

Human Effects Advisory Panel Program

PRESENTED TO:

NDIA

Non-Lethal Defense IV

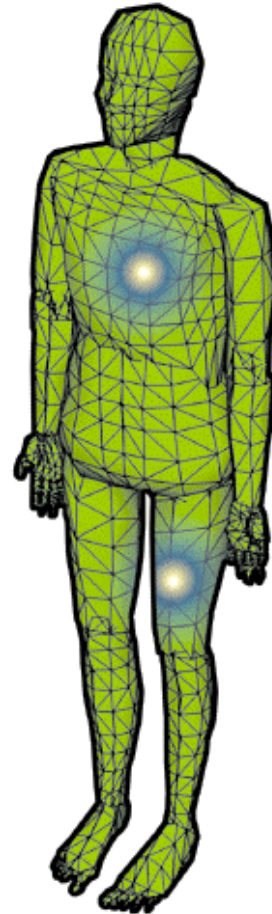
PRESENTED BY:

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22 March 2000





HEAP Human Effects Advisory Panel



OUTLINE

- Introduction, background and general tasks
- Human Effects Advisory Board panel members
- Overview of the HEAP processes and products
- Blunt impact munitions Working Group findings and opinions
- Brief overview of other HEAP assessments
- Summary



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INTRODUCTION

- To use non-lethal weapons successfully in the field, commanders must...
 - be able to evaluate non-lethal alternatives and select the best weapon
 - have confidence that the employment consequences will lessen the confrontation level
 - be able to predict the most probable effects on the population
 - have confidence the weapon will work as intended



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BACKGROUND

- Established in April 1998
- Serves as independent technical advisor and trusted agent to the JNLWD for all human effects/NLW matters
- Composed of non-DoD individuals from academia and industry
- Provides independent assessment of human effects data and models
- Initial task: Review NLW blunt impact munitions
- First panel convened 2–4 November 1998



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HEAP TASKS

- Definitions of non-lethality for non-lethal weapons
- Assessment of availability and validity of effects data and models
- Assessment of non-lethal effects on the general population



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PANEL MEMBERS

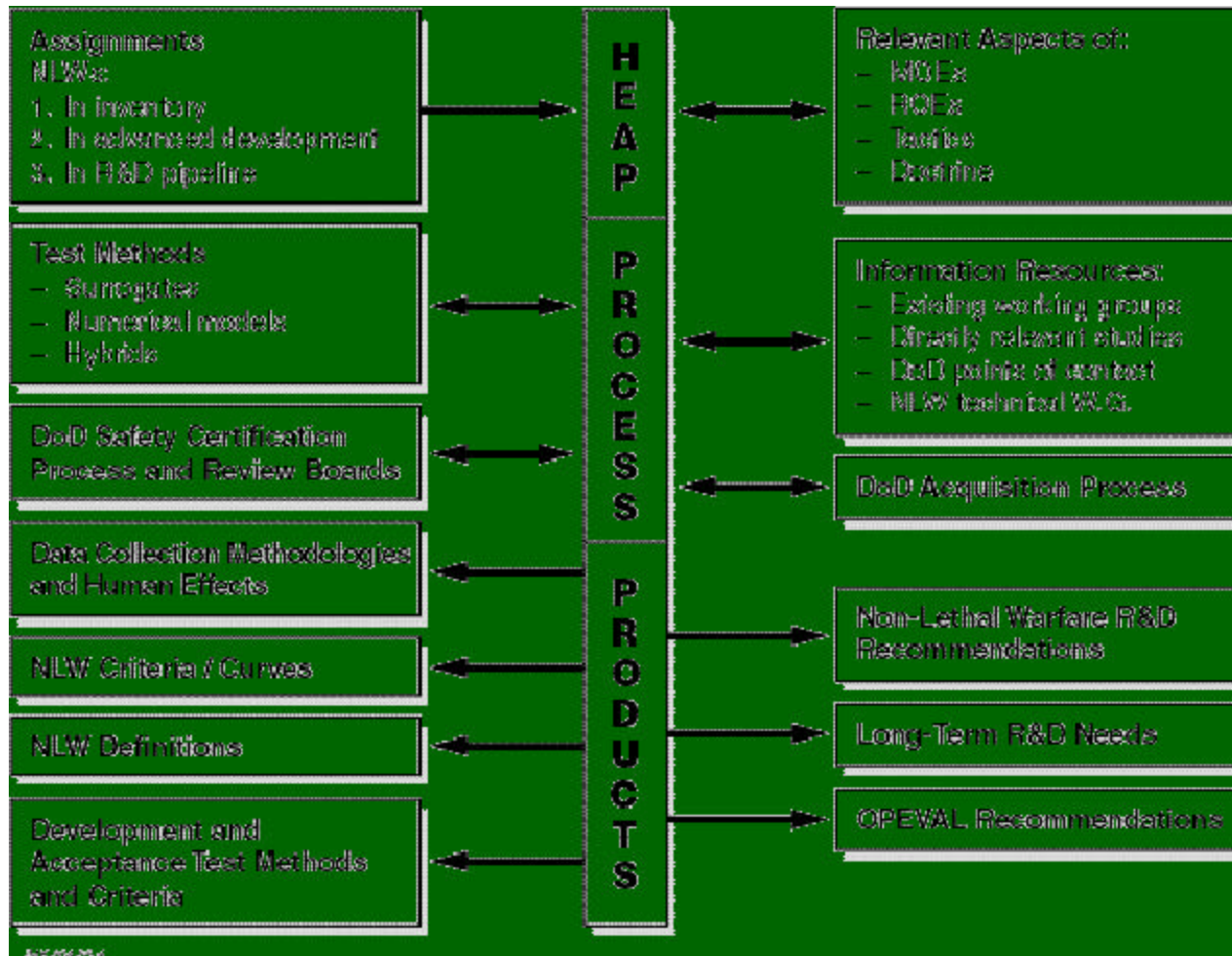
POSITION			
Toxicologist	Dr. V. K. Rao Dyess AFB	Dr. J. Lukowsky Rand AFB	Dr. C. G. Beatty Rand AFB
	Dr. J. E. Klaunig Hickam AFB		
Psychologist	Dr. R. J. Echternandis Rand AFB	Dr. D. M. Ferrer San Antonio	
		Dr. F. J. Manning Rand AFB	
Trauma Surgeon	Dr. W. J. Sakasidaniell Rand AFB	Dr. J. S. Smith Rand AFB	Dr. K. G. Swan Univ of New Jersey
	Dr. S. Hurwitz Univ of Virginia	Dr. R. J. Zalawa Yale University	
Anesthesiologist	Dr. W. B. Murray Rand AFB	Dr. E. Camporaal SUNY Health Science Center	
Physiologist	Dr. G. A. Dudley University of Georgia	Dr. W. J. Kraemer Rand AFB	
Biostatistics	Dr. M. Pitt University of Pennsylvania	Dr. D. Waugar Rand AFB	
Emer. Medicine	Dr. R. Fish Chicago		
Ophthalmologist	Dr. R. Winger Hawaii		



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HOLISTIC APPROACH





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TERMS AND ISSUES

TERMS

- **Non-lethal, incapacitation, and reversibility**

ISSUES

- **Large variability of the human population**
- **Large variability of scenarios**
- **Large variability of population within each scenario**



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HUMAN VARIABILITY



Both teams shaken up by Pronger's collapse

By Kevin Allen
USA TODAY

DETROIT — The Detroit Red Wings were going out of their way to crutch St. Louis Blues defenseman Chris Pronger one moment and praying for his health the next.

That was the surreal situation after Pronger collapsed unconscious after being hit in the chest, near the heart area, by a slap shot from Dmitri Miranov at 3:30 of the third period. He suffered an irregular heartbeat at impact, which doctors said could have caused him to lose consciousness.

"He's your enemy when the game is on," Detroit's Kirk Maltby said. "but you don't want to see that happen to anyone. We hope he's OK and doesn't have complications."

Maltby said the only scary situation of that magnitude he has seen was watching the replay of Bryan Marchment falling headfirst into an opened penalty box door last year.

In Pronger's case, he took a couple of strides after he got up and fell. Players gestured frantically for medical help.

"This is a loud building, but it got very quiet," St. Louis goaltender Grant Fuhr said.

St. Louis trainer Ray Barile said Pronger was unconscious for 20 to 30 seconds. "His heart rate was weak," Barile said.

Blues physician Aaron Birnbaum said it was possible Pronger's heart stopped briefly, although he can't be sure.

"It looked pretty scary," Blues coach Joel Quenneville said. "It wasn't a blow to his head. That's why we were so

concerned."

Pronger showed animation when he was being carried off the ice, and he made the Blues tell his mother, in attendance, he was going to be OK.

"You think about that," Detroit winger Brendan Shanahan said, "his mother watching this on Mother's Day."

Doctors kept Pronger in the hospital as a precaution.

"The potential is there for something more serious," Birnbaum said. "But fortunately it didn't happen."

The tempo of the game changed dramatically after the Blues' captain left.

"It was like everyone in the game took a punch in the stomach," Shanahan said. "I think everyone was a little rattled after that. It was pretty quiet out there."



Scary moment: Linesman Mika Civo checks on the Blues' Chris Pronger, who collapsed after being hit in the chest by a shot.

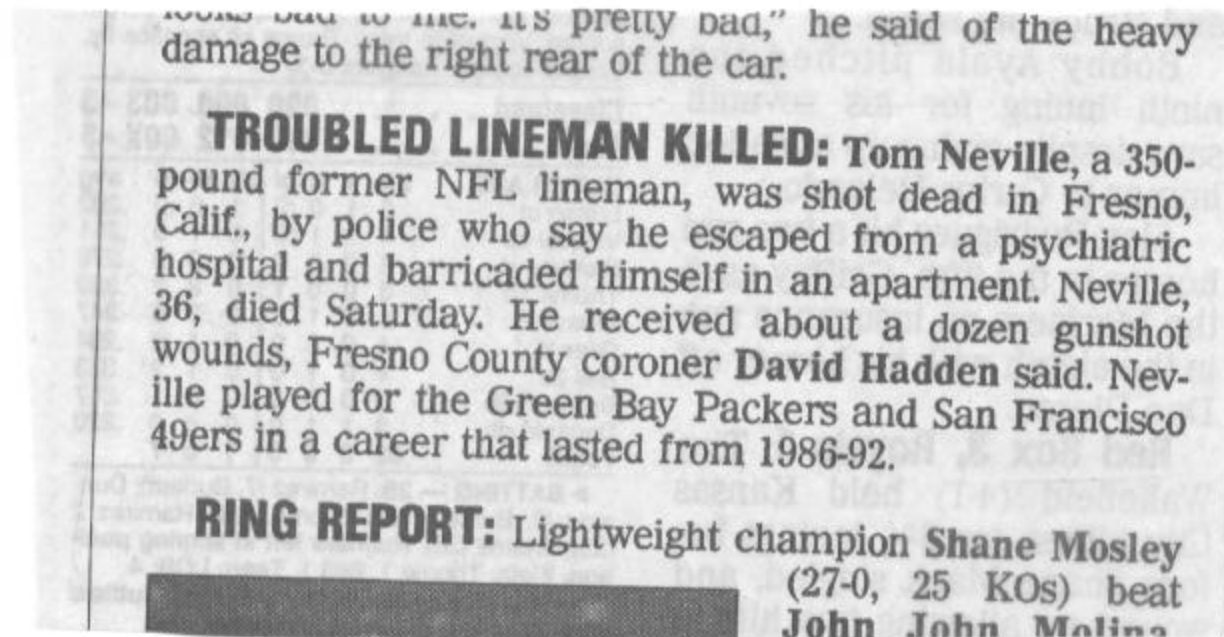
"...hit in the chest by hockey puck caused heart to stop..."



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HUMAN VARIABILITY



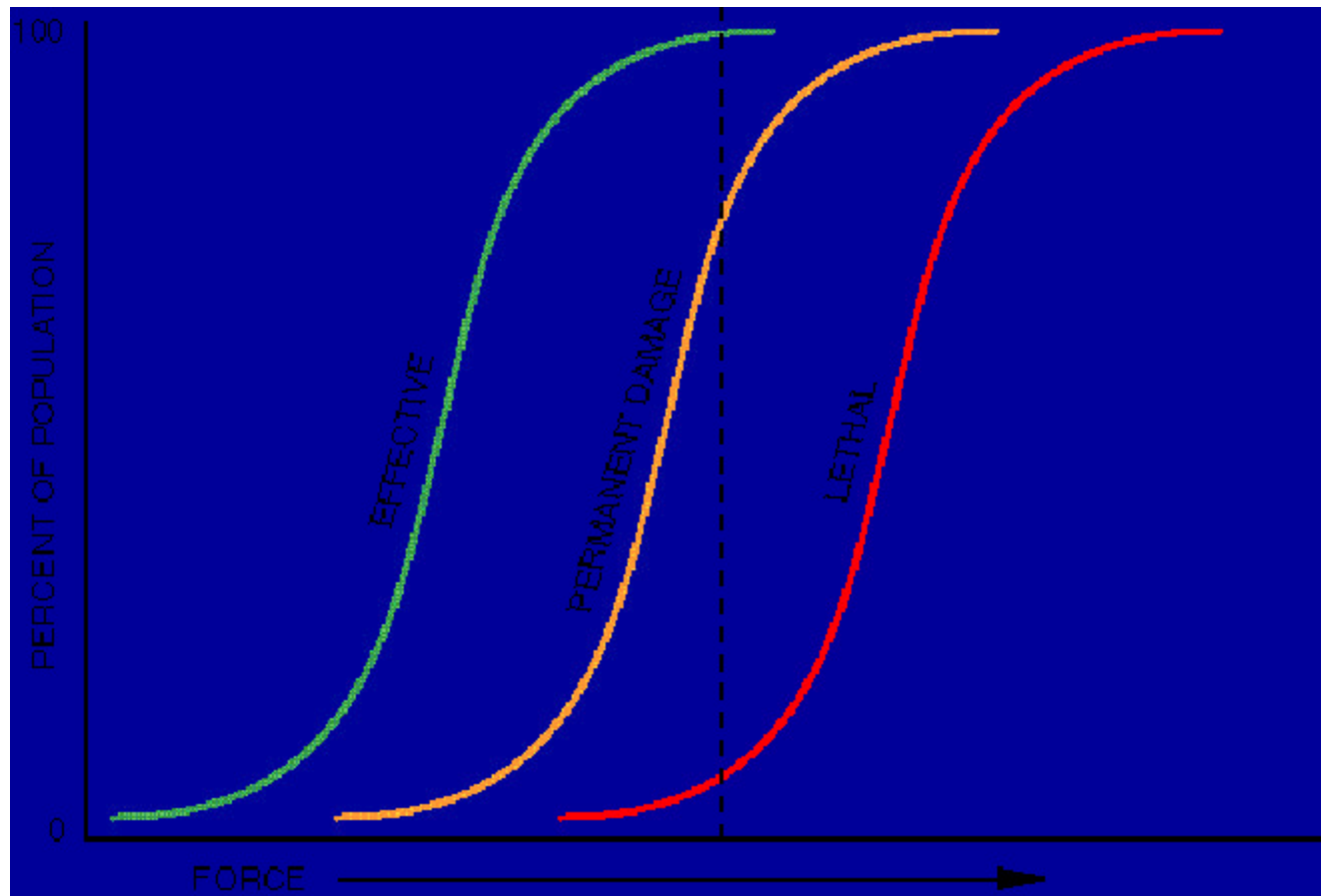
“...shot 12 times!...”



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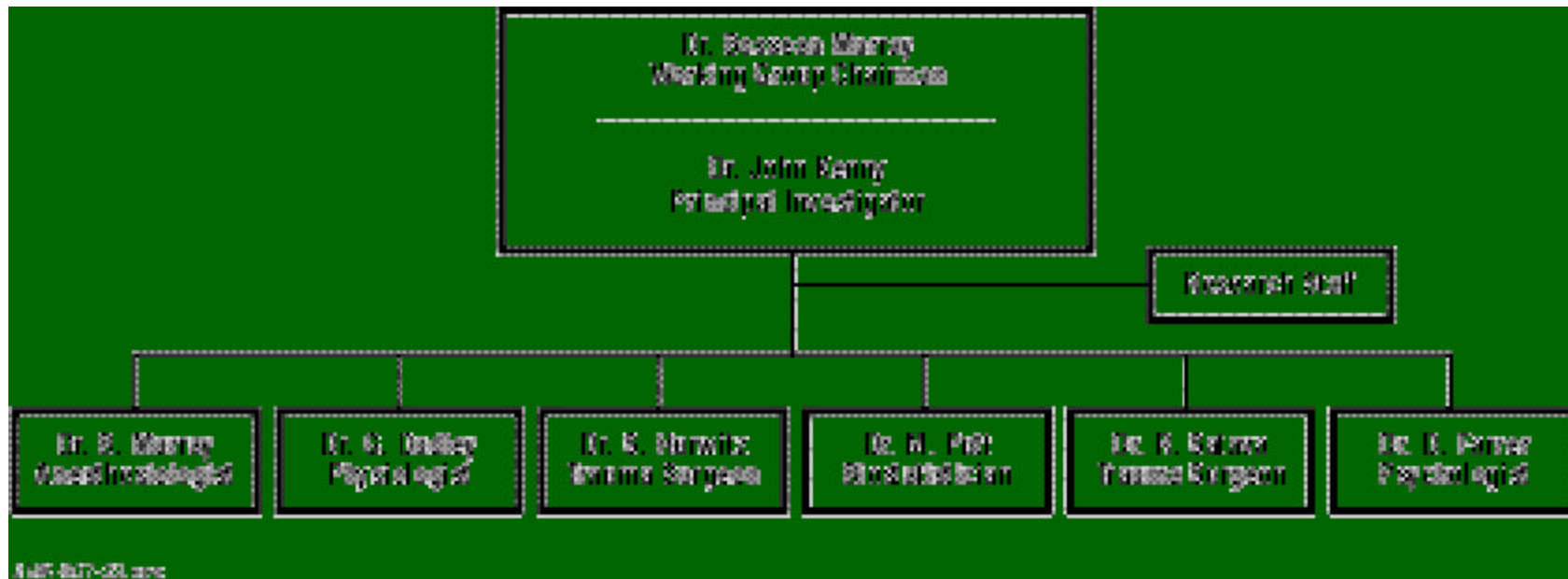
SWETT CURVE





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BLUNT IMPACT MUNITIONS WORKING GROUP





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STATEMENT OF WORK

1. Evaluate amount and validity of data to support NLW effect analysis.
2. Evaluate DoD methodology to generate and validate data.
3. Assess and recommend methods to generate and verify effect curves.
 - **Suggest alternative graphical methods**
 - **Include recommendation of the proper mix of modeling and data sources**
 - **Evaluation extrapolation methods**



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STATEMENT OF WORK (cont'd.)

4. Create a quantitative definition of non-lethal weapons. The definition should also address the terms:
 - **Incapacitation**
 - **Reversibility (permanent damage)**

5. If insufficient data exist, identify shortfalls and create a plan of action to correct the deficiency.



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PANEL PROCEDURES

- The panel chairman:
 - Encouraged the participation of the entire panel.
 - Kept the panel focused and on track.
 - Attempted to gain consensus when appropriate.
 - Encouraged both critical and creative comments... everyone's view was important.
- The panel chairman was assisted by facilitators and a weapons expert.
- The panel received presentations on the current state of data gathering and modeling as well as possible paths for future human research.



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FINDINGS: TASK 1 – Data Assessment

- The panel found that there were insufficient:
 - weapons performance data.
 - weapons effects data.
 - data for extrapolation.
 - data to measure incapacitation.
 - data to generalize to the population.
- **Conclusion:** no validated incapacitation data are known to exist.



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EXISTING BLUNT TRAUMA DATA



INJURY

- Cerebral contusion
- Skull fracture
- Mandible fracture
- Rib fracture
- Lung contusion
- Heart lesions
- Heart rupture
- Ventricular fibrillation
- Liver laceration

TEST SUBJECT

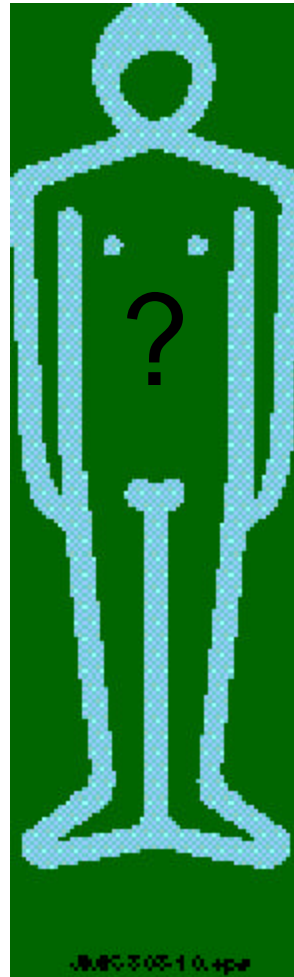
- Human cadaver
- Human cadaver
- Swine
- Sheep
- Swine
- Swine
- Swine
- Swine
- Swine



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INSUFFICIENT BLUNT TRAUMA DATA



- Eye injury
- Zygomatic fracture
- Maxilla fracture
- Cranial fracture
- Pericardial disruption
- Aorta damage
- Spleen injury
- Intestine injury
- Fetus injury
- Reproductive organ injury



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FINDINGS: TASK 2 – Methodology Assessment

- WRAIR's Interim Total Body Model incorporates the best blunt trauma data and models available. However, the model:
 - **Is not validated.**
 - **Is incomplete.**
 - **Contains confounding and bias factors.**
 - **Lacks system integration.**
 - **Lacks a broader focus.**
 - **Lacks applicability to the human population.**



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FINDINGS: TASK 2 – Methodology Assessment (cont'd.)

- **Conclusion:** The current Service methodology has a number of recognized deficiencies and is incapable of confidently predicting the probability of injury from blunt impact weapons.



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FINDINGS: TASK 3 – Methodology Analysis

- Methodology needed:
 - **Observational studies are critically important to answer the questions of interest. From a biostatistician's perspective, it is difficult to extrapolate with confidence from animals and cadavers to human populations.**
- Methodology to generate data:
 - **Combination of existing and new data collection techniques.**
 - **The data collection effort must be integrated and focused.**



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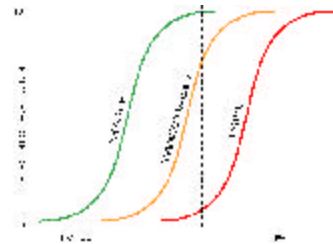


FINDINGS: TASK 3 – Graphic Display

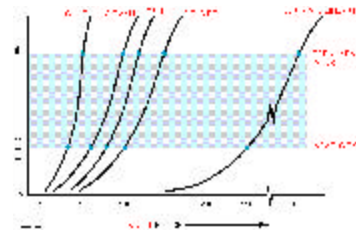
Effect curves

- When the data become available, the presentation of the data should be targeted to your audience. There is no single correct method.

- Strategic:



- Tactical:



- User:





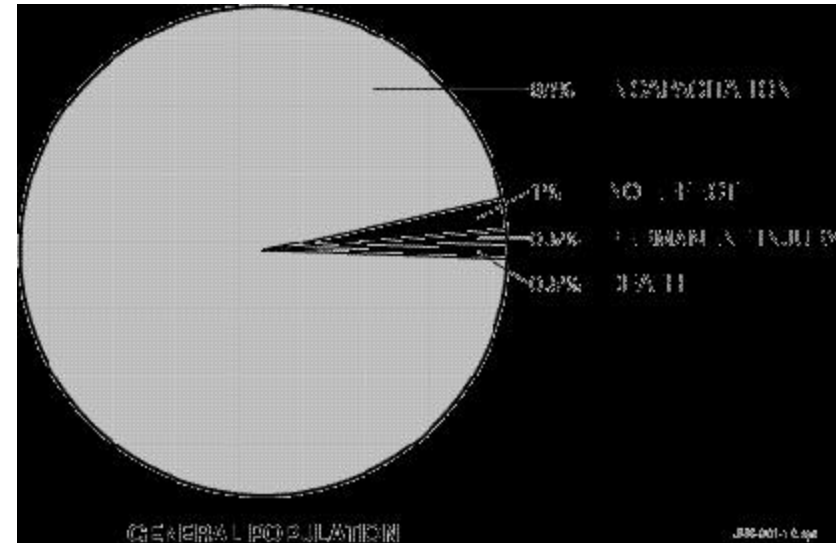
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FINDINGS: TASK 4 – Definitions

- Quantitative definition of non-lethality weapons munitions. This definition included these components:

- Incapacitates 98% of the population
- No effect on 1% of the population
- Permanent damage to 1% of the population of which .5% will die
- Temporary effect: 30 minutes or less





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FINDINGS: TASK 4 (cont'd.)

- Permanent damage is uncorrectable. It alters living capabilities and activities.
- Incapacitation means that the individual will not be able to do one, some, or all of the following:
 - Run/walk
 - Perform voice communications
 - See (visual signaling)
 - Use weapons (fire or throw)
 - Drive vehicles
 - Construct (barricades, fighting positions)



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FINDINGS: TASK 4 (cont'd.)





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FINDINGS: TASK 5 – Recommendations

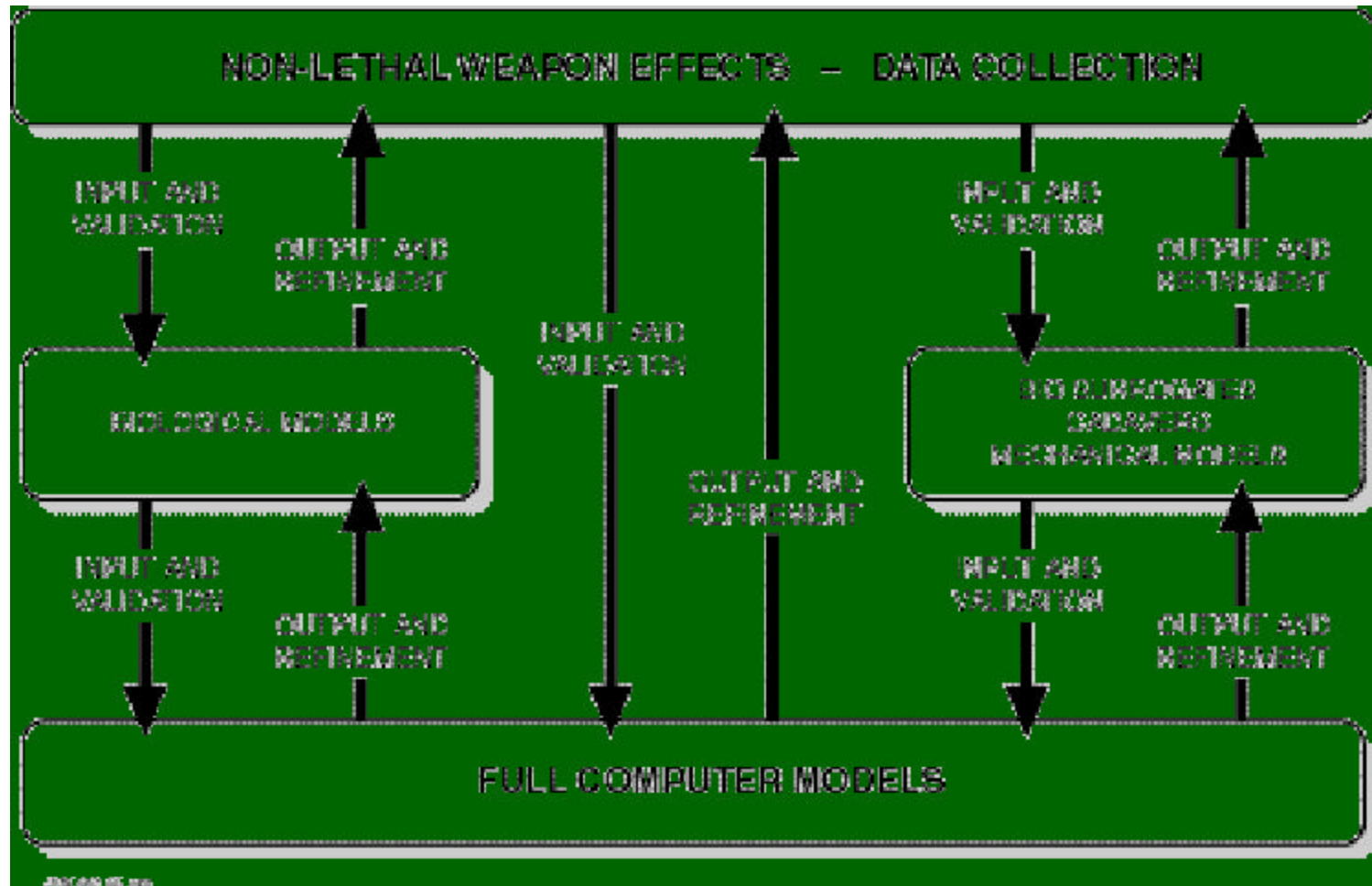
- Plan of action
 - Coordinate, prioritize and focus data collection efforts.
 - Coordinate and focus modeling efforts.
 - De-emphasize blunt impact R&D and look to other techniques.
 - Consider models which have more universal application.



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FINDINGS: TASK 5- Data Collection Plan





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SUMMARY – Panel Conclusions

- There were not sufficient data to create desired effect curves.
- There were no models that predicted incapacitation.
- There is a distinct disconnect between the expectations of the user community and the information that is being provided by the data collection and modeling community.
- There does not appear to be an organization that is responsible for generating non-lethal effect curves or determining incapacitation caused by blunt impact weapons.

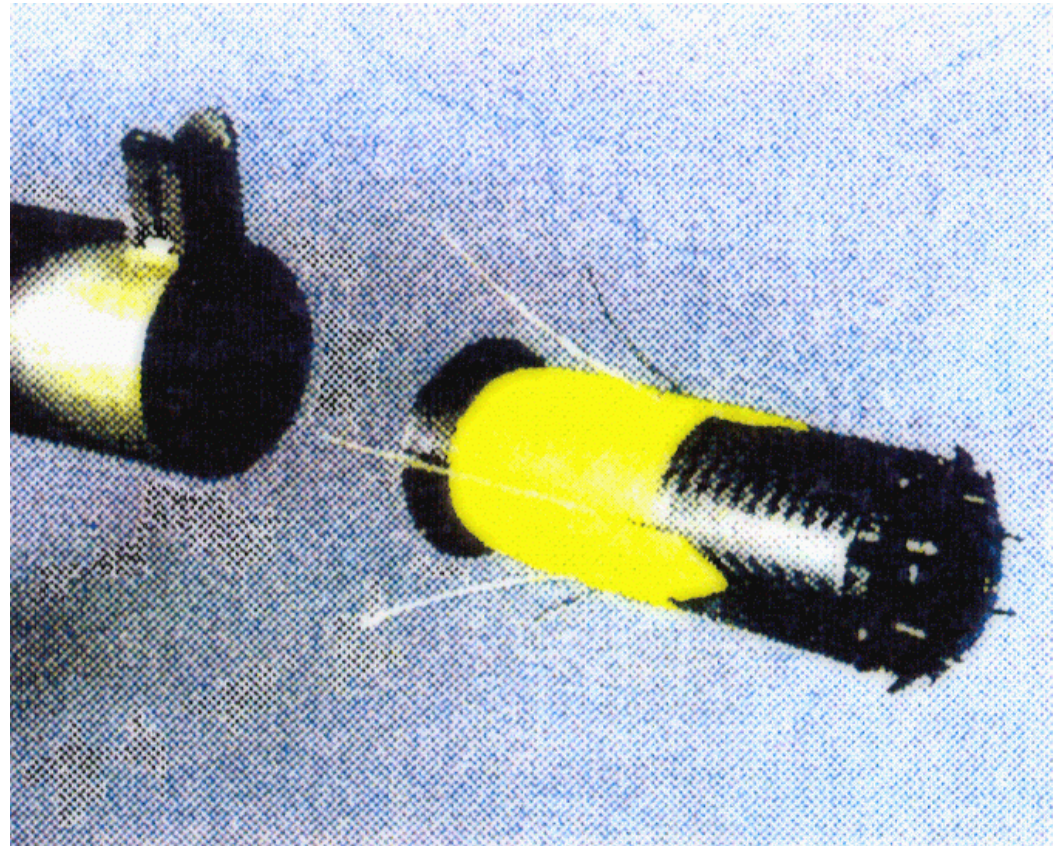


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Sticky Shocker

- Low impact wireless projectile
- 54mA – similar to Stun Gun
- Series of shocks over 8 – 12 seconds
- HEAP major concerns:
 - Blunt impact
 - Incapacitation mechanism is not understood





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Modular Crowd Control Munition

- Claymore mine with sting balls
- Max range – 30 meters
- Hit probability – 80%
- Min range – 2 meters
- HEAP major concerns:
 - Multiple strikes
 - Eye damage





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Non-Lethal Crowd Dispersal Round

- 40mm round with sting balls
- Max range – 30 meters
- Hit probability – 80%
- Min range – 15 meters
- HEAP major concerns:
 - Multiple strikes
 - Eye damage





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Portable Vehicle Arresting Barrier



- Designed to stop a 7 ton vehicle traveling at 60 mph in 100 feet or less
- Stopping force will not exceed 2 Gs
- HEAP major concerns:
 - Report in progress





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SUMMARY

- The panel continues to serve as an independent technical advisor and trusted agent to the JNLWD for all human effects/NLW matters
- Provided independent assessment of human effects data and models of several NLWs
- The panel will review other NLW techniques over the next two years.
- Innovative use of the peer review process by the JNLWD.