

2011 Military Health System Conference

Air Force Medical Modeling and Simulation

Bringing Virtual Reality to Reality

The Quadruple Aim: Working Together, Achieving Success

Colonel Deborah N. Burgess, MD, FACP

26 January 2011



Medical Modernization Division
Headquarters, Air Education & Training Command

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Overview



- Program Review
- Medical and Simulation Training Limitations
- AFMS Cloud Architecture
- Projects and Resourcing
- DoD MM&ST Consortium
- Strategic Partnerships
- San Antonio Medical Simulation CoE



Program Review



Mission

Integrate Simulation and Emerging Technologies into Education, Training and Sustainment Platforms

Vision

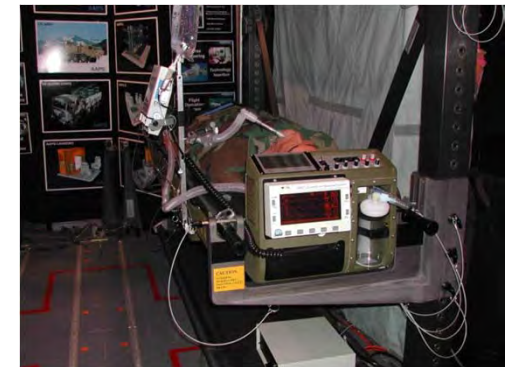
Build a Distributed Simulation Network, Create Centers of Excellence, and Exploit Technological Innovation

Battlefield Trauma, Critical Care Air Transport, In Garrison Care, Patient Safety, Humanitarian Missions, CBRN, Disaster, Homeland Defense and Pandemic Response

Targeted Training Areas



- Combat Casualty Care
- Critical Care Air Transport/Aeromedical Evacuation
- Patient Safety & Team Training
- Currency, Competency, Sustainment
- Graduate Medical Education
- Nurse and Allied Health
- Natural Disaster & Homeland Security
- Pandemic Response



A Call for Change



Preventable medical errors among the leading causes of death in the United States

November 1999

INSTITUTE OF MEDICINE

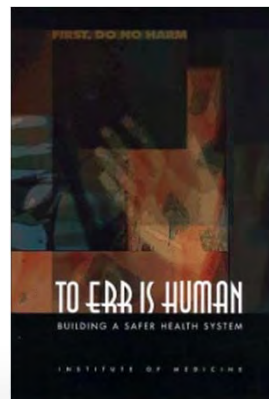
Shaping the Future for Health

TO ERR IS HUMAN:

BUILDING A SAFER HEALTH SYSTEM

Recommendation 8.1:

“Patient safety programs should...**establish interdisciplinary team training programs** for providers that incorporate **proven methods of team training, such as simulation.**”



2011 MHS Conference

March 2001

INSTITUTE OF MEDICINE

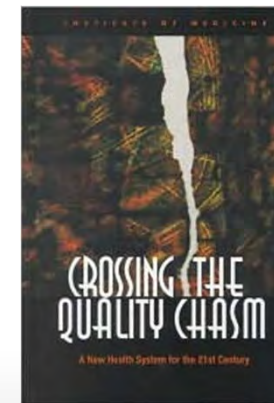
Shaping the Future for Health

CROSSING THE QUALITY CHASM:

A NEW HEALTH SYSTEM FOR THE

21ST CENTURY

“Faced with such rapid changes, the nation’s health care delivery system has fallen far short in its ability to **translate knowledge into practice and to apply new technology safely and appropriately**”



One Decade Later...



Department of Health and Human Services

OFFICE OF
INSPECTOR GENERAL

ADVERSE EVENTS IN HOSPITALS:
NATIONAL INCIDENCE AMONG
MEDICARE BENEFICIARIES



Daniel R. Levinson
Inspector General

November 2010
OEI-06-09-00090

- 13.5% Medicare inpatients have at least 1 unexpected adverse event
 - 1.6M harmed per year
 - 180,000 fatalities per year
- 44% “clearly or likely preventable”
 - 707,000 harmed per year
 - 79,000 fatalities per year

Over \$4 billion added to Medicare health care cost!

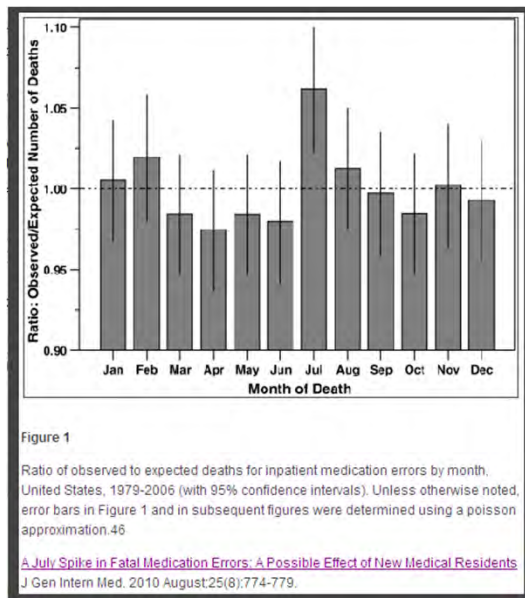
One Decade Later...



A July Spike in Fatal Medication Errors: A Possible Effect of New Medical Residents

David P. Phillips, PhD¹ and Gwendolyn E. C. Barker, BA²

¹Department of Sociology, University of California at San Diego, La Jolla, CA, USA; ²School of Public Health, University of California at Los Angeles, Los Angeles, CA, USA.



J Gen Intern Med. 2010 Aug;25(8):774-9

- 10% increase inpatient deaths from medication errors in counties with teaching hospitals
- Death rate NOT decreased despite patient safety concerns and decrease in resident work hours (cut in 2003)

Surgical Workload (Comparison to US Trauma Center*)



US Level One Trauma Center

- ~2000-7500 admission/year
- <30% penetrating trauma
- High velocity GSW – rare
- Blast injury – rare
- <10% trauma pts need surgery
- Most pts need one procedure/one surgeon
- Multiple casualty event – rare
- Trauma – nominal workload

332 EMDG/AFTH Balad

- ~8000 admissions/year
- >90% penetrating trauma
- High velocity GSW – rule
- Blast injury – very common
- >80% trauma pts need surgery
- Majority pts require multiple procedures and specialists
- Mass casualty event – common
- Trauma – majority of workload

US trauma care unlike battlefield trauma. Medics must combine hands-on with simulation training to achieve and maintain currency and competency

“On-The-Job-Training” Not An Option



Central Program Office



- Program established Jan 2008
- Developed/executed CONOPS, strategic plan
- ID requirements, develop standard curricula
- Manage resources: Staff, equipment, support
- New technology development
- Program for sustainment



Central Program Office



- Assets \$59.3M, 48.5 FTEs 80 sites worldwide*
- “DoD Center of Excellence” by the ASD/HA
- Lead Service, DoD MM&S Training Consortium
- Lead Service, Joint Technology Coordinating Group-1 Modeling & Simulation subgroup
- USAF SG designated SPO vs MEFPK for medical simulation E&T

*Current Jan 2011





“Hub & Spoke” Simulation Network

Facilities grouped into 4-tiered system based on training requirements and simulation capability

Category	Characteristics
<u>TIER 1:</u> Centers of Excellence	Curriculum and scenario development, Mentor/train Tier 2 sites, qualified instructors, full-time simulation staff, training GME/RSV/Phase II/Annual/Critical Care/Formal Courses
<u>TIER 2:</u> Core Simulation Programs	Execute training and disseminate curriculum/scenarios to Tier 3 sites; Mentor Tier 3 sites, qualified instructors and part-time support staff, training GME/RSV/Phase II/Annual/etc
<u>TIER 3:</u> Regional Simulation Programs	Execute simulation training for assigned staff, additional duty simulation staff, training RSV/Annual
<u>TIER 4:</u> Program Initiation or Drawdown	Execute RSV, Life Support Training as needed; utilize local hospitals or the VA to support training

Tier I Site Selections

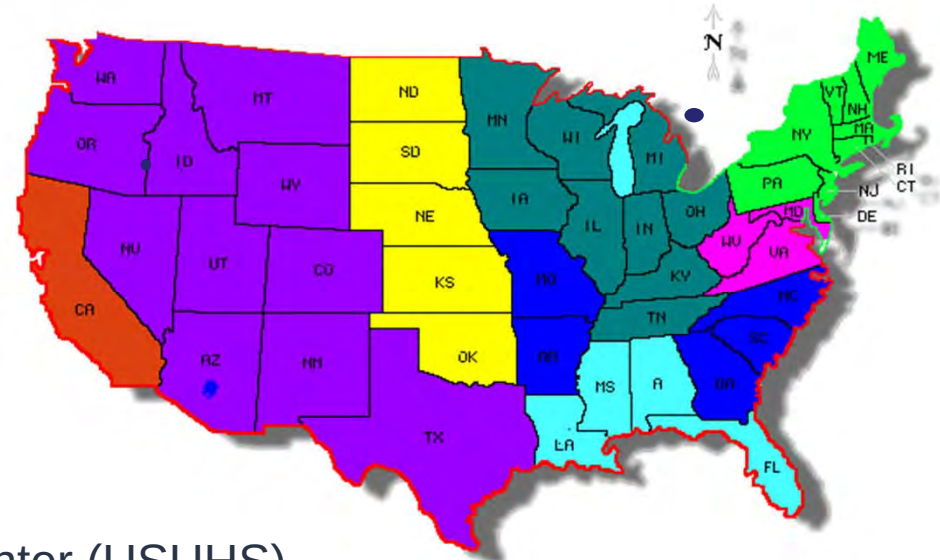


- Wilford Hall *
- Keesler *
- Travis *
- C-STARS Saint Louis
- C-STARS Baltimore
- C-STARS Cincinnati
- USAFSAM - EMEDS *
- Lakenheath UK
- National Capitol Area Simulation Center (USUHS)
- Defense Medical Readiness Training Institute (DMRTI)

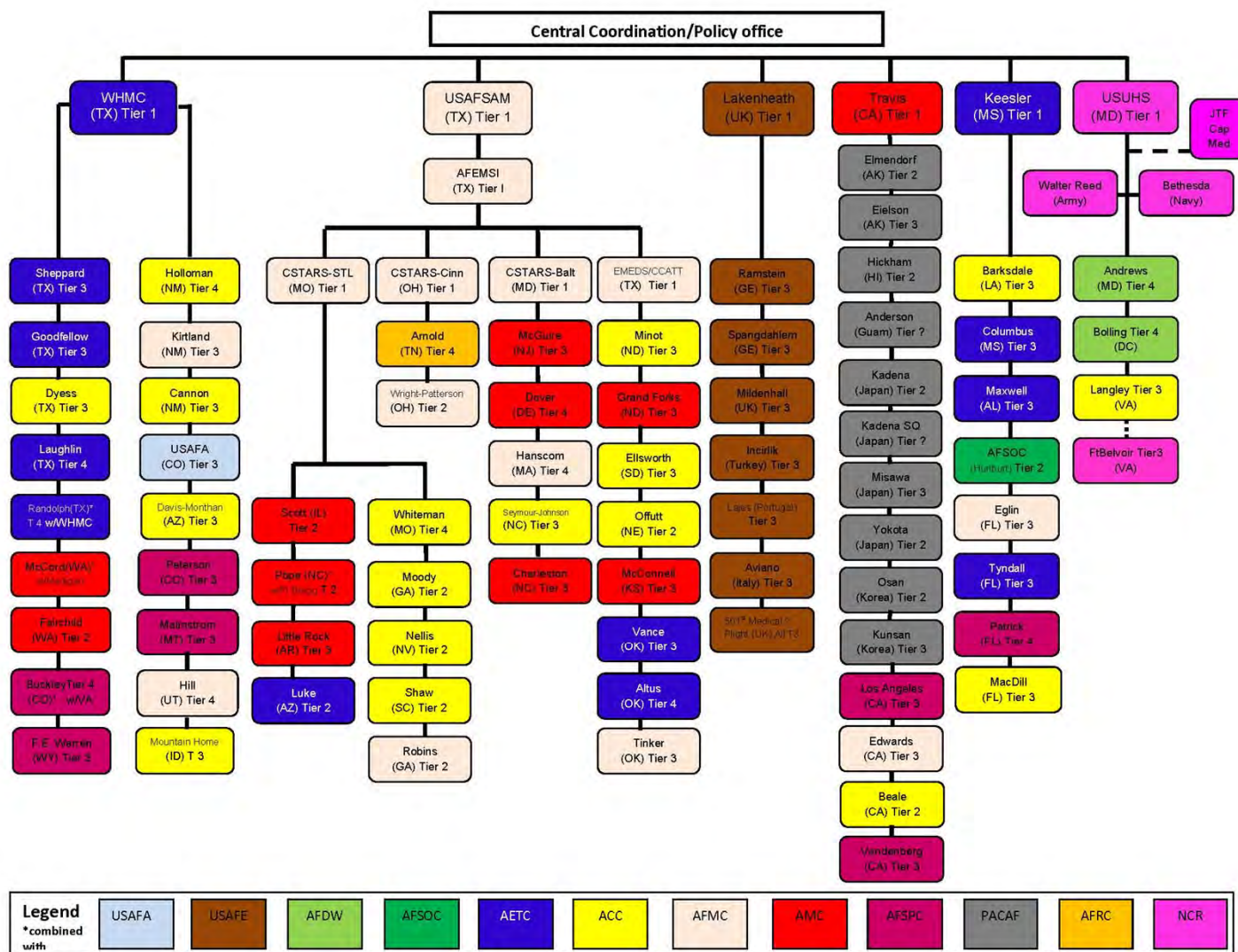
* *Simulation Operator Course*

AF Simulation Regions

- - Travis Region
- - USAFSAM
- - Cincinnati
- - Lackland Region
- - St. Louis
- - Baltimore
- USHUS
- KEESSLER
- Luke, Nellis, WP
- WIS
- PACAF/USAFE

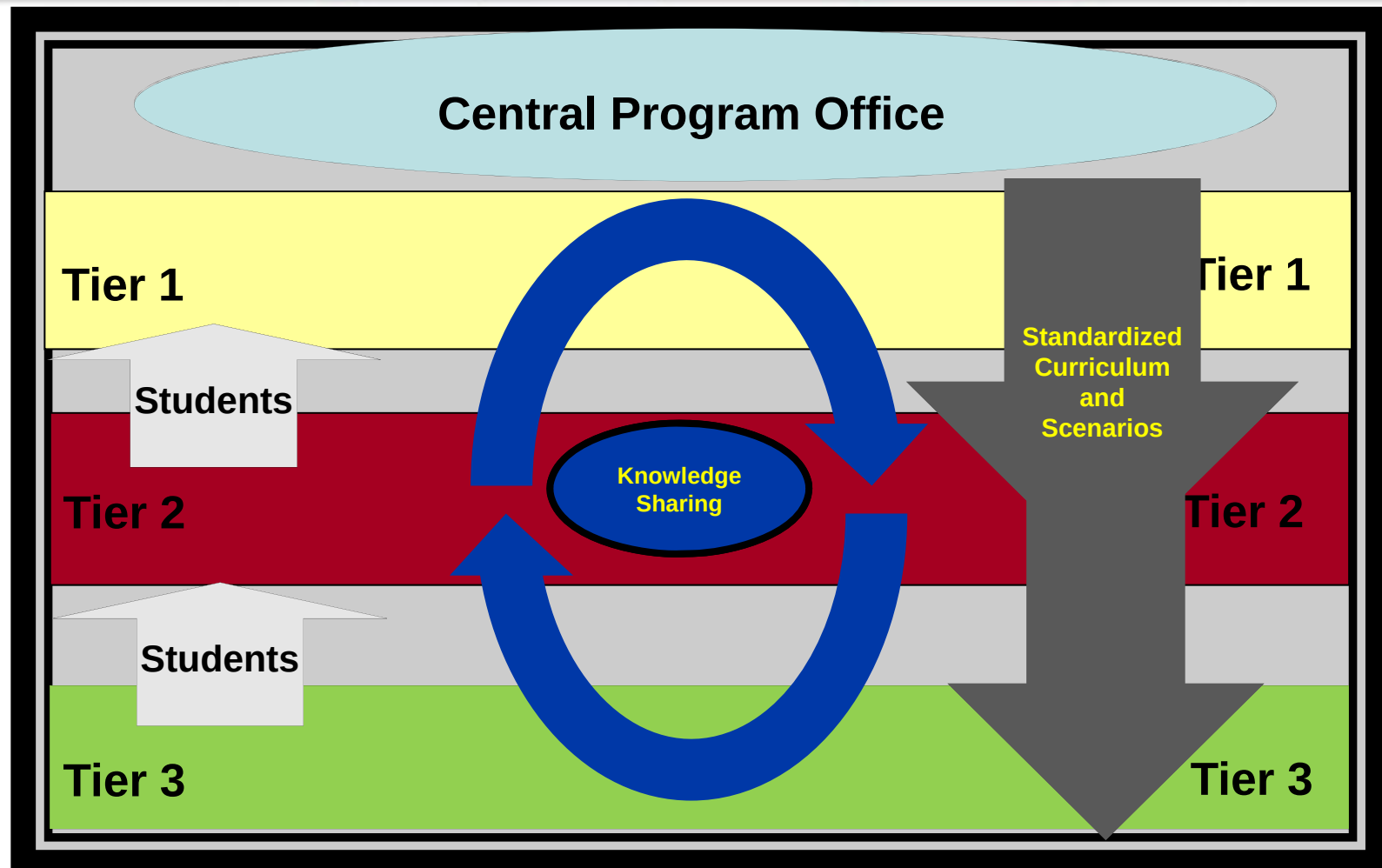


Tier 1 Organizational Structure





Simulation Training Network



Dynamic Network for information Sharing

Aligning Currency & Training



- In the last 10 years, over 50% of 522 U.S. airline accident fatalities linked to simulation training errors
- *"Far easier than in the real world"*
- Poor training = catastrophic mistakes
- Simulation is only as good as the data, knowledge and expertise used to train



USA TODAY
31 Aug 2010



Medical Training Limitations

- Curricula and training materials not standardized
- Quality variable and inconsistent in/out MTF
 - # patients, surgical cases, staff experience and availability
- Lack validation of skill acquisition, performance
 - Metrics not established, tracked or archived
- Measures of quality and competency flawed?
 - Exams, # cases, errors, complications, malpractice
- No enterprise IT architecture or interoperability
 - Multiple info sources, servers, databases, passwords
 - Difficult to access/unknown, local servers, no mobile app

Simulation Training Limitations



- Lack uniform use of standard tools
- Quality variable - Instructor SME, know simulation?
- Not formally integrated into curriculum
- Poor for surgery, invasive procedures, live tissue
- High student-instructor ratio
 - Limits individual instruction and # didactic sessions
- Low throughput
 - Set-up/breakdown, space availability
- Feedback inconsistent (verbal vs taped)
- Performance metrics not measured or tracked

Health Care Innovation Surge



- Current health care system is unsustainable
- Advances in treating disease and trauma
- Technology innovation has changed how we live
- Little application to improve health system efficiency
- Rising health costs push responsibility onto patients
- New generation of computer-savvy doctors/patients
- Ubiquity of high-speed Internet, mobile devices
- Influx of interest from technology entrepreneurs
- DoD and the Federal Government forces for change

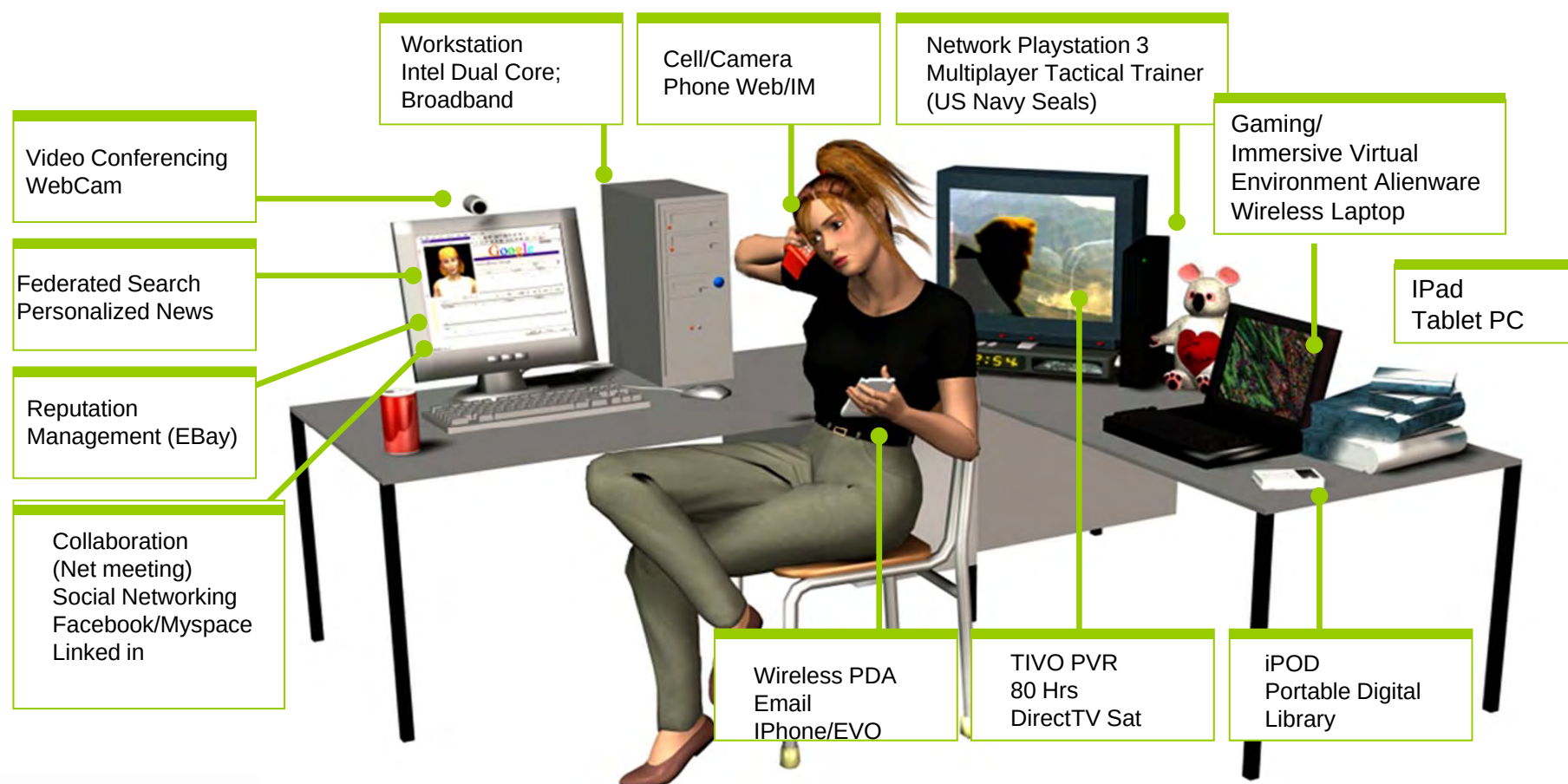


GE and Intel team up to develop Telehealth gadgets for chronic disease management, independent living, and assistive technologies



The Future Airman

Today's Cyber Teenager = Tomorrow's Airman



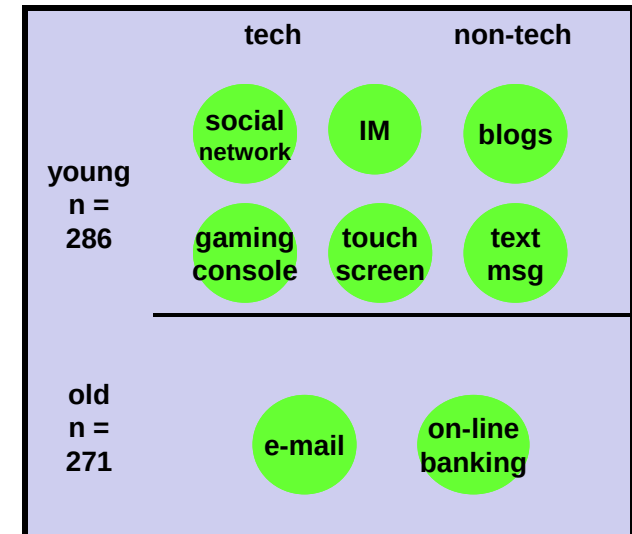
Digital Natives

Future Learning Survey Airmen & Technology*



Young vs Old: Statistical difference in use of technology

- Strategy for E+T technology
- Knowledge, attitudes, views
 - Legacy: PCs, cell-phones, e-mail
 - Newer: virtual worlds, gaming
- 557 participants in two categories
 - Age: *Young (18-21)* 286, *Old (22+)* 271
 - Excluded (40+)
- 93% - **view of bases online** beneficial
- 60% - **virtual operational exercises online** enhance readiness
- 58% - **avatars could be effective mentors**
- 65% - **online gaming** provides encouragement to join military



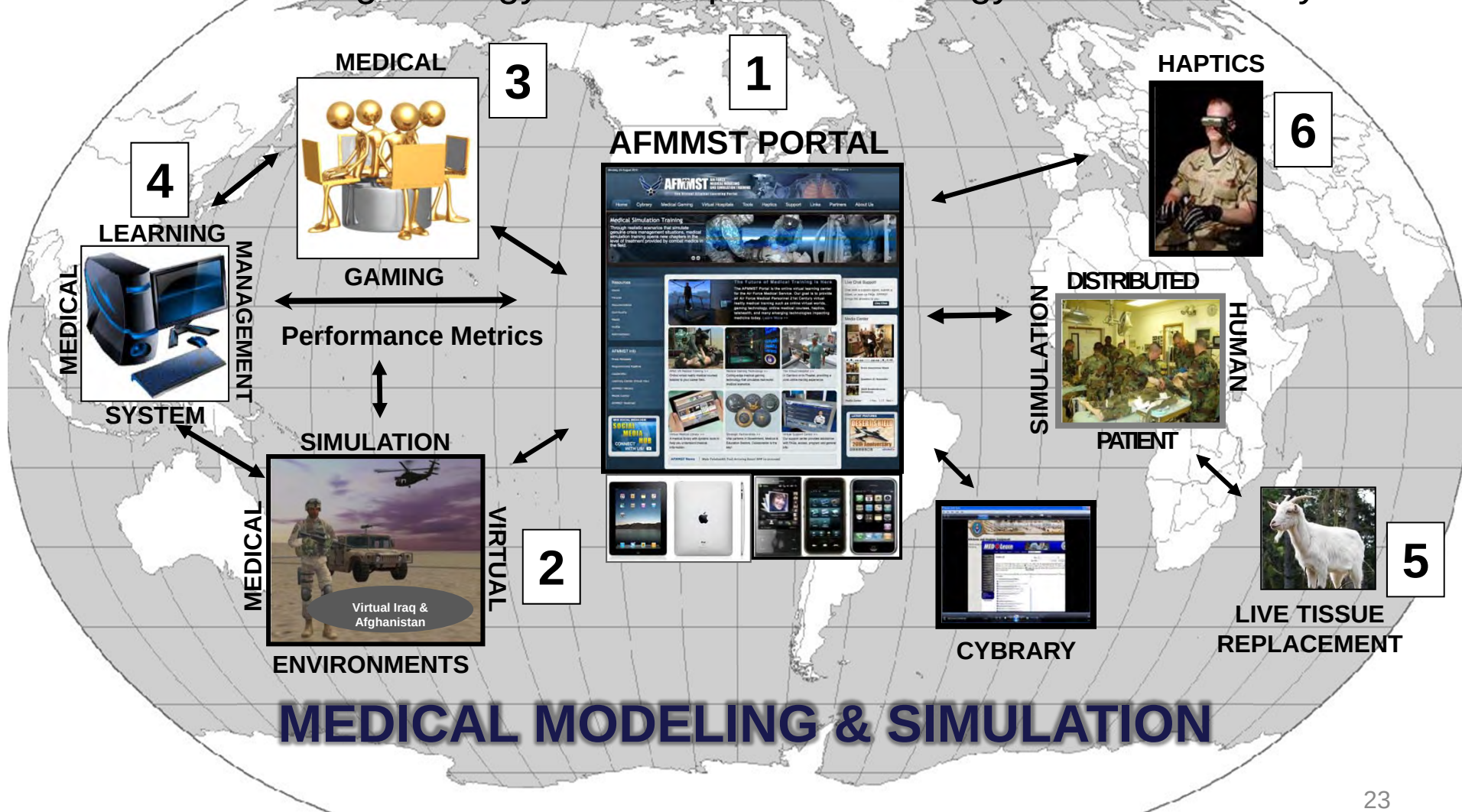
* Keesler AFB June 2008



AFMS “Cloud” Architecture

AIR FORCE MEDICAL SERVICE

Overarching Strategy for Enterprise Technology Service Delivery



Cloud Computing: Software as a Service (SAAS)



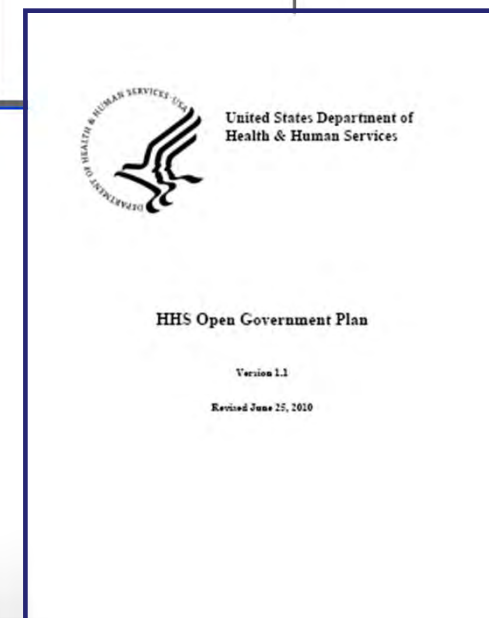
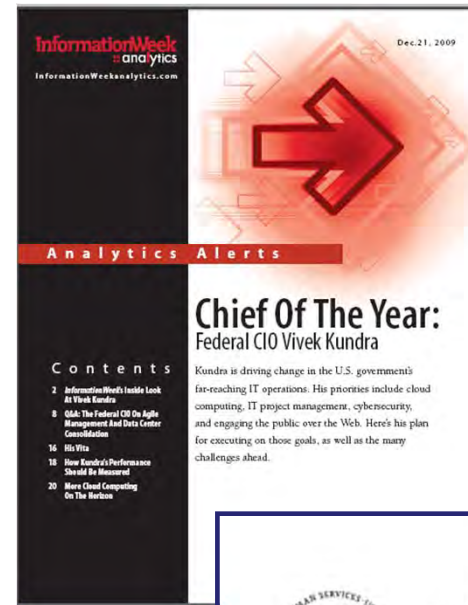
- SAAS applications managed from a central server vs on site
- Enables remote access to applications via a web browser
- Eliminates the need to download patches and upgrades
- “Turn-key” access to software and services
- Multiple users access the same app (multiplayer gaming, mobile)
- Affordable, pay-as-you-go, à la carte menu of software
- Eliminates IT infrastructure and software sustainment costs
- Reduces the number of data centers, IT systems, contractors
- Better IT application performance
- Alternative to investing in hardware

Focus shifts from managing IT infrastructure to strategic projects

DoD and Federal Government Technology Alignment



- Cloud computing a new business model for DoD and federal government
- Access to emerging technology and high value data
- Cost savings and greater efficiency





AFMMST Portal 360°

The Air Force Medical Modeling & Simulation Training Portal



VR Medical Training Online

- Web-based Virtual Reality Medical Training Portal for AFMS
- AFMS CBTs Online
- AFSC Specific Training
- Online Communities
- CAC Enabled
- Mobile Device Ready
- Industry & DoD Standards

Project Integrations

- Medical Training via Gaming Simulation
- Virtual Hospitals
- Virtual Sick-Call Training
- Haptics Technology
- LMS Integration
- Reports/Transcripts
- Web-Telehealth SimTool
- Medical Cybrary (docs/blogs, DBs)

Monday, 23 August 2010 EMS\manny

AFMMST AIR FORCE MEDICAL MODELING AND SIMULATION TRAINING
The Virtual Clinical Learning Portal

Home Cybrary Medical Gaming Virtual Hospitals Tools Haptics Support Links Partners About Us

Medical Gaming Simulation

Existing game applications, modified for educational purposes, use the characteristics of video/computer games to create immersive learning experiences for delivering specified learning goals, outcomes, and experiences.

Resources
Home
Forums
Documentation
Community
Media
Profile
Administrator

AFMMST Info
Press Releases
Requirements Pipeline
Leadership
Learning Center Virtual Tour
AFMMST Metrics
Media Center
AFMMST Webmail

MHS SOCIAL MEDIA HUB
SOCIAL MEDIA HUB
CONNECT WITH US!

The Future of Medical Training is Here

The AFMMST Portal is the online virtual learning center for the Air Force Medical Service. Our goal is to provide all Air Force Medical Personnel 21st Century virtual reality medical training such as online virtual worlds, gaming technology, online medical courses, haptics, telehealth, and many emerging technologies impacting medicine today. Learn More >>

AFSC VR Medical Training >>
Online virtual reality medical courses tailored to your career field.

Medical Gaming Technology >>
Cutting-edge medical gaming technology that simulates real-world medical scenarios.

The Virtual Hospital >>
In Garrison or In-Theater, providing a vivid online training experience.

Virtual Medical Library >>
A medical library with dynamic tools to help you understand medical information.

Strategic Partnerships >>
Vital partners in Government, Medical & Education Sectors. Collaboration is the key!

Virtual Support Center >>
Our support center provides assistance with FAQs, access, program and general info.

Live Chat Support
Chat with a support agent, submit a ticket, or look up FAQs. AFMMST brings the answers to you. [Live Chat](#)

Media Center
Brain Awareness Week
Question 21 Reminder
2010 Remembrance Ceremony
Media Center < Prev 1 / 7 Next >

LATEST FEATURES
OPERATION RAVEN DEW GREENLAND
ARCHIVE

AFMMST News | AFMS partners with Army RDECOM / STTC for Virtual Sick Call Training

Cloud Computing Strategy

- DoD Hosting Center
- Hosted Microsoft SharePoint 2010
- Network Security
- Managed Bandwidth
- IA Compliance
- Enterprise Storage Solution (SAN)
- Live Chat Support
- Virtualization

Strategic Partnerships

- CSC-A, CSC-N, USUHS
- Army RDECOM/STTC
- Air Force (Line/AETC)
- UCF Medical School
- Texas A&M (Pulse)
- TATRC, MHS, OASD/HA, VA
- OSD/DDR&E
- PEO-STRI
- METC
- AMEDD C & S MS/MSTC/BCTC
- USMC TECOM

4th Quarter FY 2010

- Requirements Process
- Funding Allocated
- Staffing Acquisitions
- Strategy Development
- Partner Evaluations

1st Quarter FY 2011

- Infrastructure Acquisitions
- AFMMST Portal Devt
- Content Mgmt
- Hardware Setup

2nd Quarter FY 2011

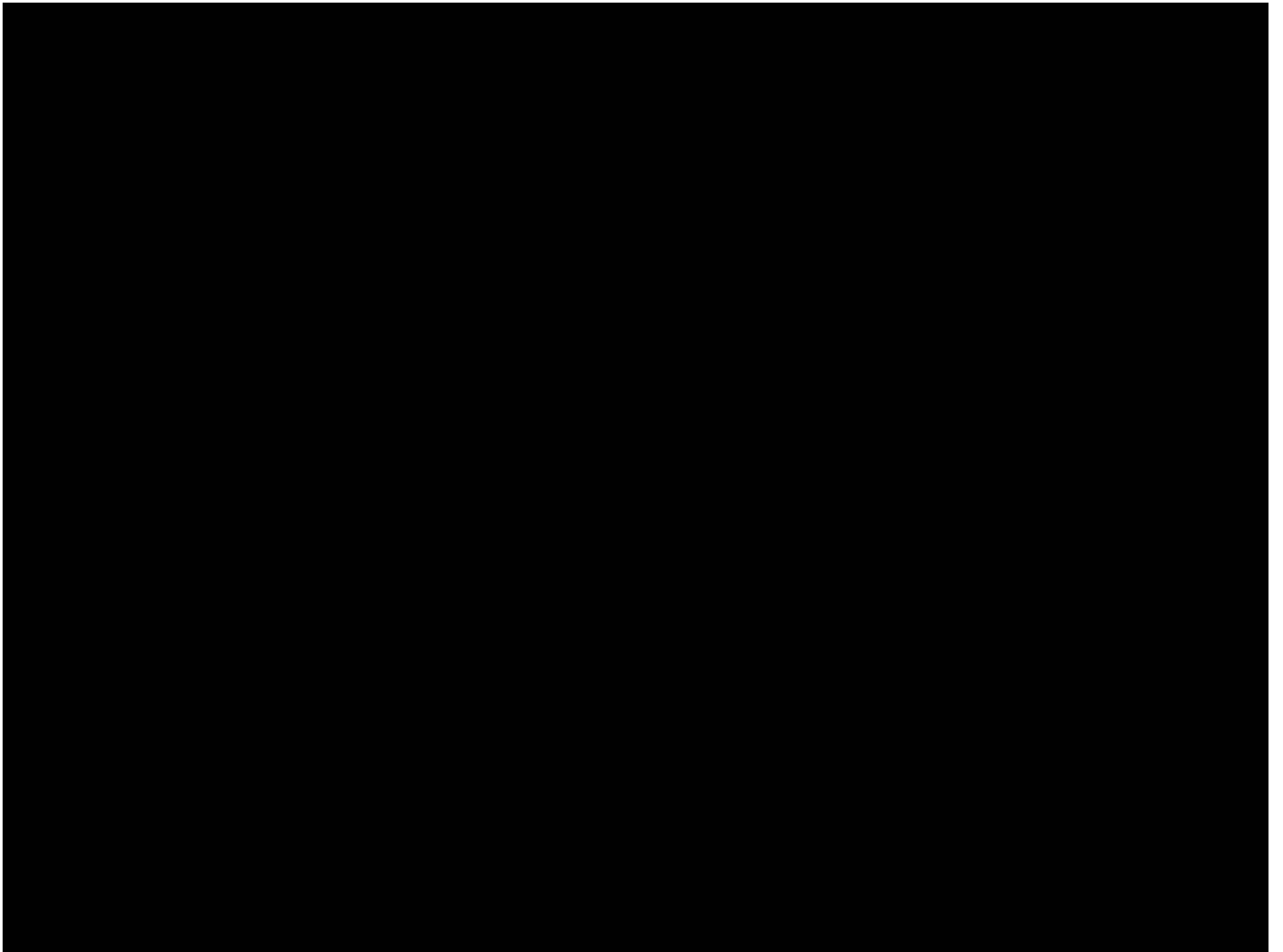
- Development
- IA Process
- Project Integrations
- Online CBTs

3rd Quarter FY 2011

- Virtual Hospitals
- Medical Gaming
- Web-Telehealth
- Video Library
- Cybrary, Blogs

4th Quarter FY 2011

- Achieve IOC
- Continued Development
- Ongoing Sustainment

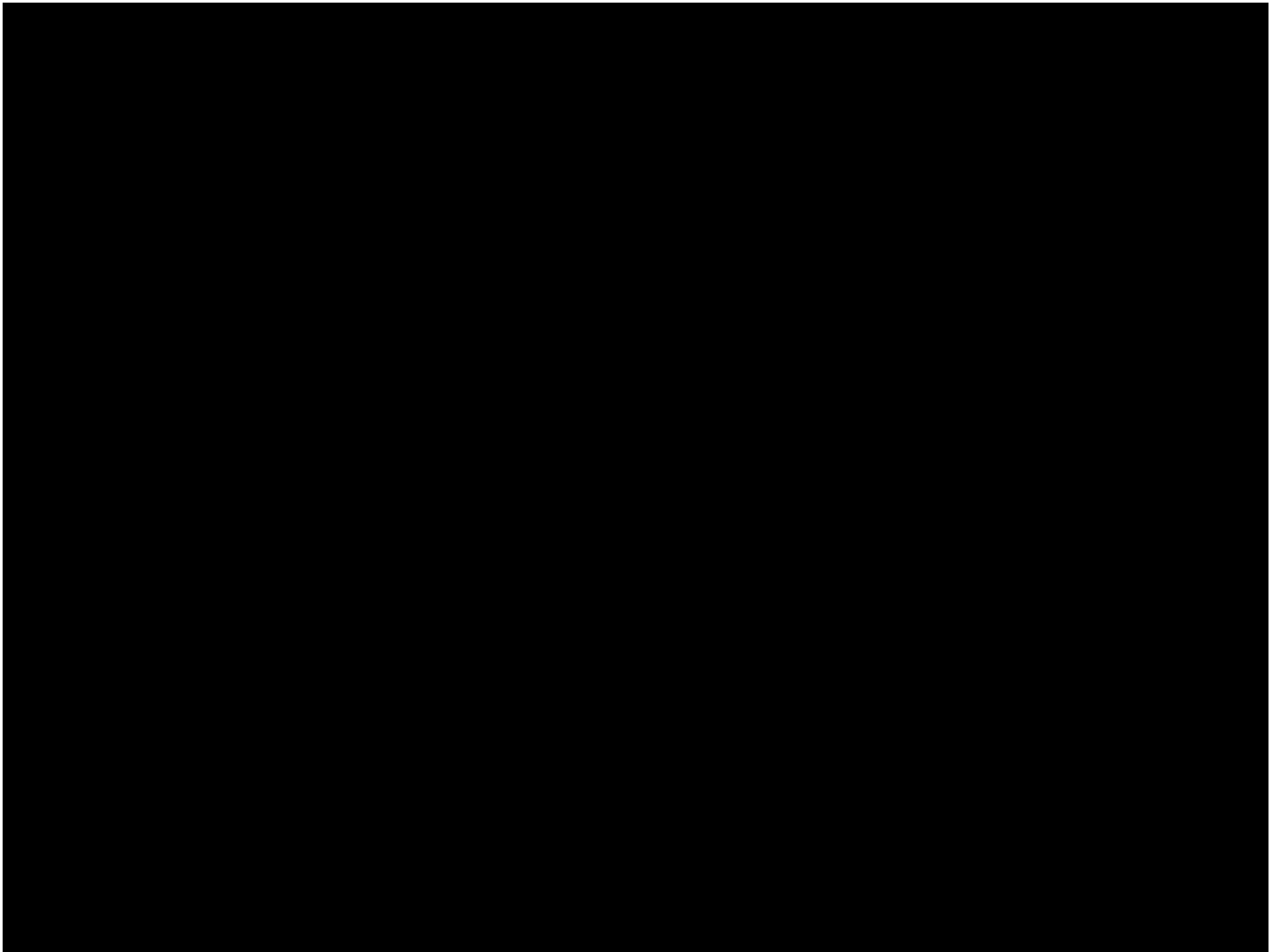


New Technology via AFMS Cloud



- AFSC and UTC specific training
- Virtual Hospital/EMEDS/C-17
- Virtual Medical Campus
 - Staff and Patient Education
- Medical Gaming – single/multi
- Cybrary, Professional Blog, CoPs
- Mobile application ready
- Web-based Education & Training System
- Defense Connect Online
- Center for Excellence in Multimedia

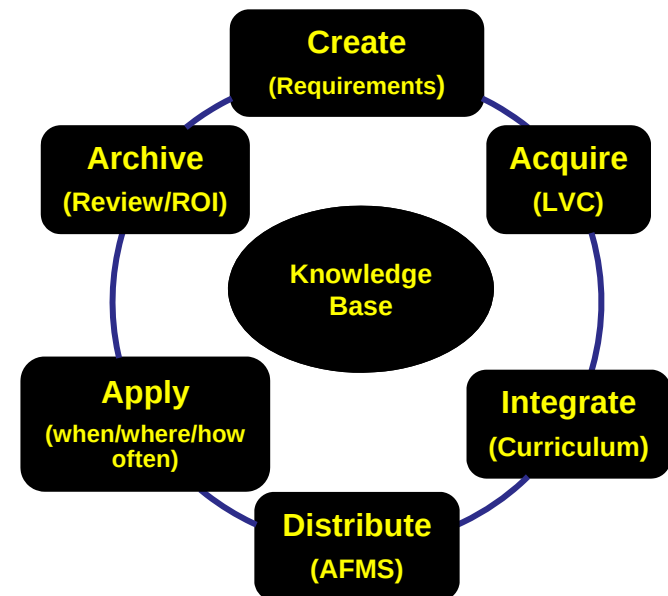




Knowledge Management Strategy



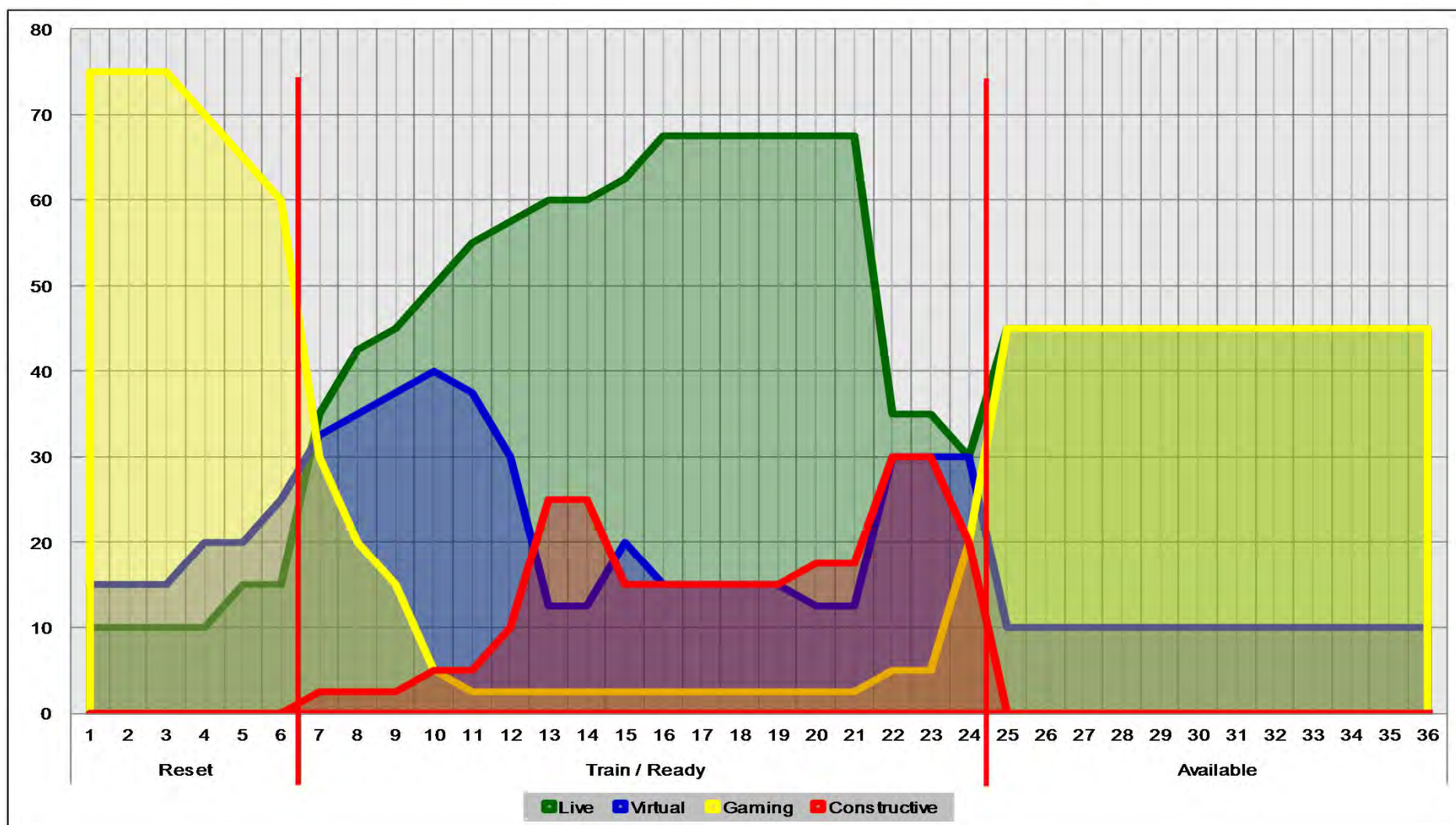
- Knowledge Management
 - Overarching Framework
 - Data tracking (performance metrics)
 - Enables archiving/historical documentation
 - Facilitates knowledge sharing
- Continuous Learning
 - Recruitment through retirement
 - Integration of learning and ops
 - Training, education, experiential learning
- Precision Learning
 - Persistent environment (24/7 access)
 - Tailored to individual styles and needs



Standardized knowledge-centric framework

Standard framework that is knowledge-centric not network-centric

Blended Learning by Environment



Training by environment across ARFORGEN

Current Program



Aeromedical Evacuation C-17 Virtual Walkthrough

Internal

External

Show Me

External View

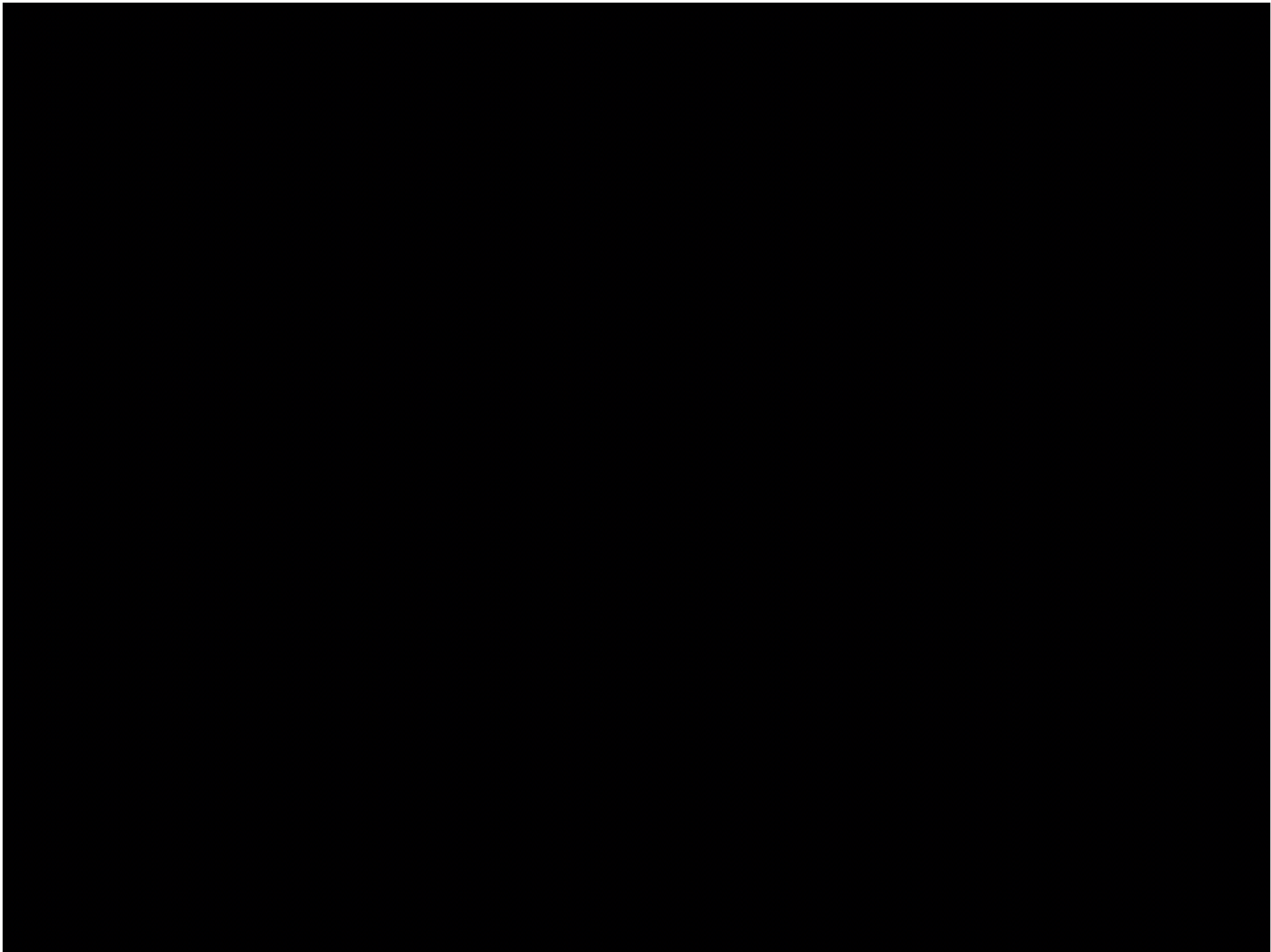


Goto

Additional Information



Image courtesy of Dorothy E Buckholdt Director, Advanced Distributed Learning USAF School of Aerospace Medicine
210-536-4671 Dorothy.Buckholdt@brooks.af.mil



Aeromedical Evacuation C-17 Virtual Walkthrough

[Internal](#)[External](#)[Show Me](#)[Cargo Bay View](#)[Goto](#)[Additional Information](#)

Image courtesy of Dorothy E Buckholdt Director, Advanced Distributed Learning USAF School of Aerospace Medicine
210-536-4671 Dorothy.Buckholdt@brooks.af.mil



- 



The Wide Area Virtual Environment

Alan Liu
Mark Bowyer
Gilbert Muniz



New Technology Development



- **Congressional Projects**
 - Natural Disaster Response Gaming Simulation (\$3.44M)
 - Military Trauma Training (\$708K) CSTARS Baltimore/UMMC
 - Spec Force Med Training – PJ/Combat Control Team (\$2.9M)
- **Small Business Innovation Research (\$300K)**
 - Medical Gaming +/- haptics - virtual surgery/invasive procedures
 - Virtual Environments - Hospital/EMEDS/CCATT
 - Synthetic Tissue to augment/replace live tissue – 1st in DoD
- **HQ AETC Advanced Tech Learning Demo (\$400K)**
 - 4N0X1 Phase 1 METC Training Gaming Simulations
- **Defense Medical Research & Development (ROI)**
 - Tri Service Medical Simulation & Trng Curriculum Development and Validation Research (\$5.5M) AF SGR is PI

Requirement	In-Place?	Initial Funding In-Place?	Partnership	ETA	AFMMST Portal & Cloud Strategy?
Medical Modeling and Simulation Training Portal (AFMMST Portal)	Yes	Yes	AETC/SGR USDA	July 2011	Yes
Virtual Reality Medical Gaming	Yes	Yes	RDECOM Texas A&M Univ	Mar 2011	Yes
Cloud Computing Hosting Partners	Yes	Yes	UCF RDECOM	Dec 2010	Yes
AFSC Based Medical Games	Yes	Yes	AETC/SGR RDECOM Mountain Top Tech	Jun 2011	Yes
Medical Scenarios VR Based Learning	Yes	Yes	AETC/SG RDECOM	Apr 2011	Yes
LMS Integration	Yes	No	AETC	TBD	Yes
AFMS Virtual World	Yes	Yes	RDECOM AETC	Jun 2011	Yes
Online TeleHealth VR Tools	Yes	Yes	SPAWAR	May 2011	Yes
Online Cybrary (Virtual Medical Research & Learning Lab)	Yes	Yes	AETC/SGR DKO	Apr 2011	Yes
AF Medical SME Online Communities	Yes	Yes	AETC/SGR DKO	Jun 2011	Yes
VR Training of Critical Medical Apps (AHLTA, TMIP, etc)	Yes	Yes	AETC/SGR	Mar 2011	Yes
Status of Emerging Technologies (Haptics, Live Tissue Replacement, Virtual Islands, etc)	Yes	Yes	AETC/SGR	Dec 2010	Yes

Bringing “Virtual Reality” to “Reality”

*Reach the Summit by
October 2012*

HIGHEST RISK / LEAST EFFECTIVE STRATEGY

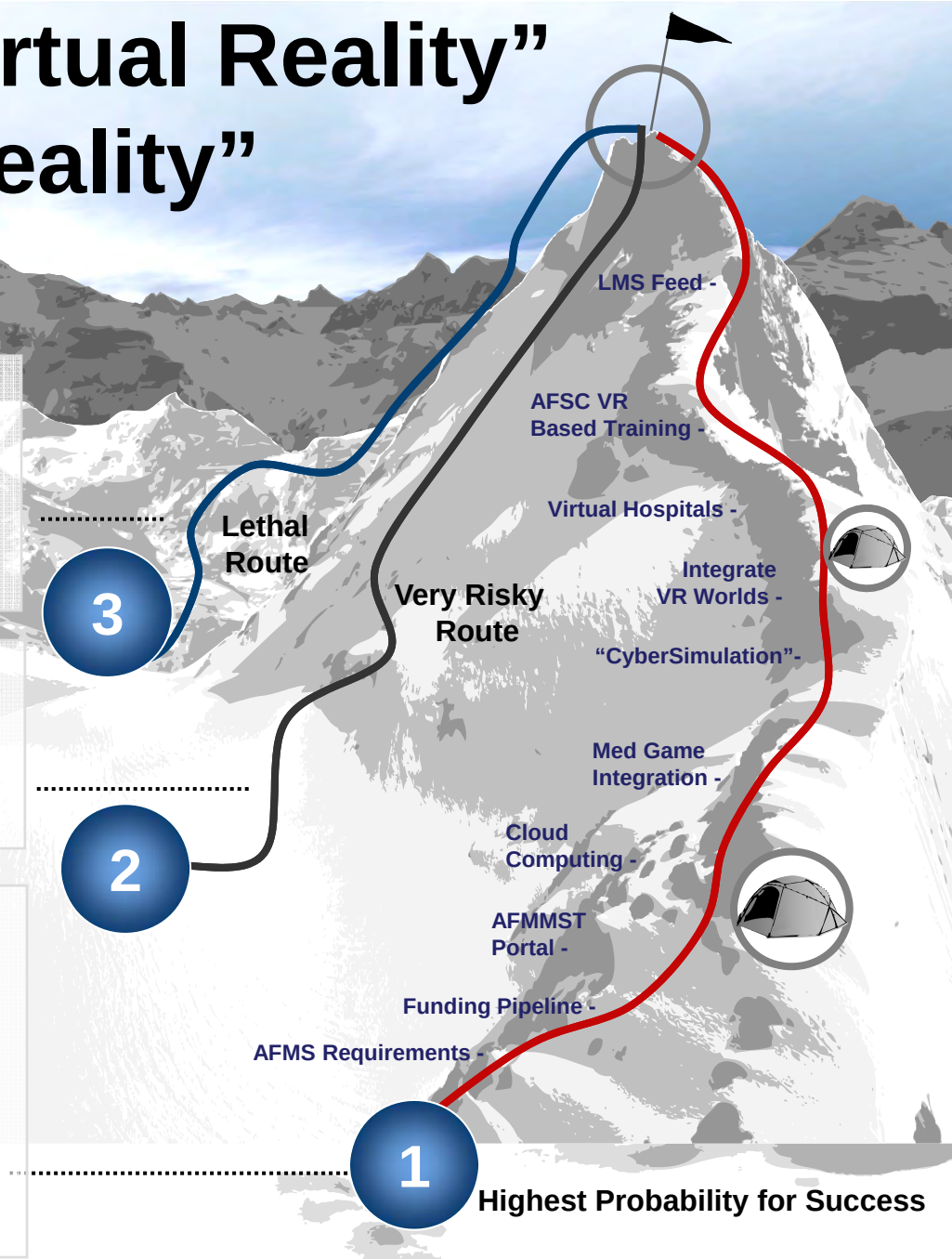
- Medical Gaming Developed for Each Service Branch
- Hardware & VR Games Installed on Base LAN
- Game Enhancements / Updates Mailed to Customers
- Lengthy DIACAP Process Per Game
- From Requirements to Time to Deploy is Very Long

MODERATE RISK / LIMITED SUCCESS STRATEGY

- Stand-Alone PCs & VR Med Games at MTFs
- Too Many Users vs. Limited Computers
- Expensive, Not Practical, Accessibility Issues
- Local Hardware/Software Support Required

MINIMUM RISK / HIGH PROBABILITY OF SUCCESS

- Tri-Service Med VR Games Hosted (Cloud)
- Centralized Mgmt, Updates, DIACAP, Enhancement
- Rapid Availability of Med Training via Web
- No Local Hardware/Software to Maintain/Refresh
- Services Leverage from Each Other
- Centralized Metrics, Feed to TTMS, LMS etc
- Subscription “A La Carte” Service to AFMS
- Lower Costs, Rapid Deployment, Joint Med Approach



Operational Milestones and Partnerships

Technical Related	Personnel	Strategy	Funding Allocated
AFMMST Portal framework development			
Portal Cloud Computing Strategy Set			
Portal Cloud Computing Infrastructure Partner Selection			
Funding for Portal Cloud Hosting and Sustainment			need sustainment tail
IT Staff Selections Complete			
MIPR funding to USDA Complete			
IT Equipment / Developer Computers Purchased			
RDECOM business model change to AF Cloud Architecture			
Web-Based Medical Gaming as a Business Model (SAAS)			
AF Medical SME Online Communities			
TC3, MSTC, CBTCS, Pulse to be Web-Based			
Migration from CD Based Games to Cloud/MilGaming			
AFMS Virtual World Strategy Set (User Entry Point)			
IT Partnerships with UCF IST, AFAMS, CEMM and ECS			
CEMM Integration to AFMMST Portal (Virtual Library)			

DoD Medical Modeling & Simulation Training Consortium



- Develop Joint requirements and standardized curricula
- Create DoD medical training platforms, exercises
- DoD research and multicenter validation studies
- Build “The DoD Medical Cloud”
- Joint technology development
 - AFMM&S CIO imbedded with Army RDECOM/STTC
 - RDECOM changed business model to adopt the AF cloud strategy
 - ECS Corpsman trauma medical game adapted to AF req's/scenarios
 - Texas A&M and CSC-N– Pulse
 - NCA Sim Center USUHS Wide Area Virtual Environment– to AFMS



Immersive Virtual Environment

DoD Medical Modeling & Simulation Training Consortium



DoD MM&S Partnerships

- AFSOC A5Z (Pararescue)
- AMEDD C+S EMS/MSTC
- METC
- CSC-A, CSC-N
- USMC TECOM
- OASD(HA)TMA
- OSD/DDR&E – ULAMETJAT
 - JTCG-1, JPC-1 (research)
- NCA Medical Simulation Center
- USUHS
- BAMC

Other Strategic Partnerships

- CEMM
- AMEDD C+S BCTC – Battle Combat Training Center
- RDECOM/STTC
- University of Central Florida
- PEOSTRI
- DMRTI
- TATRC
- HQ AETC CC
- American College of Surgeons
- USC Institute for Creative Technologies
- UC Davis

San Antonio Medical Simulation Center of Excellence



- DoD, Academia, Federal, State, Industry partners
- Assessed Joint training, space, staff req's
- Location?
 - 27.5K sq ft space close to Ft Sam Houston
 - New MILCON vs existing building refurbishment
- Resourcing and Sustainment
 - Budget, manpower, equipment
 - How do we insert, update new technology?



Strategic Roadmap



Theme: **CENTER DEVELOPMENT**

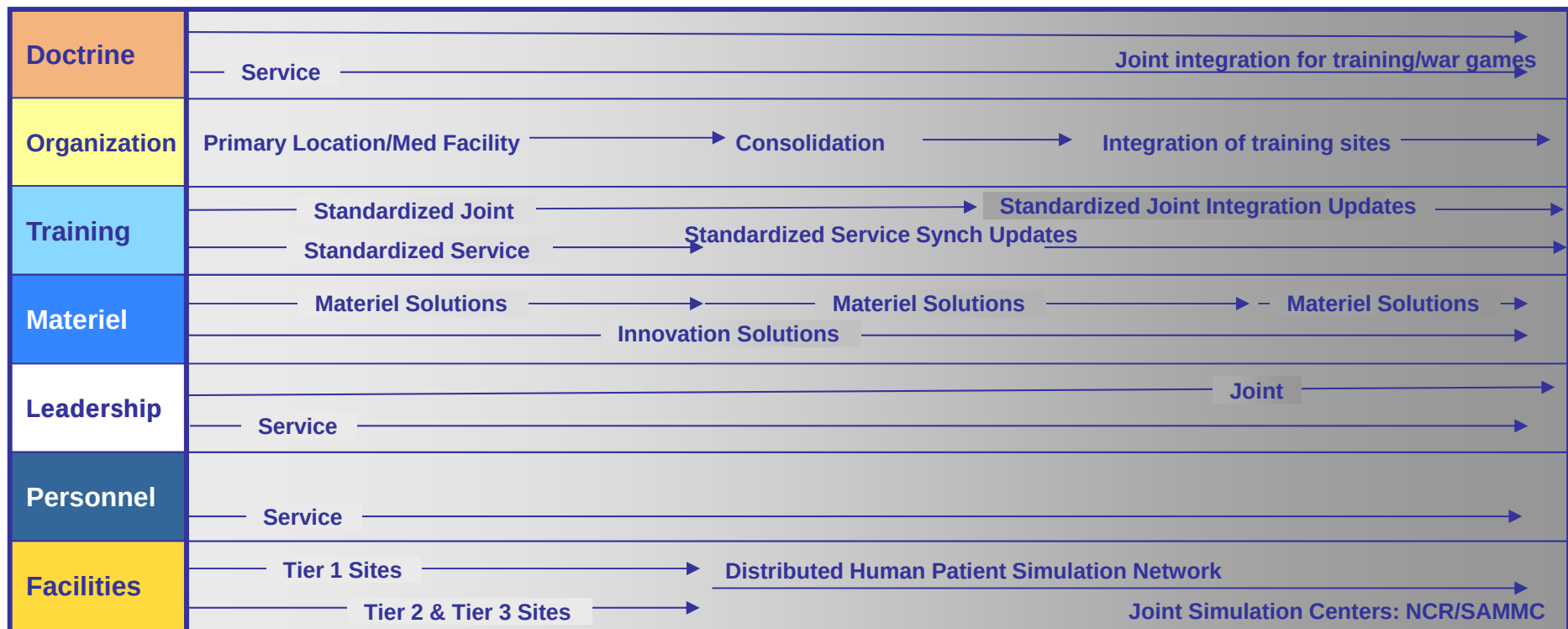
Phase: **1. Simulation Centers**

SERVICE SYNERGY

2. AFMS Distributed Simulation Network

JOINT INTEGRATION

3. Educate/Train Med War Games



Jan 2008

Jan 2009

Jan 2010

Jan 2011

2011 MHS Conference

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