



FIRE FIGHTER
SAFETY AND
DEPLOYMENT
STUDY

Multiphase Study on Firefighter Safety and the Deployment of Resources

A Collaborative Effort by:



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Why Operations Research?

THE INCIDENT

- At 0135 hours, firefighters received a call of a reported structure fire. Engines 5, 2, 1, Truck 11 and Rescue 32 responded.
- Engine 5 arrived at 0141 hours (6 minutes after dispatch) and reported a well-involved house fire.
- A Captain and 2 firefighters advanced an 1 ¾-inch hand line through the front door and down a hallway. They notice heavy fire off to the right.
- There was a flashover in the room and as the firefighters attempted to exit, the hallway became heavily involved with fire. Only two made it out.
- 56 minutes later a firefighter was found inside and pronounced dead at the scene.

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Why Operations Research?

- NIOSH investigation/recommendations:
 - Consider increasing the number of firefighters on engine companies to perform in accordance with NFPA standards
 - Ensure a RIT is established when firefighters enter a structure

- Study looks at the many operational factors that could have led to a different outcome.

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Project Objectives

Optimize a fire service leader's capability to deploy resources to prevent or mitigate adverse events that occur in an risk/hazard filled environment.

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Study Phases

- Develop a scientifically-based community risk assessment and resource deployment model;
- Conduct field experiments to assess resource deployment including crew size and time to task analysis; and
- Develop performance evaluation tools to be used by departments to assess how well they match their community risk level to resources deployed.

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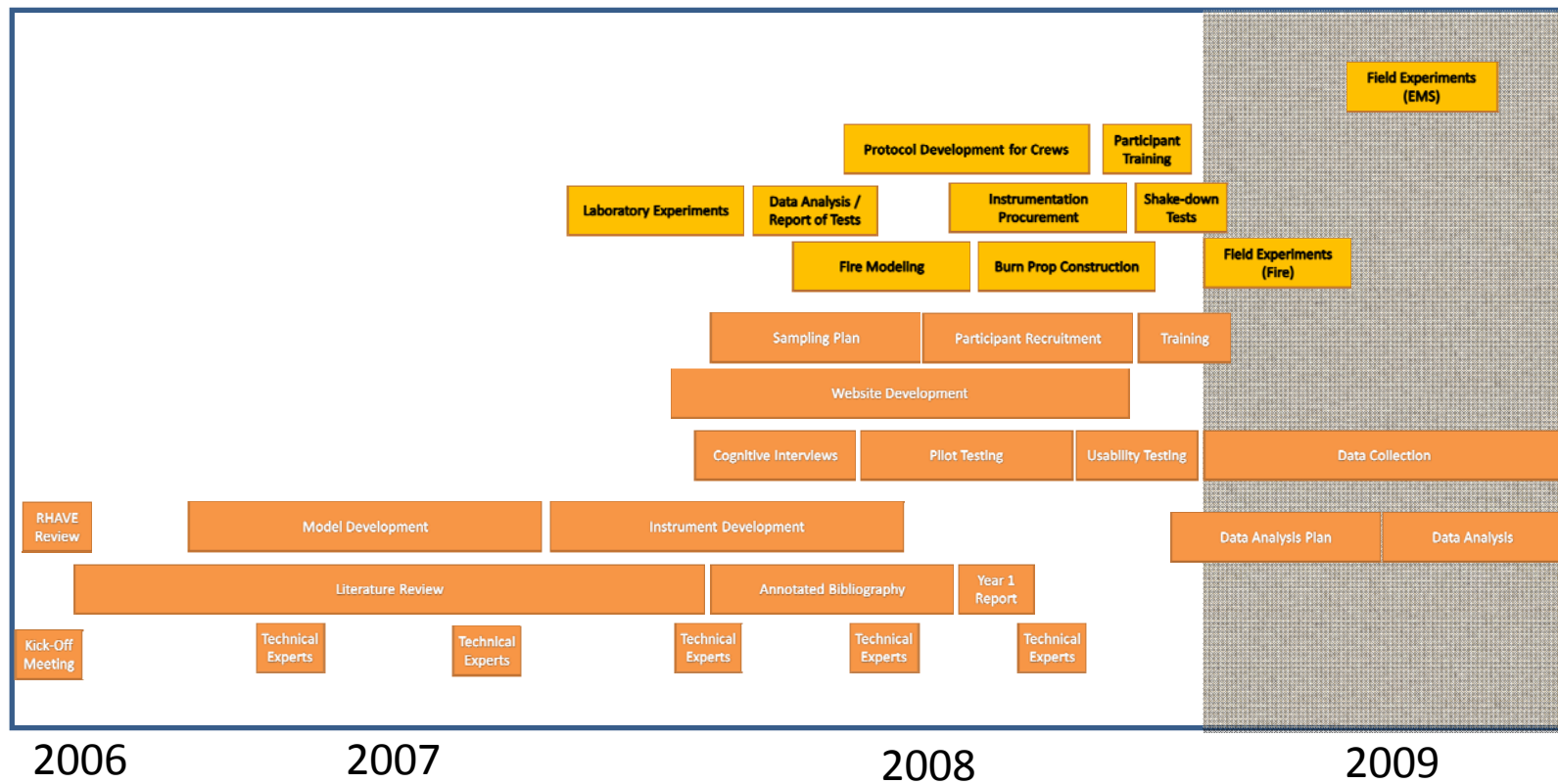


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Project GANTT Chart



Last Year We Reported...

- Stakeholder Engagement
- Evaluation of Community Risk Software (RHAVE)
- Expert Elicitation
- Literature Review
- Model Framework
- Website Launched
- Laboratory Experiments

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Since then...

- Annotated Bibliography

- Survey Design and Development
 - Sample design and selection
 - Web survey development
 - Survey testing

- Field Experiments
 - Burn Prop Construction

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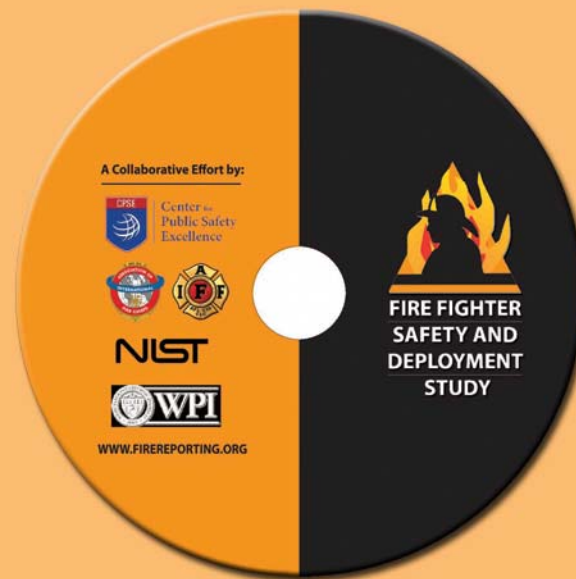


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Annotated Bibliography

- Copy on CD



- www.firereporting.org

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Survey Design

- Objectives: Fire & ALS Models

- Unit of Analysis – Events
 - Capture full range of responses
 - **How many** to sample?
 - **How to** gather the data?

- **How Many:** Power Analyses (Sample Size)
 - 2-sided test of difference of means, 5% significance and 80% power
 - Reflected clustering effects within departments

- **How to:** 2-stage Design
 - Departments
 - Events within departments

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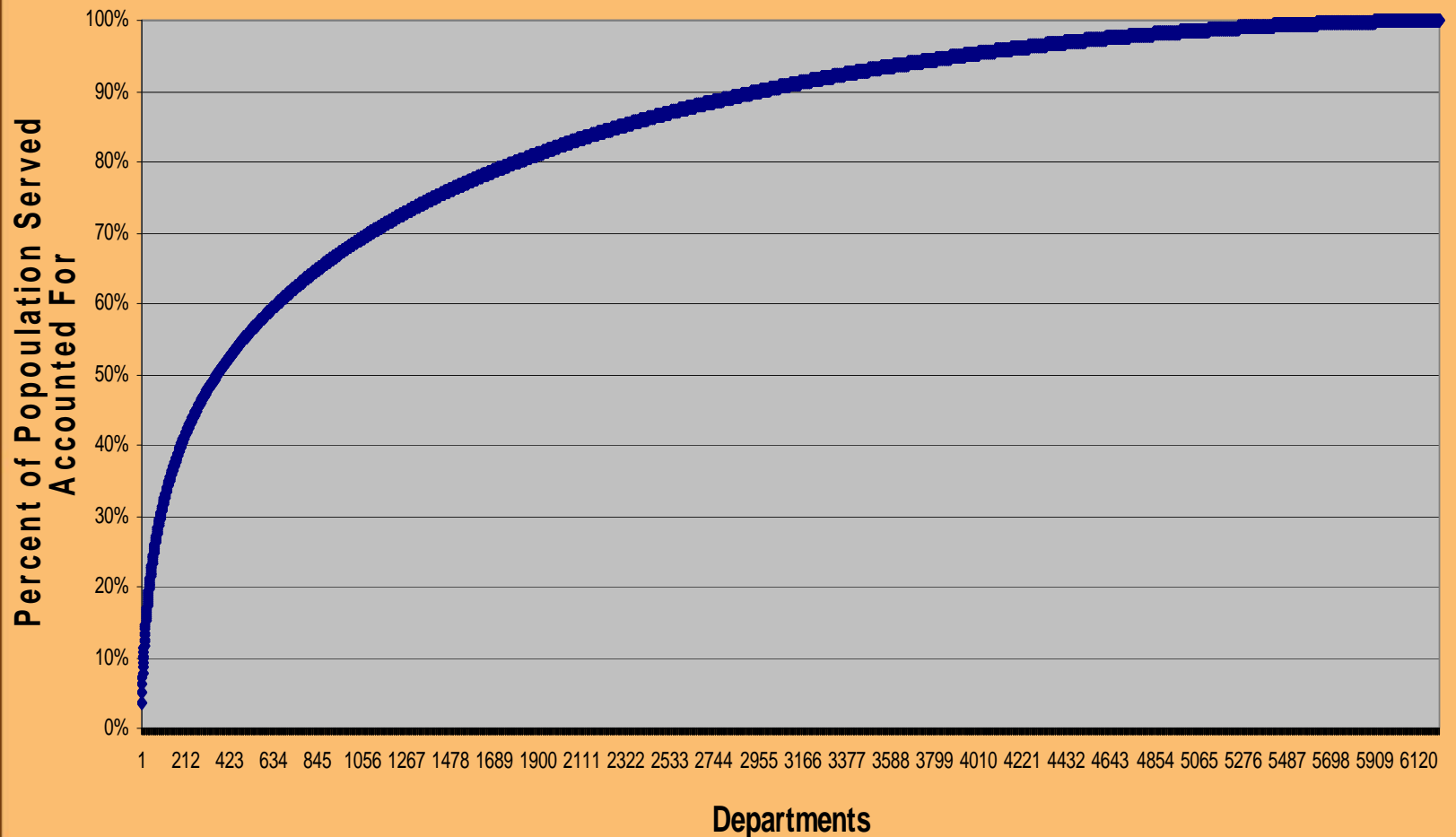




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Survey Design

Cumulative % Distribution of Population Served



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Survey Design

- Department Sample
 - 400 Departments
 - Probability proportional to size
 - Departments selected and notified

- Event Sampling
 - 100 Fire & 100 ALS events per department
 - 6 months data collection

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Website

Fire Reporting System

Firefighter Safety and Deployment of Resources



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Welcome to FireReporting.org

Many departments across the nation are being challenged by budget crises, rising call volume, personnel and equipment shortages, security issues and the overall expectation to do more with less. These and other factors, all too often, have our responding crews encountering increasing line of duty risk of injury and death as they continue to work to reduce civilian injury and property loss. Even with the technological advances of the last decades, we have not yet been able to scientifically quantify our experiences to determine what staffing levels, asset configurations and response time frames are best when responding to various levels of fire or EMS events so that we minimize risk to the firefighters, paramedics and the public. We believe the time has come to change that.

Fire Service Leaders Conduct Study to Improve Fire Fighter Safety and Deployment

The IAFF, IAFC, National Institute of Standards and Technology (NIST), Worcester Polytechnic Institute (WPI) and Center for Public Safety Excellence have partnered to conduct a study to determine what staffing levels, response times and deployment of resources work best when responding to variety of fire or EMS events in an effort to minimize the safety risks to fire fighters, paramedics and the public.

Funded by a grant from the U.S. Department of Homeland Security's Assistance to Firefighters Grant Program (FIRE Act), this study will help develop tools for fire departments to use to better assess the risks in their communities and to deploy resources more effectively and efficiently to match the level of risk.

The results of this study will be especially useful to the many fire departments across the nation that are challenged by budget crises, rising call volume, personnel and equipment shortages, security issues and an overall expectation to do more with less. These and other factors, all too often, lead to an increasing number of line-of-duty injuries and death.

More than 400 fire departments throughout the United States have been selected to participate in this national study. Each department will be asked to participate in the data-gathering effort using a custom-developed web-based form. Although participation is voluntary, all selected departments are strongly encouraged to cooperate so that the integrity of the scientific study is maintained. All data provided will be treated confidentially.

Sample Section

- How were departments selected?

More than 400 career and combination fire departments throughout the United States were scientifically

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Complete Surveys

Background Info Survey

Accurately completing this survey will contribute to better understanding of community risks and hazards and emergency response mitigation strategies, along with improved allocation of fire suppression and emergency medical resources. Thank you for your time and effort.

Press the button to enter data. These questions should be answered at the individual station level and information should be entered only **once** per station. Please do not enter on all shifts.

[Department Survey](#)

[Station Survey](#)

Incident Data Collection Survey

Accurately completing this survey will contribute to better understanding of community hazards and mitigation strategies, along with improved allocation of fire suppression and emergency medical resources. Thank you for your time and effort.

Press the button to enter data for an event.

[Incident Survey](#)

Update Account

Change your user name and password here. Make sure to remember any changes that you make.

[Update Account](#)

[The "Allocation of Resources for Fire Suppression and Emergency Medical Service" Project information](#)

Survey Status

- Cognitive Testing
- Pilot testing
- Usability Testing
- Training Manual Developed
 - Web-X Training
- Deployment Pending

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Field Experiments

- Fire
 - Two story, 2,000 sf residential response
 - Comply with NFPA 1403
 - Technical foundation for NFPA 1710
 - Depth-of-understanding for survey findings



Crew Size



Response
Time



Fire Growth
Rate

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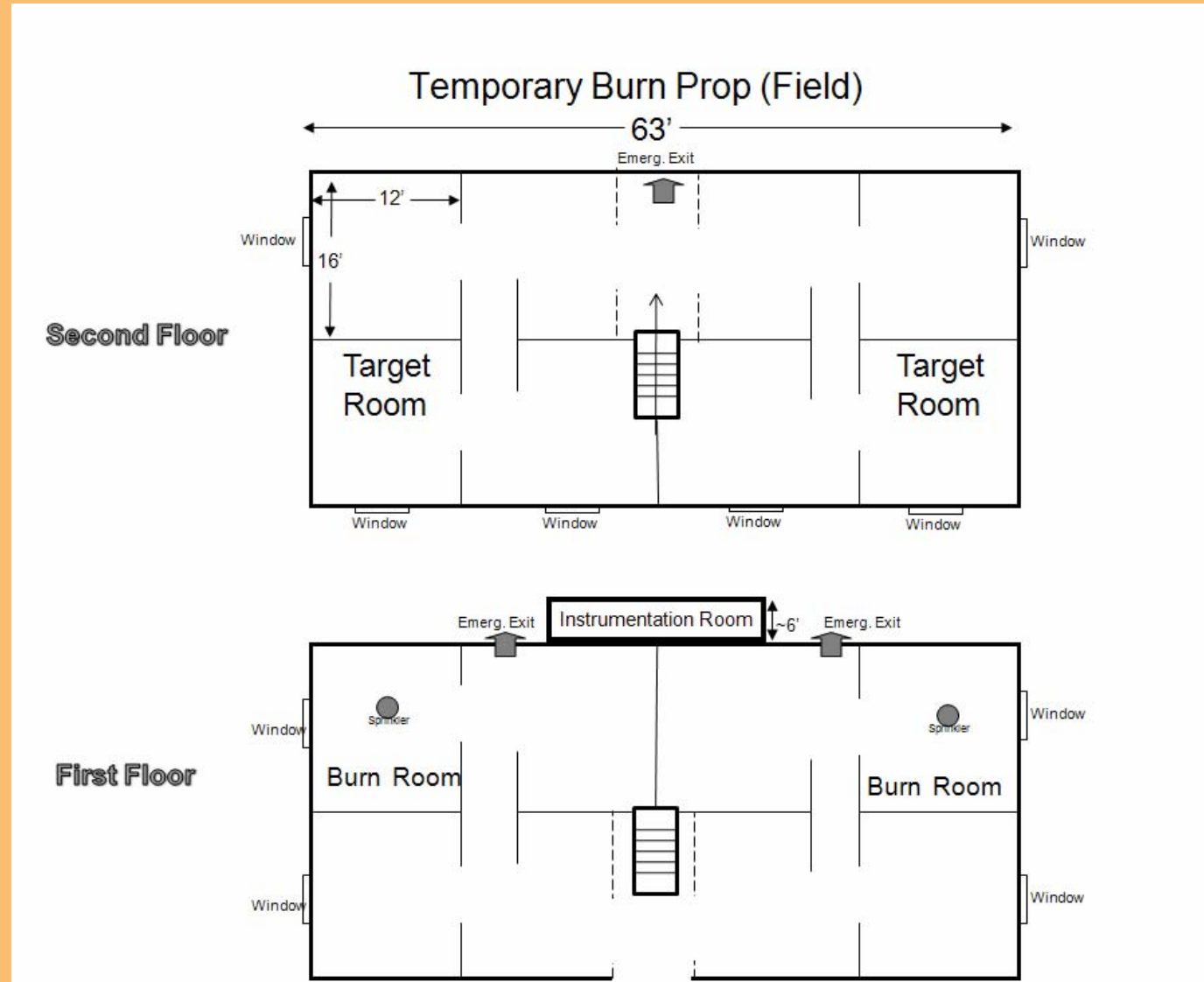
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Burn Prop



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Site Plan



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14 11:05AM



Field Experiments

- EMS
 - Basic system and extremity trauma
 - Cardiac arrhythmia and arrest
 - Interactive ‘Harvey’ mannequin
 - Depth-of-understanding for survey findings

Training

Response
Time

Incident
Type

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We Plan to...

Phase 3 – Pending Funding

- Model and GUI Version
- Validation and Verification Exercises
- Final Report and Model
Documentation and Delivery
- Educational Materials for fire and
EMS operations

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Final Message

➤ The intent of the study is to determine how well the fire service decision makers **match resources to risks** and **what factors are important** in making better decisions about these matches in the future... recognizing that decisions must be made in light of available funding in the community and the level of service the community expects.

➤ The overall goal is to **reduce firefighter injury and death** by making better decisions about resource deployment in a risk filled environment.

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Questions or Comments

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