



Simulations in AWOC

Advanced Warning Operations Course
Facilitator Workshop – II

Part 1 – Simulation Theory

Part 2 – Evaluating Performance in Simulations

Warning Decision Training Branch –
October 2011

AWOC students get a subset of this material



Optimizing Learning

Advanced Warning Operations Course
IC Core 1
Warning Decision Training Branch



IC CORE 1: Optimizing Learning

Combines elements of:

1. Learning strategies
2. Simulations in AWOC
3. LMS

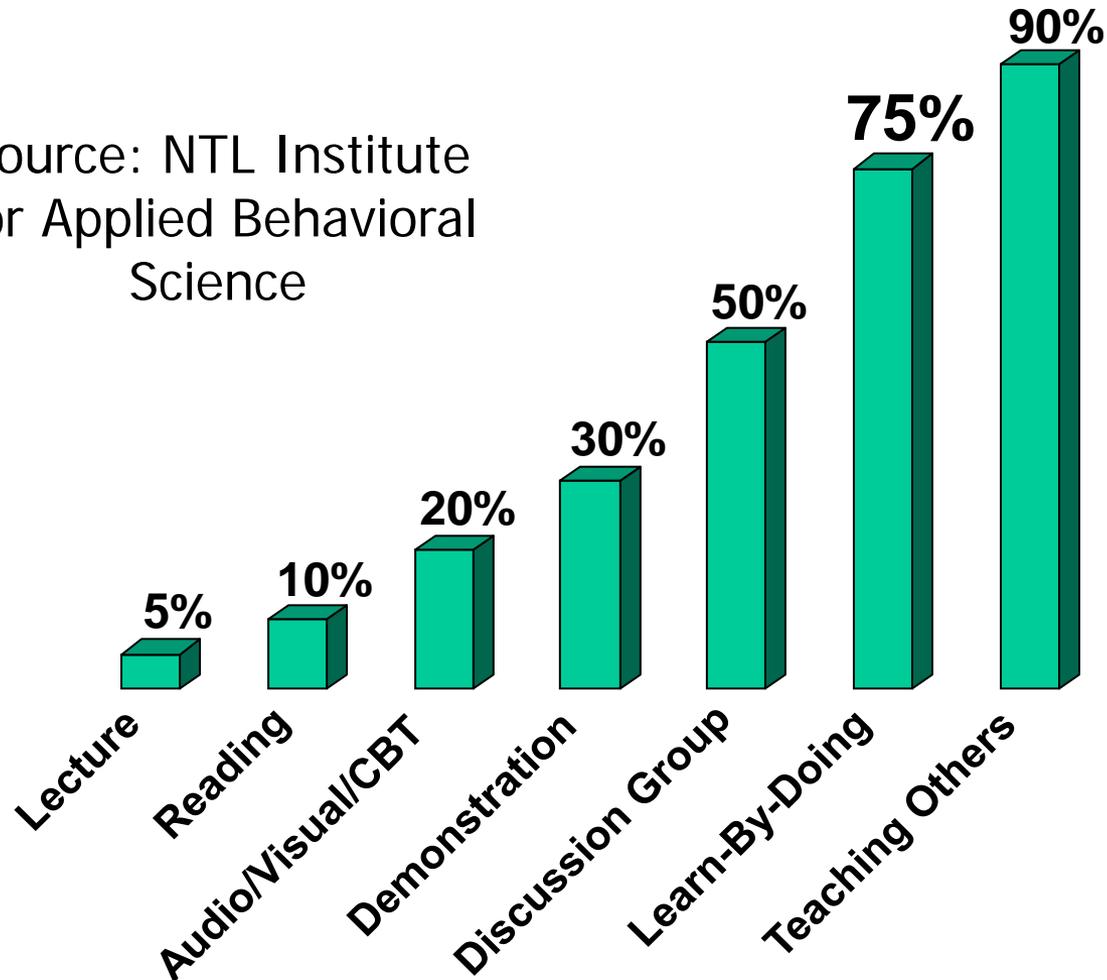
Simulations Improve Job Performance

- Flight Simulators
 - *Department of Defense*
 - *NASA*
 - *All Major Airlines*
 - *Flight Schools*

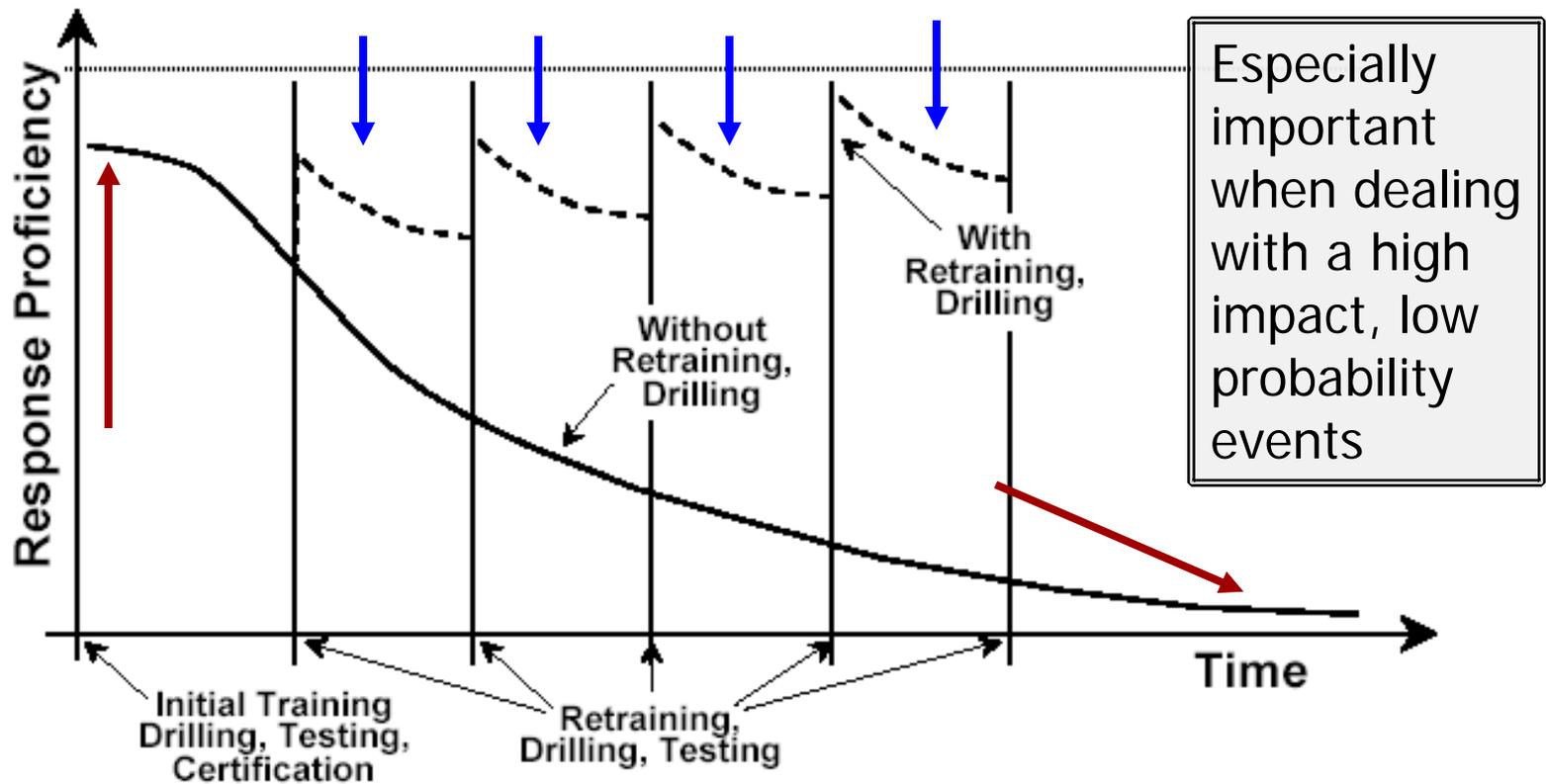


Simulations Deliver Better Understanding and Retention

Source: NTL Institute
for Applied Behavioral
Science



Simulations...a way to gain/retain expertise

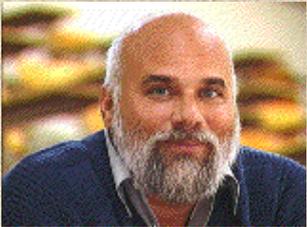


From "Human Error Evaluation and Human Reliability Analysis"; B. J. Bell; American Institute of Chemical Engineers

Simulator – Not Enough

“...feedback offered by the simulator is not enough...the evaluator must provide feedback to help students understand the results caused by their actions.”

- Dr. Roger Schank, Director Institute of Learning Service, Northwestern University



What Is a Simulation?

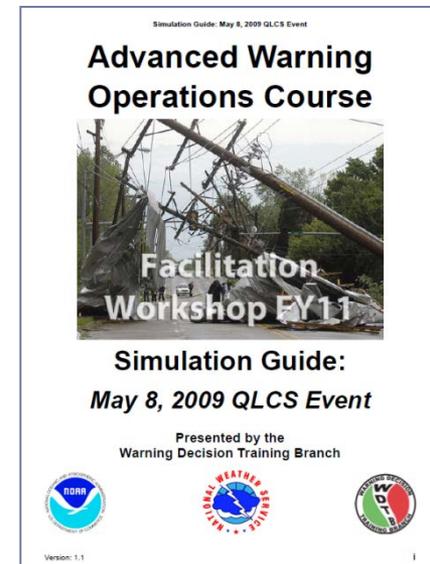
Context

Task

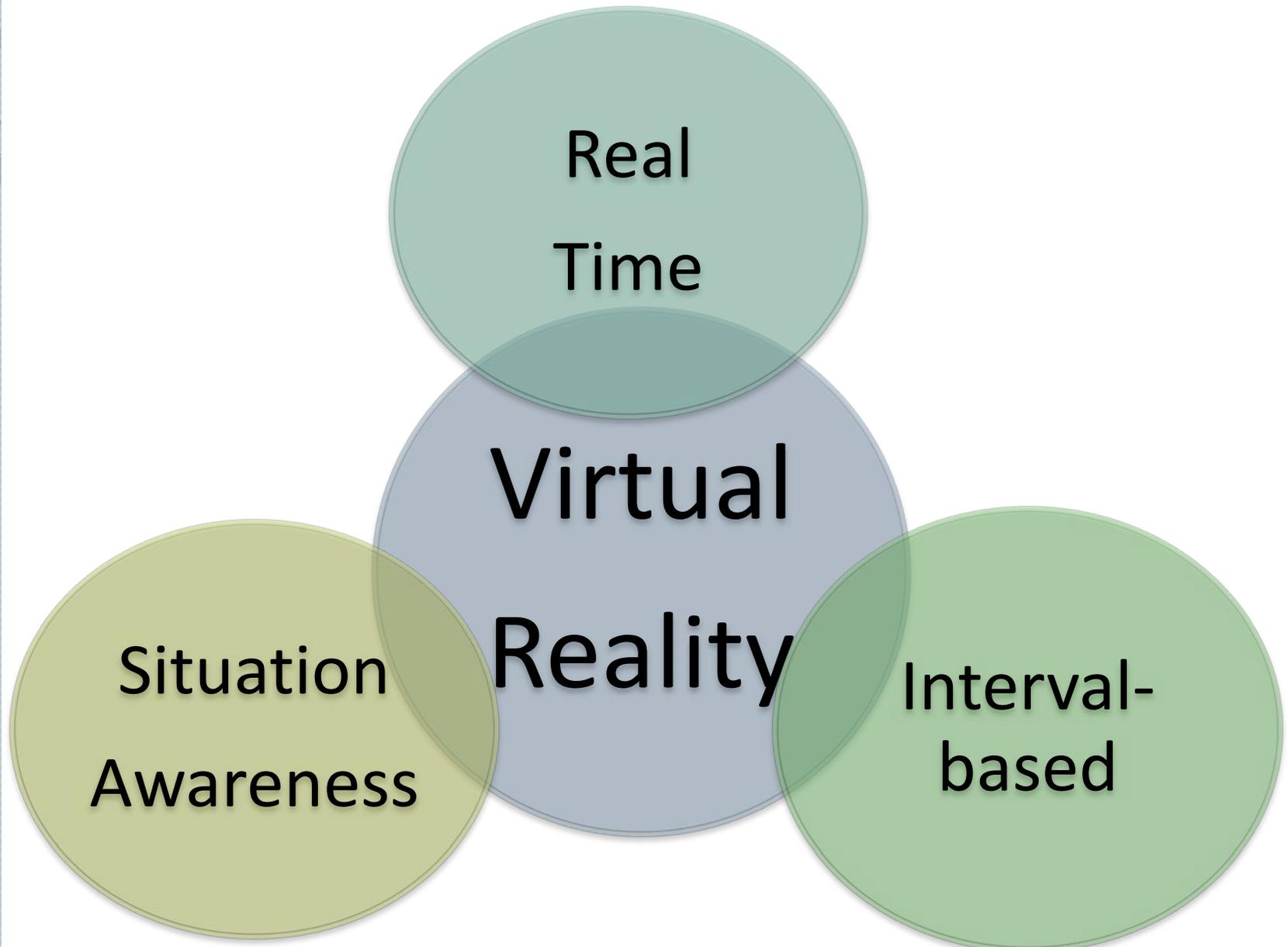
Feedback

Support

- Specific Context
 - *Focused Learning Objectives*
- Meaningful Task
 - *How long?*
- Natural or Exaggerated Consequences
- Supporting Resources



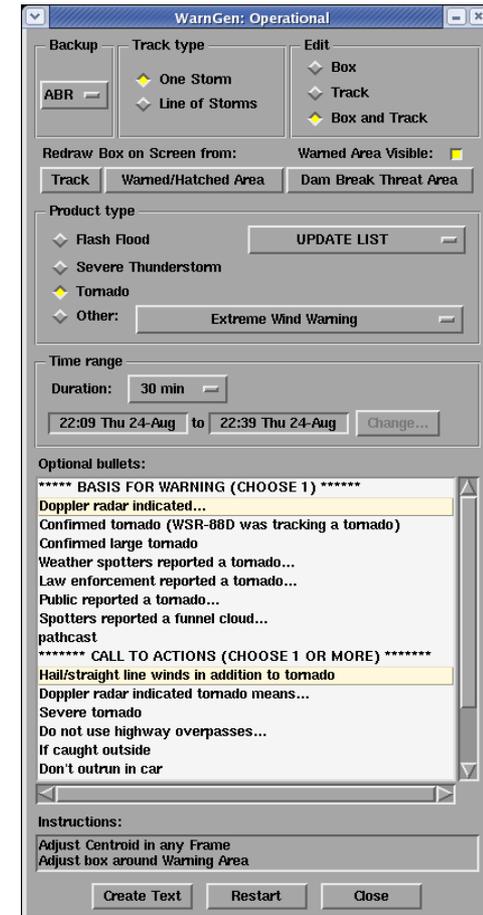
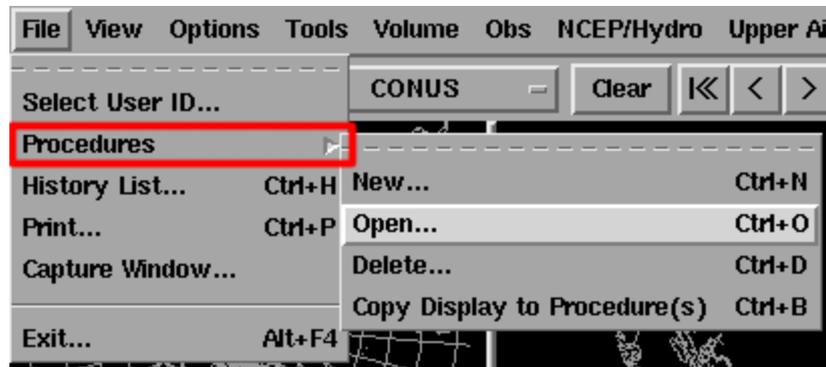
Types of Simulations in AWOC



Real-time Simulation

- Learning objectives relate to:

- *Mastering technology*
- *Developing routines/methodology*
- *Practicing new software*
- *Familiarization: procedures geography, topography, etc.*



Real
Time

Virtual
Reality

Situation
Awareness

Interval-
based

Interval-based Simulation

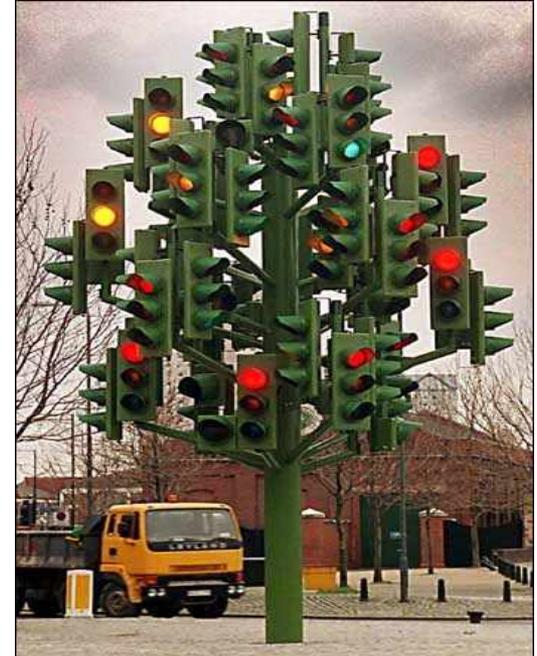
- Pause at decision point
 - *Pre-determined or situation dependant*
- Discuss possible decisions and their expected outcomes
- Maybe you resume, maybe you don't

Real
Time

Virtual
Reality

Situation
Awareness

**Interval-
based**



Interval-based Simulation

- Learning objectives relate to:
 - *Weighing information*
 - *Handling uncertainty*
 - *Developing critical thinking skills*
 - *Applying concepts over an extended time period (winter weather or flood events)*



Real
Time

Virtual
Reality

Situation
Awareness

**Interval-
based**



Situation Awareness Simulation

- Simulation paused randomly.
- Warning forecaster queried:
 - *State of the situation?*
 - *Which storms are severe?*
 - *What is likely to happen during next 30 minutes?*

Real
Time

Virtual
Reality

Interval-
based

Situation
Awareness

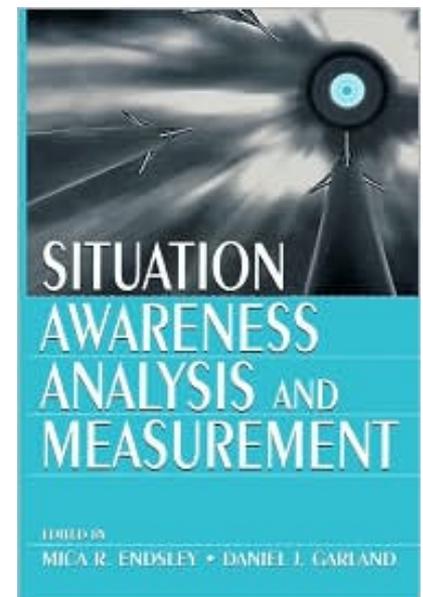
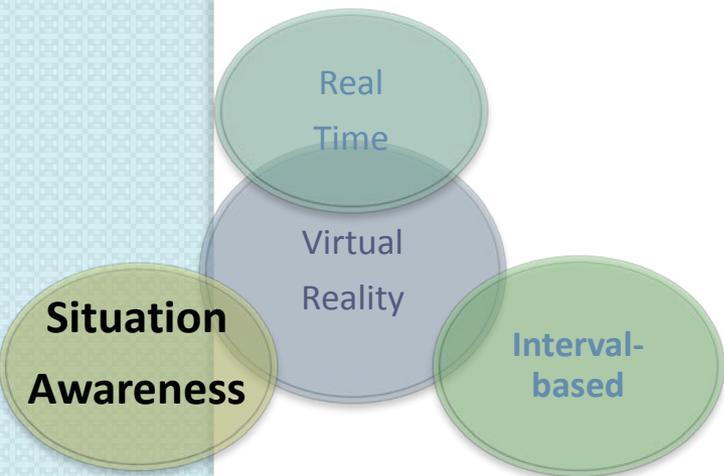
The screenshot shows the 'WES II Bridge' software interface. The window title is 'WES II Bridge'. Below the title bar, there is a tab labeled 'bigCaseAug'. The interface contains several sections for configuring simulation parameters:

- Case Name:** Name: bigCaseAug
- Case Description:** Name: August 2009 Big case
- Case Time:** Case Start Time: 2009-08-26 12:00, Case End Time: 2009-08-27 12:00
- Load Time:** Start Time: 2009 / 8 / 26 - 12 : 0, End Time: 2009 / 8 / 27 - 12 : 0
- Simulation Time:** Start Time: 2009 / 8 / 26 - 17 : 45, End Time: 2009 / 8 / 26 - 21 : 0

At the bottom of the interface, there are four buttons: 'Start Simulation', 'Save Macro', 'Load Macro', and 'Reset'.

Situation Awareness Simulation

- Learning objectives relate to:
 - *Assessing and practicing situation awareness skills*
 - *Anticipating events that may change decisions*
- Useful for measuring SA impacts of new tools and techniques



Virtual Reality Simulation

- Clock running
- Incoming reports, phone calls, etc
- Problems are interjected
 - *Conflicting information is presented*
 - *Anything that can happen in a real life setting*
 - *Everything is an opportunity to problem solve*

Real
Time

Virtual
Reality

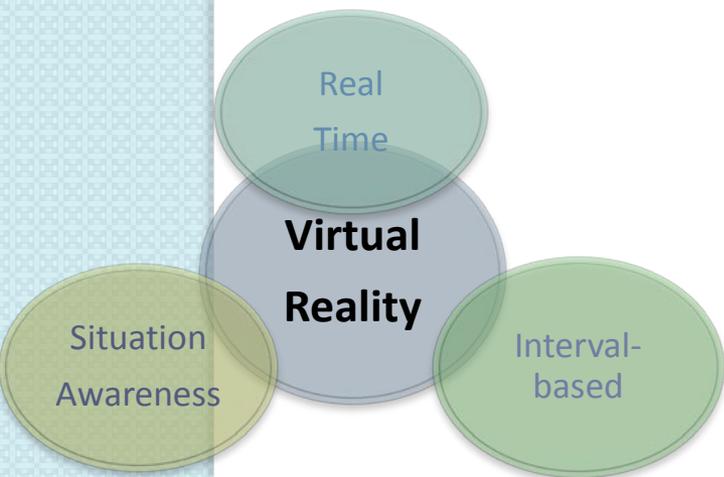
Interval-
based

Situation
Awareness



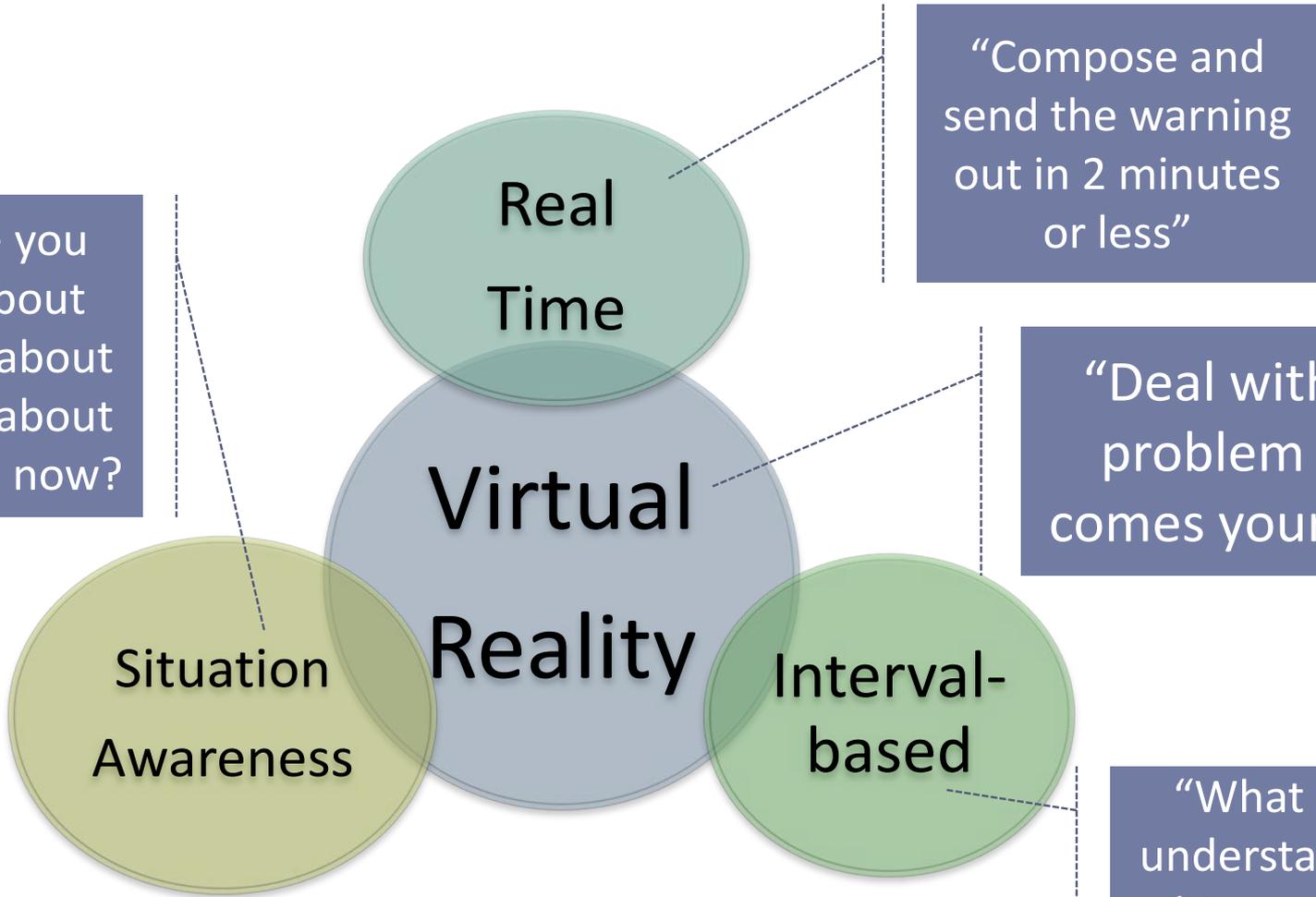
Virtual Reality Simulation

- Objectives:
 - *Simulate stress, time limits, equipment and personnel challenges*
 - *Practice team work and communications*
 - *Practice backup procedures*
 - *Respond to the unexpected*



One case – all four simulations

“What are you worried about now? How about now? How about 1 hour from now?”



“Compose and send the warning out in 2 minutes or less”

“Deal with any problem that comes your way.”

“What is your understanding of this conceptual model?”



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Warning Decision Training Branch –
May 2011

Simulations in AWOC

Use Collaborative Development of Expertise (CDE)*

*Klein Associates

- Domains studied to develop this concept:
 - *Navy Aegis class ships*
 - *NICU nurses*
 - *Army National Guard*



Result: On-the-Job Training process for trainer/trainee *team*

CDE Goal

- Advance expertise and critical thinking skills through a trainer-trainee partnership
- Do this by:
 - *Setting the right learning climate*
 - *Defining roles and responsibilities*



CDE strategies for the trainer

- Ask open-ended questions
- Tell what he/she should be considering
- Pass on your experience
- Give feedback
- Offer prompts



Setting the right climate

- In an learning environment, it is safe to:
 - *admit lack of knowledge*
 - *voice confusion*
 - *talk to superior about those things without repercussions*
 - *ask ANY question*

“In some theories of learning, errors form the critical events that allow learning to take place.”



Roles and responsibilities of the Trainer

- Develop a clear set of learning objectives
- Provide motivation
- Provide opportunities for questions
- Observe and evaluate and progress and the effectiveness of the training materials



Roles and Responsibilities of the Trainee

- Active participant
 - *not passive receiver*
 - *stakeholder in his/her own progress*
- Receives rules of engagement and strategies to be active participant



What does this look like in action?

- Trainer needs to know that trainee is actually gaining the knowledge and skills
- Confirm that the training simulation is an effective tool in teaching the desired skills



Example 1: Virtual Reality Simulation

1. Prebrief of exercise
 - Establish goals of simulation
2. Training exercise
 - Trainer fills out OAR form during simulation
3. One-on-one debrief
 - Trainee fills out self-evaluation (OAR) form
 - Then trainee and trainer discuss perspectives
4. Team debrief (optional)

Observation and Assessment Record (OAR)

Trainer Form – Filled out during event

Trainee _____ Observation and Assessment Record (OAR) Date _____ Trainer _____
Trainer Form

Challenges	Examples of what trainee is doing: Good	Examples of what trainee is doing: Other
<i>Science</i>		
- Understanding/Applying Conceptual model		
- Discriminating severity		
<i>Technology</i>		
- Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)		
- Use of data sets		
<i>Human Factors</i>		
- Getting/Maintaining SA		
- Managing workload		
- Threat communication to public		
- Managing sectors/ <u>boxology</u>		
Follow up actions:		

OAR Form – What filled out form might look like (trainer)

Trainee LizQ Observation and Assessment Record (OAR) Date 6/10/04 Trainer Joe

Trainer Form

Challenges	Examples of what trainee is doing: Good	Examples of what trainee is doing: Other
Science		
- Understanding/Applying Conceptual model	Caught on to the potential for <u>supercells</u> . Recognized cyclic nature as seen in radar data	Did not consider nature of training echoes and potential impact on FF
- Discriminating severity	Good job with tomodo threat	Large A report – failed to correlate with TBSS
Technology		
-Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)	Good use of ALLTILTS feature, 4panels	Warning sent with bad motions. Difficult to keep warnings straight with orientation of <u>stms</u>
-Use of data sets	Noted boundary interactions in <u>mesonet</u> data near tomadic storm	Not accessing other radars very often. Not looking at <u>precip</u> data
Human Factors		
- Getting/Maintaining SA	Initially very well with regard to tomodo threat.	Needed additional radar data on storms in south part of CWA (<u>lvl 1</u>). No monitoring of FF threat (<u>lvl 2</u>).
- Managing workload	Did well early on.	Needed to ask for help with unexpected reports came in.
- Threat communication to public	Communicated tomodo threat well. Kept steady stream of SVS's	Disregarded large hail report – didn't see radar support.
- Managing sectors/ <u>boxology</u>		A difficult situation...needed better coordination for storms moving across sectors
Follow up actions:		

OAR Form Trainee Form – To be filled out after event

Trainee _____ Observation and Assessment Record (OAR) Date _____ Trainer _____

Trainee Form

Challenges	How am I doing?				Specific Examples from Scenario
	Great	OK	Shaky	Clueless	
<i>Science</i>					
- Understanding/Applying Conceptual model					
- Discriminating severity					
<i>Technology</i>					
-Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)					
-Use of data sets					
<i>Human Factors</i>					
- Getting/Maintaining SA					
- Managing workload					
- Threat communication to public					
- Managing sectors/ <u>boxology</u>					
What would you do different next time? (Filled out with trainer after debrief)					
Follow up actions you'd like to take:					

OAR – What filled out form might look like (trainee)

Trainee Liz O

Scenario Debrief Worksheet

Date 6/10/04

Trainer Bill

Trainee Form

Challenges	How did I do?				Specific Examples from Scenario
	Great	OK	Shaky	Clueless	
Science					
- Understanding/Applying Conceptual model	X				Expected a long duration cyclic <u>supercell</u> and kept warnings on storm
- Discriminating severity			X		Hail size in warnings over southern sections was different than reports
Technology					
-Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)		X			Handled <u>WARNGEN</u> but sent out some bad motions. <u>Alltilts</u> used extensively and showed good rotation in <u>tornadoic</u> storms.
-Use of data sets			X		Didn't look at other radars very often. Didn't check <u>precip</u> til report came in
Human Factors					
- Getting/Maintaining SA		X			SA would have been improved by alternate radar view (<u>shd</u> have done earlier). Report of ff a total surprise. Good job in tornado threat.
- Managing workload			X		Wasn't able to investigate storms in south part of CWA very well (too busy)
- Threat communication to public		X			Tornado <u>threat communicated</u> but <u>hail size</u> not correlated (see above). Missed ff.
- Managing sectors/ <u>boxology</u>				X	Total mess trying to coordinate boxes with adjacent sector
What would you do different next time? (Filled out with trainer after debrief). <u>Sectorize</u> differently (or more quickly change sectors if not working). Look more often at alternate radars (would have shown TBSS and might have included higher hail size in warning). Always include FF monitoring in routine, even if not expected (farm out if too busy)					
Follow up actions you'd like to take: Work on developing some procedures to help with other radar views. Develop ff monitoring					

Example 2: Interval-based simulation using “SADRT “

Situation Awareness Decision Requirements Tool: A tool to assess SA during a simulation exercise

- Based on over 12 years of research in assessing SA and the decision process with:
 - *U.S. Marine Corps*
 - *Nuclear Power Plants*
 - *Hospital Emergency Rooms and ICUs*
 - *AWACS Weapons Directors*
- Used to:
 - *Chart and document progress*
 - *Assess the impact of training materials*

Interval-based Simulation

(looking specifically at SA)

1. Prebrief of exercise
 - Establish goals of simulation
2. Training exercise includes stop times where:
 - Trainee fills out “SADRT” form
 - Trainer has “ideal” solution
3. One-on-one debrief
 - Trainee and trainer perspectives
 - Discuss differences and similarities in forms
4. Simulation continued until next stop time

SADRT

Filled out by trainee at stop times

Stop Time:

Assessments so far?

What watches/warnings if any do you have out?

What are you worried about now?

What data is most important right now?

What data or information do you need that you're not getting? Are there any system status issues?

What is this situation going to look like in (....)hours/minutes?

What will be your next action?

SADRT... What a filled out form might look like (trainer/trainee)

Type of information we are looking for...a sample "answer sheet" for stop 1,2

Stop Time: 18:30z

Events/Assessments so far? Squall line developing with isolated storms (showing supercell characteristics) out ahead. Very saturated ground and potential training echoes.

What watches/warnings if any do you have out? Flash flood watch; Svr tstm.

What are you worried about now? Training echoes; Storms moving into area with few spotters. Concerned about high winds in developing bows. Area of rf masking parts of the line. Line configuration makes it hard to sectorize (potential warnings overlapping or being lost). Workload is becoming an issue – difficult to do good base data analysis on all storms.

What data is most important right now? Radar ref, hi-res v and srm. Mesonet data may show storms moving into more conducive environment.

What data or information do you need that you=re not getting? Are there any system status issues? Spotter reports. Low-level velocity data at far end of squall line. Not getting any radar data from KXXX.

What is this situation going to look like in 1 hour? Could have additional isolated storms develop. May have large scale damaging wind event underway. May also have ff threat near metro area.

What will be your next action? Notify law enforcement/Ham operators of need for reports in remote areas. Experiment with PRF changes. Get someone to do updated mesoanalysis. Probably need to redistribute workload and see who is available to come in and help. Order pizza.

Simulations - Review

- Structured, based on goals
- Establish a safe learning environment
- Developing skills and expertise
 - *Simple and focused, or elaborate and realistic*
- Four methods presented
 - *Real-time, Interval, Situation Awareness, Virtual Reality*
- Two Tools
 - *OAR (Virtual Reality, Real-time)*
 - *SADRT (Interval Based, SA)*



Questions?



References

- Hahn, Bianka B. , D.W. Klinger, Klein Associates. Advanced Warning Operations: Collaborative Development of Expertise Workshop (Work funded by OCWWS, Warning Decision Training Branch) 2004.
- Stanard, Terry, R. M. Pliske, A. A. Armstrong, S. Green, C.E. Zsombok, D.P. McDonald, B.W. Crandall. Collaborative Development of Expertise: Evaluation of an on-the-job (OJT) training program. Proceedings, Human Factors and Ergonomics Society 46th Annual Meeting, Baltimore, MD 2002
- Zsombok, Caroline E. , Klein Associates. High performance OJT: New power for the world of work. (Work funded by the US Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA MDA903-93-C-0092) 1995.