



PROGRAM EXECUTIVE OFFICE FOR
SIMULATION, TRAINING & INSTRUMENTATION

Funding Landscape for Game-Related Research

ROGER SMITH

Chief Technology Officer

US Army PEO STRI

<http://www.peostri.army.mil/CTO>

roger.smith14@us.army.mil



Approved for Public Release.
Security and OPSEC Review Completed: No Issues.

Foundations of Digital Games
26-30 April 2009

Notes

The military is becoming a hungry user of game technologies. Games are following an adoption path similar to that of Virtual Reality and 3D graphics in the 1990's. Those created the entire field of "Virtual Simulation" that are a major part of our training systems today. "Game Technologies" are offering better graphics, better user interface designs, better physics models, more compact AI, and networking to form ad hoc teams. As society in general and the military in particular overcome the stigma of "a kids toy" associated with games, the adoption of these technologies will become more widespread.

This briefing identifies the kind of funding that has been available for research in computer games within military offices. This kind of work is one indication of what the military will support in the future. The briefing also paints a picture of a future in which every soldier has a personal simulator, a system which will probably contain a number of game technologies. We pose the question: What kind of game engine can be created to support 316 different kinds of military jobs?



Funded Game Research

- Army Game Project
 - ❖ Americas Army Development
- RDECOM Simulation & Training Technology Center
 - ❖ BAA & SBIR
- USC Institute for Creative Technology
 - ❖ Multiple Research Projects
- PEO-STRI
 - ❖ SBIR & Interoperability Research
- DARPA IPTO
 - ❖ Real World Project

2

Notes

The military has funded a number of research projects that involved computer gaming. In most cases, this work has been pursued by a small group of boutique companies that have experience with both entertainment games and military simulation. This short list shows just a few organizations that have offered research projects and that will most likely continue to do so.



MG Kamiya, Director, Joint Warfighting Center
Games make it possible for every soldier to have his own simulator.



Notes

MG Kamiya, Director of the Joint Warfighting Center, has compared computer games to the rifle and the radio. Every soldier has had his own weapon for decades/centuries. But every soldier did not get a radio until very recently. Computer games may make it possible for every soldier to have a personal simulator/training device just as he has his own weapon and radio today.



One Million Soldiers

➤ Army Size*

❖ Regular Army:	507,082
❖ Army National Guard:	333,177
❖ <u>Army Reserve:</u>	<u>189,005</u>
❖ Total:	1,029,264



*Numbers as of: Regular Army, 2007; ARNG & USAR, 2005

4

Notes

There are over one million soldiers in the Army. Can you imagine a world in which each of them has a personal training device? To what degree can this device be built from or include computer game technologies?

Sources:

As of March 31, 2007, the Regular Army reported a strength of 507,082 soldiers.[2] By the end of 2005, the Army National Guard (ARNG) reported 333,177 and the United States Army Reserve (USAR) reported 189,005,[3] putting the approximate combined component strength total at 1,029,264.

1. http://en.wikipedia.org/wiki/United_States_Army
2. <http://siadapp.dmdc.osd.mil/personnel/MILITARY/ms1.pdf>
3. <http://www.armyg1.army.mil/hr/demographics/FY05%20Army%20Profile.pdf>



U.S. Army Military Occupational Specialties

Enlisted MOS

Infantry Branch

11B Infantryman
11C Indirect Fire Infantryman
11X Infantryman (ambiguous; turns into 11B, 11C, or 11M)
11Z Infantry Senior Sergeant
11H Infantry Anti-Armor Specialist
11M Mechanized Infantryman

Field Artillery Branch

13B Cannon Crewmember
13C TAC Fire Operations Specialist
13D Field Artillery Tactical Data Systems Specialist
13E Cannon Fire Direction Specialist
13F Fire Support Specialist
13M Multiple Launch Rocket System Crewmember
13P MLRS/LANCE Operations Fire Directions Specialist
13R Field Artillery Firefinder Radar Operator
13S Field Artillery Surveyor
13W Field Artillery Meteorological Crewmember
13X Field Artillery Enlistment Option
13Z Field Artillery Senior Sergeant

Air Defense Artillery Branch

14E Patriot Fire Control Enhanced Operator/Maintainer
14I Early Warning System Operator
14M Man Portable Air Defense System Crewmember
14R Bradley Linebacker Crewmember
14S Avenger Crewmember
14T PATRIOT Launching Station Enhanced Operator/Maintainer
14Z Air Defense Artillery (ADA) Senior Sergeant

Aviation Branch

15B Aircraft Powerplant Repairer
15D Aircraft Powertrain Repairer
15F Aircraft Electrician
15G Aircraft Structural Repairer
15H Aircraft Pneumatics Repairer
15J OH-58D Armament/Electrical/Avionics Systems Repairer
15K Aircraft Components Repair Supervisor
15M UH-1 Helicopter Repairer
15N Avionics Mechanic
15P Aviation Operations Specialist
15Q Air Traffic Control Operator
15R AH-64 Attack Helicopter Repairer
15S OH-58D Helicopter Repairer
15T UH-60 Helicopter Repairer
15U Medium Helicopter Repairer
15V Observation/Scout Helicopter Repairer
15X AH-64 Armament/Electrical Systems Repairer
15Y AH-64D Armament/Electrical Systems Repairer
15Z Aircraft Maintenance Senior Sergeant

Special Forces Branch

18B Special Forces Weapons Sergeant
18C Special Forces Engineer Sergeant
18D Special Forces Medical Sergeant
18E Special Forces Communications Sergeant
18F Special Forces Assistant Operations & Intelligence Sergeant

Armor Branch

19D Cavalry Scout
19K Armor Crewmember

Corps of Engineers Branch

21B Combat Engineer (Formally 12B)
21C Bridge Crewmember
21D Diver
21E Heavy Construction Equipment Operator
21G Quarrying Specialist
21H Construction Engineer
21J General Construction Equipment Operator

21K Plumber
21L Lithographer
21M Firefighter
21N Construction Equipment Supervisor
21P Prime Power Production Specialist
21Q Transmission and Distribution Specialist
21R Interior Electrician
21S Topographic Surveyor
21T Technical Engineering Specialist
21U Topographic Analyst

21V Concrete and Asphalt Equipment Operator
21W Carpentry and Masonry Specialist
21X General Engineering Supervisor
21Y Topographic Engineering Supervisor
21Z Combat Engineering Senior Sergeant

Signal Corps Branch

25B Information Systems Operator Analyst (to be renamed Information Technology Specialist in Oct'07)
25C Radio Operator Maintainer
25D Telecommunications Operator/Maintainer (to be deleted in Oct'07)
25F Network Switching Systems Operator/Maintainer
25G Wire Systems Installer
25M Multimedia Illustrator
25N Nodal Network Systems Operator/Maintainer
25P Microwave Systems Operator/Maintainer
25Q Multichannel Transmission Systems Operator
25R Visual Information/Audio Equipment Repairer
25S Satellite Communication Systems Operator/Maintainer
25T Satellite/Microwave Systems Chief
25U Signal Support Systems Specialist
25V Combat Documentation & Production Specialist
25W Telecommunications Operations Chief
25X Senior Signal Sergeant
25Y Information Systems Chief (to be deleted in Oct'07)
25Z Visual Information Operations Chief

Judge Advocate General Branch

27D Paralegal Specialist
Military Police Corps Branch
31B Military Police
31D CID Special Agent
31E Interment/Resettlement Specialist

Military Intelligence Branch

33W (35T) MI Systems Maintainer/Integrator
96B (35F) Intelligence Analyst
96D (35G) Imagery Analyst
96H (35H) Imagery Ground Station Operator
96R (35I) Ground Surveillance Systems Operator
96U (35K) Unmanned Aerial Vehicle Operator
96Z (35X) Intelligence Senior Sergeant
97B (35L) Counterintelligence Agent
97E (35M) Human Intelligence Collector
97L (35Q) Translator/Interpreter
97Z (35Y) Counterintelligence/Human Intelligence Senior Sergeant
98C (35N) Signal Intelligence Analyst (Linguist)
98G (35P) Cryptologic Linguist
98P (35U) Multi-Sensor Operator
98Y (35S) Signals Collector/Analyst
98Z (35Z) Signals Intelligence Senior Sergeant
09L (35V) Translator Aide
05B EW/SIGINT Morse Intercept Operator

Psychological Operations Corps Branch

37F Psychological Operations Specialist

Civil Affairs Branch

38B Civil Affairs Specialist

Adjutant General Branch

42A Human Resource Specialist
42F Human Resource Systems Information Specialist
42L Administration Specialist (to be deleted)
42R9B Trumpet Player
42R9C Baritone or Euphonium Player
42R9D French Horn Player
42R9E Trombone Player
42R9F Tuba Player
42R9G Flute or Piccolo Player
42R9H Oboe Player
42R9I Clarinet Player
42R9K Bassoon Player
42R9L Saxophone Player
42R9M Percussion Player
42R9N Piano Player
42R9T Guitar Player
42R9U Electric Bass Guitar Player
42S Special Band member

Finance Branch

44C Finance Specialist/Accounting Specialist

Public Affairs Branch

46Z Public Affairs Chief

Chaplain Branch

56M Chaplain Assistant

CMF 63 - Mechanical Maintenance

44B Metal Worker
44E Machinist
45B Small Arms/Artillery Repairer
45G Fire Control Repairer
45K Armament Repairer
52C Utilities Equipment Repairer
52D Power Generation Equipment Repairer
62B Construction Equipment Repairer
63A M1 Abrams Tank Turret Mechanic/M1 Abrams Tank System Mechanic
63B Light-Wheel Vehicle Mechanic/Heavy Wheel Vehicle Mechanic/Wheel Vehicle Repairer
63D Artillery Mechanic
63H Fuel and Electrical Repairer/Track Vehicle Mechanic
63J Quartermaster and Chemical Equipment Repairer
63M M2-3 Bradley Fighting Vehicle System Mechanic/Bradley Fighting Vehicle Systems Turret Mechanic
63X Track Vehicle Repairer
63W All Wheel Vehicle Repairer
63Z Mechanical Maintenance Supervisor

Medical Department Branches

68A Medical Equipment Repairer
68D Operating Room Specialist
68E Dental Specialist
68G Patient Administration Specialist
68H Optical Laboratory Specialist
68J Medical Logistic Specialist
68K Medical Laboratory Specialist
68M Hospital Food Specialist
68P Radiology Specialist
68Q Pharmacy Specialist
68R Veterinary Food Inspection Specialist
68S Preventive Medicine Specialist
68T Animal Care Specialist
68V Respiratory Specialist
68W Health Care Specialist (aka Combat Medic)
68X Mental Health Specialist
68Z Chief Medical NCO

Chemical Branch

74D Chemical Operations Specialist (formerly 54B)

CMF 79 - Recruiting and Retention

79R Recruiter Noncommissioned Officer
79S Career Counselor
79T Recruiting and Retention NCO
79V Retention and Transition Noncommissioned Officer

Transportation Branch

88H Cargo Specialist
88K Watercraft Operator
88L Watercraft Engineer
88M Motor Transport Operator
88N Traffic Management Coordinator
88P Railway Equipment Repairer
88T Railway Section Repairer
88U Railway Operations Crewmember
88Z Transportation Senior Sergeant

Ordnance Branch

89B Ammunition Specialist
89D Explosive Ordnance Disposal Specialist
Quartermaster Corps Branch
92A Automated Logistics Specialist
92F Petroleum Supply Specialist
92G Food Service Specialist
92L Petroleum Laboratory Specialist
92M Mortuary Affairs Specialist
92R Parachute Rigger
92S Shower/Laundry and Clothing Repair Specialist
92W Water Treatment Specialist
92Y Unit Supply Specialist
92Z Senior Noncommissioned Logistician

CMF 94 - Electronic Maintenance

94A Land Combat Electronic Missile System Repairer
94D Air Traffic Control Equipment Repairer
94E Radio and Communications Security Repairer
94F Special Electronics Devices Repairer
94H Test, Measurement & Diagnostic Equipment Support Specialist
94K Automatic Test Equipment Operator/Maintainer
94L Avionics Communications Equipment Repairer
94M Radar Repairer
94P Multiple Launch Rocket System Repairer
94R Avionics System Repairer
94S Patriot System Repairer
94T Avenger System Repairer
94W Electronic Maintenance Chief
94Y Integrated Family of Test Equipment
94Z Senior Electronic Maintenance Chief

Branch Immaterial (not oriented to a branch)

00Z Command Sergeant Major
Commissioned Officer & Warrant Officer MOS
Officer MOS's are usually two numerical digits plus a letter (most of the time "alpha"). Letterless MOS's are ambiguous and have several specific MOS's within the E.g. 62 contains 62A (Emergency Physician) and 62B (Field Surgeon).
Warrant Officer MOS's (known as WOMOS) are three numerical digits plus a letter, except 09W who is not yet WO.

Officer Candidates

09R Cadet
09S Officer Candidate
09W Warrant Officer Candidate

Infantry Branch

11A Infantry Officer
Field Artillery Branch
13A Field Artillery Officer
131A Field Artillery Targeting Technician
Air Defense Artillery Branch
14 Air Defense Artillery Officer
140A Command and Control Systems Technician
140E Air and Missile Defense (AMD)
Tactician/Technician (Patriot Systems Technician)
140X Air Defense Artillery (ADA) Immaterial

(Page 1)

5

Notes

A soldier's job is defined as his Military Occupational Specialty (MOS). There are over 316 of these specialties currently in the books. Very few of these jobs are trained via a simulator. But how many of these jobs are addressable using simulation/gaming systems?



U.S. Army Military Occupational Specialties

Aviation Branch

15 Aviation Officer
150A Air Traffic and Air Space Management Technician
150U Tactical Unmanned Aerial Vehicle Operations Technician (still classified at 350K until official transfer to Aviation Branch)
151A Aviation Maintenance Technician
152C OH-6 Pilot
152B OH-58A/C Pilot
152D OH-58D Pilot
152H AH-64D Pilot
153A Rotary Wing Aviator (Aircraft Nonspecific)
153B UH-1 Pilot
153D UH-60 Pilot
153DD UH-60 MEDEVAC Pilot
153E MH-60 Pilot
154C CH-47D Pilot
154E MH-47 Pilot
155A Fixed Wing Aviator (Aircraft Nonspecific)
155E C-12 Pilot
155F Jet Aircraft Pilot
155G O-5A/EO-5B/RC-7 Pilot
Special Forces Branch
18A Special Forces Officer
180A Special Forces Warrant Officer
Armor Branch
19A Armor, General
19B Armor
19C Cavalry

Corps of Engineers Branch

21A Engineer Officer
210A Utilities Operation and Maintenance Technician
215D Geospatial Information Technician (Old - Terrain Analysis Technician)

Signal Corps Branch

25A Signal Officer
250N Network Management Technician
251A Information Systems Technician
254A Signal Systems Support Technician
255Z Senior Signal Systems Technician
Judge Advocate General Branch

27A JAG Corps Attorney
27B Military Judge
270A Legal Administrator

Military Police Corps Branch

31A Military Police Officer
311A CID Special Agent

Military Intelligence Branch

35D Military Intelligence Officer
350F All Source Intelligence Technician
350G Imagery Intelligence Technician
350Z Attaché Technician
350K (150U) Tactical Unmanned Aerial Vehicle Operations (*transferring to Aviation Branch in Summer 07*)
351L Counterintelligence Technician
351M Human Intelligence Collection Technician
351Y Area Intelligence Technician
352N Traffic Analysis Technician
352P Voice Intercept Technician
352Q Morse Intercept Technician
352R Emanations Analysis Technician
352S Non Morse Intercept Technician
353T Intelligence and Electronic Warfare Technician

Psychological Operations Corps Branch

37A Psychological Operations Officer
37X Psychological Operations Officer, Designated
Civil Affairs Branch
38A Civil Affairs Officer
38X Civil Affairs Officer, Designated

Adjutant General Branch

42B Personnel Systems Management Officer
42C Band Officer
420A Military Personnel Technician

Finance Branch

44A Finance Officer

Chaplain Branch

56 Chaplain
56A Command and Unit Chaplain
56D Clinical Pastoral Educator

Medical Department Branches

60A OPERATIONAL MEDICINE
60B NUCLEAR MEDICINE OFFICER
60C PREVENTIVE MEDICINE OFFICER
60D OCCUPATIONAL MEDICINE OFFICER
60F PULMONARY DISEASE/CRITICAL CARE OFFICER
60G GASTROENTEROLOGIST
60H CARDIOLOGIST
60I OBSTETRICIAN AND GYNCOLOGIST
60K UROLOGIST
60L DERMATOLOGIST
60M ALLERGIST, CLINICAL IMMUNOLOGIST
60N ANESTHESIOLOGIST
60P PEDIATRICIAN
60Q PEDIATRIC SUB-SPECIALIST
60R CHILD NEUROLOGIST
60S OPHTHALMOLOGIST
60T OTOLARYNGOLOGIST
60U CHILD PSYCHIATRIST
60V NEUROLOGIST
60W PSYCHIATRIST

61A NEPHROLOGIST

61B MEDICAL ONCOLOGIST/HEMATOLOGIST
61C ENDOCRINOLOGIST
61D RHEUMATOLOGIST
61E CLINICAL PHARMACOLOGIST
61F INTERNIST
61G INFECTIOUS DISEASE OFFICER
61H FAMILY MEDICINE
61J GENERAL SURGEON
61K THORACIC SURGEON
61L PLASTIC SURGEON
61M ORTHOPEDIC SURGEON
61N FLIGHT SURGEON
61P PHYSIATRIST
61Q RADIATION ONCOLOGIST
61R DIAGNOSTIC RADIOLOGIST
61U PATHOLOGIST
61W PERIPHERAL VASCULAR SURGEON
61Z NEUROSURGEON

62 Medical Corps Officer

62A Emergency Physician
62B Field Surgeon

63 Dental Corps Officer

63A General Dentist
63B Comprehensive Dentist
63D Periodontist
63E Endodontist
63F Prosthodontist
63H Public Health Dentist
63K Pediatric Dentist
63M Orthodontist
63N Oral and Maxillofacial Surgeon
63P Oral Pathologist
63R Executive Dentist

64A Veterinary Corps Officer

640A Veterinary Services Food Safety Technician

65 Medical Specialist Corps Officer

65A Occupational Therapy
65B Physical Therapy
65C Dietitian
65D Physician Assistant
65X Specialist Allied Operations

66 Nurse Corps Officer

66B Community Health Nurse
66C Psychiatric/Mental Health Nurse
66E Perioperative Nurse
66F Nurse Anesthetist
66G Obstetrics and Gyneco
66H Medical-Surgical Nurse
66N Generalist Nurse
66P Family Nurse Practitioner

67 Medical Service Corps Officer

67A Health Services
67B Laboratory Sciences
67C Preventive Medicine Sciences
67D Behavioral Sciences
67E Pharmacy
67F Optometry
67G Podiatry
67J Aeromedical Evacuation

670A Health Services Maintenance Technician

70A Healthcare Administrator
70B Health Services Officer
70C Comptroller
70D Information Systems Manager
70E Patient Administrator
70F Human Resources Manager
70H Plans, Operations, Intelligence Training, and Security
70K Medical Logistics
70K91 Health Facilities Management

Chemical Branch

74A Chemical, General
74B Chemical Operations and Training
74C Chemical Munitions and Materiel Management

Transportation Branch

88A Transportation Officer
88D Transportation Officer - Motor/Rail
880A Marine Deck Officer
881A Marine Engineering Officer
882A Mobility Officer

Ordnance Branch

91A Ordnance Officer
890A Ammunition Technician
913A Armament Systems Maintenance Technician
914A Allied Trades Technician
915A Automotive Maintenance Technician
915E Senior Automotive Maintenance/Senior Ordnance Logistics Officer
919A Engineer Equipment Maintenance Technician

Quartermaster Corps Branch

92A Quartermaster Officer
920A Property Accounting Technician
920B Supply Systems Technician
921A Airdrop Systems Technician
922A Food Service Technician
923A Petroleum Systems Technician

CMF 94 - Electronic Maintenance

948B Electronic Systems Maintenance Technician
948D Electronic Missile Systems Maintenance Technician
948E Senior Electronics Maintenance Technician

Notes

That is a really long list.



Long Tail of Military Games

Trigger Pullers
Combat Missions
Life Threatening

\$50M project



Medical
Logistics
Intelligence

\$1M project



Signal/IT
Linguist
Interrogation

\$100K project



Ethics
Culture
Engine Repair

\$10K project



Notes

In the past we have focused all of our simulation funding on systems that train “the trigger pullers”. These are the people directly involved in combat and whose lives are on the line if they make a mistake. The high cost of these systems has made it economically impossible to extend these kinds of systems to all soldiers and all MOS’. Computer games may offer a lower-cost solution which would allow us to work our way down the curve creating systems for significantly lower costs.

In this world “The Long Tail” refers to all of the military jobs that are too specialized, too few, or too unique to be able to afford a computer-based simulation or game. If we could find a way to use a common game engine for multiple jobs we might be able to create mods for unique jobs at very low cost.

Note: “The Long Tail” was proposed by Chris Anderson in a 2004 Wired magazine article and later in a book. The application of the term here is a slight twist on his original meaning.

<http://www.wired.com/wired/archive/12.10/tail.html>



Military Serious Games

Full Spectrum Warrior

America Army

VBS2



Tactical Iraqi

TC3

Tactical Questioning



Notes

The military, and particularly the US Army, has already developed and fielded a number of games for training. Though we continue to create combat-focused games, we are also beginning to apply the technology to other jobs like social interactions and combat medics. There are potentially many more non-combat applications than combat applications.



Game Product for 316 Different Jobs

	Combat	Logistics	Medical	Intelligence	Social	Maintenance
GUI						
Artwork						
Data						
Models						
Game Engine						
Network						

Notes

Is it possible to create a game engine that is flexible enough to be applied to multiple applications in different areas? There is certainly not “one game engine to bind them all”, but there is also no need to create 316 unique game products to serve 316 job descriptions. There has to be some reusability across applications. Multiple games will also call for interoperability among these games – another reason to keep the lower layers of the software product generic or common.



Notes

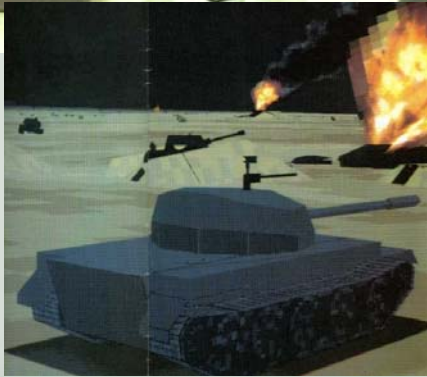
Military customers are also becoming very interested in the tools that are used to create databases/levels/scenarios for the game. If soldiers are equipped with a personal simulator, then they need to be able to use tools to create the scenarios they are interested in playing – as well as downloading professionally created scenarios.

Once a scenario is run, soldiers need to be able to understand their performance. What did they do right? What did they do wrong? How can they improve? This data will also be shared with trainers who can help them improve.



Conclusion

20th Century



21st Century



11

Notes

We certainly are **NOT** going to use **LESS** game technology in the future.