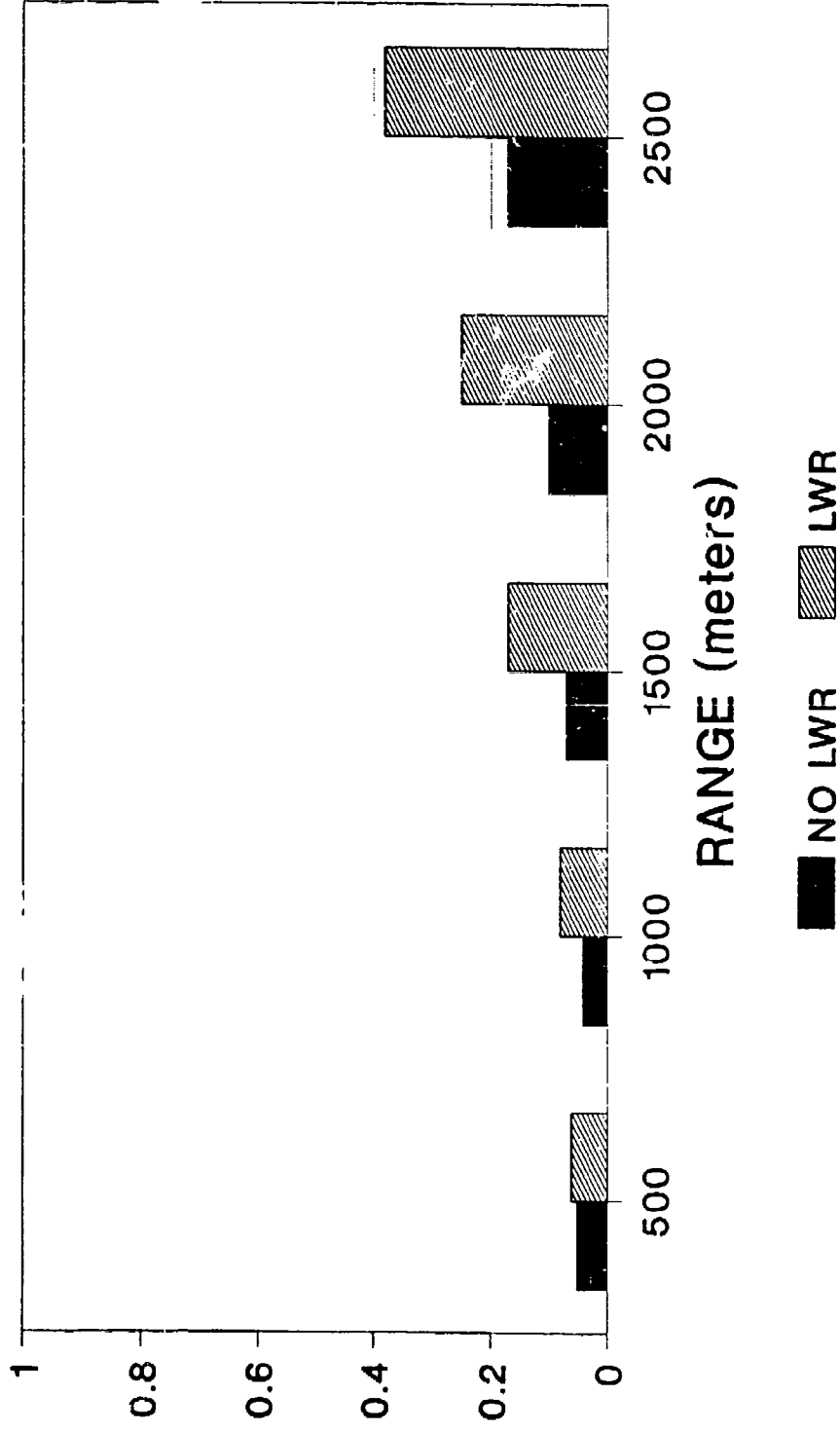
BLUE ATTACK

AVERAGE # RED DEAD

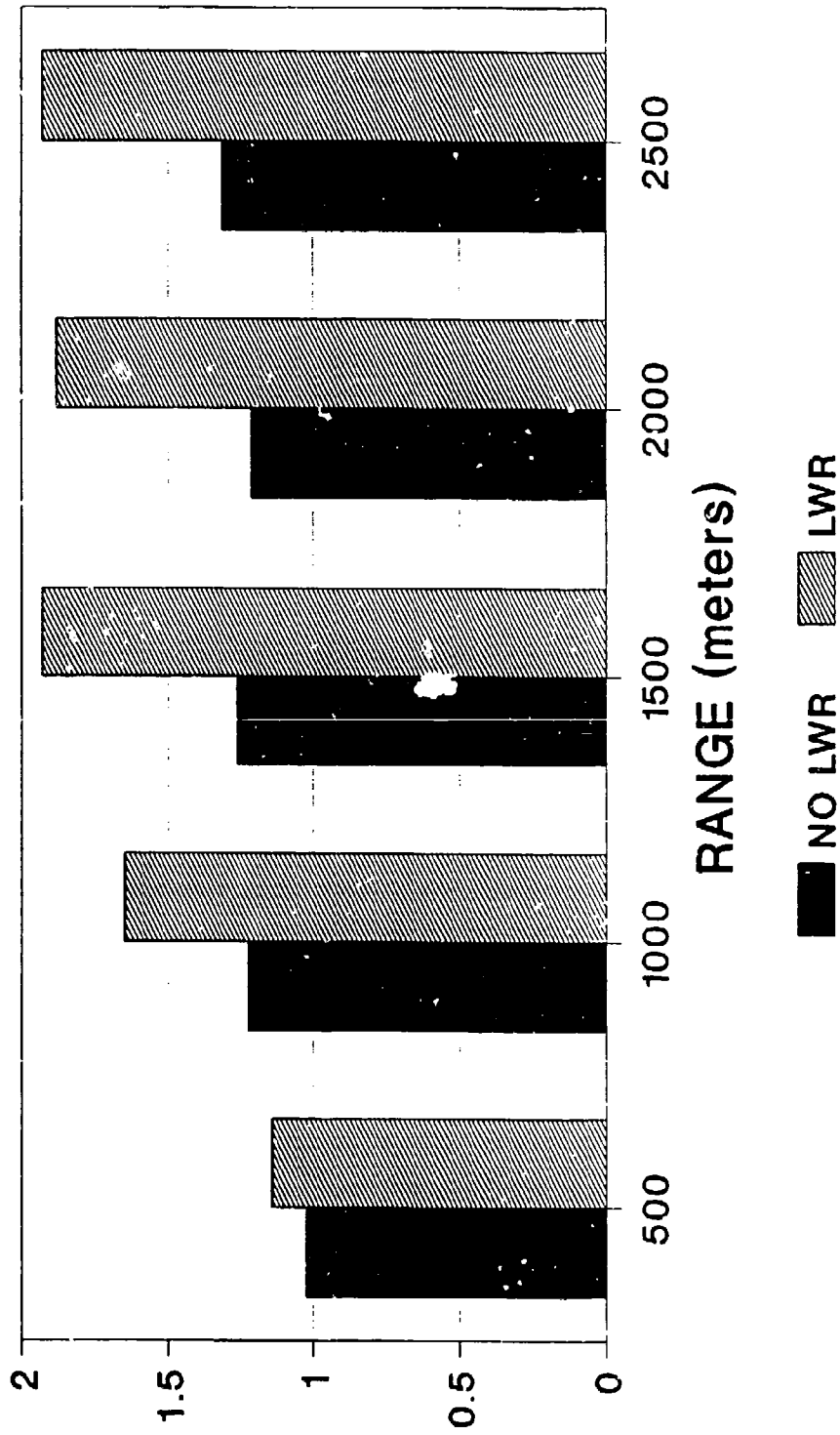


PROBABILITY OF SURVIVAL

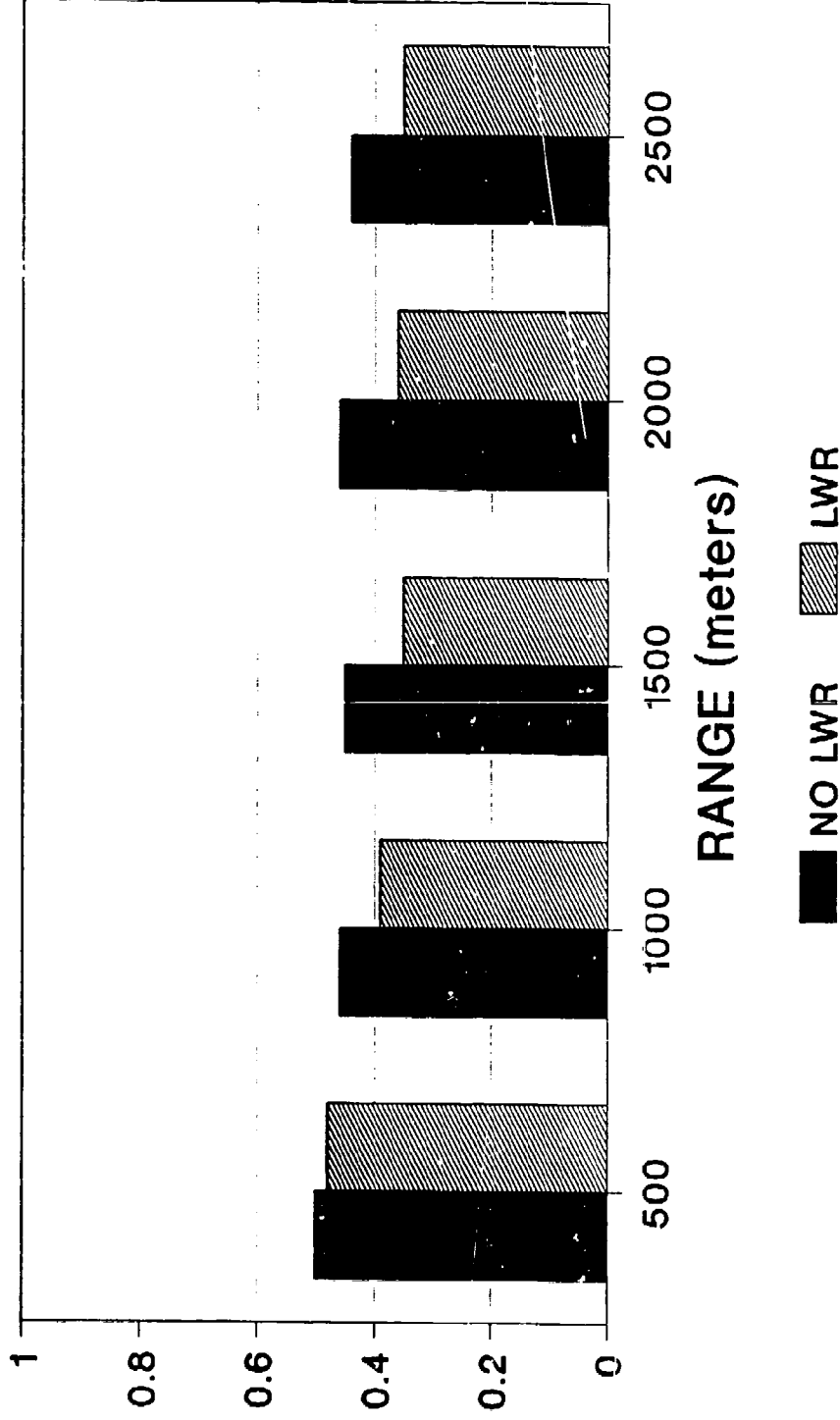
BLUE ATTACK



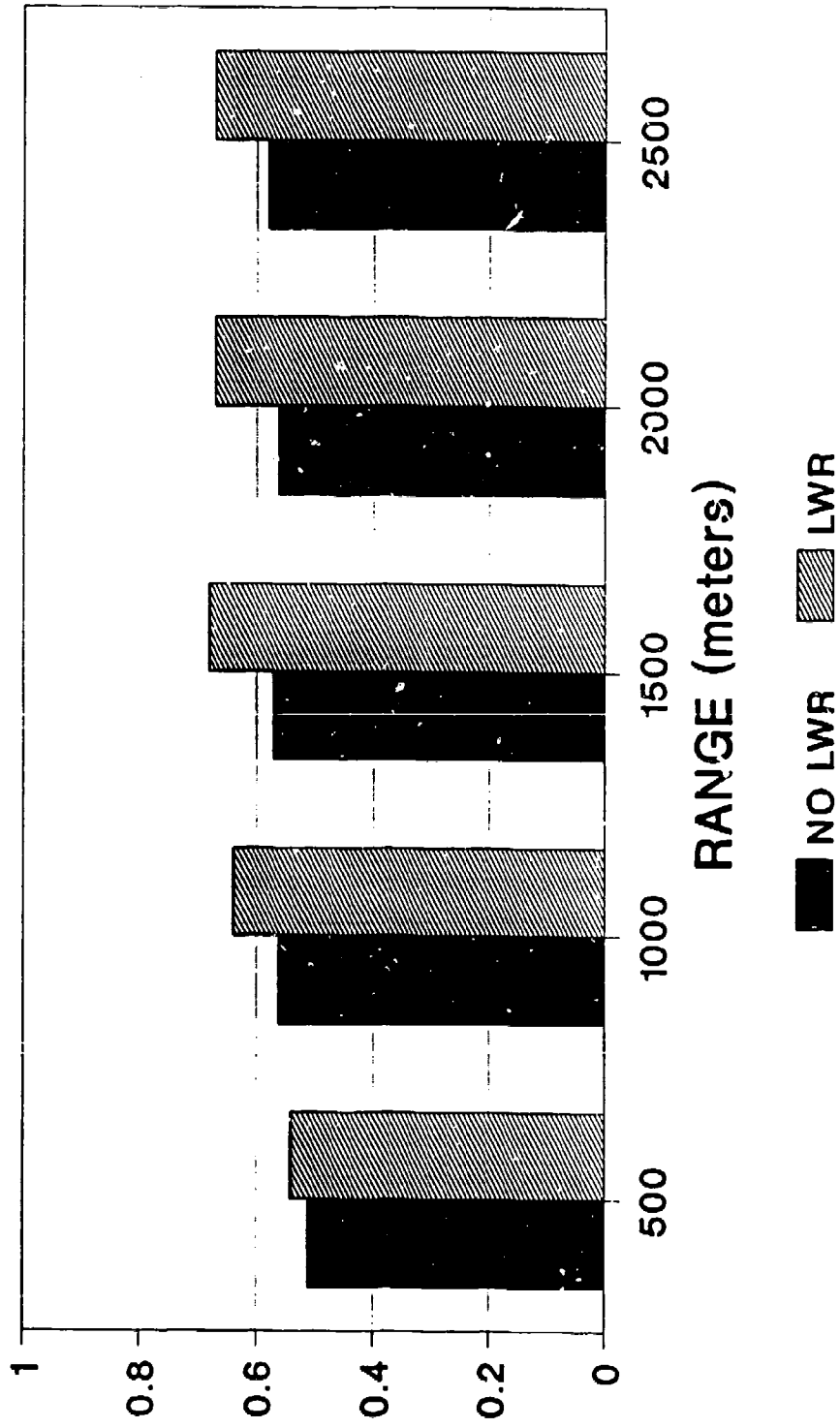
BLUE DEFENSE EXCHANGE RATIO



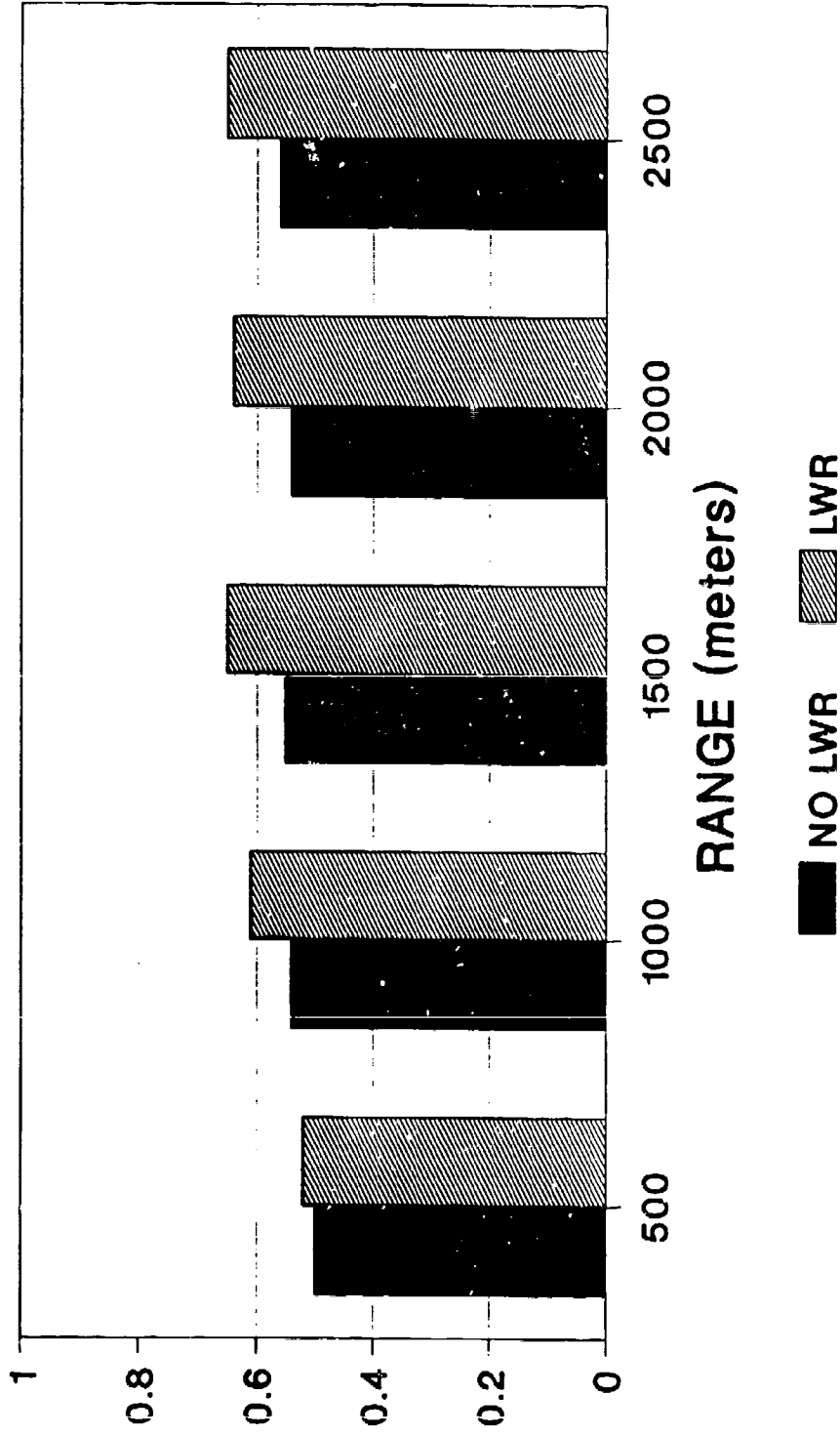
BLUE DEFENSE AVERAGE # BLUE DEAD



BLUE DEFENSE AVERAGE # RED DEAD



PROBABILITY OF SURVIVAL BLUE DEFENSE



CONCLUSIONS

- The LWR showed great benefit in attack except at close range where detection is simple and the rate of first round kills is high. It showed more benefit at greater ranges, doubling the chance of survival at 2500 meters.
- The LWR also shows benefit in defense when not at close range.