ELSEVIER | NOVEMBER 2010

SIMULATIONS:

THE FUTURE OF FIRE SERVICE TRAINING

How simulation can improve decision-making, communications & performance under stress

FIRERESCUE

An exclusive supplement to *FireRescue* magazine
sponsored by FLAME-SIM, LLC

You're Paid to be Ready...

Are You Trained to be Ready?

Train Safely

- FLAME-SIM is the latest in training simulation software that is used to train firefighters in a 3D real-time environment which allows them to practice tactical priorities and fireground operations before they put them into practice at a live burn or on the fireground.
  - In a report published by the NFPA **8,145 firefighters were injured during training** in 2008.
  - Fireground operations accounted for **29 of the 108 firefighter deaths** that occurred in 2008.
- With FLAME-SIM firefighters are given the opportunity to perform fireground operations risk free in order to eliminate error which can save their lives.

Train Often

- With the number of fires diminishing, as well as training budgets, firefighters have minimal opportunities to get first hand experience.
  - According to a study by the NFPA, from 2004 to today, the **number of fire incidents in the US has declined by 13%.**
- To improve incident command performance and decision making at critical junctures one department put their firefighters through 3 months of simulation based training with FLAME-SIM.
  - One company officer increased their number working fires as well as Interior Assignments by 600% training with FLAME-SIM.
  - That same Company Officer had never acted as Incident Commander prior to simulation training but at the close of the 3 month training he had acted as Incident Commander 6 times.

Save Money

- A fire department in Texas ran **91 fire personnel through forty four unique FLAME-SIM scenarios in the summer of 2009**, which they ran on their ten seats of FLAME-SIM, a **$15,990 investment.**
- Running nine firefighters in two scenarios a day would have taken that department 233 days of burn tower training at a cost of almost **$111,500* to get the same experience.**

*Amount calculated based upon two sessions per day with nine people in each session and a $500.00 per day burn tower rental; excludes payroll, equipment and maintenance cost.

Phone: (877) FLAME01
Email: Info@flame-sim.com
Address: 2345 Pembroke Ave, Hoffman Estates, Il 60169

Visit us online at www.flame-sim.com

Simulators Help You Train Like It's Real

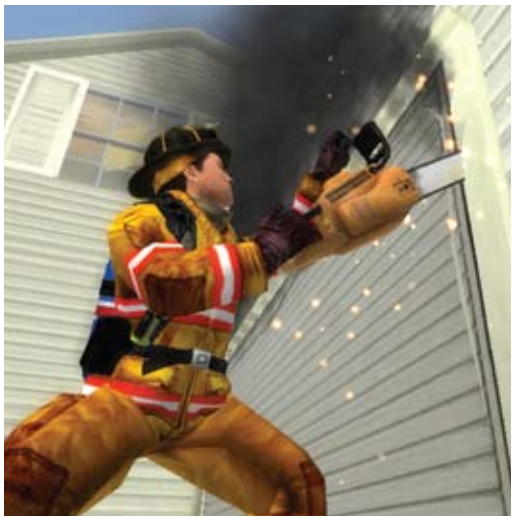


IMAGE FLAME-SIM

On Jan. 15, 2009, Captain Chesley "Sully" Sullenberger and the crew of US Airways Flight 1549 safely landed a commercial airliner in the Hudson River just 6 minutes after being disabled by a flock of Canadian geese. The incident would later be described as "the miracle on the Hudson." But truth be told, this was no miracle. And it wasn't the result of first-hand experience. The survival of those 155 people was the result of standardized, predictable actions developed and refined through training—simulation training.

As the number of fires continues to decline with the advancements of public education, enhanced fire protection systems and early detection/response, so too do the experience levels of firefighters and fire officers alike. Although simulations can't *replace* street-level experience, they can effectively prepare a firefighter or fire officer for the real thing. They enhance crew continuity, refine company-level performance and establish a firm understanding of high-risk, high-stress decision-making comparable to the emergency scene. Modern simulations are fast becoming the tool of choice in developing today's fire officers and their crews for the challenges they will eventually face.

This editorial supplement introduces you to tactical simulations and how simulation training can be used in a cost-effective and realistic training environment. Most importantly, it provides the information you need to build support for implementing a simulation training program that increases your personnel's safety and operational effectiveness on the fireground.

—Timothy E. Sendelbach
Editor-in-Chief, FireRescue magazine

Vice President/Publisher
JEFF BEREND

Editorial Director
A.J. HEIGHTMAN, MPA, EMT-P

Editor-in-Chief
TIMOTHY E. SENDELBACH

Managing Editor
JANELLE FOSKETT

Advertising Director
SHERI COLLINS

Art Director
JASON PELC

Cover Photo
GERT ZOUTENDIJK

Cover Illustration
FLAME-SIM, LLC

Contents

Simulations: The Future of Fire Service Training is an editorial supplement sponsored by FLAME-SIM, LLC and published by Elsevier Public Safety, 525 B Street, Ste. 1800, San Diego, CA 92101-4495; 800/266-5367 (Fed ID # 13-1958712).

Subscription information: To subscribe to an Elsevier publication, visit www.firerescuemagazine.com. Advertising information: Rates are available on request. Contact Elsevier Public Safety, Advertising Department, 525 B Street, Ste. 1800, San Diego, CA 92101-4495; 800/266-5367.

Disclosure of Author Relationships: Contributing authors have been asked to disclose any relationships they may have with commercial supporters of this supplement or with companies that may have relevance to the content of the supplement. Such disclosure at the end of each article is intended to provide readers with sufficient information to evaluate whether any material in the supplement has been influenced by the writer's relationship(s) or financial interests with said companies.

The Science Behind Simulation

Study shows how simulation training program improves incident commander fireground decision-making skills

—By Division Chief Jonathan Boyd & Assistant Chief Kurt A. Hall

A newly promoted captain is en route with his crew to an apartment complex fire. The 911 caller had reported a large amount of smoke coming from one apartment and people trapped on the second floor. Suddenly, the captain realizes that he *is going to be the incident commander (IC).*

Nearing the scene, the captain sees a column of smoke and becomes incredibly anxious. He stammers over the radio, "Engine 3 is out and is command!"

Once the engine pulls up to the building, the captain exits the vehicle and tries to get his bearings. He walks around to the side of the apartment building and sees the first-arriving engine trying to place a ladder to rescue the victims on the balcony. He knows he has to get someone inside with an attack line—and fast.

The arriving units now start stacking up on the captain, ready for assignments. "Engine 6, you'll be Division 2, along with Engine 2; Truck 4, you'll be ventilation," he says over the radio. He needs a second alarm, but he forgot to call for it earlier.

The fire is getting out of control, and interior units aren't making progress. The ventilation group isn't even on the roof yet. Victims have been rescued from the balcony, but there aren't enough resources to search the other apartments and *fight the fire.*

The captain keeps the plan he started with, even though he knows he doesn't have enough resources. He can't think of anything else to do because he's never had to handle anything like this before. Then, a unit on the second floor calls a mayday.

The instructor pushes pause. This isn't an actual fire; it's a simulation. The only thing that's real is the captain's stress level. His hands are still shaking, and sweat is soaking through his shirt. His brain *thought* it was real, and the resulting physiological response hampered his ability to make decisions.

Understanding Decision Science

Traditional decision-making takes place in a static environment where decision-makers have access to vast amounts of information and resources—personal and professional networks, communication technology and the Internet—without time pressures, to evaluate multiple options.

Fireground ICs make decisions in a significantly different environment. They must recognize and appropriately respond to a highly dynamic environment, using their experience and knowledge to coordinate and assign an array of necessary tasks. Their decisions must occur with precision, despite the fact that they're typically made with incomplete information, insufficient resources and under significant time constraints. In short, ICs can't just push a "pause button."

Research shows that while making job-related decisions at structural and/or wildland fire incidents, fireground ICs use naturalistic decision-making (NDM) processes based on their personal knowledge and past firefighting and incident command experience.[1] Other studies have concurred, establishing that ICs use their firefighting experience to make rapid and highly effective decisions through the recognition of and response to situational cues during incident mitigation operations.[2,3] One study finds that fireground ICs will begin the NDM process by completing an initial assessment of the emergency scene, and then evaluating it for familiar patterns.[4] Further, according to my own research (Kurt Hall), which will be addressed later, any recognized patterns are used to establish initial goals and then assign the necessary tasks to mitigate the incident based upon past experiences in similar situations.[5]

Following initial assessment and establishment of the action plan, the IC must continuously assess the environment and accomplished tasks to measure the success or failure of the current plan and anticipate possible

To gain experience, every decision & action must have a consequence, & realistic simulators can provide a majority of this feedback.

required action(s).[6] Continuously assessing the environment supports situational awareness, which in turn supports the NDM process employed by ICs. In fact, the loss of situational awareness can be catastrophic to individuals working in these environments because decision-makers may be slower to identify problems and cannot respond to them in an effective fashion.[7]

With all this in mind, it seems clear that fireground incident command training programs should focus on the incident command system, correct decision-making and situational awareness.

Simulation-Based Training Programs

Dr. Steve Kozlowski, a professor at Pennsylvania State University, has focused his research on the dynamic systems that exist within teams and organizations. His research shows that to have a successfully coordinated outcome, teams operating in the NDM environment must have strong adaptive capabilities to properly assess the situation, the team's performance and the proper timing. He writes, "When one asks how these desired capabilities can be enhanced, the attention naturally turns to training. Yet traditional training systems are not well equipped to address these concerns."[8] In short, traditional classroom environments are not effective in teaching teams how to operate in the NDM environment.

It is therefore important to develop *experiential learning* environments. This type of learning happens during real-life experiences—but also when the team is placed in a simulated environment that's realistic enough for the brain to temporarily suspend disbelief, and when the environment realistically changes based on decisions the team makes.

Enter computer gaming-based simulation systems. These systems allow us to place teams into environments where the virtual world is real enough for teams to interact with the simulated environment. If a team member hits a window with an axe, it opens; if they apply water to a fire, it's extinguished; and if they forget to provide ventilation, then the entire team suffers through low visibility and high heat. The realism of the team environment is a key part of experiential learning, where each team member's decisions affect the team as a whole. Such simulations put teams in real situations without exposing them to any actual danger.

Along with realistic simulated environments, feedback is key to successful experiential learning. To gain experience, every decision and action must have a consequence, and realistic simulators can provide a majority of this feedback. However, simulators will never show *all* the consequences of the real world, so proper instruction and critique are vital to the success of this training.

Our department, the Allen (Texas) Fire Department,

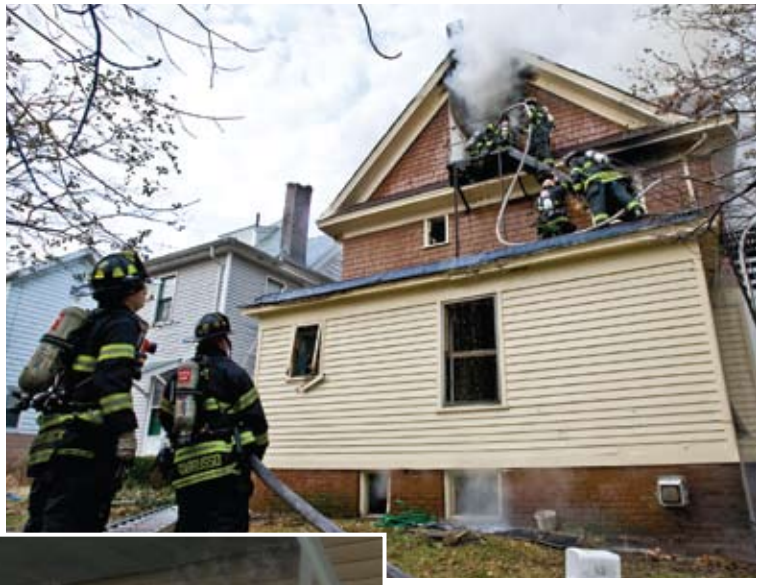


PHOTO MICHAEL J. COPPOLA

IMAGE FLAME-SIM

Fireground ICs must recognize and appropriately respond to a highly dynamic environment, using their experience to coordinate and assign an array of tasks. It is therefore important to develop *experiential learning* environments—something simulation programs can do. This type of learning happens during real-life experiences—but also when the team is placed in a simulated environment that's realistic enough for the brain to temporarily suspend disbelief.

PHOTO RYCHE GUERRERO

Computer gaming-based simulation systems allow us to place teams into environments where the virtual world is real enough for teams to interact with the simulated environment. If a team member hits a window with an axe, it opens; if they apply water to a fire, it's extinguished; and if they forget to provide ventilation, then the entire team suffers through low visibility and high heat—just like the real world.

IMAGE FLAME-SIM

uses simulation-based training that focuses on the basics of fireground organization. First, each team member learns how their actions affect the entire team. Those lessons are then transferred to the next session, which is incrementally more complicated, and this continues until the teams are operating on a simulated multi-family dwelling with significant fire, multiple victims and a mayday.

The instructors are tasked with not only taking notes for the critique, but also providing instant real-time instruction to the team members. We find that the students grasp the concepts quicker when instructors coach them on the proper tactic. Students can then perform the action again, this time correctly—a more effective tactic for gaining experience than learning from their mistakes.

Research Study

Despite a proven track record in industries like aviation, simulation hasn't caught on as much in the fire service, partly because some leaders continue to doubt that it can be effective. Accordingly, for my doctoral dissertation, I (Kurt Hall) set out to test whether simulation was effective in training fire service personnel. I predicted that computer-based simulation could be used to create environments where participants gained knowledge and experience without having to face the hazards associated with live-fire incidents or training.

Read Chief Hall's dissertation at http://tinyurl.com/dissertation-hall

The research design is an accepted academic design. It involves first testing two groups to develop baseline scores. Then one group receives the training while the other group does not. The groups are then retested, and their new scores are compared to their previous scores to determine the effectiveness of the training.[9]

The two fire departments used for the study—the Allen and McKinney fire departments—were similar in their size, equipment operated, services provided and personnel training program philosophies. The participants were experienced firefighting personnel who, by job description (driver/engineers, captains and battalion chiefs), were trained and served as fireground ICs. The 66 participants were divided into two groups—33 in the treatment group (Allen) and 33 in the comparison group (McKinney).

One of the quantitative measurement instruments was used as the pre-test and post-test measurement. NFPA 1561: Standard on Emergency Services Incident Management System and the National Incident Management System (NIMS) were used to create a score sheet to measure how the participants performed compared to the standards. A point value was assigned to each benchmark, and participants received credit for completing each item. The final score was the sum of the points, with 100 being the total points possible.

Each participant from both the treatment (Allen) and comparison (McKinney) groups completed the pre-test using the computer-based simulator. Three fire service professionals, each having considerable fireground incident command experience, scored the pre-test. Each of the individual scores from the evaluators was averaged to obtain a single score for each participant.

Then, over the course of 7 months, the treatment group (Allen) participated in a fireground incident

command training program using a computer-based simulation program. The comparison group (McKinney) did not receive the training program.

After the treatment group (Allen) had completed the training program, all study participants from both groups completed a post-test using the same instrument, computer-based simulation and instrument scorers as were used in the pre-test. Both the pre- and post-test data were coded, tabulated and analyzed statistically.

The results: The participants in the treatment group (Allen) showed a statistically significant average score increase of 12.54 points, or approximately 22 percent, whereas the comparison group (McKinney) did not. Further, the statistical analysis established a correlation between the computer-based simulation training program and the increase in the treatment group's (Allen) post-test scoring.

Conclusions

After seeing the results, it is clear to us that the simulation training program that the Allen Fire Department underwent made a significant difference in the participants' ability to make sound decisions in a dynamic environment with significant time constraints and considerable stressors. In short, this study shows just how powerful simulation-based training could be for the fire service if more departments implemented these programs.

Simulation has already proven successful in the military, aviation and medical industries, so imagine how this training could impact fireground decision-making in real-world environments. After all, training officers around the world have long been frustrated with the difficulty of training firefighters. But we now have a tool that could dramatically change the way we train. Put simply, years of experience may no longer take years.

Division Chief Jonathan Boyd is a 15-year veteran of the fire service with the Allen (Texas) Fire Department, and a proponent of experiential learning through simulation. Boyd studies at the University of Texas at Dallas School of Economic, Political and Policy Sciences.

Kurt A. Hall is an assistant fire chief with the Allen (Texas) Fire Department. Hall earned a PhD in public administration at the University of Texas at Dallas. He is a graduate of the Executive Fire Officer Program and has been designated as a CFO by the Commission on Professional Credentialing. Hall's research expertise is in naturalistic decision theory and simulation training programs.

The authors have reported no conflicts of interest with the sponsor of this supplement. Their department uses FLAME-SIM software.

References

1 Klein, G, Calderwood, R, Clinton-Cirocco, A. Rapid decision making on the fire ground. *Army Research Institute for the Behavioral and Social Sciences*. 1986.

2 Klein, G, Calderwood, A. Decision models: some lessons learned from the field. *IEEE Trans Syst Man Cybern*. 1991;21(5):1018–1026.

3 Lipshitz, R, Klein, G, Orasanu, J, et al. Taking stock in naturalistic decision making. *J Behav Decis Mak*. 2001;14(5):331–352.

4 Klein, G. An overview of naturalistic decision making applications. In *Naturalistic Decision Making*. Zsambok, CE, Klein, G (Eds.). Lawrence Erlbuam: New Jersey. 1997.

5 Hall, KA. The effect of computer-based simulation training on fire ground incident commander decision making. PhD dissertation. University of Texas at Dallas. 2010.

6 Chapman, T, Nettelbeck, T, Welsh, M, et al. Investigating the construct validity associated with microworld research: a comparison of performance under different management structures across expert and non-expert naturalistic decision making groups. *Aust J Psychol*. 2006;58(1):40–47.

7 Endsley, MR, Kris, EO. The out of the loop performance and level of control in automation. *Hum Factors*. 1995;37(2): 381–394.

8 Kozlowski, SWJ. Training and developing adaptive teams: theory, principles, and research. In *Making Decisions Under Stress: Implications for Individual and Team Training*. Cannon-Bowers, JA, Salas, E (Eds.). American Psychological Association: Washington, DC. 1998(115–154).

9 Creswell, JW. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* 3rd ed. Sage: Thousand Oaks, Calif., 2009.

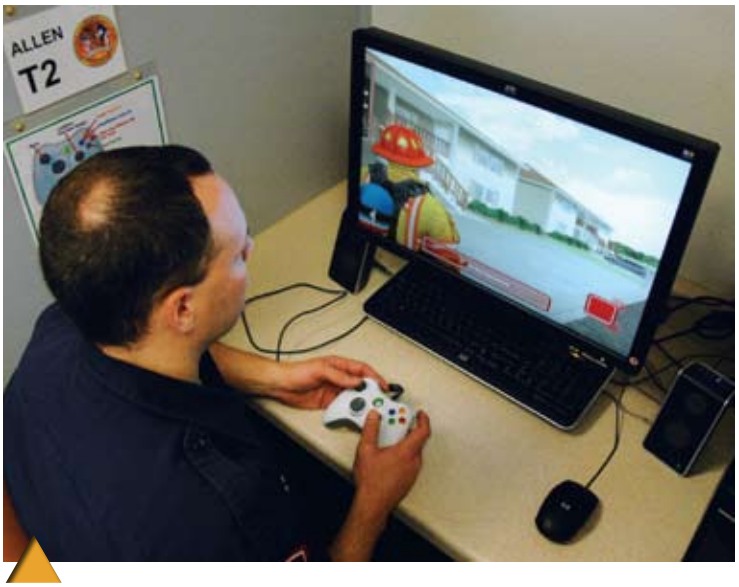


PHOTO ALLEN (TEXAS) FIRE DEPARTMENT

The research study tested whether simulation was effective in training fire service personnel. Two groups of fire personnel completed a pre-test using a computer-based simulator. One group then participated in a 7-month fireground incident command training program using a computer-based simulation program, while the other group did not. Both groups were then retested. The results showed that computer-based simulation could be used to create environments where participants gained knowledge and experience without having to face the hazards associated with live-fire incidents or training.

The Simulator Roundtable

Advice & lessons learned from departments that have implemented simulation training

Building an effective simulation program requires significant planning—deciding where the simulation center will be housed, what software will be used, what the goals of the program will be, and more. In a roundtable discussion, several fire service leaders who have implemented or are in the process of implementing simulation training share tips on executing this type of program. Following is an excerpt of the feedback from Steve Walton, division chief of training for the Henderson (Nev.) Fire Department; Tim Capehart, fire technology coordinator for Bakersfield College in Bakersfield, Calif.; Frank Odermann, assistant fire chief for the Billings (Mont.) Fire Department; and Mike Clemens, assistant chief for the Montgomery County (Md.) Fire & Rescue Service. For the complete article, visit www.firefighternation.com/page/simlulations-the-future-of.

Briefly describe your simulation technology.

Steve Walton (SW): Our simulation program is focused on incident command functions. Our simulation technology runs commercially available special-effects software using video and still images. Each scenario runs off of one computer with eight video cards, which send the images to separate screens where officers are stationed for the exercise.

Frank Odermann (FO): We have an Incident Command System (ICS) Training Center. The training is delivered via gaming software that uses Xbox technology and gaming hardware.

Mike Clemens (MC): We use three types of simulation training: a human patient simulation lab, a driver training simulator and a command development training center, where we teach and test all our certified chiefs in incident command competencies each year.

Tim Capehart (TC): We use incident command training software that we're considering installing in a tractor-trailer rig so it can be towed around from station to station. We hope to use simulations in company-level training, promotional exams, post-incident analysis, implementation of SOPs, etc.

What funding resources are available to tap into for simulation technology?

FO: The Billings ICS Training Center is funded through donations from agencies that we interface with through mutual aid and incident management (i.e., local refineries, the county's health department).

SW: We were able to secure an Assistance to Firefighters Grant (AFG). This helped with computer hardware and software, scenario development and personnel training costs.

TC: The Bakersfield and Kern County fire departments have a contract with Bakersfield College, so we were able to purchase our system with college funds.

How do you build support for a simulation program among line firefighters? Among administration/city officials?

TC: I believe the folks in the field have to see the practical relationship to what they do on calls, and how practicing different types of calls in a simulator will build more confidence when they respond on actual calls. The software must provide a certain level of realism. Administration/city officials, on the other hand, will react more to the cost savings that simulations can provide while at the same time keeping companies available in their first-in areas. Finally, the training bureau must buy in to the concept.

FO: A real advantage that we've used to attain buy-in is the availability of video tutorials and program evaluations available on our software manufacturer's website. A picture speaks a thousand words, and seeing is believing.

SW: Our goal is safe and effective emergency scene operations. The simulation program is one of the pieces that support that goal. All of the stakeholders share the goal and, therefore, all of the stakeholders support the various ways we seek to support it. We had typical resistance to change and suspicion of a new process, but allowing participants to provide feedback in the process and adapting according to their feedback was also critical in

gaining buy-in and support for the simulator program.

What's the first step in integrating simulations into your training program?

TC: Before installing the system, you must evaluate the capabilities of your existing hardware and factor in how you will train the folks in the field on how to use the software.

SW: The development of objective performance expectations as well as performance measurement instruments was critical. We went out on the road and visited other departments that had simulator programs in place and learned from them.

FO: For us, the first step in the integration of the ICS Training Center will be to familiarize our personnel with the new technology. The next step will be to train our battalion chiefs and training officers to operate the equipment and conduct training evolutions. Training for company officers will follow and include a minimum expected level of competency in ICS, with emphasis in areas like scene size-up, communications, appropriate utilization and deployment of resources, fireground strategy and tactics, and personnel accountability.

What challenges should be expected in integrating simulation training?

SW: One challenge is to find a few technical experts who can help build the system that will work best for you. You also need to find tech-savvy firefighters (officers if possible) to build the scenarios, based on accurate building construction, fire behavior, deployment and other department-specific factors.

Another challenge is communicating with all of the command officers in the creation of the scenarios, as well as consistent teaching and evaluation methods for each scenario type.

MC: The Help Desk has always been useful. Sometimes you might need a company's IT person to make a site visit to work out a problem.

What are some of the logistical aspects of integrating simulation training?

MC: Location: mobile vs. fixed; curriculum; building resources, such as lighting, power, air, security and computing power; monies for educating your instructors, students; and more than anything, schedule!

SW: You need to select a location that can accommodate the audio/visual needs of simulation as well as all the instructors, evaluators and participants.

TC: The decision we're faced with is, do we build the simulator into a couple of classrooms, or do we install it in a tractor-trailer that can be taken out into the field, thus keeping apparatus in their first-in areas?

FO: Another thing to think about is whether your center will be open to other departments.

Simulations come in many formats and program types. What do you believe is most successful and why?

MC: Scenario-based learning works the best. Letting the student be hands-on and integrate what they have learned is paramount for ingraining knowledge. You can keep costs down by doing smaller scenarios that focus on one aspect of learning.

SW: The ability to drop in community-specific photos is very important, as is portability (ability to push simulations out to stations via the Internet) and the ability to insert realistic fire, smoke, hazmat, etc. As long as the simulations are supported by SOPs and adequate instruction, the format does not need to be elaborate.

IMAGE FLAME-SIM

TC: A simulator that allows you to be interactive offers users a more realistic experience.

What differences are you seeing in fire crew performance since implementing a simulation program?

SW: We've noted a more confident and safe workforce and a higher degree of effectiveness of on-scene operations due to reduced second-guessing of expectations.

MC: We've seen an improvement in the students' levels of confidence and professionalism and their ability to learn best practices by doing it without the chance of getting hurt or doing damage to any property. It gives real-time feedback to the students. Each student can be tested and evaluated at the same scenario, and it validates the training and testing. Students can make mistakes in a virtual-reality world without injuring a patient, burning down a structure or doing damage to an emergency vehicle.

Make It Real

Key elements to consider when building simulation programs for your department—By Battalion Chief Steve Prziborowski

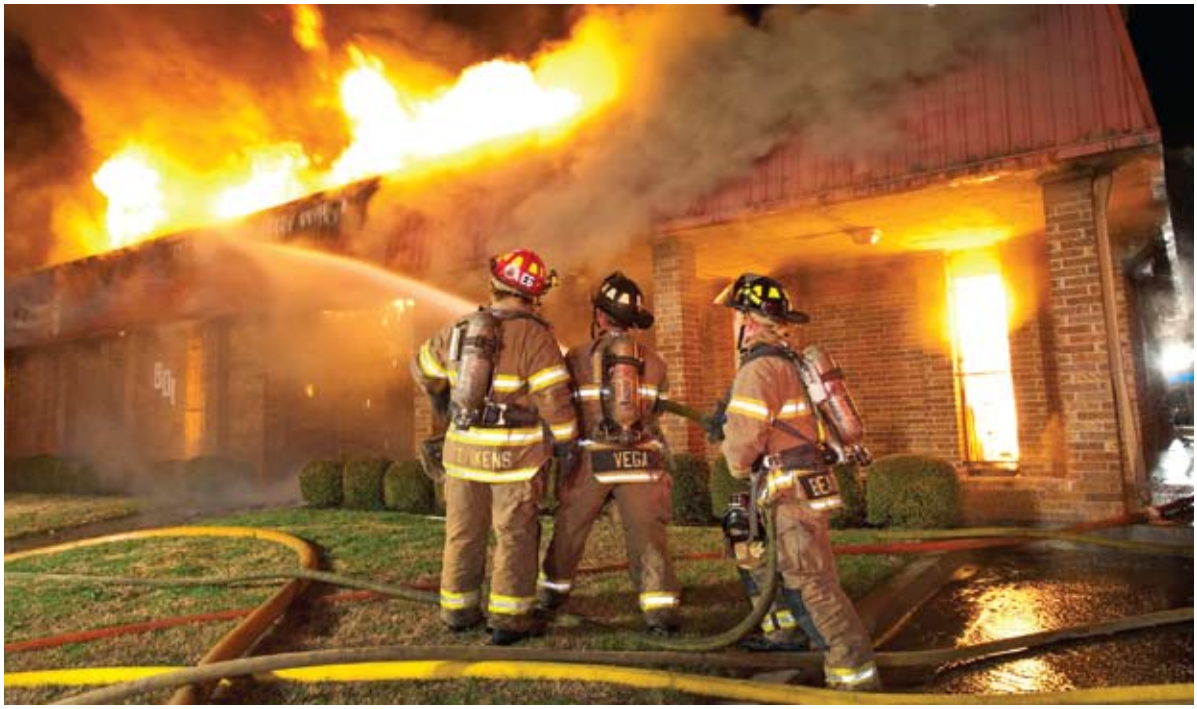


PHOTO GLEN ELLMAN

With the number of actual fires we're responding to on the decline, it's extremely challenging for firefighters and officers to gain real-world experience. Although live-fire training is one option, it can be complex and difficult to conduct and, of course, there are inherent risks.

To combat these challenges, some fire departments, such as the Phoenix Fire Department and the Sacramento Metropolitan Fire District, have constructed full-fledged command training centers. But you don't need to build a fancy command training center to create high-quality training scenarios. All you need are some dedicated personnel who are willing to learn and a good software package. That's right, *software*.

Targeted Learning

Computer-based simulations can fill the gap between classroom learning and real-world experience. They're the closest thing to real-life experience as one can get, allowing officers the ability to train and evaluate personnel to ensure that they're ready to take on the challenges of the modern fireground.

A key benefit of command simulations is the depth of what can be measured. Rather than a single firefighter at a command console, effective simulation is about running through scenarios as a crew so that each member is learning what they need to about their specific role. Specifically,

- Firefighters learn decision-making skills as they demonstrate their ability to prioritize specific tasks.
- Company officers learn discipline and coordination among themselves as well as how to effectively communicate the tactical aspects of their decisions while maintaining crew continuity and accountability.
- Incident commanders (ICs) learn to verbally manage and communicate their strategic objectives.

Key Simulation Elements

With this in mind, following are some elements to consider when building simulations for your department.

Objectives: Well-designed objectives are perhaps the most important element of any simulation. You need to establish what you want to get out of each session. Do you know the strengths and weaknesses of your personnel? If so, you can focus your efforts on those areas in need of improvement. If not, consider starting with very basic goals and objectives.

Some examples of skills to test in a command simulation include, but are not limited to:

- Strategic and tactical decision-making;
- Hoseline placement;
- Apparatus positioning;
- Strategic/tactical objectives;
- Radio reports on conditions (first on scene, CAN reports, follow-up reports, etc.);
- Size-up/critical fireground factors (COAL WAS WEALTH, WALLACE WAS HOT, FPODP, etc.);
- Establishment of command;
- Command and strategic mode determination;
- Incident priorities;
- Assigning of companies/personnel;
- Incident benchmarks and notifications; and
- Knowledge of department standard operating procedures (SOPs).

SOP Alignment: Keep in mind that for command training to be successful, it must be built on the SOPs used in the department's everyday operations. This creates the "playbook" on which training is based, and also creates consistency in training.

Evaluation: Before conducting a simulation exercise with actual students, have some mock students or fellow instructors run through it to see if you're meeting your goals and objectives. Something may sound great on paper or in your mind, but once you get started, it may not play out exactly as you expected.

Time: Simulations should last anywhere from 30 seconds to 30 minutes depending on the number of skills you want to evaluate. Anything longer than 30 minutes in one sitting will probably be too taxing for all parties involved.

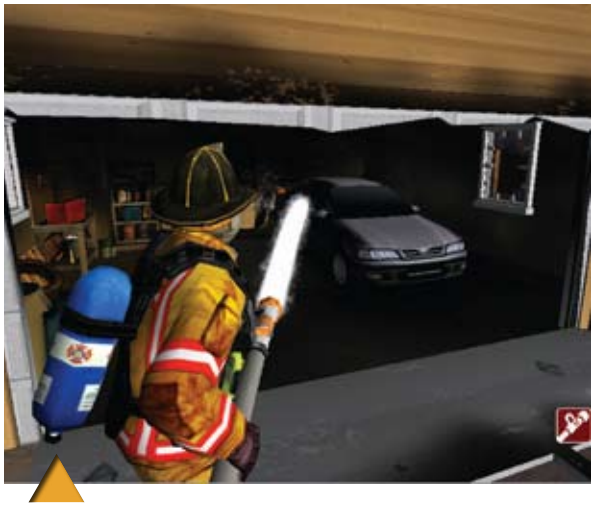
Immediate-Need Challenges: Properly run simulations can provide as much or as little stress for the student as you want. To assist with evaluating how an individual and/or crew would manage a stressful situation, I suggest adding what I call "immediate-need challenges" to the simulation. Examples of immediate-need challenges include:

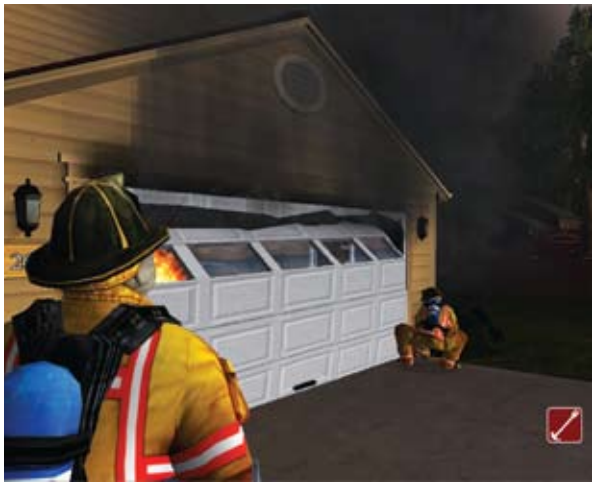
- Firefighter down/missing/trapped;
- Exposure problems (embers causing fires to exposure buildings);
- Civilians in need of rescue, shelter-in-place or just calming;
- In-your-face people, such as an irate citizen, the city manager, a city council person, a law enforcement officer, a victim's family member, a member of the media wanting an interview, etc.

All of these challenges are meant not only to add some real-life stress, but also to actually evaluate how the individual and their respective crews would manage such scenarios.

Roles: Simulations allow students to practice different roles to see how that changes their responsibilities on the fireground. Anyone can try their hand at being the first-arriving company officer or chief officer. You can determine if you want someone to be an engine, ladder or rescue company officer.

Additionally, are you going to have one person use the simulator at a time or do you want multiple candidates operating simultaneously, each playing a different role? Look for simulation packages that offer you

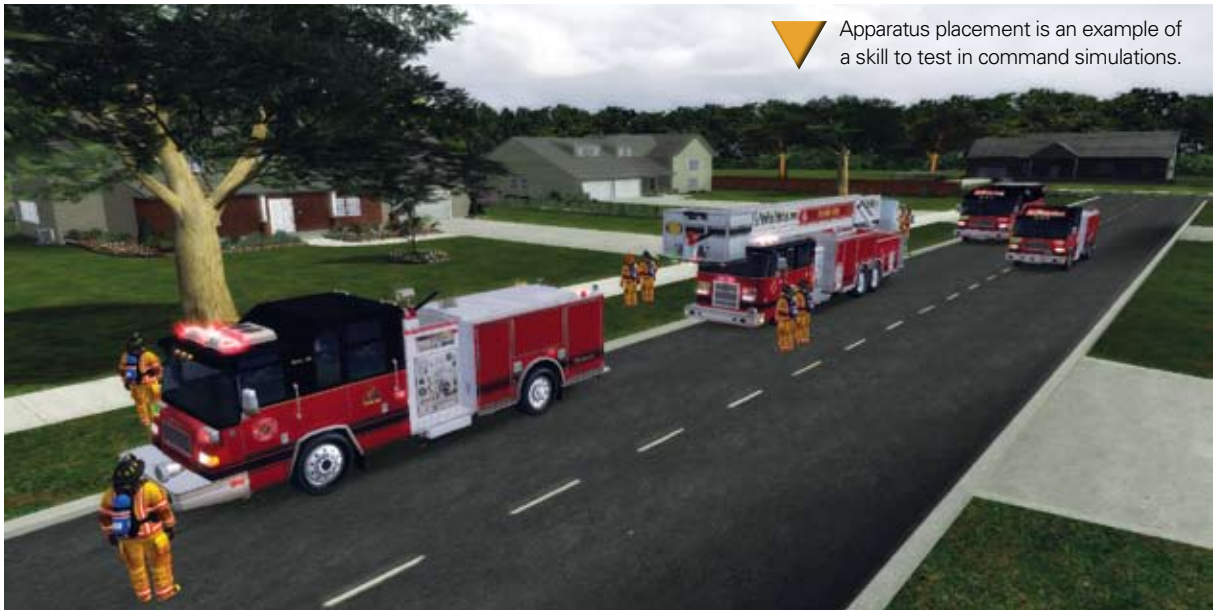




IMAGES FLAME-SIM

An effective simulation is about running through scenarios as a crew so that each member is learning about their specific role. Specifically, firefighters learn decision-making skills related to prioritizing specific tasks, like fire attack on a car fire (left), while ICs learn to verbally manage and communicate their strategic objectives, like directing crews to force entry (right).

Simulations that can evaluate various ranks of personnel at the appropriate levels (strategic, tactical or task) are valuable training tools that can be used over & over again.



Apparatus placement is an example of a skill to test in command simulations.

IMAGE FLAME-SIM

the ability to simultaneously evaluate multiple roles, including firefighters, engineers, company officers and even chief officers. In my opinion, simulations that only allow one person (typically the first-arriving officer as the IC) to participate are missing the mark.

Paperwork: Simulations can be very effective for getting new officers comfortable with documentation and evaluating the use of department documentation. Possibilities include tactical worksheets, incident command forms or white board systems used on command vehicles.

Follow-up Questions: After the simulation is finished, consider asking the students some follow-up questions:

- What (if anything) would you do differently?
- Did you have enough resources on scene?
- Why did you do this or that (a chance for the individual to defend or justify what they did or did not do)?
- Describe to us your objectives, your strategy, your tactics, your ICS structure, etc.

Simulation Termination: A properly designed simulation would not be complete without a proper debriefing session that allows all participants the opportunity to state what they did, what they would do differently, what they felt went well, etc. It should also allow for feedback from the instructors as to what they felt went well and what could have been done differently.

Final Thoughts

Simulations have been proven by the airline industry to successfully prepare pilots for the challenges they may face in the sky. It only seems appropriate, then, that similar programs would offer considerable benefits to the fire service. When effective objectives are created and applied in simulations, fire service personnel can offer standardized and consistent training, while improving decision-making skills and providing measurable outcomes. In sum, simulations that can evaluate various ranks of personnel at the appropriate levels (strategic, tactical or task) are valuable training tools that can be used over and over again. And they make up for the real-world experience that many of today's firefighters are missing.

Steve Prziborowski is a battalion chief for the Santa Clara County (Calif.) Fire Department, with more than 18 years of fire service experience. He's an adjunct faculty member at the Chabot College Fire Technology Program, where he has been teaching fire technology and EMS classes since 1993. Prziborowski is a past president of the Northern California Training Officers Association, and was named the 2008 Ed Bent California Fire Instructor of the Year. He is a state-certified Chief Officer and Master Instructor, and has earned an associate's degree in fire technology, a bachelor's degree in criminal justice and a master's degree in emergency services administration. He is currently in the last year of the Executive Fire Officer Program at the National Fire Academy, and has received Chief Fire Officer Designation through the Commission on Professional Credentialing.

The author has reported no conflicts of interest with the sponsor of this supplement.

Simulation Pays Off

Colorado department's simulation training directly contributes to the safe & efficient mitigation of a real mayday event—By Fire Chief Steven M. Gillespie

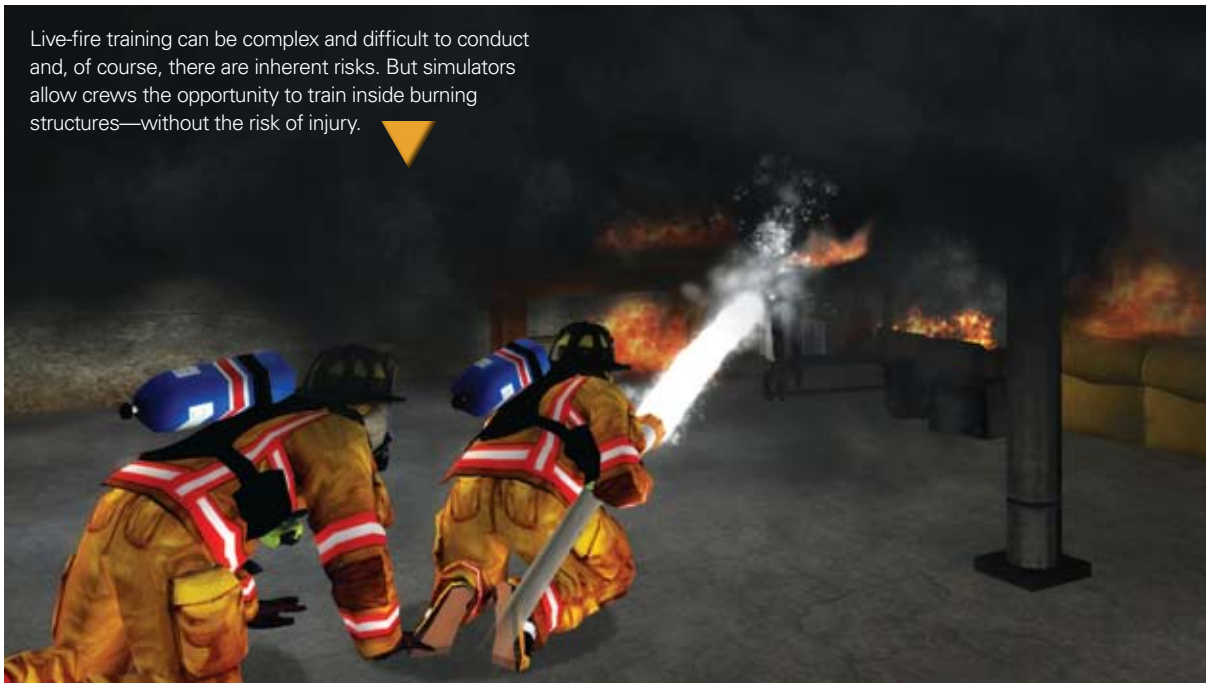
On Nov. 21, 2009, the Wheat Ridge (Colo.) Fire Protection District responded to a reported residential structure fire. According to the after-action report, within minutes of initiating interior operations, two members lost their primary means of egress and encountered a rapidly advancing fire. As a result, they initiated a mayday. During the subsequent rescue effort, the two members of the interior team and one firefighter working on the exterior sustained minor injuries. All three firefighters were treated and released from the hospital that night.

Although three firefighters sustained injuries during operations, the important thing is that they survived. And I believe that the department's incident command training related to mayday procedures, held in our district's simulation lab, directly contributed to the safe, efficient and proficient mitigation of this event within minutes of the initial mayday call. (For more about this incident, see the sidebar "Real-World Scare" on p. 15.)

It's All About Decision-Making

But why is this type of training so effective? Psychologist Gary Klein's research on recognition-primed decision-making tells us that people make decisions based on recognized patterns stored in their memories—patterns that are the result of previous experiences.[1] These experiences allow the decision-maker to develop an "action script," which is the game plan, or incident action plan, for any given situation. Prior to initiating an action script, people run a sort of mental simulation to determine an outcome. If the outcome of this mental simulation is favorable, the action script is implemented. If the mental simulation is not favorable, an alternate mental model is developed.

Additionally, according to Barbara Sorensen's article, "Decision Superiority Process Model," the ability to *implement* an action script is dependent on being able to acquire the right information at the right time and transfer that information into actionable knowledge.[2] Simply put, you have to know what's happening to



Live-fire training can be complex and difficult to conduct and, of course, there are inherent risks. But simulators allow crews the opportunity to train inside burning structures—without the risk of injury.

IMAGE FLAME-SIM

By being proactive in the use of simulation training & coaching our members to success, there is no question that we have enhanced the operational effectiveness of our membership.

understand what to do. Sorensen finds that the ability to develop an effective action script is dependent on situational awareness, relevant and accessible information, and experience (previous frame of reference).[2]

It's also important to know that decision-making is influenced by an individual's ability to manage stress. According to Kelly Wolgast's research, under times of duress, people have difficulty accessing "stored" information, and two factors—bounded reality and convergent thinking—hinder the decision-making process. Bounded reality is the inability to accurately judge what's happening (situational awareness). Convergent thinking is the narrowing of options or solutions to problems. When confronted with stress, inexperienced decision-makers default to making decisions that are "good enough"—they put into action the first thought/solution that comes to mind. This generally happens in situations involving extreme time constraints, when decisions need to be made in rapid sequence.[3]

Wheat Ridge Starts Simulating

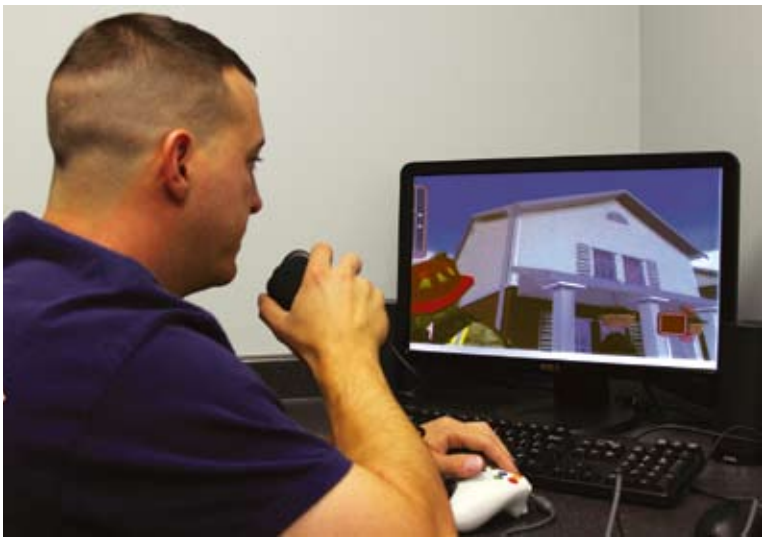
With all this information about how people make decisions—and considering the costs associated with live-fire training—our fire district actively sought ways for the membership to gain experience in incident command, fireground tactical decision-making and stress management.

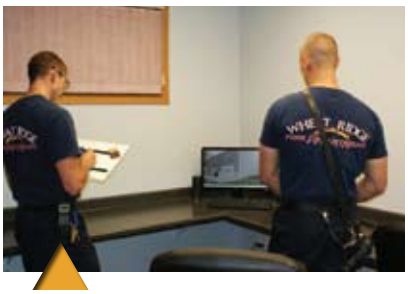
When weighing our options, we considered that, although new to the fire service, simulation training has a long-standing record of success within the aviation industry and military. As such, we decided to make it a part of our department's training methodology.

The district purchased a multi-user dynamic simulation software program and constructed a simulation-training laboratory. We purposefully call the training area a *laboratory* because the training consists of running simulated fires in a controlled environment to develop our crewmembers' cognitive decision-making process. Further, through the continual use of the system, we're developing pragmatic decision-makers by experimenting with multiple simulated scenarios, thus enhancing crewmembers' ability to recall "previous experiences" and developing a safe, effective and proficient action script.

All company-level and chief officers are currently required to complete a 32-hour simulation training program. Training focuses on the decision-making process, situational awareness, incident command, communication and the ability to develop and modify an incident action plan based upon "cues" given to the incident commander (IC) by role-players or the incident itself.

Using a sequential learning process, participants begin with "smaller" incidents and progress to large-scale multi-alarm incidents up to and including firefighter mayday events. Company-level personnel must complete four incidents as the first-due officer (initial IC) and serve as the rapid-intervention team (RIT) officer on two simulated mayday events. Chief officers are required to complete 10 incidents as the overall IC, four of which include multi-alarm





PHOTOS WHEAT RIDGE (COLO.) FIRE PROTECTION DISTRICT

Our district purchased a multi-user dynamic simulation software program and constructed a simulation-training laboratory where we can run simulated fires in a controlled environment to develop our crewmembers' decision-making process.

Real-World Scare

Lieutenant credits simulation training with saving his life

On Nov. 21, 2009, two members of the Wheat Ridge (Colo.) Fire Protection District found themselves in a dangerous environment, having lost their primary means of egress and facing a rapidly advancing fire. Fortunately, just hours before the call, these members had completed the 32-hour simulation training program required for the department's company-level and chief officers. One of the critical components of this training involves when to call a mayday. Having just completed this training, the lieutenant in trouble was able to properly identify that he was in a mayday situation and made the call. He later indicated that had he *not* had this training—training that reinforced over and over again that there should be no hesitation in calling a mayday in situations like the one he faced—he may have waited much longer to call for help. The lieutenant credits the simulation training with affecting his willingness to make the call and, ultimately, saving his life.

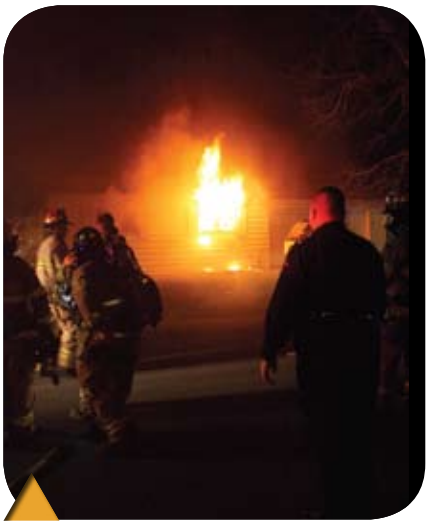


PHOTO WHEAT RIDGE (COLO.) FIRE PROTECTION DISTRICT

One year ago, two of our department's personnel had to call a mayday while working this residential structure fire. I believe the firefighters survived the close call because of the simulation-based training those members had conducted just hours before the event.

assignments and mayday events.

Given the rarity of mayday events, crews receive invaluable training on recognizing and calling a mayday. Simulation training reinforces the district's standard operating procedures/guidelines (SOPs/SOGs) as the principle building blocks for calling, acknowledging and mitigating a mayday event.

As with all simulations, mayday training is based on the decisions of the IC and company-level personnel. Simply put, each simulation is unique to its own set of circumstances based on the decisions of those operating within the simulation. Plus, the key learning objectives center on the modification of the incident action plan to mitigate two separate events simultaneously: a working fire and an active firefighter rescue.

The Bottom Line

Of course, simulation training should not be considered the end-all cure-all—firefighters still need to conduct live-fire training and practical, hands-on drills. However, our experience with simulation training has been extremely positive, leading me to believe that it should be a part of every organization's leadership development toolbox.

As for us, our district's use of simulation training serves one main goal: Develop the decision-making capabilities of our members. By being proactive in the use of simulation training and coaching our members to success, there is no question that we have enhanced the operational effectiveness of our membership. And although an objective score sheet is utilized to gauge performance within the training program, there is no better testament to the transference of knowledge from a virtual environment to a real-world environment than avoiding a double line-of-duty death during the course of a "routine" residential structure fire, like we did on Nov. 21, 2009.

Chief Steven M. Gillespie started his fire service career in 1992. He joined the Wheat Ridge Fire Protection District as the training officer in September 2008 and was appointed fire chief on May 4, 2009. Gillespie is a certified firefighter, fire officer and paramedic. Additionally, he has an associate's degree in fire science technology, a bachelor's degree in organizational leadership and a master's degree in executive fire service leadership, and is currently pursuing a doctorate of education in organizational leadership.

The author has reported no conflicts of interest with the sponsor of this supplement. His department uses FLAME-SIM software.

References

1 Klein, G. The recognition-primed decision (RPD) model: Looking back, looking forward. In C.E. Zsambok & G. Klein (Eds.), *Naturalistic Decision Making*. Lawrence Erlbaum Associates: Mahwah, N.J., 1997.

2 Sorensen, BH, Madni, AM, Madni, CC. Decision Superiority Process Model. *Journal of Integrated Design and Process Science*. 2008;12:37–46.

3 Wolgast, K. Command Decision Making: Experience Counts. *U.S. Army War College Strategy Research Project*. 2005.

FLAME-SIM™

Virtual Training

FLAME-SIM is the latest in 3D real-time simulation software technology that is bringing cost effective training to fire departments across the US and Canada and revolutionizing the fire service industry. The virtual training brings the challenges and stress of the fireground to life which effectively transcends lessons learned to the live fire scene.

Below are a few of the tactics, communication, and decision making skills that are being trained with FLAME-SIM to better prepare Incident Commanders and firefighters for the fireground.

Scene Size-Up

- Brief description of the incident situation
- Assumption, Identification and Location of Command
- Declaration of strategy to be employed

Tactical Priorities

- Exposures
- Confinement
- Extinguishment
- Overhaul
- Ventilation

Fireground Operations

- Groups and Divisions
- IRIT/RIT
- Accountability
- Rehabilitation
- Support Vehicle

Real Results

- Studies have shown that using computer based simulation training can increase Incident Command decision making efficiency and accuracy on the fireground by 20% across the entire department.
- Training with FLAME-SIM regularly can double a firefighter's understanding of **command-driven fireground tactics.**
- Departmental surveys have shown that FLAME-SIM users rate the simulation software training higher than other incident command training they have previously recieved.
- Departmental surveys have shown that after training with FLAME-SIM the vast majority of firefighters feel **more confident with their decision making skills as an Incident Commander.**

Phone: (877) FLAME01
Email: info@flame-sim.com
Address: 2345 Pembroke Ave, Hoffman Estates, IL 60169

Visit us online at www.flame-sim.com