J8.2 USING THE WARNING EVENT SIMULATOR

John T. Ferree and Elizabeth M. Quoetone
National Weather Service / Warning Decision Training Branch

Michael A. Magsig
Cooperative Institute for Mesoscale Meteorological Studies
Warning Decision Training Branch

1. INTRODUCTION

Over the last ten years, considerable research has shown that simulations are particularly effective in closing the gap between training and performance. Case studies from the Departments of Defense and Transportation to companies as diverse as Target, Bennigan's, and Ameritech demonstrate simulations not only improve retention rates, but result in measurable improvements in job performance (Schank 1997).

"25 Hours of quality simulation can achieve about two years of experience" (Rosenheck 1997). The key word in this statement is "quality." Improvement in job performance is *highly* dependant on the content and quality of the simulation. Scenarios or simulations can be a very effective way to gain experience with software, hardware, data set interpretation, applied science, and the integration of all these with the human(s) in control. To add value and increase expertise, however, invest additional thought into the design of the simulation. The goals of the simulation should be considered when orchestrating the content.

The Warning Event Simulator recently deployed at National Weather Service Forecast Offices (Magsig and Page, 2001) provides the first opportunity for personnel at these offices to develop their own local simulations. In the authors more than ten years of experience in designing simulations for WSR-88D Operations Courses, we have developed some insight in how to better optimize the simulation to meet the goals of the training. In this paper we have attempted to catalogue some training strategies for those developing and delivering simulations.

2. LOCAL vs. REMOTE

Some offices will prefer to run simulations on data from their own radar using their own localizations. This method can help forecasters get familiar with the predominate weather they can expect in their area. It can also help forecasters become familiar with their local geography and is especially good for a beginner or newly arriving forecasters. However, this method can also be detrimental if the forecaster is familiar with the data set and ends up "playing the game" versus working the event.

Corresponding author address: John T. Ferree, Warning Decision Training Branch, 3200 Marshall Ave, Suite 202, Norman, OK 73072 (405) 366-6560 x 4266, email: John.T.Ferree@noaa.gov

Running simulations using data sets from other areas can pose a challenge in geography, but can also allow for evaluation of the decision making process, independent of the forecaster's memory or experience. It also allows forecasters to experience weather types they infrequently encounter.

Regardless, there are benefits to doing both types of simulations. Good decision making is good decision making, independent of the data sets. All feedback should focus on the reasoning behind the decision (is it sound?), not solely on verification.

3. SIMULATION LEVELS

We list four examples of ways to run simulations (averaging 30 minutes to two hours in length). Each method achieves a different training goal.

3.1 - Novice Level (or newly arriving forecasters)
Simulation runs from start to finish **without interruption**. The Warning Forecaster (WF) issues products at their convenience. The training officer does not interact with the WF during the simulation.

What is accomplished? : The WF can become more proficient at running warning generation software, running procedures, and manipulating data sets. They can become more familiar with local geography.

3.2 - Beginning Level
As the simulation begins, the WF issues products as they are able. **At specific points**, the training officer pauses the simulation to discuss challenging or complicated decision points. Training officer and WF discuss the data available at the stopping point and spend time interpreting data and discussing possible decisions and their expected outcomes.

What is accomplished? : A new WF with the help of an expert can become more familiar with data interpretation and the process of weighing information to arrive at a decision. They can also learn about ways to handle uncertainty and make the best decision given the data available. The training officer can also illustrate ways to better manage data and screen real estate. They can discuss the type and content of warnings. The WF and the training officer work through the process of critical decision making together.

3.3 - Intermediate Level

As the simulation begins, the WF issues products as normal. The training officer pauses the simulation **randomly** and queries the WF as to the state of the situation: which storms are severe, which are intensifying, and why, and what is likely to happen during the next 30 minutes (and why?).

What is accomplished? : This simulation is a way of not only assessing the WF's interpretation of what is happening, but also whether they have good situation awareness (SAGAT Technique, Endsley 1988). They should discuss their reasoning. If the reasoning is faulty, help them recover. If they have poor SA, investigate the reasons why (did they get behind? poor use of workstation real estate? ineffective procedures? improper conceptual models? poor environmental assessment?)

3.4 - Challenging Level

Run the simulation without interruption with the WF issuing products as normal. County warning area may be sectorized and another WF added to help with the workload. A third person can be added to act as coordinator (or the training officer can perform this task). The training officer provides reports and phone calls requesting information or assistance that require a response. Conflicting information is presented (e.g., reports that the radar does not support). Training officer should interject problems for the warning forecaster or coordinator to handle such as: primary radar goes down, workstation locks up, warnings aren't being transmitted, etc. They should include **anything** that can happen in a real life setting (for example, high risk or "key" decision points such as when to transition to generator power). Using examples from your forecasters' own experiences can personalize this. Similarly, any naturally occurring glitch (either in the hardware or software) can be used as a learning experience. For example, even if the computer crashes, it can be an opportunity for the WF to simulate the procedures for handing off most office functions to adjacent offices, as can happen when the office is disabled.

What is accomplished? : The challenge is putting it all together under stress. This simulation focuses on the highest level of performance and critical thinking skills that should be present with an expert warning forecaster. If more than one forecaster is present, one may be performing at an expert level allowing someone capable, but less experienced, to participate as a second forecaster. The WF(s) can experience stress, time limits, equipment and personnel challenges that if not handled correctly can derail the effort. WF(s) have to resolve conflicting information and constantly re-prioritize the demands for their time. Success depends on how well they work with each other and how well they can communicate. Feedback on their decisions, whether they involve data interpretation or situation management, should be given at the end of the simulation. This feedback should be a combination of their input and observations (self critiquing can be very beneficial), and any insights the training officer may have to offer. Include what could be done better and what challenges were handled well. Be aware that sometimes the training officer can learn more from the expert WF in these simulations than they can impart! Learning what the expert does when they do their job well is an opportunity to design simulations around these skills.

4. SUMMARY

Defining training goals to match specific forecaster needs is critical to the design and development of an effective simulation. The benefit gained addressing forecaster needs is far greater than if the focus is on the right outcome without regard to the soundness of the decision making.

Developers can use the same data set for different levels of simulation from novice to expert. Time and effort is better spent in optimizing the simulation experience to meet the training goals than in researching new data sets.

Well-designed simulations have resulted in measurable improvements in job performance in several fields. If properly utilized, the Warning Event Simulator offers an opportunity to improve job performance in the National Weather Service.

6. REFERENCES

Barron, Tom, 1999: **Simulation gets real.** *Technical Training* (November/December)., 12-17

Endsley, Mica and M. D. Rodgers, 1988: **Situation Awareness Global Assessment Technique (SAGAT):** *Proceedings of the Human Factors Society 32nd Annual Meeting,* 97-101

Klein, G., 1988: **Sources of Power: How People Make Decisions**, The MIT Press, 330pp

Magsig, Michael A and Elizabeth M. Page, 2001: **Development and implementation of the NWS Warning Event Simulator Version 1.0.** *Preprints Interactive Symposium on AWIPS,* Orlando FL, Amer. Meteor. Soc. (This preprint)

Rosenheck, Marty, 1997: **Closing the gap between training and performance.** *CBT Solutions* (May/June)., 50-53

Schank, Roger, 1997 **Virtual learning: a revolutionary approach to building a highly skilled workforce.** McGraw-Hill: New York, NY., 86-89.