

NPS Journal
March 1, 2002
By Margaret Davis

GI Agents of Organization

Captain Joel Pawloski's *GI Agent* simulation software was recently highlighted in the *LA Times* and on *Fox News* as the latest hope against terrorism. Pawloski might instead have been the author of a halftime wowzer for Superbowl 2002 but for an ironic truism about football and war.

Assigned to pursue a master's degree in simulation at the Naval Postgraduate School after seven years in the field, Pawloski's initial goal was merely to "get through calculus," as he admits with a grin. When time came to choose a topic for his thesis, he originally thought about writing a program that simulates football to experiment with different strategies.

But while the ensuing notoriety among gridiron fans might have been gratifying, Pawloski had to put the idea on the shelf. "Football is just too complex," he says. "I had to turn to combat."

That requires explanation. As an irreducible system, football would have necessitated work far beyond the scope of a master's thesis. In other words, you can't make football any simpler and retain the basic nature of the game. But combat, the greatest of organizational challenges, can be sliced narrowly into discrete realms for study and analysis. Captain Pawloski decided to treat a crucial aspect of military operations by simulating the effect of organizational changes on the performance of an

infantry unit in the field—changes that might involve anything from the abrupt introduction of unfamiliar weapons to the addition of new platoons.

The exercise is far from academic. All other factors being equal, well-organized troops with adequate support predictably achieve order and victory, while the poorly organized go down in mayhem. Finding and maintaining a robust organizational structure within the kaleidoscopic exigencies of real war is a harrowing challenge that requires the most precious commodity of all: time to experiment.

Enter Pawloski's simulator. *GI Agent* purchases time, compressing hours or months of planning and live trials into minutes or days of runtime in which electrons—not men—are at risk.

In *GI Agent*, individual soldiers, or “agents” represented by colored dots, are pitted against opposing teams in a simplified landscape with all variables controlled except the organizational structure of the unit: where snipers hide, where leaders stand, whether agents are directed to stick with a buddy or spread out, persist at a given risk level or flee. Personal factors such as loyalty, aggressiveness, and religious motivation were assumed equal in Pawloski's experiment. The agents' movements, though autonomous and individually unpredictable, accurately reflect unit behavior as a whole.

An agent's behavior is driven by his goals and guided by a set of rules for achieving various goals. Which goals and rules he chooses depends on what he has done so far in the fray and what the agents in his vicinity are doing. As he responds to changes around him (such as the death of a sniper who provided cover or perhaps arriving at a lake or other obstacle), his actions remain motivated by his primary goals.

Thus individual agents may exhibit unforeseen behaviors, and the battle might correspondingly swing one way or the other. Encounters between opposing forces can be tested and retested in pursuit of a robust plan.

The time savings of a program like *GI Agent* could be phenomenal. Pawloski estimates that if *GI Agent* had been available during Desert Storm, the two months occupied in finding a way to breach the Iraqi obstacle belt might have been reduced to a few days of computer-based trials, followed by live testing to verify results.

Devising a theoretical “game” in the laboratory that is also truly practical in the trenches requires the combined know-how of a strong abstract thinker and a man who’s seen the view from “day fourteen in the box.” Pawloski is both.

Joel Pawloski enlisted in the army in 1983 as a helicopter-crew chief and, after a short stint, entered Embry-Riddle Aeronautical University under an ROTC scholarship. Subsequent operational field experiences created the intellectual frustration that eventually fueled his creation of *GI Agent*.

Pawloski cites one such example. “At Ft Hood in ’94, I was a scout-platoon leader in a divisional cavalry squadron. I had a platoon with six Bradley fighting vehicles ready to deploy to the NTC [national training center] at Ft. Irwin, California, for war games. We’d been training for months and were sharp, ready to go. Two months before loading up for transport to the NTC, we were thrown into complete organizational chaos.” The troop lost one scout platoon and gained two tank platoons, and was allotted one short field exercise to work out the new organization before deployment. A similar reorganization occurred just before an NTC mission in which the platoon was to advance towards the enemy without knowing his location—a delicate, hazardous maneuver. “In

the midst of this ‘movement-to-contact’ mission, I was given electronic-warfare, chemical-reconnaissance, and mortar sections, and a combat-engineer platoon, in addition to my own scout platoon. In the space of an hour, my command ballooned from thirty men to seventy-two, and from six vehicles to fourteen.”

The result was predictable. An unwieldy composite of mismatched sections pursuing tactically incompatible missions, his new platoon was forced together against logic like the hybridized victims of “Sid” in *Toy Story*. Pawloski and his men surmounted the challenge—but the experience wasn’t forgotten.

“I kept turning the situation over in my mind, how it could have been improved. We were given tools whose capability we never had time to exploit or understand, so they were effectively burdens rather than assets. In real combat, men would be dead from untested organizational decisions. I began thinking about ways computers could be used for training before important trials like the NTC—or real combat.”

Meanwhile, Pawloski transferred to aviation and entered flight training at Ft Rucker, Alabama. Emerging as a captain and army aviator in 1997, he went on to command an air-cavalry troop in a divisional cavalry squadron at Ft Hood, Texas. There again his squadron weathered a drastic change in organization on the brink of trials at Ft. Irwin: his air-scout and attack platoons were replaced by two platoons of Kiowa Warrior helicopters, precipitating radical job changes all around. In the war games, the formerly crack unit lost eight of ten fights. This was not a false crisis engineered by tough senior officers. To Pawloski, the problem was clear, present, and dangerous: leadership didn’t understand the capabilities and limitations of the new organization.

After a tour in Bosnia, Pawloski was sent to the Naval Postgraduate School's MOVES Institute (Modeling, Virtual Environments, and Simulation) to pursue a master's degree. There he began the studies that led to *GI Agent*.

Pawloski may have toyed with football simulation for his thesis, but in retrospect, *GI Agent* was meant to be. "I came upon the idea by evolution, not epiphany. I had had these experiences in the field. The degree requirements offered an unexpected opportunity to address them. I wanted to contribute something useful—eye candy didn't interest me. I had a knack for seeing clearly into organizational structure and a certain feel about how it should be done, and went with it."

GI Agent took eight months and 14,000 lines of code to write. Testing alone for the 16 basic rules that govern agent behavior consumed eight weeks. Still, to Pawloski's mind, *GI Agent* is far from complete. "*GI Agent* is a first-draft, two-dimensional simulation: grids, lines, dots. *GI Agent II* will be in 3-D."

So imagine a commander in wartime using *GI Agent* version X. His laptop depicts the terrain before him as mapped from satellite-captured images. He observes a forest to his right, corresponding to a forest onscreen—only there he can click to a view of the other side. He watches lifelike representations of himself and his men working through his ideas, and spots agents acting in ways he hadn't anticipated.

In this program, he can experiment with ways of organizing his men and materiel until he explores every plausible contingency. He has it in his power, so far as Providence allows, to secure the outcome of the battle the night before.

The military has awakened to a hunger for programs like *GI Agent*. Army Chief of Staff General Eric Shinskei recently ordered stepped-up research in agent-based

simulation and other nascent virtual technologies, asserting a need to transform training and operations in the 21st century. *GI Agent* is but part of a new digital vanguard in the defense of American liberty against both terrorist and conventional foe.

As for you football maniacs, hang tight. Joel plans to tackle that next.

Captain Pawloski is currently assigned to the Training and Doctrine Command Analysis Center, Monterey, as a Simulation Operations Officer on the Naval Postgraduate School campus. He was accepted as a doctoral candidate in July to continue work on *GI Agent* in his spare time. He expects to complete his PhD in 2004.

Joel's *Fox* interview can be viewed at

www.movesinstitute.org/Press/FoxNewsNov2001.mov

His *LA Times* article is at

<http://movesinstitute.org/Press/LATimes-Sims>