Alternate Reality Game (ARG)-Inspired Training for Staff-Level Skills

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ABSTRACT

The first demonstration of an Alternate Reality Game (ARG) style training event for military training applications has shown the unique benefits and challenges of this approach. ARGs are web-based, interactive experiences for large numbers of distributed individuals, built around a gradually unfolding narrative. Our event, *Dark Waters*, was designed to accommodate 100 participants in a scenario lasting 28 days and orchestrated by a small number of controllers. This initial demonstration was not developed for a specific training course but was instead designed to give volunteer participants invited from the military training community an opportunity to see how aspects of ARGs could be applied to training for staff-level skills for long-term situation management. Lessons learned from this demonstration include the need for explicit community building, the role of both synchronous and asynchronous event content, and some feasible approaches towards assessing learning in an ARG-based event.

The event used a scenario about a disaster relief effort complicated by an unexplained epidemic to provide a narrative context for task assignments. Participants were assigned two tasks per week, designed to be completed by each individual, but with collaboration explicitly encouraged. These tasks provided opportunities to develop, practice, and demonstrate three main learning objectives: Information Management, Organizing and Organization Navigation, and Interagency Interaction. The scenario content and task assignments were designed for a target minimum participation time of 3-4 hours per week; however, the content was also designed to provide deeper avenues of exploration to support optional additional participation.

This demonstration event showed that an ARG style training event can be used to provide immersive, web-based training to distributed participants. We discuss the strengths and weaknesses of the method as demonstrated by this event in terms of participation over the course of the event, feedback from the participants, and lessons learned about design and execution.

ABOUT THE AUTHORS

Alice Leung, Ph.D. is a Senior Scientist at BBN Technologies. Her main research interest is the application of game-based technologies for shaping and measuring human behavior. She is currently co-principal investigator for the JFCOM/DARPA Helical Training project to apply concepts from Alternate Reality Games to military training needs. Previously, she was the technical lead on the DMSO/AFRL SABRE project to develop a game-based testbed for cultural behavior modeling and team performance research.

William Ferguson is a Lead Scientist at BBN Technologies with expertise in artificial intelligence, cognitive science, games and computer-based training. At BBN he applies this knowledge as a designer,

evangelist, and technology visionary. He played a principle role in the DARWARS project, a DARPA funded program to revolutionize computer-based training for the military by exploiting ideas and technologies developed in the commercial gaming world. Currently, he is co-principle investigator of a project called Helical Training which attempts to transfer the experience provided by Alternate Reality Games into pedagogical use.

Bruce Roberts is a Lead Scientist at BBN Technologies, where he has developed numerous simulation-based intelligent tutoring systems: for Air Force technicians troubleshooting flight-line avionics, for conning officers practicing shiphandling in a virtual environment, and for Air Weapons Officers controlling air-to-air attack aircraft. He is the Principal Investigator for DARWARS architecture and integration, part of DARPA's Training Superiority program, and led the rapid development and successful deployment of DARWARS Ambush!, a widely used multi-player game-based training system.

Erin Panttaja has a broad background in the design and creation of user interfaces that are intuitive and facilitate efficient human-computer interaction. At BBN, she assists with the design of user interfaces and user experiences for game and simulation-based training systems and the evaluation of the usability of existing tools. She has worked as a game and user interface designer and programmer on the Helical Training, SABRE, and Capable Manpower projects.

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MOTIVATION

Experiential learning, delivered using game-based simulations, has been widely accepted as a training approach that can increase retention and excite motivation. The military's goal of "train as you fight" recognizes both the value of experiential learning and the benefit of using real interfaces and tools during training. However, it can be difficult to develop experiential training for staff-level skills, such as recognizing emerging trends or developing relationship networks, which span a long time period. Additionally, many staff-level personnel must work with individuals in a variety of organizations and locations, making physical co-location for lengthy training sessions costly and impractical, particularly for interagency training. In this paper, we describe an Alternate Reality Game (ARG)-based approach for immersive, experiential training which can be used for distributed, asynchronous training that focuses on staff-level skills for intermediate intensity, long duration operations.

ARG-based training seeks to integrate and intersperse training with daily work. This interspersal is logistically necessary, since a training event lasts for weeks but only requires short sessions each day, and also serves a pedagogical purpose. Since the training experience is not strictly segregated from real life by location, time period, or the interaction media, trainees should be able to easily integrate ideas and skills learned into their daily routine.

Training inspired by ARG concepts has the potential to achieve experiential learning with a revolutionarily low instructor-to-trainee ratio. Within the ARG genre, it is typical for a team of just a few individuals to create and administer a long-term, interactive experience for hundreds or thousands of players. Yet, the approach is versatile in scale. Because the training does not replicate roles and responsibilities with high fidelity, events can operate with varying numbers of trainees. A small group of 30 or a large group of hundreds could be handled by adjusting the scope of the scenario.

Like traditional online courseware, ARG-based training is zero-footprint, requiring just a normal web browser for participation. However, it is also interactive, encouraging large numbers of participants to work with each other, providing a community building group experience.

Finally, a key pedagogical advantage of ARG-based training is the natural development of an ongoing meta-conversation about the training event. Because the event continues over a long time at an intermediate intensity level, frequent feedback from peers and trainers creates a continual discussion during the event rather than a single post-event after-action review (AAR). In fact, this type of feedback may be critical to training for long duration operations, because natural feedback (i.e., the final success or failure) in complex, lengthy scenarios occurs long after important actions have been taken. If we accept a definition of training as *relevant practice with feedback* and acknowledge that the natural feedback from final results or an AAR may occur too long after relevant actions are taken during a long duration situation, it is clear that the method of ongoing feedback and meta-discussion are critical for teaching skills for intermediate intensity operations.

ALTERNATE REALITY GAMES

In the last few years a new kind of game called an Alternate Realty Game (ARG) has begun to be played over the Internet. In an ARG, a small group of insiders (called "puppet masters") create the game by designing an interactive narrative that takes place over weeks or months. The puppet masters design this story to be incrementally discovered through a fictional set of incidents that are gradually exposed via various media as if these incidents were happening in the real world. Players of ARGs find clues that a game has started and then join in by gathering and sharing information about the unfolding drama. The puppet masters disseminate information through websites, email, phone calls, or other media in the real world. Newspaper advertisements, graffiti, printed flyers, or even live events might be employed. The usual conceit in these

games is that the fictional events are really happening, as it is impossible for players to tell whether a web site or other online information was planted as part of the game or not. The puppet masters dynamically improvise, impersonating fictional characters and responding to player actions as the story unfolds. The game ends when the planned narrative has run its course and the players have been guided to solve the mystery, uncover the truth, or explain the central puzzle of the game (Kim et al, 2008).

Alternate Reality Gaming is growing as an advertising and marketing approach, as well as an entertainment vehicle. However, this is not a mature industry—many ARGs are still independent efforts, written and financed by a few enthusiastic volunteers. Approximately three dozen such independent games ran in 2006. Commercially funded projects are becoming more common, with five significant campaigns in 2006. A commercial effort might have million dollar budgets, run for 2-3 months, and draw in 10,000 active players and many more onlookers. Marketing ARGs measure success through website viewing metrics, with a well-executed project generating 6-8 million hits from 100,000-200,000 unique visitors (The IDGA Alternate Reality Games SIG, 2006).

Playing an ARG

While playing an ARG usually involves using a computer (for web browsing, email, chat, and discussion forums), it is not a typical computer game. There is no virtual environment and players do not control a digital avatar. Instead of driving a digital tank and shooting a virtual gun, players seek and share information, formulate hypotheses, and coordinate efforts using real-world communications media. Although the events within the game narrative are fictional, players take action using real-world tools (Szulborski, 2005).

During an ARG, the players are essentially trying to solve a problem and figure out what is really going on. There are usually no predefined game goals or rules, just a series of mysterious situations demanding a collective effort to piece together the (fictional) truth. Sometimes, a fictional character asks the world at large for assistance, through a blog. Often, an ARG includes artificial, deliberate puzzles (scrambled messages, encoded or hidden URLs, passwords which must be guessed). Because the necessary information, expertise, and ingenuity needed to solve each puzzle require coordinated efforts, players spend much of their time communicating with each other. Discussion forums, web documents, and instant messaging are all used to propose and evaluate ideas. Some players may spend hours each day trying new ways to solve puzzles and looking for additional clues. Others might only tune in weekly to read about the latest discoveries (Metaurchins, 2006).

At the most concrete level, playing an ARG involves sending email, making phone calls, reading web forums or documents, and potentially physically attending staged events. At a more abstract level, playing an ARG involves extracting information from data, formulating and testing hypotheses, developing and evaluating courses of action, and coordinating to execute plans. Additionally, participants in an ARG must form and manage communities, develop trust networks, choose tools and processes for distributed collaboration, and re-organize to handle new developments. The players essentially transform themselves into a community of practice (Wenger, 1998), constantly evaluating and adjusting how the group works together. Each individual determines their own contribution to the group, along with their personal purpose in participating.

HELICAL TRAINING™: A BLENDED APPROACH

Nearly all ARGs to date have been designed either for entertainment or advertising purposes. Storylines have included all sorts of science fiction and supernatural elements. Sometimes the games have been elaborate treasure hunts with either an actual object or a well-hidden secret as the goal. However, these characteristics are not the essence of the ARG genre, and would not be incorporated into an ARG-based training event. The critical characteristics of ARGs which would be included in training applications are: (1) the use of real-world communications media (2) the emphasis on information fusion and coordination among distributed participants, (3) the interactive experience shared by many participants while dynamically guided by a few controllers, and (4) the long event duration. We use the term *Helical Training* to describe an ARG-based approach to military training for long duration, intermediate intensity, operations.

Key Differences between ARGs and ARG-based Training

A Helical Training event differs from a marketing or commercial ARG in several critical ways. First, the scenario is designed around a set of motivating learning goals and metrics for evaluating performance at both the individual and group level. Trainees are informed about the schedule of the event and their

expected level of participation, and each trainee's actions and work are tracked and rated. This makes it clear that the scenario is part of a training event, in contrast to the normal ARG conceit that game events are real events. Second, in order to increase the percentage of actively engaged participants, trainees are given a role in the scenario and explicit instructions (task assignments) to accomplish during the event. The event includes content to motivate each individual to interact within the scenario. Third, the tasks do not involve puzzles (such as secret codes or hidden messages) but are instead motivated by more realistic problems (such as developing a transportation plan or tracking down the cause of an illness outbreak). Realistic problems allow the participants to draw on common sense, standard planning procedures, and creative problem solving.

Serious Application of ARGs

There have been exploratory efforts to exploit the ARG approach for training or education. In May of 2007, an ARG exploring the consequences of a widespread oil shortage was held.[1] The goal of *World Without Oil* was to raise public awareness of oil consumption and how much modern society depends it. The event was designed as a learning experience, including accompanying lesson plans for teachers. In the summer of 2007, a pilot scale ARG was used to teach data security (Enspire Learning, 2007). Previously, there was also a small-scale corporate experiment to use elements from ARGs to teach employee ethics[2], and an ARG for interdepartmental communications[3]. In April of 2008, a short beta test of an instructional ARG, which was designed for the intelligence community was run (mediaEdge, 2007).

In the rest of this paper, we describe a ground-breaking effort to explore the training value of ARG-based experiences for the military. The *Dark Waters* demonstration event in January 2008 was designed to show how ARG-based training could employ an engaging, dynamically tailored narrative to immerse trainees in situations where they could practice information management, planning and organizational skills.

DARK WATERS: A DEMONSTRATION EVENT

As there have been almost no precedents for the military training application of ARGs, an initial 28 day demonstration event for 50-100 participants was planned as an experiment and proof of concept. This event was used to elucidate the anticipated risks and benefits of the approach. It provided a practical example of how the ARG paradigm, assumptions, and event structure could be changed to target training rather than entertainment. Additionally, it would also allow us to ascertain whether these changes would adversely affect the immersive and compelling nature of an ARG-based experience.

Other purposes of this demonstration event were to investigate how to assess student learning in Helical Training by conducting a small formative evaluation, and to provide data for estimating the level of effort needed to develop and run such training. Additionally, this project would prototype the software infrastructure necessary to support Helical Training and identify future tools which could streamline the event development and execution process. Finally, the demonstration would give decision makers who were considering using Helical Training for their organizations a chance to take part in a sample event.

Scenario Design

The narrative scenario is the central component of a Helical Training event. The scenario provides the world of information, hypotheses, possibilities, characters, and occurrences that the participants explore and interact with during the event. Unlike a typical ARG, whose plot centers on a few fictional characters whom the players may assist, the *Dark Waters* scenario cast the participants themselves as having key roles.

The *Dark Waters* scenario began with a tsunami in Puerto Rico. The participants took on the roles of Intelligence, Operations, Logistics, and Public Affairs Office members of a Joint Task Force (JTF) remote team. This team was brought into the disaster relief operation to supplement on-site forces and concentrate on solving a specific problem – what was causing an unexplained, deadly epidemic among tsunami survivors and how could it be stopped. During the course of the event, there were growing anti-US sentiments spearheaded by a separatist movement, rumors of bio-terrorism, a new camp for displaced civilians, a missing field team, and other unexpected occurrences. Participants interacted with each other and with fictional characters such as JTF officers, representatives from local government, members of press organizations, and Non-Governmental Organization (NGO) personnel played by the controller team. The scenario was designed to be plausible and

[1] http://worldwithoutoil.org/

[2] Personal communications with Dave Szulborski

[3] SMB: Missed Steaks by Brooke Thompson

believable, but not a high fidelity recreation of a real domestic disaster relief operation.

Web Portal

The Looking Glass Interface™ (LGI) was a web portal used to access and interact with the *Dark Waters* event. All participants were given individual log-in accounts and saw customized content on their main portal page. For the participants, the LGI supported access to dynamic scenario content (news feeds, alerts) and communications through web email, discussion forums, and on-line chat group meetings. It also provided access control to the event through the log-in. For trainers and observers, the LGI provided access to searchable records of participant actions (emails, document views, chats, forum posts, etc) and a way to observe and review on-line group meetings. Controllers also used the LGI to roleplay the fictional characters within the scenario (messaging participants, posting memos, responding to questions) and to provide any necessary technical support.

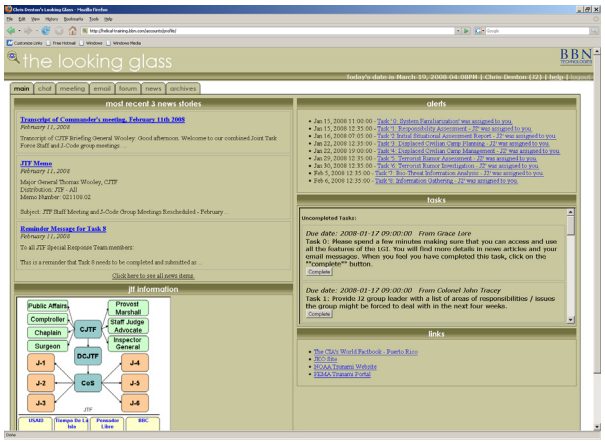

Figure 1. Looking Glass Interface

The LGI prototype implemented for this project includes some of the key features found in a distributed collaboration environment. By providing email and chat capabilities through the portal, confusion between "real world" and fictional content was avoided. A single LGI also gave all participants a uniform set of communications systems. However, in future ARG-based training events, the value of using participants' actual professional collaboration systems may prove more important than the convenience of having a single interface for all event interactions. A Helical Training event can be deployed with or without a dedicated web portal as long as the critical capabilities of content access control and participant action visibility are supported.

Task Assignments and Role Groups

Typical ARGs have many participants who "lurk" and a relatively small percentage who actively engage with each other and characters in the scenario. We wanted to increase the percentage of active participants, assuming that active participation would result in a greater training benefit. Thus, the scenario was designed for fewer but more uniformly active participants than a typical ARG. The main method used to motivate each participant to take direct, assessable actions within the scenario was assignment of explicit tasks. These tasks generally involved locating relevant information, summarizing or prioritizing, making recommendations, and contacting or consulting other people. To simplify scenario design and assessment of task assignment completion, participants were divided into four role groups and everyone in a particular group was given identical task assignments. Collaboration and division of labor was encouraged, and there were some task dependencies across the groups, but it was left up to participants to decide whether and how to work together on task assignments.

The division into four groups was also designed to give each individual an opportunity to work both within a group to accomplish shared goals and between groups to coordinate between mutually supportive but different goals. It was anticipated that having a particular area of responsibility would help the participants feel involved with the scenario. Also, breaking the large participant pool into more manageable sub-groups enabled controllers to consistently interact with the same participants when providing feedback or support. Finally, the groups served as parallel "tracks" through the event, demonstrating that a future ARG-based event could be designed for several medium sized training audiences, each too small to support an entire custom event, being brought together in a single scenario.

Two task assignments were issued to the individuals in each role group each week. These assignments were designed to provide short term goals to focus participants on specific questions that would require them to interact with the scenario materials, other participants, and fictional characters. For example, Task 4 for the J3 group was to *Collect, analyze, and report upon information regarding available forces for carrying out standard security, recon, and relief efforts in the (geographical) area the small team (remote JTF support) is responsible for.* The group's leader assigned this task via LGI email, with additional instructions and hints. A short summary of each task

assignment, along with the due date, was displayed in the participant's task assignment list on their main portal page, and reminder alerts were displayed on their main page in the three days prior to an assignment due date.

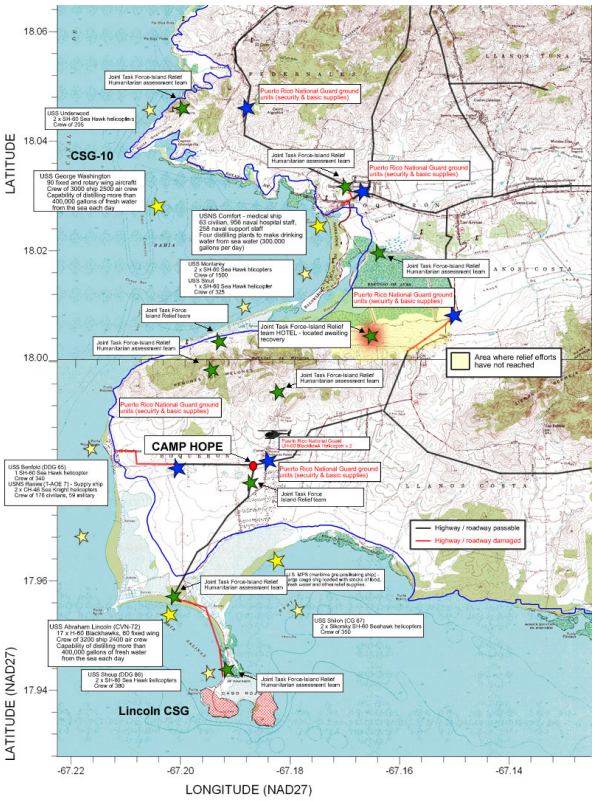

Figure 2. Sample Briefing Map

Information Feed and Events

Helical Training uses a mixture of asynchronous and synchronous interactions similar to what participants encounter during their normal jobs. One of the key asynchronous components of the event was the information feed and archive. This information included task assignment and meeting reminders, JTF memos, bulletins from external organizations such as the Centers for Disease Control and Prevention (CDC), and news articles, pictures, and videos about the unfolding tsunami relief effort and related situations. Though participants were encouraged to supplement these items with their own prior knowledge and external research, the LGI information feed and archive provided much of the scenario-related information participants needed. As one of the motivating learning goals of *Dark Waters* was information management, the amount of incoming information was deliberately large with some irrelevant content.

During the course of *Dark Waters*, there were over 200 information items delivered and archived. Some were directed only to the members of a single role group while others were distributed to all participants. Although each of these items was preloaded into the LGI database with a target display time, both the display time and the content of the items could be dynamically edited by the controllers to adjust the course of events.

A number of synchronous, pre-scheduled events were included in Dark Waters to get participants on-line at the same time and provide more opportunity for interaction. These events were (1) dial-in phone conferences, (2) on-line group meetings via text chat, and (3) on-line office hours with group leaders and technical support via text chat. The phone conferences were used for mission kick-off and wrap-up, and consisted of voice actors playing the parts of the JTF Commander and the group leaders. These phone conferences were "lecture mode" and did not allow participants to speak. The on-line group meetings and office hours were both held once each week. These events allowed participants to text chat with each other and coordinate responses to task assignments, or to ask questions about the assignments or LGI. Participants were sent weekly reminders about the group meetings using their real-world email accounts; these emails also served as a reminder about *Dark Waters* participation.


Section B

Tiempo de la Isla

TODAY'S WEATHER
TODAY AND TONIGHT...CLOUDY SKIES ACROSS MUCH OF THE ISLAND, WITH LIGHT TO MODERATE WINDS

February 4, 2008 - Monday

Images of Hope and Relief

Caring for the Survivors - The Aid Camps

What People Are Saying

BY ANTONIO DESIRA

They call it Camp Hope, and that's exactly what it represents to many tsunami survivors, people who have lost everything in the terrible natural disaster that shook the island on January 8th, almost a full month ago now. The Camp, located in the hardest hit southwest area of Puerto Rico, is also a shining example of true cooperation and shared effort, as people and resources from many different sources have contributed to create this place offering relief to the citizens who need it so much. Whether they are from the small villages that line the western coast, the many resorts and country inns in the same area, or from the population surrounding the area of Boqueron Bay, they all fled their homes when the tsunami waters came in the dark of night. With no chance to grab resources or supplies they fled inland under fear for their lives and not knowing if they would live to see the light of day.

Even though they survived the horrific night and morning of January 8th, some of them died anyway, succumbing to either their injuries or from the mysterious new illness that came to be known as the "Mystery Death." Not knowing what lie ahead, they ran into the woods and hills, anywhere to be away from the ocean, once a provider, now turned deadly. The ones that survived somehow made it to Camp Hope.

alongside local relief agency InboundAid, had begun coordinating manpower and materials for a few days prior, but still witnessing the creation of Camp Hope was somewhat of a wonder to behold. within 48 hours an empty field became a center capable of housing and feeding over a hundred refugees. And even at that pace it was completed none too soon.

As soon as the walls of the small shelters were complete people had already begun moving in.

As miraculous as its construction has been the relief the camp has provided, "whomever named it Camp Hope was brilliant," said Harry Jules from InboundAid, "because that's exactly what it has provided to all of us."

When the service men and women of the U.S. Joint Task Force and Operation Island Relief told the personnel from the Puerto Rico National Guard their intent, many of the Guardsmen thought they were crazy. "I thought they were mad," one said, "to tell us we would build a camp from nothing in just two days. Now, I believe whatever they say we can do." In reality, it was a slightly longer process than two days, as the Task Force, working

Figure 3. Sample News Article

Participant Pool

The participants for *Dark Waters* came from heterogeneous backgrounds. Individuals from different branches of the military, other government agencies, universities, industry, and foreign military organizations participated. Approximately 50 University of New Hampshire Army ROTC cadets were directed to participate by their course instructor. These students were all juniors or seniors. Approximately 75 individual volunteers from the military training community were informally recruited through personal contact, symposiums, and other publicity. Approximately 25 of these individuals had military experience and a number of them were knowledgeable about JTF operations.

Observers and Controllers

The Dark Waters event controller team consisted primarily of one ARG expert and two scientists. The controller team was responsible for the news and event injects into the scenario, playing the fictional characters (over 50 named characters), and dynamically adjusting the scenario as necessary to respond to participant actions and decisions. Joint Forces Command (JFCOM) and Advanced Distributed Learning (ADL) personnel, as well as other members of the contractor development and assessment team, acted as event observers. Observers were able to view all event data such as LGI emails and log-in information, watch group meetings, access the news feed and use text chat to communicate among themselves. Several observers examined participant task completions and analyzed pre- and post-event surveys.

RESULTS AND RECOMMENDATIONS

Overall, interest from the training community was strong. The majority of participants felt the Dark Waters event was a useful experience. Some participants were interested in investigating the training technique for use within their organizations, and a majority thought this approach would be useful to the military. However, this training event with assigned tasks (similar to real work) was not inherently self-motivating enough to sustain a high level of individual participation from busy people with no actual training need. A participation distribution qualitatively similar to that of a typical ARG was observed, with many participants only passively involved. Below we discuss the event data and recommendations for how to improve participation in ARG-based training events by making active involvement easier, more relevant, and more fun.

Participation

Log-ins

One big question about Helical Training was whether individuals who had not been specifically required to attend a training course, and who did not have a specific training need addressed by the material, would find the immersive experience itself so interesting that they would participate in an event. In a typical ARG, all the participants take part simply because they want to – would Helical Training, which included enough training and assessment that it might be considered more like work than like play, retain enough of a game-like feel that people would voluntarily engage in this activity in their spare time? Or, in future events, would it be necessary for participants to be tasked to take the training course and be allotted some scheduled hours for Helical Training activities?

The demonstration event indicates that the inherently engaging aspect of the Helical Training experience is not enough motivation, in isolation, to compel the majority of individuals to actively participate. Approximately 5% to 10% of individuals completed all the task assignments during the entire duration of this four week event, in spite of the lack of a direct match between their personal training needs and the content covered in the event. For future applications where the majority of the participant pool needs to benefit from the training experience, the event scenario and task assignments must be designed specifically to address relevant training requirements and the relevance of the Helical Training event must be clear to participants. An example of this sort of application domain might be training Individual Ready Reservists in preparation for becoming JTF staff members. However, if Helical Training were applied in a situation where it was acceptable for only a small fraction of the potential participant pool to actively take part, the learning objectives could be much less specific. An example of this second type of application might be forming a personal relationship network across local first responders, state governments, federal agencies, and community organizations who might be involved in a natural disaster response.

The event began with accounts created for 124 individuals who had either contacted us individually to volunteer or who had been volunteered by another party. In the middle of Week 3, we recruited 7 additional individuals to investigate how people would fare when joining a Helical Training event late. Before the event launch, there was a log-in test period to allow participants to confirm that their computer network and software were compatible with the LGI and to

complete a pre-event survey as a way to practice using the LGI email feature. Approximately 80 individuals participated in the log-in test, with over 70 responding to the pre-event survey. During the course of *Dark Waters*, a total of 85 participants logged into the system. This indicates that nearly a third of the volunteers never experienced any part of Dark Waters. This level of non-participation is roughly in line with what game companies experience with volunteer beta testing – up to half of the people who indicate interest initially do not actually try the game.

During the course of *Dark Waters*, the number of individuals logging in on any particular day varied over the days of the week. Generally, there were fewer log-ins during weekends and more log-ins on days where a synchronous event (such as Tuesday on-line group meetings) was scheduled. There was a trend of reduced participation over the course of the event.

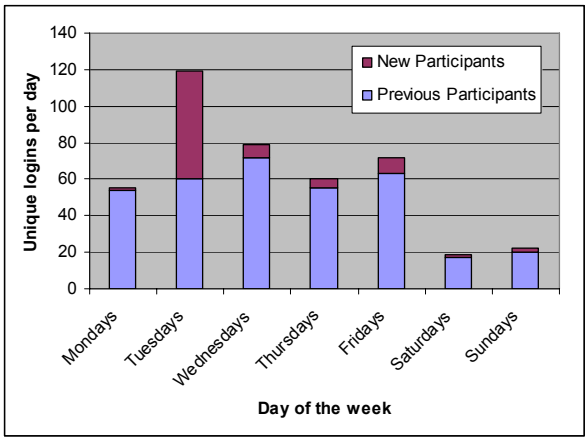

Figure 4. Weekly Participation Pattern

Many of the participants volunteered for this experimental event so that they could see what a Helical Training event looked like. Based on an understanding of what the participant pool wanted to get out of the experience, some of the fall-off in participation can be attributed to the fact that after a week, some individuals may have decided that they had seen enough to understand Helical Training and did not need to continue further. However, some of the participation fall-off can also be attributed to several weaknesses of the *Dark Waters* scenario design which should be improved for future events. From the answers to the post-event survey and from telephone feedback sessions held at the end of *Dark Waters*, suggestions for future improvement have been identified as (1) target a specific training need for the particular audience, (2) increase active participation to build a community critical mass, and (3) design the event to include more "fun".

Actions

The LGI was instrumented so that participant actions could be recorded, searched, and tallied. Below is a summary of the total number of different action types performed by participants during Dark Waters.

Table 1. Participant Action Counts

Action	Counts
View news item details	2460
View document	1045
Send chat message	370
Send email	289
Post to discussion forum	144

This data suggests that participants were able to access all the important features of the LGI. During the course of the event, we provided technical support and assistance for using the LGI capabilities. Some participants were not familiar with the use of online discussion forums, which can provide a key communication channel for distributed, asynchronous coordination. Over the course of the event, the handful of participants who sought assistance in using the discussion forums gained familiarity with this type of application and successfully integrated this channel into their task assignment work.

Task Completion

Beginning with the LGI familiarization task (Task 0) and finishing with summarizing a hand-off plan for the group's mission responsibilities (Task 8), participants were asked to complete a total of 9 task assignments of increasing complexity during four weeks.

Task assignment completions (as self-indicated by participants) dropped from 77 (Task 0) to 10 (Task 8). A few participants joined in towards the end of the event and retrospectively completed old task assignments, but most completed them in the week following initial assignment. A few participants who completed the assignments (as evidenced by submitting recommendations via LGI email to their group leader) but did not indicate task completion via the LGI were not counted in this total. Similarly, a few participants who self-indicated task assignment completion but whose work was missing some requirement were counted in this total.

The stated minimum time commitment for participants was 10-16 hours over the entire event, or an average of 2.5-4 hours per week. At the lower end of the range,

with 2 hours a week, a participant was expected to be able to read the materials, follow the narrative, and take some actions towards completing assignments. At 4 hours a week or more, a participant was expected to be able to read the materials, follow the narrative, and minimally complete the assignments.

Because this was a demonstration event, a majority of participants signed up with the goal of seeing a new way to deliver training. However, they may have been more interested in observing than in participating in the event. Many participants were not able to meet the minimum time commitment due to other competing concerns. For future training events in which the participants would be fulfilling a real training requirement through their involvement, it is anticipated that time commitment and task completion would be significantly increased.

The mid-January to mid-February schedule of the event was non-optimal for the ROTC cadets, requiring them to begin participation prior to the start of the spring term. A significant fraction of them did not access the event at all. This was an unexpected result and it was not possible to ascertain whether their non-participation was due to inadequate communication of expectations, a reluctance to engage in additional training, or some other cause. Any future events that include student participation should begin by establishing a closer working relationship with the instructor and a better understanding of how Helical Training would supplement the course requirements.

The tasks for this event were designed to encourage each participant to take an active role. This required some suspension of disbelief ("In a real organization, you'd never ask so many people to independently answer the same question" was one response) in order to motivate everyone to do the work and have a learning experience. This unrealistic duplication of individual effort is a common convention both in classroom assignments and in many online computer games and ARGs so that each person can experience being the main character or hero. However, this convention was received with some confusion by our participants, and a refined variation on this approach is recommended for the future.

Improving Participation

During *Dark Waters*, it was observed that when as few as 2 or 3 individuals in a group were willing to speak up in discussions, it catalyzed additional group interactions. Because a sub-optimal level of participation was the greatest concern during *Dark Waters*, future recommendations focus on strategies for increasing and motivating participation. A minimum amount of participation is necessary to achieve critical mass in Helical Training, since interactions between participants is an important aspect of the learning experience. Participation is needed to develop a community of practice which supports peer driven education through mutual constructive critique and analysis. In contrast to an ARG, Helical Training is designed for the majority of participants to take an active role in the scenario, rather than having mostly passive participants.

The first recommendation for increasing participant interactions is to include deliberate community building activities. In *Dark Waters*, participants were assigned a pseudonym along with a role group. This type of relative anonymity has often been observed to facilitate interactions in other on-line settings. However, the military culture presents some barriers to free and casual interaction – some participants commented that they felt inhibited about making suggestions or speaking up during on-line meetings and forum discussions, in case a high ranking officer was among their anonymous teammates.

Other participants mentioned that they were hesitant to interact via email or chat with people whom they had never met in person or even on the phone. However, people actively contacted other participants they had met briefly in synchronous chat meetings. Therefore, it is recommended that future Helical Events include more community building events. These events might include initial small group telephone conferences so that each participant meets several other individuals they will be working with, and opportunities for asynchronous introductions, such as participant profile pages where each person can list basic information as well as interests and expertise, and "introduce yourself" discussion forum threads. Additionally, event designers should consider explicit interaction facilitation and mentoring to establish community norms. For example, a subset of participant volunteers might participate in pre-event interface familiarization and group facilitation training, and act as peer resources and discussion starters during the event.

It has been discussed above that future Helical Training events should be designed around targeted, relevant training content for specific training audiences. This should also increase participation levels, since the students will be able to see a direct training benefit from the experience. Also above, the recommendation to put more emphasis on individual responsibilities and consequences by using smaller teams and group assignments was addressed. There

may also be ways to use the scenario narrative to emphasize consequences, such as having an operation run into difficulties resulting from a group's failure to accomplish a previous assignment. However, that approach runs the risk of discouraging participants who feel responsible for an early failure and greatly complicating scenario development and design, as consequence branch points increase the amount of scenario content needed.

Finally, it is recommended that some game-like elements which were deliberately omitted from the *Dark Waters* event be cautiously re-introduced in future events. As most participants found the scenario believable, and feedback about the parts perceived as unrealistic centered on disaster relief procedures rather than the plot twists in the narrative, narrative drama could be increased without adversely impacting scenario believability. For example, future scenarios could introduce more distinct personalities in the fictional characters, possibly even using a conflict between characters as the focus of a sub-plot. Another aspect of game design that could be beneficially applied to Helical Training event planning is to concentrate resources on developing and perfecting the first contact hour. One possibility would be for the initial mission kick-off conference to be interrupted by a crisis which requires the participants to immediately solve a problem together. Finally, the game element of accumulating points, getting a high score, or otherwise earning public recognition for accomplishments could be integrated into a Helical Training event. Although some group rivalry was cautiously introduced by noting which groups were leading in task performance in the AAR discussion thread, this did not attract a lot of attention. Future events might include publicly visible icons next to participant names indicating high achievement. Such recognition could be based on the instructor's rating of task assignment completion and also on participation levels (e.g. helping peers by answering questions on the technical help forum could earn points).

Restructuring Task Assignments

The main design goal for the individual duplicate assignments was to give each participant motivation to take action. This system would be appropriate if Helical Training were used as part of an academy or college course; however, an alternative for other applications would be to use small group pooled assignments. Pooled assignments would consist of larger overall assignments that a group was jointly responsible for delivering. Initially, the larger assignment could be broken down into a list of detailed sub-tasks, and each subtask assigned to an individual or small number of individuals. As the event progressed, participants could be encouraged to take on a growing level of responsibility for task delegation and division. Potentially, participants could be divided into small groups of approximately 5 people, with each group given small assignments to accomplish collaboratively. The groups in *Dark Waters*, consisting of approximately 30 individuals, were too large for most people to feel a sense that their individual contributions were critical. Using a larger number of unique, smaller tasks assigned to smaller groups may help individuals feel more responsibility to complete assignments. The main risk of this change would be the increased workload for assessors who would have to rate more types of task assignments. It would be crucial for assessors to have a list of all the tasks and sub-tasks, each with clearly defined success criteria and sample completions.

CONCLUSION

There is strong interest in the military application of web-delivered, interactive training for staff-level skills. The Helical Training project demonstrated that a multi-week, asynchronous, multi-person, immersive training experience can be feasibly developed, deployed, and assessed. Additionally, relatively few controllers are needed to execute an event which has the capacity to accommodate many participants. It was also shown that an event run through a web-portal, such as the Looking Glass Interface with a range of electronic communications channels, is quickly and easily accessible to people who have limited experience with computer games. Measuring and assessing participant performance was feasible, and many participants felt that they learned about Joint Task Force organizations through this event.

Helical Training necessarily differs from typical Alternate Reality Games (ARGs), making event and scenario design challenging. One of the major additions to the participant experience in Helical Training which does not have a parallel in ARGs was the use of task assignments, which called for individuals to complete some duplicate assignments. This large scale duplication of efforts did not fit into the narrative and required some suspension of disbelief which was not popular with our participants, and consideration of an alternative assignment scheme for future events is recommended.

The main challenge during the *Dark Waters* demonstration event was the difficulty in getting enough participation to achieve community critical

mass. The sub-optimal participation level can be partially attributed to the nature of the demonstration event, in that it was not designed to fulfill a specific training requirement for the participants and the participants were primarily interested in simply seeing an example of Helical Training. This underscores the necessity of designing future Helical Training events for a specific training audience, targeting their key learning objectives. Analysis of the *Dark Waters* event was used to identify several other event design strategy recommendations for improving overall participation through community building and incorporation of selected game-like elements.

The software prototype developed for the Helical Training project was adequate to support execution of the *Dark Waters* event. Key features of the Looking Glass Interface were that it (1) requires only a web-browser for the clients (2) provides complete server-side logging (3) supports email, text chat and meetings, discussion forums, and controlled news feeds and (4) facilitates observation and performance assessment. The prototype software was developed using a mixture of open-source and custom code, and would require significant testing and hardening before it could be deployed. Based on participant and observer feedback during *Dark Waters*, high priority feature additions to make assessment more efficient and increase participation have been identified.

There are a variety of immediate military training applications where Helical Training would fill a need for experiential, multi-person, information and communication centered learning and practice. First, although individual augmentees are likely to be too busy between assignment and reporting for duty to participate in a training event, personnel serving in COCOMs could benefit from Helical Training. These personnel, whose next assignments may be staff-level positions, could participate in a Helical Training event for a month during their current assignment. Second, Helical Training could be used as complementary and preparatory experience before a large-scale exercise. It would allow participants to experience the medium intensity, long time-duration build-up towards the crisis which initiates an armed engagement. Third, this training methodology could be used to motivate, reinforce, and extend training concepts during a formal course of study at a military academy or war college. Fourth, Helical Training could be a tool for addressing the interagency training gap. It is difficult for multiple organizations in different locations with distinct goals, cultures, and training priorities to engage in interagency training or exercises, due to the high cost, amount of planning necessary, and time required. A Helical Training event could be used to teach overall adaptability and awareness of differing organizational processes and cultures, and to build personal relationships between individuals from different agencies, while allowing everyone to remain at their current location and continue performing their normal duties. Similarly, Helical Training could be used for team building and teamwork practice in distributed organizations, such as the individual ready reserves, disaster response teams, and homeland security groups. Finally, a Helical Training event might be used to catalyze community building and increase traffic for an existing military web portal by providing a common experience and encouraging people to use discussion forums and collaboration tools.

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