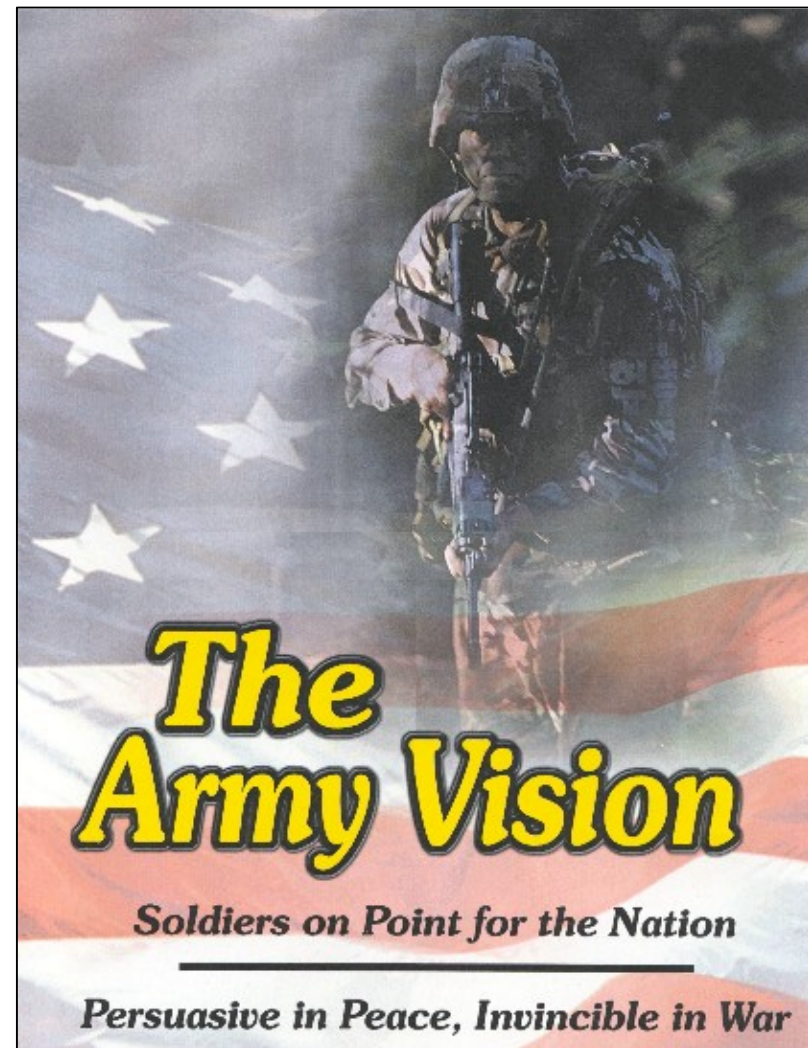
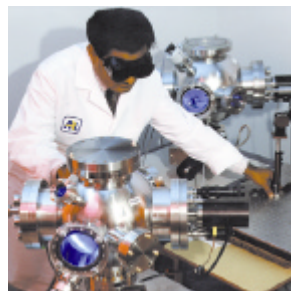


Army Science & Technology ...Accelerating the Pace of Transformation

NDIA
*Science & Engineering
Technology*
6 March 2003



Dr. John A. Parmentola
*Special Assistant to the
Deputy Assistant Secretary, Research
and Development*



What is success for today?

Understand...

- ***The Army is Transforming - - 4th year***
- ***Transformational Technology Investments***
 - ***State of FCS Technology Today***
- ***S&T for Objective Force...beyond FCS Increment I***

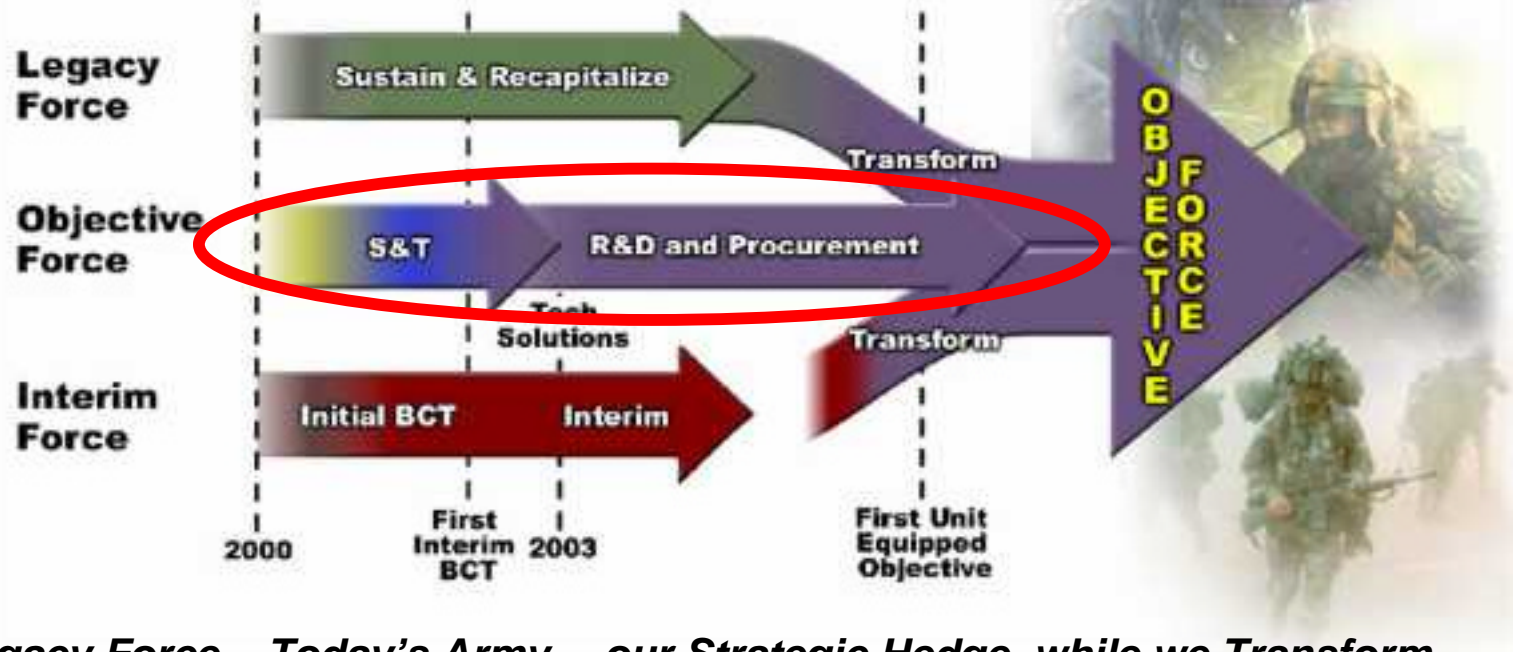


“The S&T community is the key to the long term transformation of the Army.”

Chief of Staff, Army Congressional testimony, 1999



The Army Transformation



- *Legacy Force – Today’s Army... our Strategic Hedge, while we Transform*
- *Interim Force – Our Bridge to the Future*
- *The Objective Force – The Army’s Full Spectrum, Decisive Ground Combat Force*

***... Responsive, Deployable, Agile, Versatile, Lethal,
Survivable, Sustainable***



Concept of the Objective Force

Objective Force "Space to Mud"



- Full Spectrum Army** - campaign quality forces with special purpose capabilities
- Joint & Combined Force** - by design: BCT worldwide in 96 hrs; Div in 120 hours; 5 Divs in 30 days
- Enabled by Knowledge** - network centric, self-aware and adaptive soldiers and leaders, agility enhanced by advanced technology
- Adaptive Organizations** -
 - Unit of Action (UA) (Bde) – conducts engagements; enabled by maneuver, maneuver support, and maneuver sustainment from the UE
 - Unit of Employment (UE₁) (Div TF) - conducts battles & precision attacks of key enemy capabilities
 - UE₂ (Corps TF) – conducts campaigns and major operations

Objective Force "Factory to Foxhole"



A Revolution in Capabilities

... Smaller, Smarter, Lighter & Faster

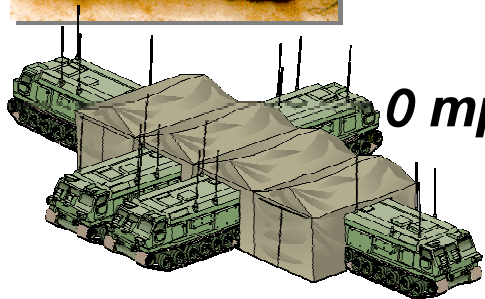
Today



~100 lb.
load

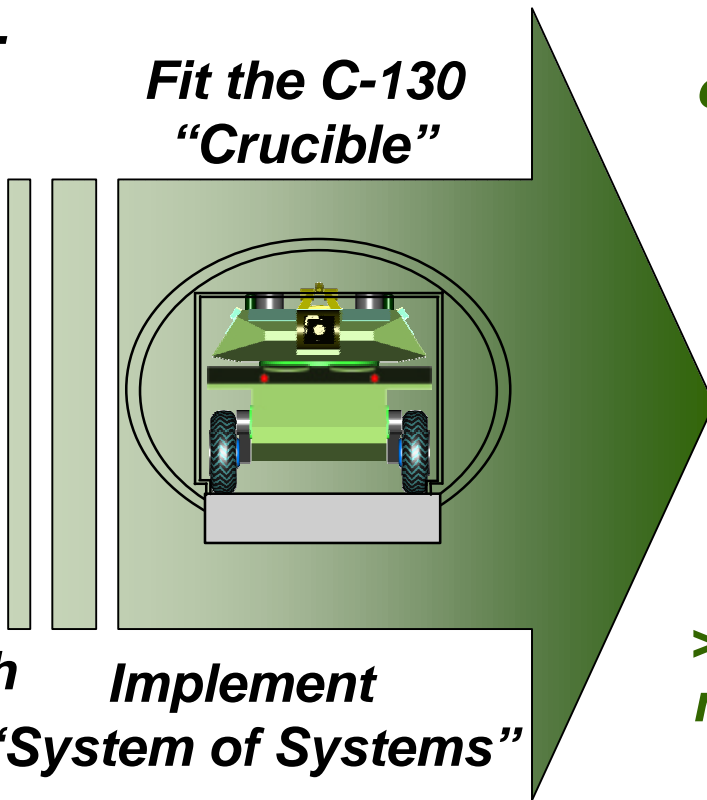


70+
tons



0 mph

Fit the C-130
"Crucible"



Implement
"System of Systems"

Objective Force

< 40 lb.
effective
load



< 20
tons



> 40
mph

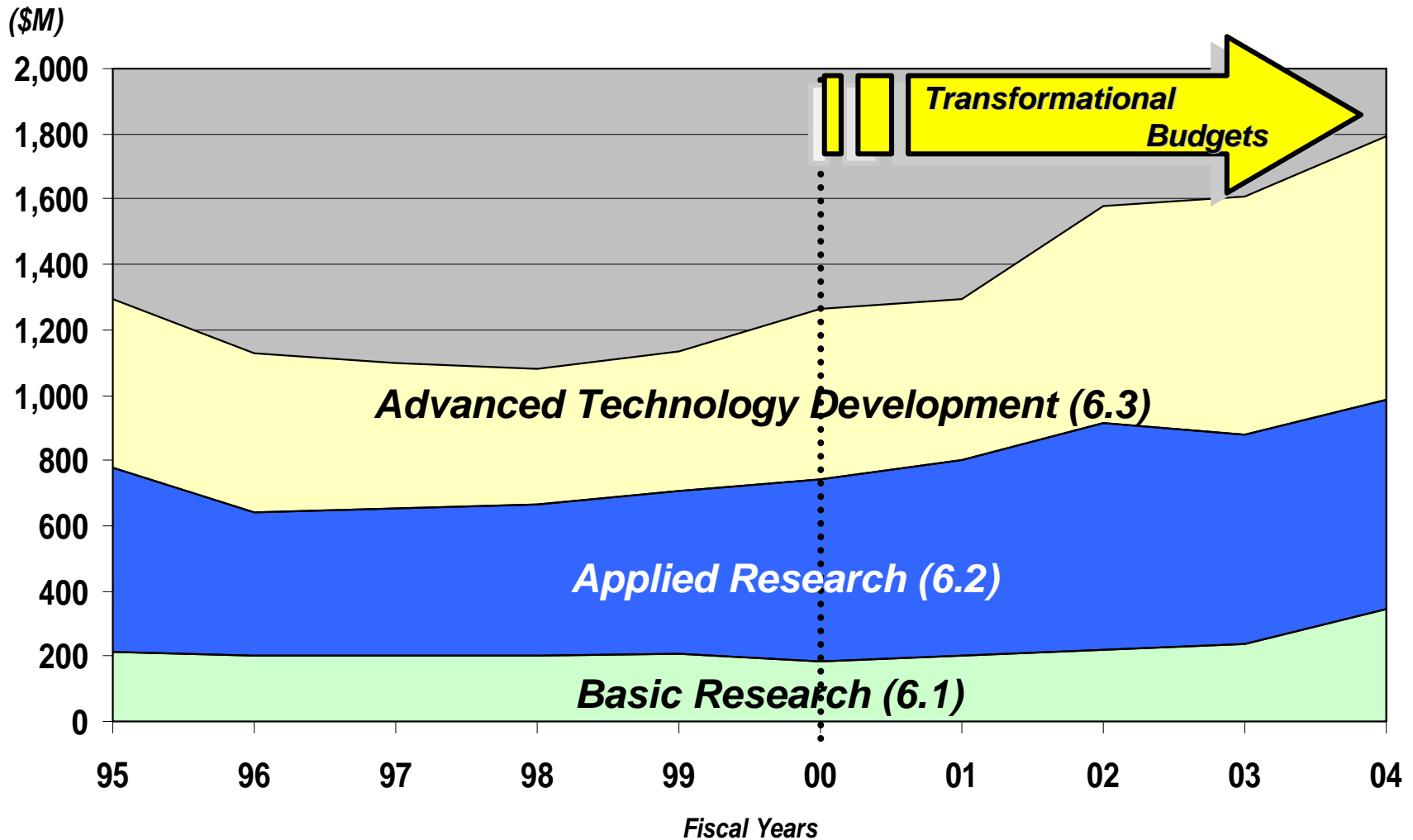


S&T Mission -- Accelerating the Pace of Army Transformation



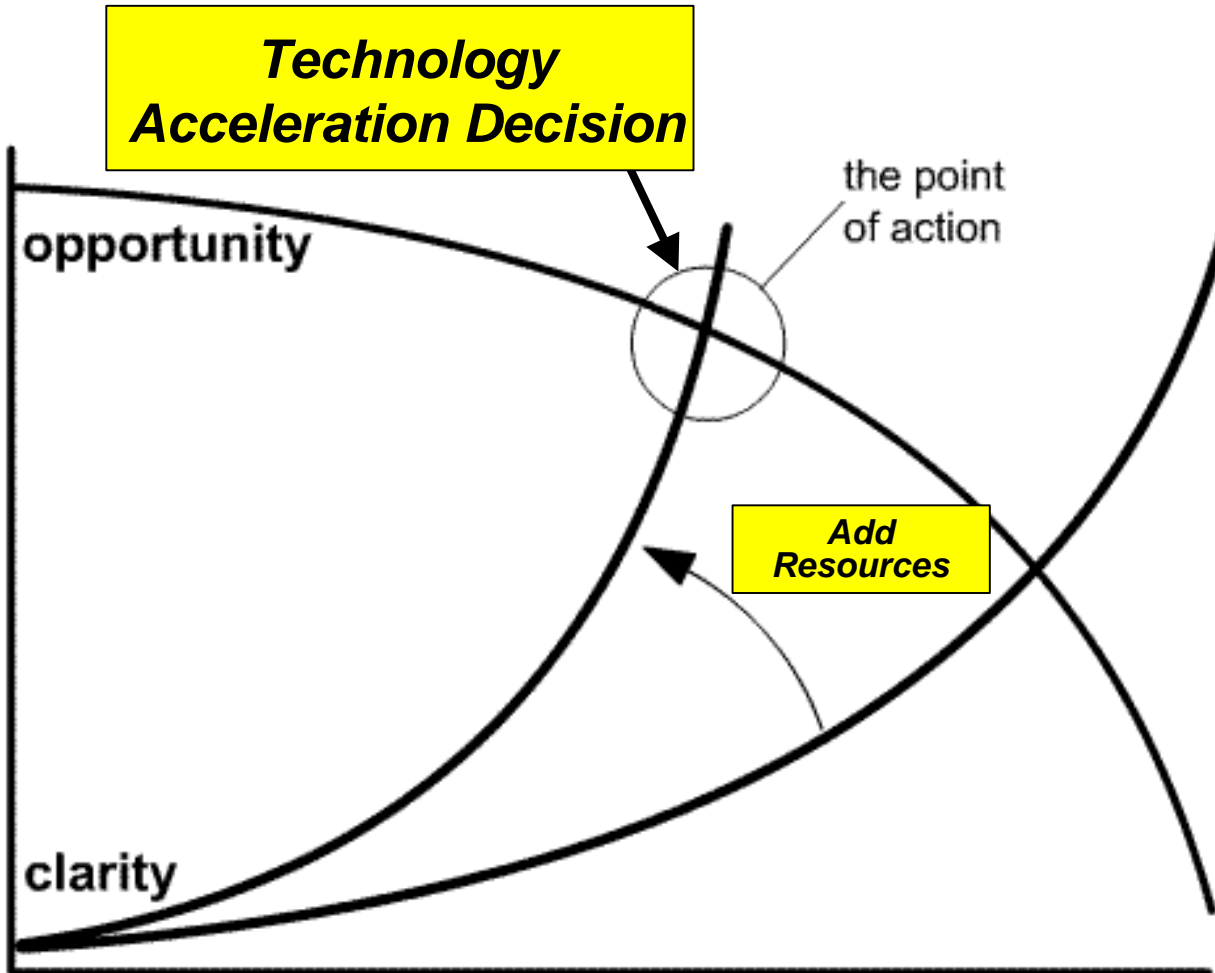
Army S&T Funding Trends

Presidents' Budget Requests





Increase Probability of Success... Make Strategic Decisions Earlier



- **Create tools to grasp the essence from “weak signals”**
- **Achieve the clarity to seize opportunity**

Fourth Generation R&D, Miller and Morris, 1999

We know our customer, and “his” needs



Army Transformation began in 1999

FY04 is the fourth year of Army Transformation - Highlights -

- ***PB01 FCS 2012 and DARPA MOA, UGVs, Institute for Creative Technologies***
- ***PB02 FCS 2010, Objective Force Warrior (OFW) 2012, HEL, Collaborative Technology Alliances, Institute for Soldier Nanotechnologies***
- ***PB03 FCS 2008 and Lead Systems Integrator, C3 On-the-Move Demo, Institute for Collaborative Biotechnology***
- ***PB04 FCS Increment II, OFW 2010, fully fund Unmanned Combat Armed Rotorcraft MOA with DARPA, Energy & Power, Flexible Displays, Hypersonics***

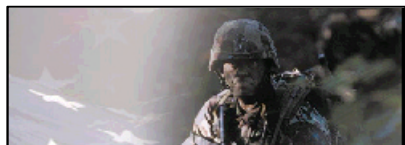
***“I am absolutely committed to a strong S&T base.”
Secretary White, March 6, 2002 Senate Appropriations Sub-Committee***



Building the Army Science and Technology Program

**Statements of Needs to Sharpen
the Focus of S&T**

FY04-09 - \$11.3B



**Future Combat Systems
Mission Needs Statement**

**Future Combat Systems
Statement of
Required Capabilities**



FY02-07 - \$9.3B

FCS Technologies \$3,276M
Basic Research \$1,265M
C4ISR \$1,226M
Medical \$638M
Rotorcraft \$604M
Obj Force Warrior \$551M
Lethality \$330M
Survivability \$279M
Logistics \$270M
Classified \$227M
Personal Tech \$204M
Advanced Simulation \$136M
Other S&T \$286M

FCS Technologies \$3,058M
Basic Research \$2,095M
C4ISR \$1,463M
Obj Force Warrior \$789M
Rotorcraft \$725M
Medical \$722M
Lethality \$524M
Logistics \$522M
Survivability \$359M
Classified \$270M
Personal Tech \$245M
Advanced Simulation \$236M
Other S&T \$311M

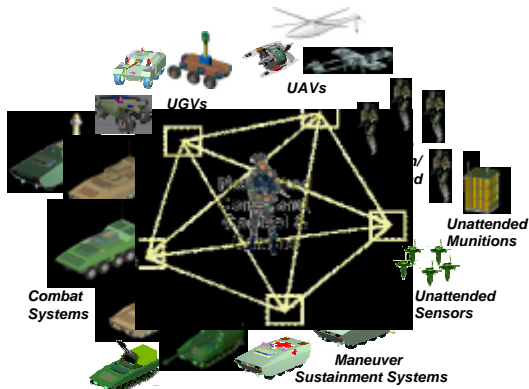


FCS MS B...A Referendum on Transformation and Systems of Systems



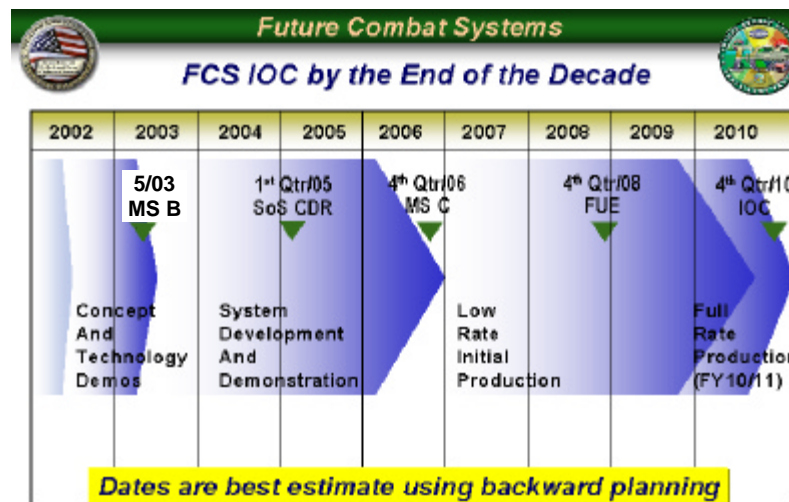
Future Combat Systems (FCS) Army/DARPA Partnership

FCS is the networked system of systems that will serve as the core building block within all maneuver Unit of Action echelons to develop overmatching combat power, agility, and versatility while minimizing sustainment requirements necessary for full spectrum military operations.



110602_ASTWG_Andrews_BG(P)Thrasher_102902_1400.ppt

PM FCS Schedule



Source: FCS OIPT January 2003

022003_Andrews_Sega_Final

1

Technologies to Build FCS in this Decade



Where we are with FCS Technologies Today



OAV

A-160 Hummingbird



UAV RSTA / Comm Relay



Adv. Sensors



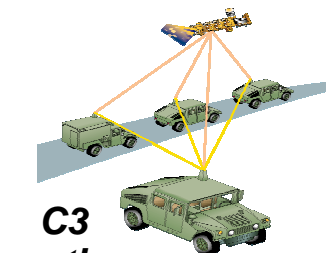
UGCV (150 Kg Payload)



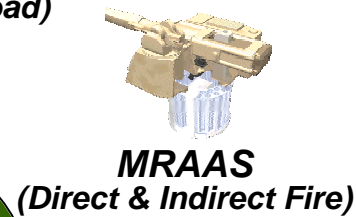
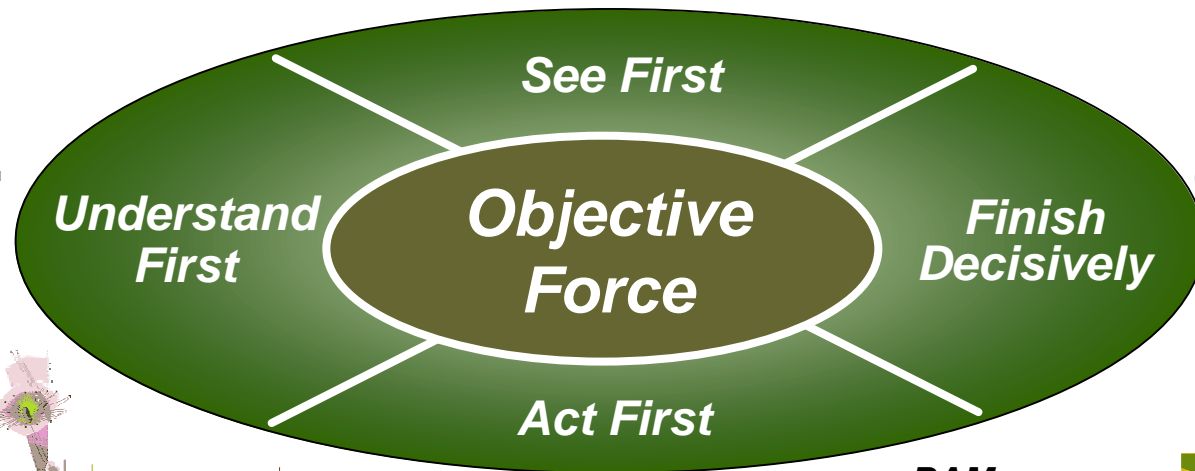
UGCV (2,000 Kg Payload)



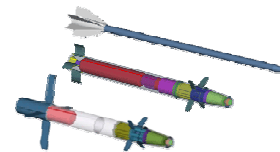
Follower UGVs (Autonomy)



C3 on the Move



MRAAS (Direct & Indirect Fire)



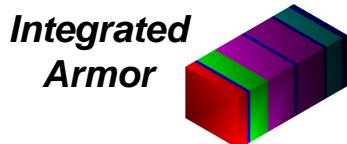
Compact Kinetic Energy Missile



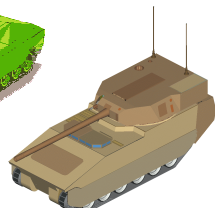
OCSW



Active Protection



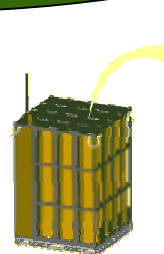
Integrated Armor



Advanced Mobility

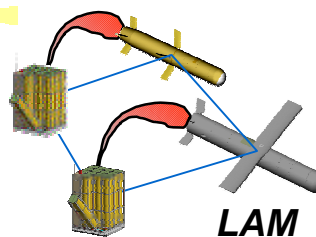


Hybrid Electric Propulsion



NLOS-LS

PAM



LAM

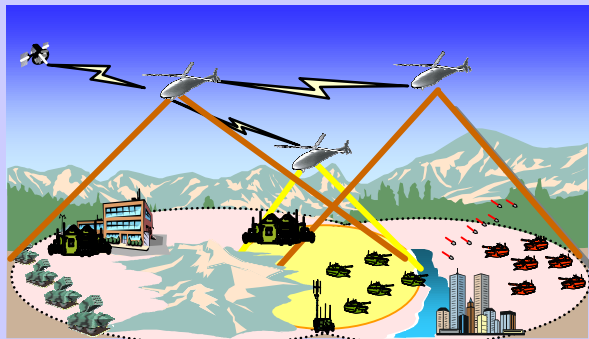
Technologies to Build FCS in this Decade



Networks and Sensors

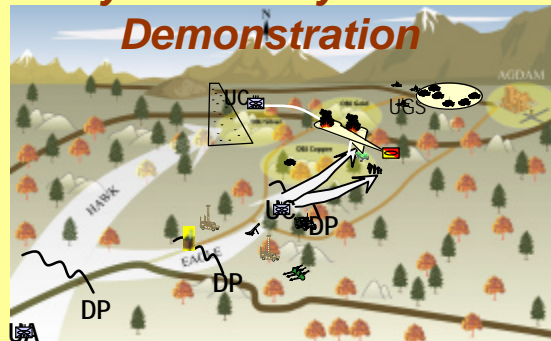
FY04-09 \$1.8B

Wide Area OTM Comms



UAV Comms/Intel

System of Systems Demonstration



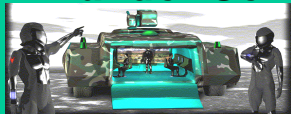
C3 OTM Testbed

More Bandwidth for Dismounted Operations



JTRS Squad Comms

Commander Centric



Distributed Battle Command

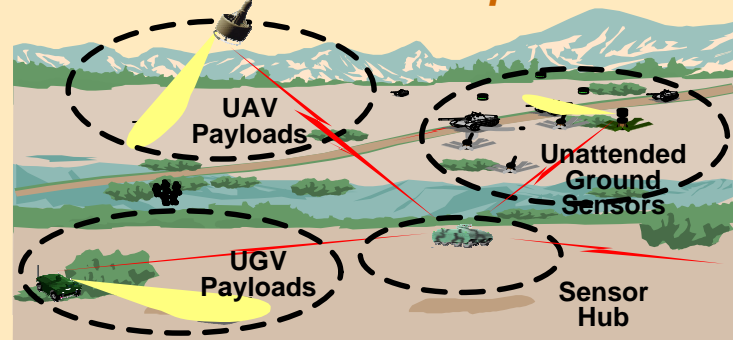
- Persistent Sensor Coverage
- Assured Communications
 - C2 On-The-Move
 - Battle Command

Portable SA for the Soldier



Disposable Sensors

Fills the SA Gaps



Networked Sensors

Improved MOUT SA



Through Wall Sensing



Lethality

FY04-09 \$1.7B

Missiles...Extended Range and Loiter with greater Lethality

Next Gen NLOS-LS and C3

Loitering Attack Missile (LAM)

Precision Attack Missile (PAM)

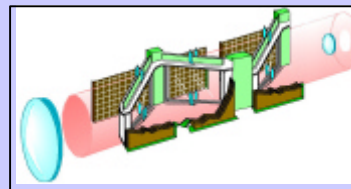
Compact Kinetic Energy Missile

Maintain Lethality w/ Increased Stowed Kills

National Aerospace Initiative - Hypersonics
2x Distance in 1/2 the Time

- Precision Strike
- Overwhelming Lethality at Longer Ranges
- Reduced Logistics

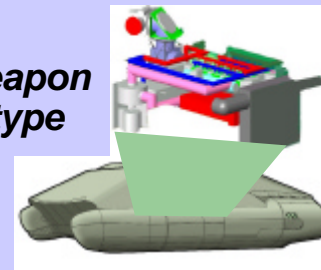
Directed Energy ...Tunable Lethality



Solid State Laser (SSL) Technology Development

Speed of Light Engagement

SSL Weapon Prototype



Guns and Munitions ... One Shot – One Kill

Multi-Role Armaments & Ammunition
Multi-mission Capability from a Single Platform

EM Gun Tech Demo

Validate Hypervelocity Lethality

Multi-Purpose Warheads

Compact Shaped Charge

Explosively Formed Penetrator

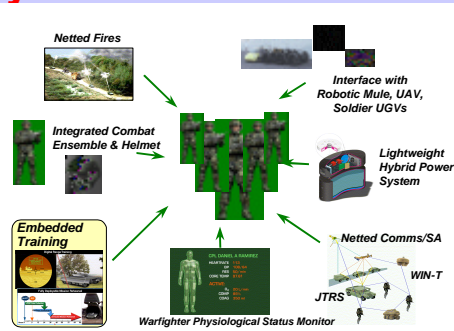




Technologies for the Soldier

FY04-09 \$1.1B

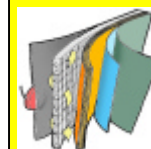
Objective Force Warrior



- Dismounted Fighting Ensemble (50lb threshold; 40lb obj)
- Objective Force Network Connectivity
- Netted Comms & Fires Situational Awareness

Training and Leader Development

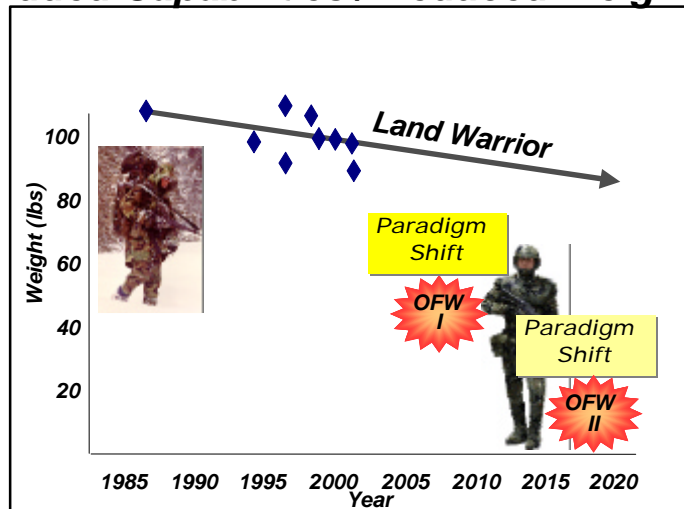
- Soldier and Leader Training
- Crewman's Associate



Soldier Performance & Survivability

- Human Factors Engineering
- Nano-based & Multi-functional Materials for Threat Protection
 - Ballistic, Chem/Bio, Laser, Environment, Emerging

-System of Systems - Added Capabilities / Reduced Weight



Combat Casualty Care

- Physiological Status Monitoring
- Enhanced Performance
- Hemostatic Dressing
- Medical Mission Package
 - Emergency Room "in a box"





Unmanned Systems

FY04-09 \$0.9B

Lethality...first shot, first kill



Unmanned Combat
Armed Rotorcraft

- Autonomous Team Attack
LOS/BLOS/NLOS Fire -

Unmanned Ground
Vehicle



Autonomous
Combat Operations
with Unmanned
Systems

Logistics...reduced footprint

Soldier Mule



- Autonomous Re-supply -



A-160
Hummingbird

C4ISR...assured comms and situational awareness

A-160 Hummingbird



Extended Range &
Increased Payload

Organic Air Vehicle (OAV)



Extended Range and
Endurance

Micro Air Vehicle (MAV)



Extended Loiter
"Perch and Stare"



Survivability

FY04-09 \$0.9B

Avoid threat detection and acquisition

Virtual Prototyping		Hardware Integration	
Thermal Models			
Radar Models			

Signature Management
Radar Deception

Mobility for the Unit of Action



Mine Detection &
Neutralization

See First / Act First

Don't be Seen!

Don't be Acquired!

Don't be Hit!

Don't be Penetrated!

Don't be Killed!

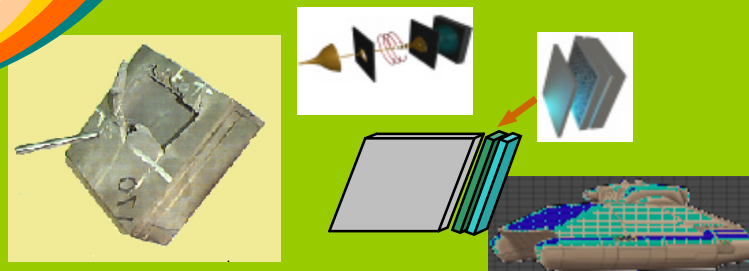


Intercept Direct and Indirect munitions



Full Spectrum
Active Protection,
Chemical Energy OTM
Kinetic Energy Static and OTM

Survive the hit



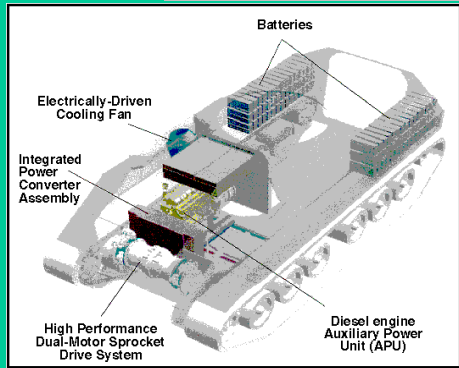
Armors: Structural, Electromagnetic,
and Smart



Power and Energy Technologies

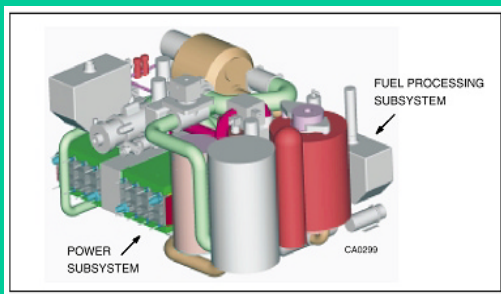
FY04-09 \$0.6B

FCS Vehicle Power

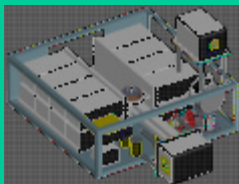


- All Electric vehicles
- Fuel efficiency
- Silent mobility

Hybrid Electric Drive



Diesel Reformer Power

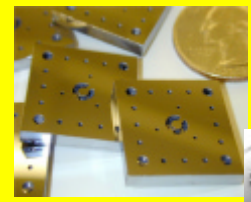
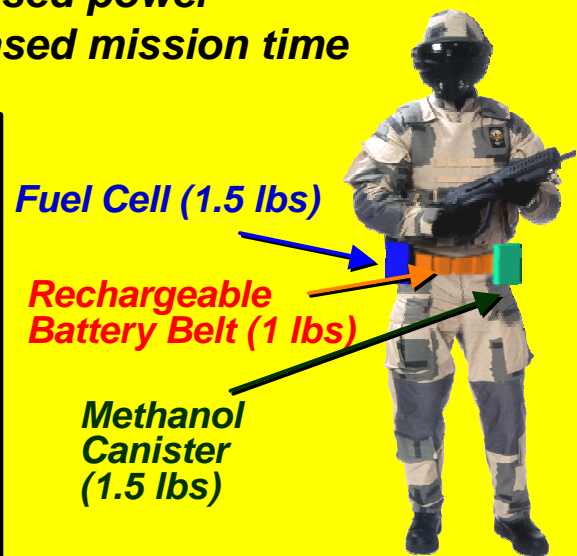


Pulse Power for...
Electric Weapons & Protection
6x Power Density

Soldier System Power

- Reduce weight
- Increased power
- Increased mission time

- Minimize deployment time
- Self Sustainment
 - 3 days - High optempo
 - 7 days - Low optempo
- New capabilities
 - Lethality
 - Survivability



**Microturbine/
Microengines**

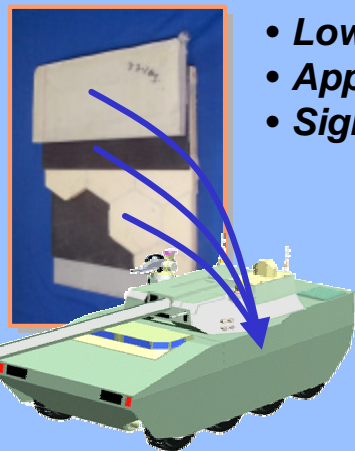
10x Power Density



Manufacturing Technology

FY04-09 \$0.5B

Armor -- Survivability



- Low-cost Composite
- Appliqué Armor
- Signature Management

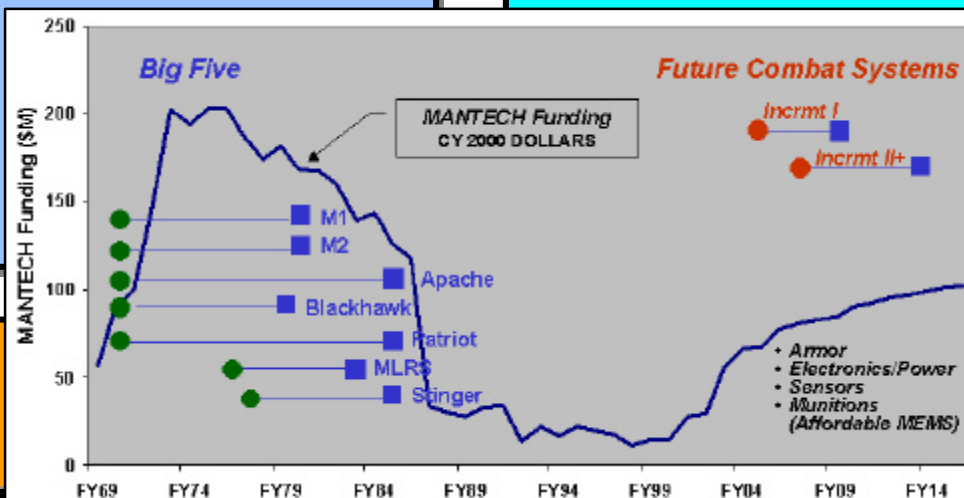
Electronics/Power Systems -- Networks

- Flexible Display
- S/W Radios
- Silicon Carbide Switches
- MEMS-Tenna ESA
- Power storage systems

Flexible Display Initiative



Li-Ion Cell



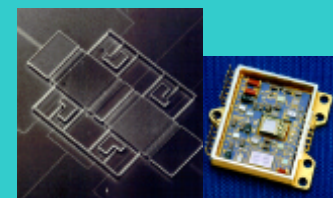
Sensors -- See First



- Two Band FPA Cooled
- Laser Source Affordability

In 1990s \$48M ManTech investment in JAVELIN resulted in estimated savings of \$364M in production

Munitions -- Finish Decisively



MEMS-IMU GPS



Basic Research...

The Next Generation of Transformational Technologies

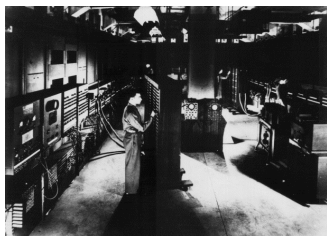
FY04-09 \$2.1B

Decade of the 1950's

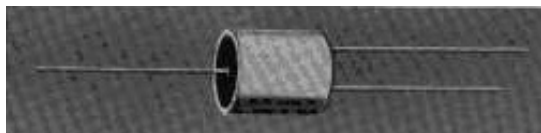
Lasers



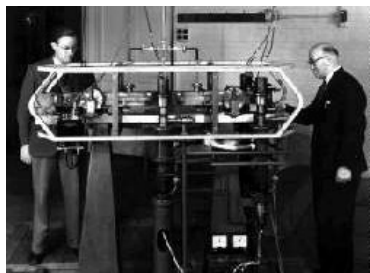
Programmable Systems



Transistor



ENIAC



Atomic Clock



DNA

Today for 2015 and beyond...

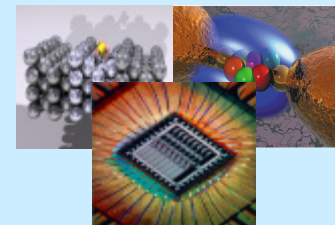
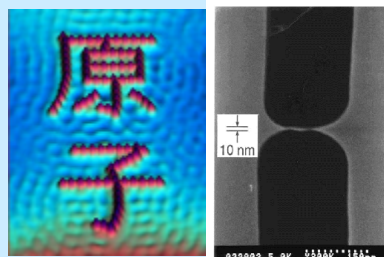
Directed Energy



Robotics



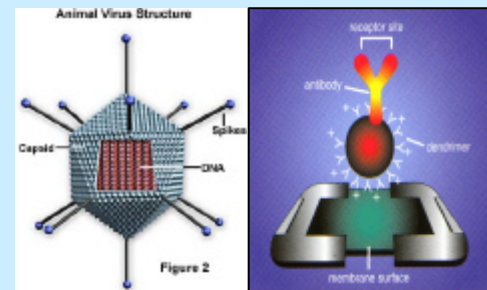
Nanotechnology



Advanced Computing



Immersive Environments



Biotechnology

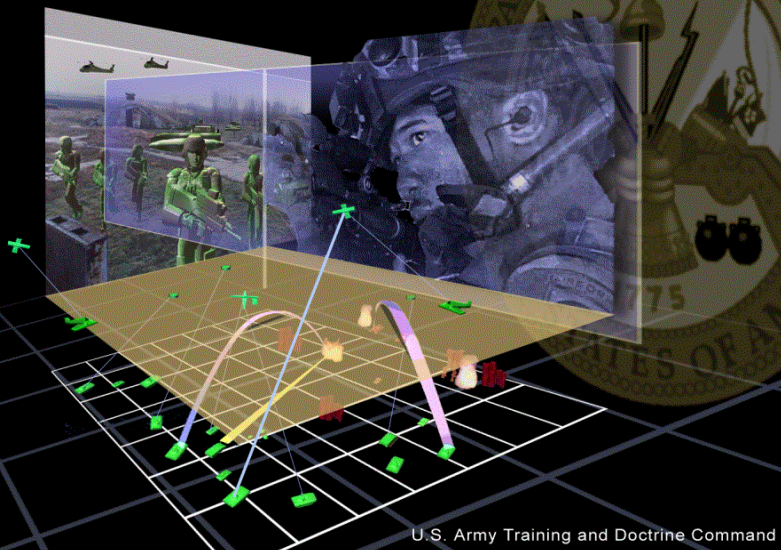


The Army...

On the Fast Track to Transformation

Objective Force

This Decade



Finishing Decisively

“With your help, the Army is able to fully fund the second Interim Brigade Combat Team and commit greater resources toward science and technology...”

***Joint Statement, Under SEC Army/VCSA
March 14, 2002
Senate Armed Services Committee***

“I am absolutely committed to a strong S&T base.”

***Secretary White, March 6, 2002 Senate
Appropriations Sub-Committee***