A Moon Shot for Simulation Learning[1]

In May 1961, President John F. Kennedy made a radical proposal to a joint session of Congress:

> I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish.[2]

In September 1962, he elaborated on his plan in a famous address at Rice University:

> We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.[3]

NASA met President Kennedy's goal within the decade, landing Apollo 11 on the moon with 164 days to spare. Having spent $127 billion[4] in 2003 dollars over the course of the entire Apollo program, the US reasserted its scientific and technical leadership over the Soviet bloc and never looked back. Apollo not only invigorated the nation both technologically and morally, but created numerous spinoffs, including Computer-Aided Tomography (CAT), Magnetic Resonance Imaging (MRI), kidney dialysis machines, cordless power tools and appliances, and even the theories underlying complex program management.[5] (And, some might add, Tang.)

Like the US space program in 1961, we in the simulation learning community know how to achieve lofty goals, even as our knowledge is increasing rapidly. We have numerous successes to which we can point—and, yes, a few dramatic failures. Even as the demand for our products increases exponentially, we face critical challenges as an industry to respond to this demand. Global market intelligence and advisory firm IDC has recently forecast "technology-based simulation adoption in the corporate sector at an epidemic level within the next five to seven

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[1] An abridged version of this article was published in the August/September 2004 issue of *Training & Simulation Journal*.
[2] http://www.cs.umb.edu/jfklibrary/j052561.htm.
[3] http://www.cs.umb.edu/jfklibrary/j091262.htm.
[4] http://www.hq.nasa.gov/office/pao/History/ap11ann/legacy.htm, http://www.jsc.nasa.gov/bu2/inflateCPI.html.
[5] http://www.sti.nasa.gov/tto/apollo.htm.

years,"[6] while noting a number of obstacles that must be addressed to make such adoption possible.

What we need now is the equivalent of a moon shot: a goal so far above what we have already achieved that, even while many of us will be imagining how to make it happen, a few will be saying that it can't be done. What we need is a goal so ambitious that it will unite the industry, accelerate and solidify standardization efforts, and provide benefits easily explainable in a sound bite. As with the Apollo Project, the only organization large enough to propose and fund such a goal is the US government.

The proposal outlined in this article meets these targets. It is far beyond anything we have achieved to date, would bring together the simulation learning industry, would accelerate standardization, and both the project and its benefits are easily explainable.

Simply stated, the proposal is that the US Department of Defense (DoD) set the goal that within five years, every enlisted and non-commissioned military specialty will have available complete simulation-based e-learning courseware.

How lofty a goal is this? According to the US Army's recruiting site[7], there are currently 189 Military Occupational Specialties (MOSes) in that service alone. Most MOSes have multiple levels. For example, 3Dsolve is currently building simulation-based e-learning courseware for the US Army Signal Center and School's 74B10 Information Systems Operator/Analyst course. This is only the first level of training for 74Bs, who can go on to 74B20, 74B30, 74B40, and 75B50. Assuming an average of five levels per MOS, that gives us a rough estimate of 945 individual courses within the Army. Extrapolating out over the Navy, Air Force, and Marine Corps, we get a total of 3,780 individual courses throughout the DoD.[8]

The most complex form of Interactive Multimedia Instruction (IMI) is Level IV, which is simulation-based. Assuming an average of 160 hours of Level IV instruction per specialty, at a nominal $25,000 per finished hour, we arrive at a figure of approximately $15 billion for the entire program. According to the Congressional Budget Office,[9] the DoD budget over the period 2005-2009 will total $2.437 trillion. $15 billion represents just over one-half of one percent of that total. In other words, for about 1/160th of its overall budget over the next five years, the DoD would receive complete simulation-based e-learning courseware for every enlisted military specialty—nearly 4,000 courses in all. Not the page-turning, screen-scrolling, filmstrip-in-a-browser courseware of a few years ago, but challenging, compelling, and engaging courseware based on interactive simulations of the real world—courseware for the "Nintendo generation."

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[6] "The Promise and Reality of Technology-Based Simulations," Michael Brennan and George Kao, *CLO*, May 2004, http://www.clomedia.com/content/templates/clo_businessint.asp?articleid=473&zoneid=13.

[7] http://www.goarmy.com, 3Dsolve research.

[8] This is an approximation. A comprehensive survey leading to a far more detailed and accurate estimate of the actual requirements to meet the high-level goal outlined here would be a worthwhile effort.

[9] http://www.cbo.gov/showdoc.cfm?index=4985&sequence=4.

What would be the benefits of this $15 billion moon shot for simulation learning? For the ultimate users of the courseware—the military students and their teachers—the benefits would be dramatic:

- **Flexibility**. Instead of being tied to a facility, training could take place anywhere. Instead of occurring only during the workday, training could take place at any time.
- **Cost savings**. For many specialties, students may not need to travel at all, but take the entire course of instruction at their home base. For other specialties, time away from home may be greatly reduced. Education-related travel expenses will drop significantly.
- **Better students**. When in-person participation is required, students can arrive pre-trained (and certified as such). In-person training can then focus on the highest value subjects instead of teaching the basics.
- **Better graduates**. The average knowledge retention rate from a lecture is only 5 percent. For a demonstration, this rises to 30 percent. For hands-on practice, the retention rate climbs to 75 percent—an improvement of 2.5 times over demonstrations and an amazing 15 times over a lecture.[10] Simulation learning offers hands-on practice in a virtual environment.
- **Sustainment**. With anytime, anywhere training, the same materials used before and during schooling will continue to be available to military personnel in the field, providing an instant refresher course, available whenever and wherever it is needed—the lifelong learning demanded by the realities of modern military service.

Taken together, these benefits would give US soldiers, sailors, airmen, and marines the best military training the world has ever seen, preparing them for the dangerously fluid world in which we now live, and in which they must now fight. It is our responsibility not only as a service or as a government, but as a nation, to give them no less.

$15 billion is a significant amount by any standard, but it is entirely possible that this investment will generate a positive return on investment within the duration of the effort. Much of the cost will replace or expand upon required expenditures in training materials. Moreover, savings due to lower travel costs, higher graduation rates, and other fiscal benefits may well offset the remainder of the costs of this program.

As with so many DoD programs, this effort will have a ripple effect throughout NATO and other allied nations. Simulation training developed for specific weapons systems used by allies will be repurposed for use by foreign personnel. As a result, the standards set by this training will be adopted by our allies, leading to a force multiplier effect (or a 'network effect' in civilian parlance). In time, we may find our allies contributing substantial resources to this effort, further increasing the return on investment.

A recent paper from the US Army's Training and Doctrine Command (TRADOC) observed:

> The dispersed nature of our forces today and in the future requires new and innovative training approaches for the networked environment. To train

[10] Meister, Jeanne C., *Corporate Universities: Lessons in Building a World-Class Work Force*, McGraw-Hill, 1998.

> collaboration skills while maintaining crucial digital proficiency, these new approaches to training must capitalize on the potential of distributed-learning technologies. Exploiting advances in training technologies—such as interactive simulations available over the Internet, providing realistic scenarios—will result in better-quality individual and collective learning of network-enabled decision-making skills.[11]

This proposal will accelerate the efforts of organizations like TRADOC and the Signal Center who are already pushing forward with high-fidelity simulations for training.

For the simulation learning community—including customers, vendors, academia, and others—the benefits would be equally dramatic:

- **Critical mass**. This effort will create a critical mass of simulation-based e-learning courseware—over 600,000 hours of instruction in total.
- **Standardization**. For the military to effectively deploy and utilize so much courseware, the process of standards development and adoption will necessarily accelerate. This process is underway, with 3DIF—led by Intel, Adobe Systems, Boeing, and others—as the highest-profile group working in this area. (See sidebar.) The sheer scale of this proposal will force standards adoption to happen even more rapidly, and on a more widespread basis, than would otherwise be possible.
- **Reusability**. The efficient development of this amount of courseware will demand that standards move beyond application-level interoperability to robust, object-level interoperability. If an M16A1 rifle is modeled for a particular simulation, that model—complete with all its complex behaviors—should be capable of being dragged and dropped into any other simulation as needed. This will create an almost unimaginably vast library of fully reusable, fully interactive content.
- **Technology transfer**. The technology developed to enable this effort will transfer to the civilian world, enabling private industry to follow in the wake of the military, maintaining and enhancing our national competitiveness for decades to come. This would be especially true if the government were go beyond commercial off-the-shelf (COTS) requirements and mandate open source software development and usage as the basis of the effort.

Over a five-year period, $15 billion works out to $3 billion per year—just over one-half of one percent of the overall defense budget, and about 12 cents out of every $100.00 the federal government spends.[12] Is 12 cents too much to ensure we have not only the best trained troops in the world, but the best trained troops in history?

More often than many civilians might realize, the military has led the way forward in American society, not only technologically, but socially as well. The GI Bill of 1944 enabled countless veterans to attend college, creating a generation of educated men and women who helped enable America's rise to superpower status. The military services began the process of racial integration in 1948, 16 years before the Civil Rights Act began the same process for civilian society. The

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[11] http://www.tradoc.army.mil/pao/Web_specials/lifelong_learning/intro.htm.
[12] http://www.cbo.gov/showdoc.cfm?index=4985&sequence=4.

time has come for the military to lead the way forward once again—in this case, both technologically and socially, with a moon shot for simulation learning.

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3Dsolve, The Simulation Learning Company, creates collaborative simulation learning solutions for government, military, and corporate applications, a market estimated to reach $6.1 billion by 2006. 3Dsolve's simulation learning products use realistic, interactive 3D graphics, based upon industry standards, enabling users to learn by doing. 3Dsolve has been named as one of *Military Training Technology* magazine's Top 100, the "companies that have made a significant impact in the military training industry."