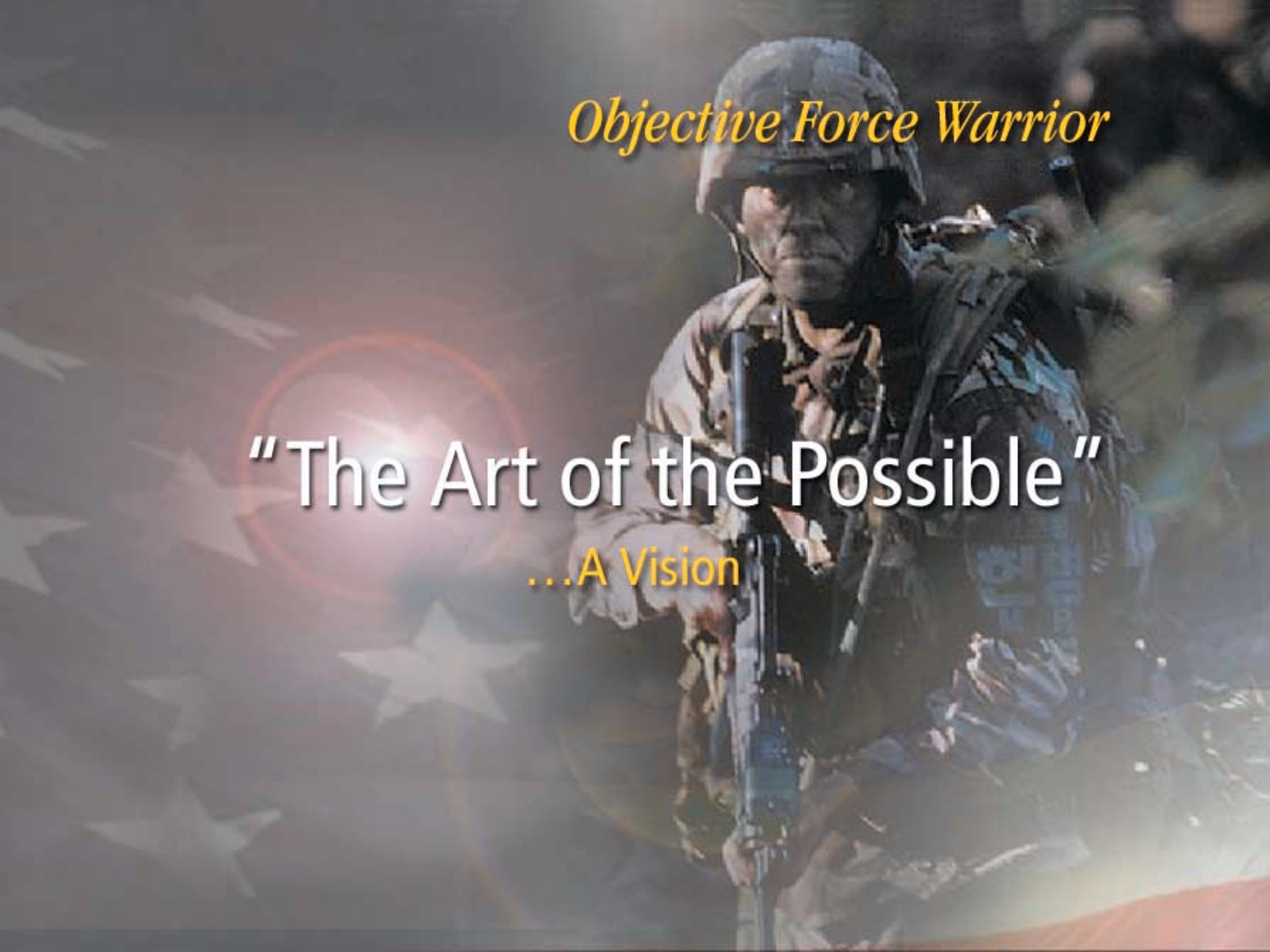
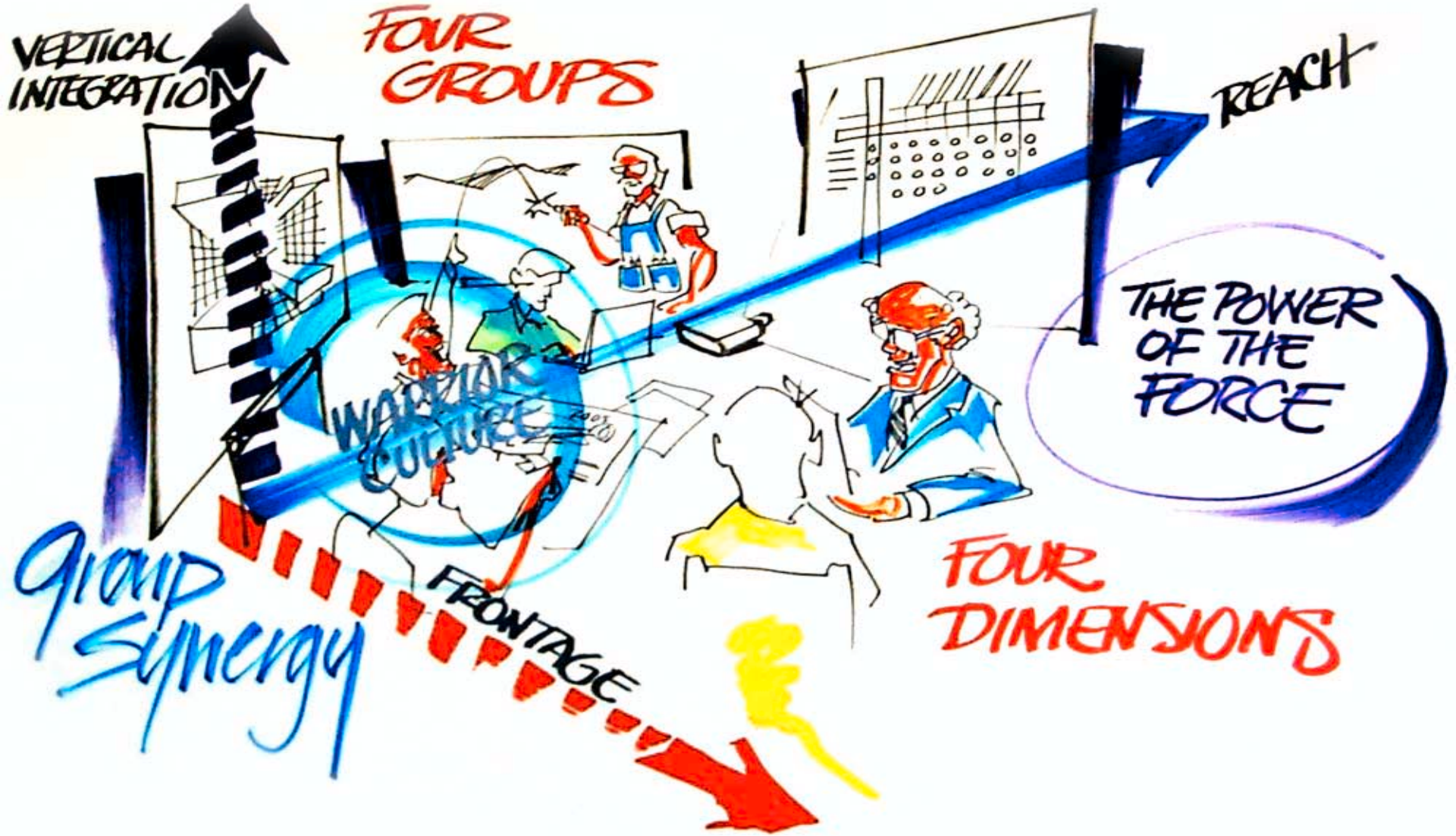

Objective Force Warrior
"The Art of the Possible"
…A Vision

The Composite Vision selects the best aspects of each of the four panel visions produced during the Objective Force Warrior "Another Look" sessions. The Composite Vision forms a concept more powerful and complete than any of the individual visions singly. While each of the groups took a different approach to the vision, many of the essential components and enabling technologies converged into a relatively well-focused set.

A central theme among each of the four groups was the concept of expanding the ability of the Objective Force Warrior (OFW) to affect the battle space three dimensionally by bringing the total power of the Objective Force to bear. This provides significantly more capability gain than individual improvements to the soldiers' on-person suite; in essence, exponential versus on-the-margin capability advances.

THE PROCESS


VERTICAL INTEGRATION
FOUR GROUPS
REACH
THE POWER OF THE FORCE
WARRIOR CULTURE
Group Synergy
FRONTAGE
FOUR DIMENSIONS

General Paul Gorman framed the effect the four panels wanted to achieve in eloquent fashion. The soldier of tomorrow will know what the systems know and will bring the power of the force to bear without having to carry the assets directly. The Objective Force Warrior must be able to employ the full range of national and joint capabilities to see first, understand first, act first, and finish decisively.

The Objective Force Warrior

**"The soldier of today is thrust far forward.
He is the point of the Army spear.
It is very lethal and very lonely out there.
The soldier of tomorrow will never be alone
and he will advance on his enemy shielded by
dominant information.
His leaders will be able to say this to him:**

> **'Soldier, you are the master of your battlespace. You will shape the fight. The network will enable you to see all that can be seen. You will out think, out maneuver, and out shoot your enemy.**
> **The Force is with you.**
> **You are one with the Force.,"**

—General Paul Gorman

The Objective Force Warrior poster portrays a capability to expand the effect of the soldier by a factor of twenty across the spectrum of conflict. It captures the effect the panels believed was achievable with a dedicated focus on a few essential capabilities.


"Another look"
OBJECTIVE FORCE WARRIOR
Exploiting the Power of the Entire Force
... in a spectrum of operations ...
... from putting a village back together
... to taking a city apart
VISION...
THE ESSENTIAL PRINCIPLES
Vertical Integration
Reach • Stand-Off 30X
Frontage 10X
Warrior Culture
Sustain
Protect
Strike
see ... first
decide and act ... first
finish decisively
survive & endure

This vision conceptualizes the ability to achieve netted communications leading to collaborative situational awareness for the soldier. It also envisions the ability to apply netted fires to achieve the massed effects of the force. These two capabilities (netted communications and netted fires), if fully achieved, provide the twenty-fold increase in capability for the Objective Force Warrior. All of the other technology advances together, were judged to provide a one or two-fold increase in capability. Thus, a very focused approach to achieving soldier overmatch emerged.

Certain aspects of the Warrior Culture are essential and require consideration in the design of the system to achieve performance-centric results. The manning and management aspects of a force of this complexity will require new approaches.

Particularly in the C^4ISR arena, a move to open architecture designs, which would allow easily integrated capabilities as they matured, was considered essential for success. This would require a more refined vision of future possibilities, but would avoid the "outdated when fielded" syndrome.

VISION — Essential Principles

- "Overmatch" for the Soldier
  - Dominate through Information; know what the network knows
- Apply the Power of the Force
  - Collaborative massed effects
- Three-dimensional Aspect of Effects
  - Vertical integration
  - Stand-off
  - Extended frontage
- Warrior Culture
  - Human performance - centric design
  - Extended cohesion
  - Paradigm shifts in recruiting, manning, and training
- Open Architecture
  - Integrate emerging capabilities continuously
  - Design 2018 architecture now

The essential elements of the Objective Force Warrior vision involve providing the ability for the individual soldier and his unit of action to achieve "overmatch" over their opponents across the entire spectrum of conflict. This overmatch is achieved by leveraging the combat power of the entire Objective Force. Emerging information technology provides the means to leverage the full range of combat multipliers inherent in the Future Combat System and those of joint service systems. A robust C^4ISR architecture is the common thread that links the Objective Force Warrior to the fully netted communications and fires of the Objective Force and provides the essential situational awareness to greatly increase lethality and enhance survivability.

These technological capabilities must be woven together in a manner that supports the warrior culture and optimizes the warrior's fightability and spirit. Open architecture designs provide the opportunity to optimize potential and keep pace with the exponential growth of technology.

VISION

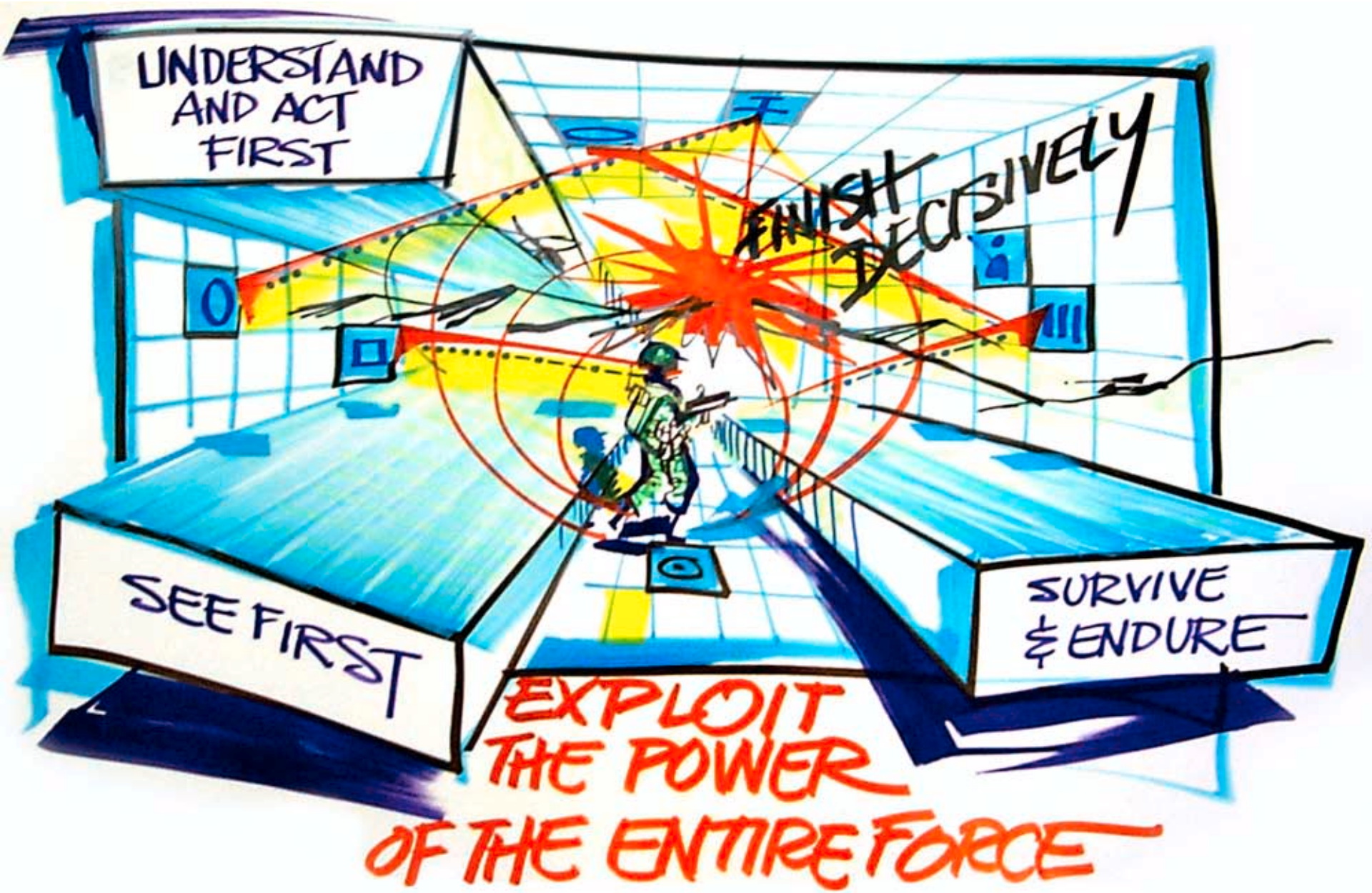
The Objective Force Warrior (OFW) concept achieves “overmatch” at the individual soldier and unit of action level. It leverages and focuses the power of the entire Force, empowering the OFW to dominate the battlespace.

Netted communications and collaborative situational awareness affords the OFW unparalleled knowledge. The application of the full range of FCS combat multipliers and fires expands the effect of the OFW three dimensionally.

Technological capabilities are woven in a synergistic manner to optimize fightability and the indomitable spirit of the warrior culture.

The integration of emerging capabilities occurs continuously through open architecture designs to optimize potential and keep pace with the exponential growth of technology.

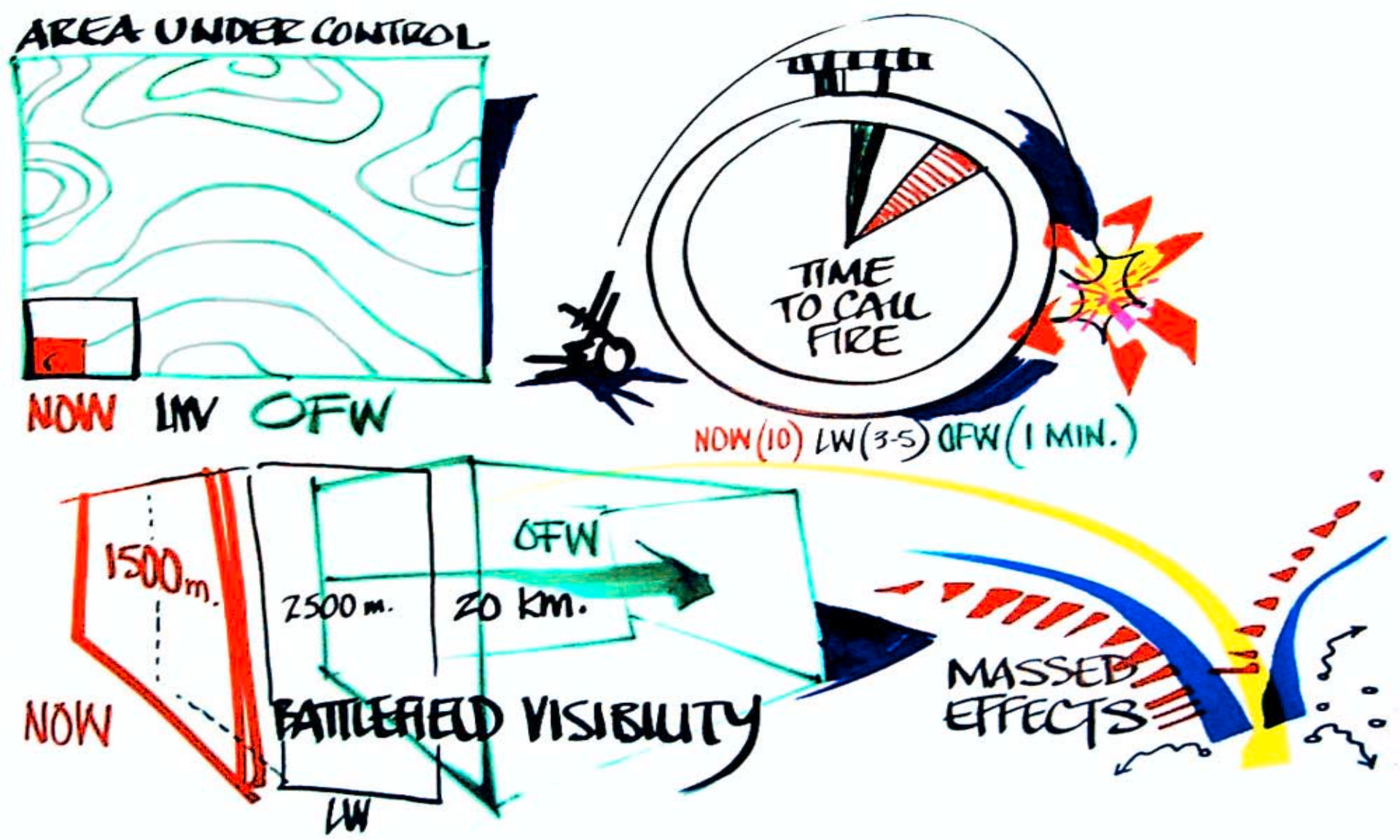
The vision exploits the power of the entire force and integrates with the Future Combat System of systems. It optimizes the Army's doctrinal concepts of *see first, understand first, act first, and finish decisively*. The soldier is the enabler of collaborative massed effects. It is critical that the full range of national and joint capabilities, which will enable the Objective Force to *see first, understand first, act first, and finish decisively* at the strategic operational, operational, and tactical levels, be extended to the Objective Force Warrior and his unit of action.


UNDERSTAND AND ACT FIRST
FINISH DECISIVELY
SEE FIRST
SURVIVE & ENDURE
EXPLOIT THE POWER OF THE ENTIRE FORCE

Under this concept, the Objective Force Warrior's potential to exponentially expand battle space control and effect is achieved in three dimensions and time. The advanced C^4ISR architecture of the Objective Force will be integrated from the strategic to the tactical level. This information superiority backbone will provide the means for the Objective Force Warrior to achieve revolutionary situational understanding and establish, maintain, and distribute a tailored common operating picture.

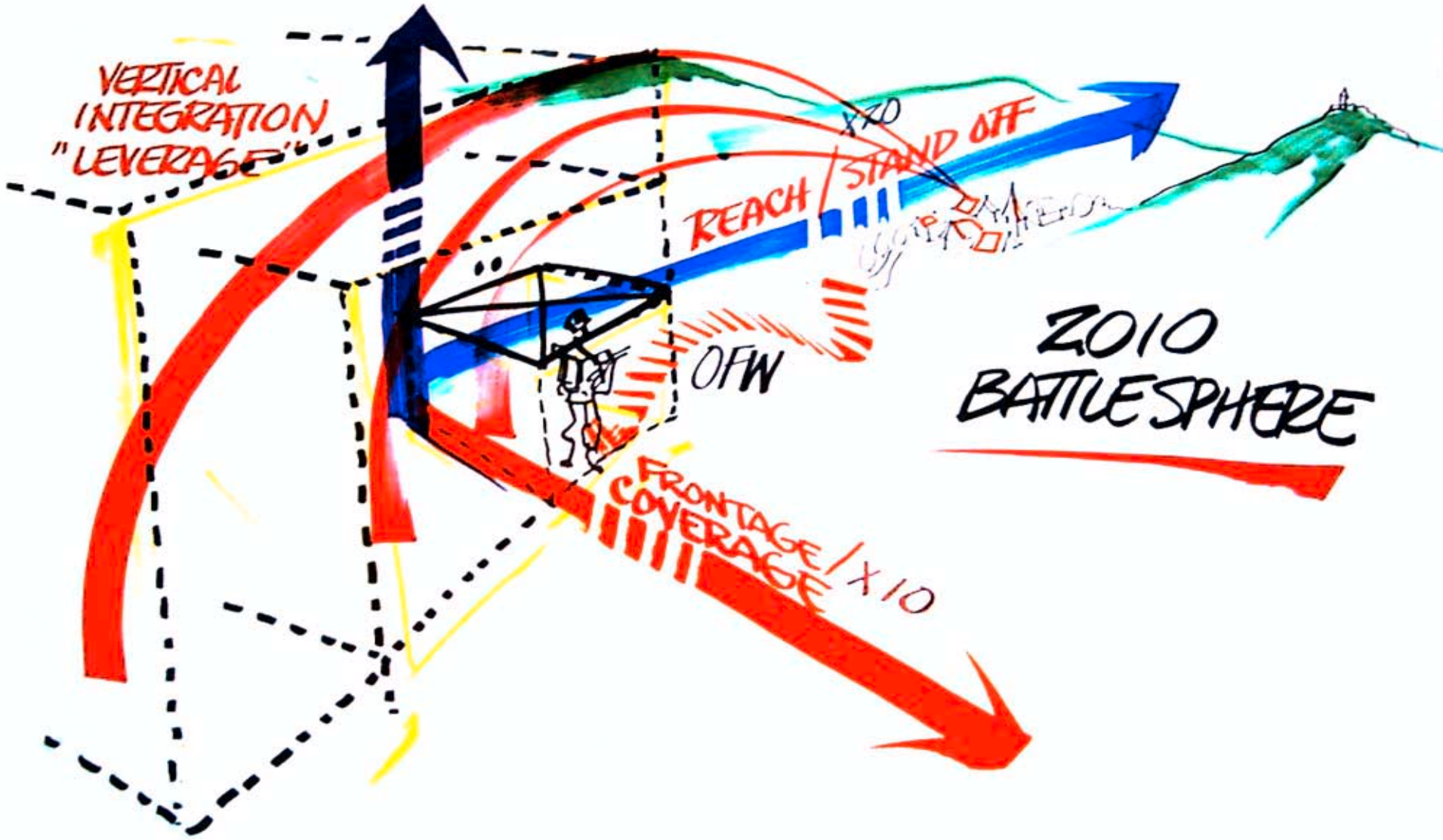
Extended range redundant communications and networked beyond line of sight fires will extend the Objective Force Warrior's reach and influence over an exponentially expanded battle space. Improved organic and joint sensor-shooter linkages will reduce response time and expand the means and rapidity with which targets can be engaged with the massed effects of the entire force. Through technological improvements in weapons and munitions, the Objective Force Warrior will have the ability to engage and destroy the enemy at longer ranges, with greater precision, and with effects that are more devastating.

BATTLEFIELD CONTROL



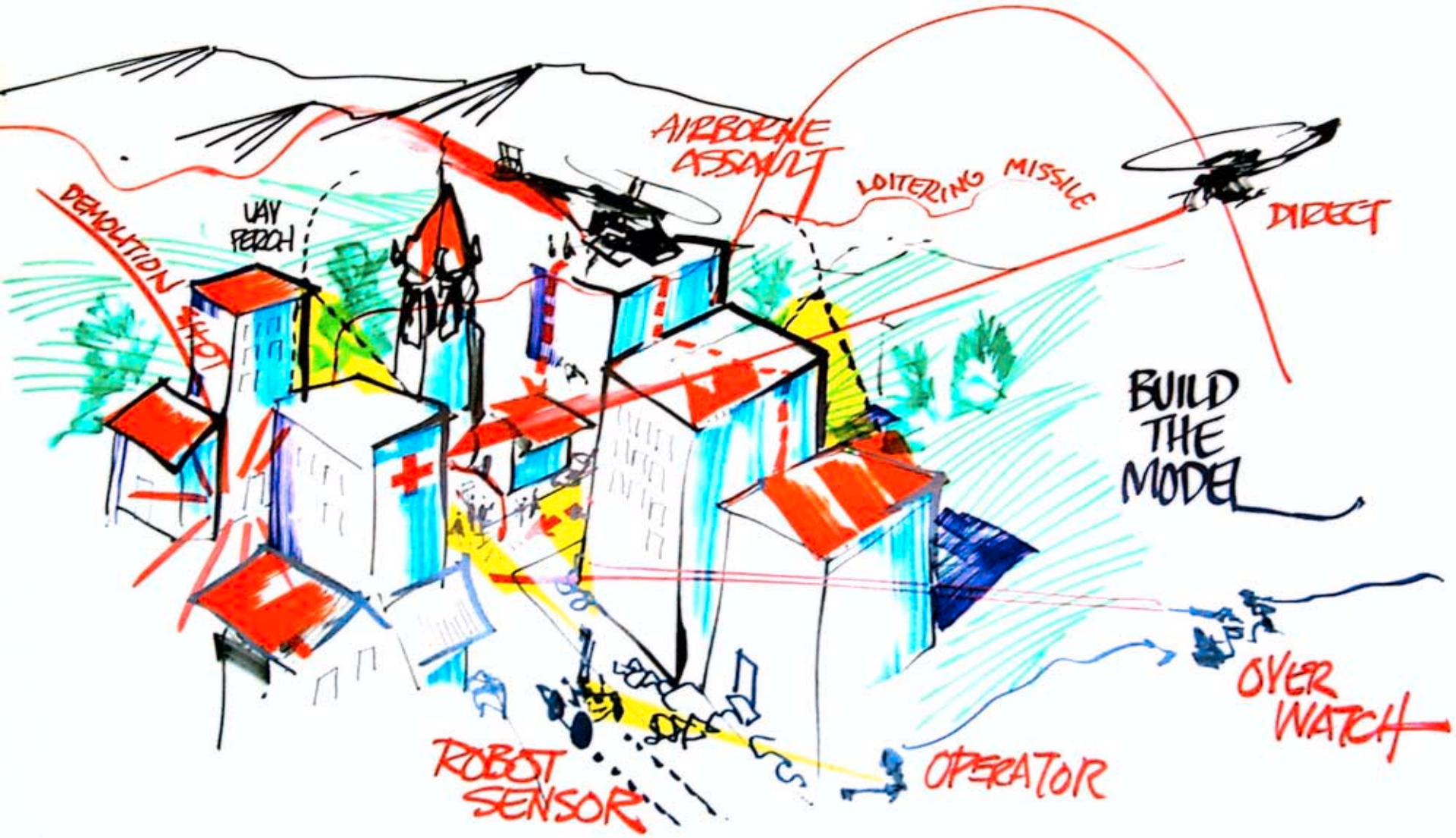
Battle space is the volume of area in which the Objective Force Warrior will dominate the enemy. Through dramatically improved battlefield visualization, the warrior will decide where, when, and how he will dominate the enemy within his battle space. The multiplier aspects of vertical integration and standoff are achieved. As these massed effects are achieved, the soldiers' concomitant risk is lowered. By seizing and maintaining the initiative and seeing, understanding, and acting first, the Objective Force Warrior will enhance his own survivability.

MASTER OF THE BATTLESPACE

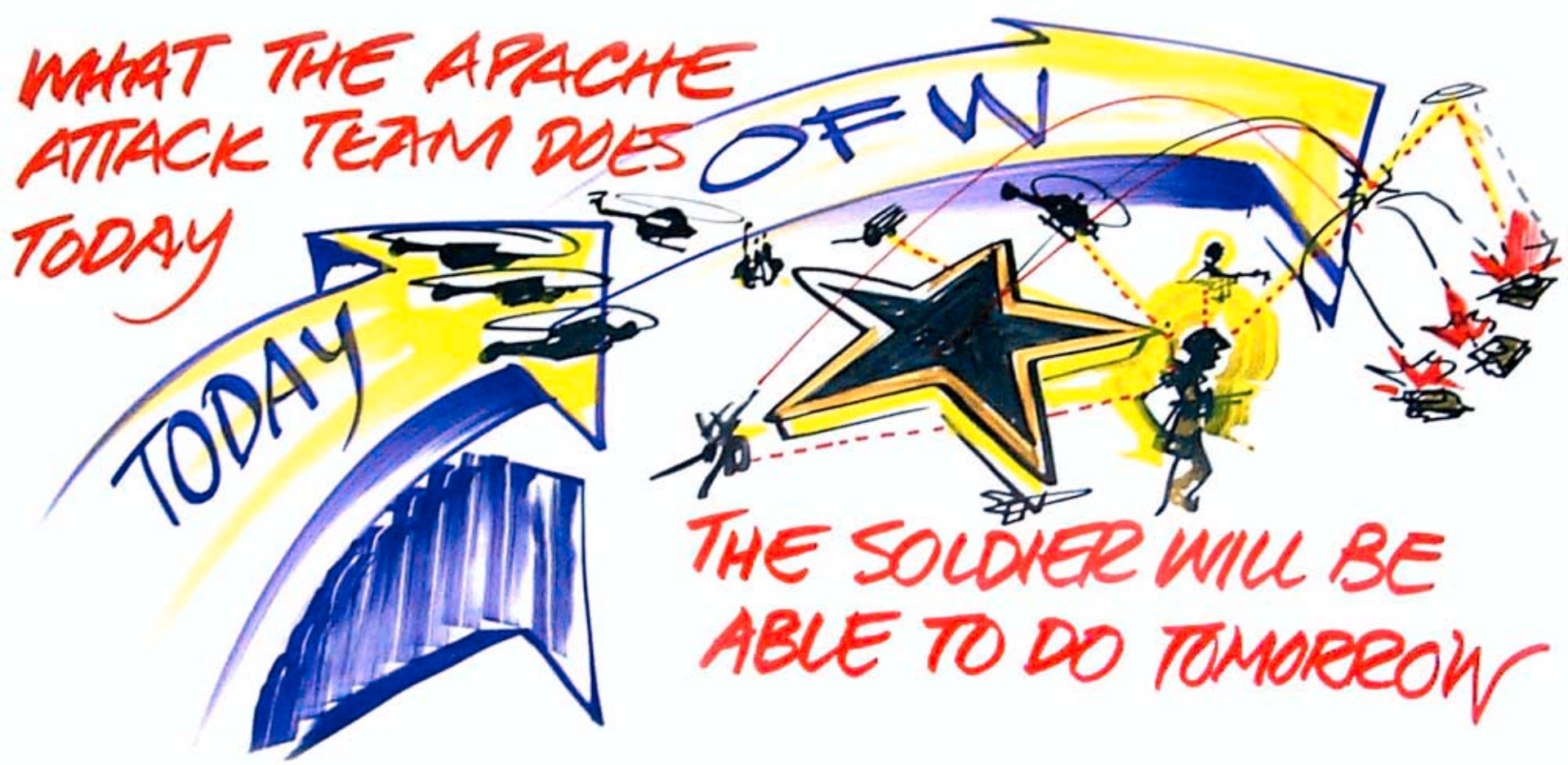


The urban conflict situation provides a good example of the Objective Force Warrior's capability to bring integrated, collaborative massed effects to bear with a three-dimensional perspective.

COLLABORATIVE MASSED EFFECTS



Another analogy is that we want tomorrow's soldier to be able to achieve the massed effects that the Apache attack team does today.


WHAT THE APACHE ATTACK TEAM DOES TODAY
TODAY
OFW
THE SOLDIER WILL BE ABLE TO DO TOMORROW

Through centuries of warfare, the human dimension has played the most critical role. Those fundamental principles, elevated by technology, provide the most dynamic potential for decisive results.

Soldiers and leaders will be the heart of Objective Force units. These disciplined, physically tough, and mentally conditioned warriors will have the perseverance and technical and tactical competence to be adaptive and decisive across the full spectrum of conflict. Technology will serve as an enabler to allow them to remain persuasive in peace and invincible in war.

the American Warrior

...is an adaptive brotherhood elevated by technology ...and decisive across the spectrum of conflict

THE HUMAN DIMENSION!

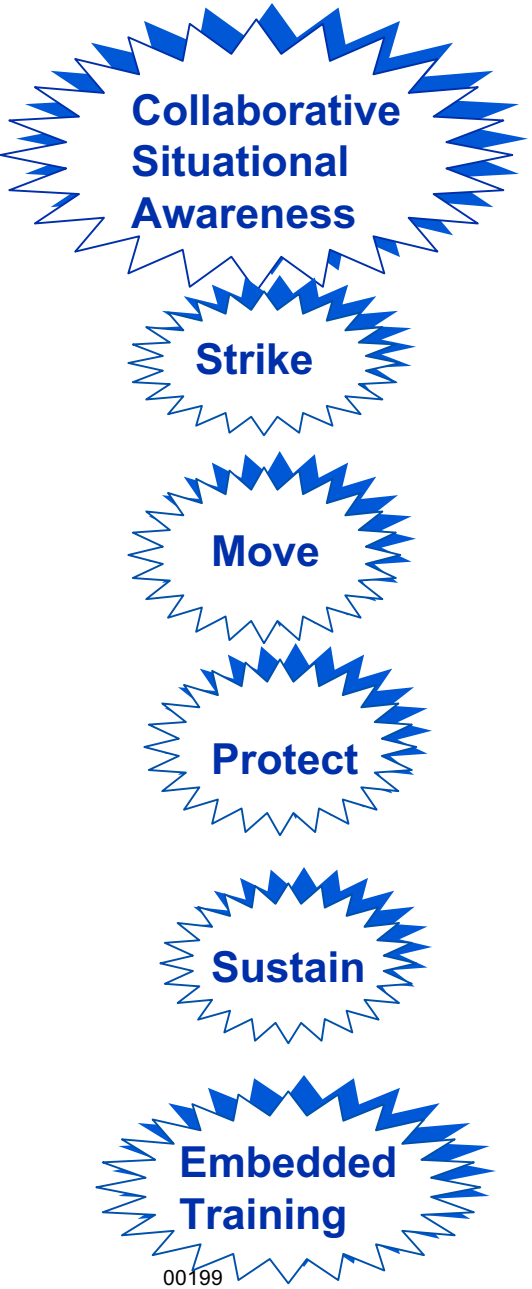
It is essential that the Objective Force Warrior systems be designed around the critical operational elements of the Warrior Culture. The resulting mosaic illustrates the philosophy that allows us to gain optimum utility from our technology. Technology becomes the catalyst that enables an effective integration of leadership, training, doctrine, and organization. It elevates our capability to the next level in a way that the solider recognizes as valuable and usable.

HUMAN PERFORMANCE-CENTRIC DESIGN

Six essential components were identified as crucial for an Objective Force Warrior fielding in 2010. The first two, Collaborative Situational Understanding (netted communications) and Netted Fires, were by far the most important. Even if 100% capability cannot be achieved by 2010, maximum focus and resources should go to optimize these two areas. Collaborative Situational Understanding and Netted Fires are where the big payoff lies in capability. These two items allow the soldier to "know" what the system knows and apply the power of the force.

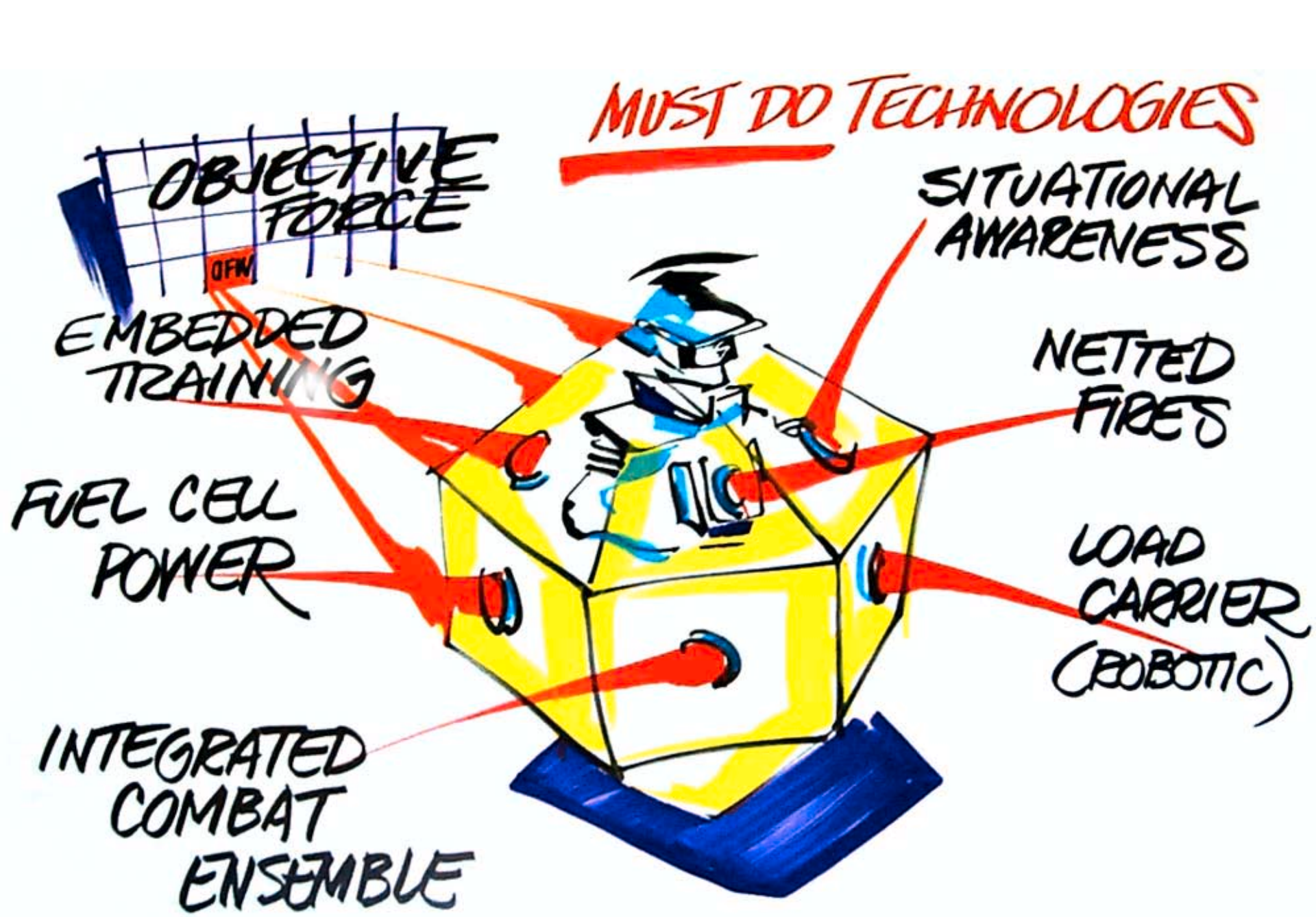
Other supporting key components emphasize providing a robotic load carrier now, producing an integrated combat ensemble, developing the best advanced power source possible, and providing integrated embedded training capabilities.

"MUST HAVE" OFW COMPONENTS



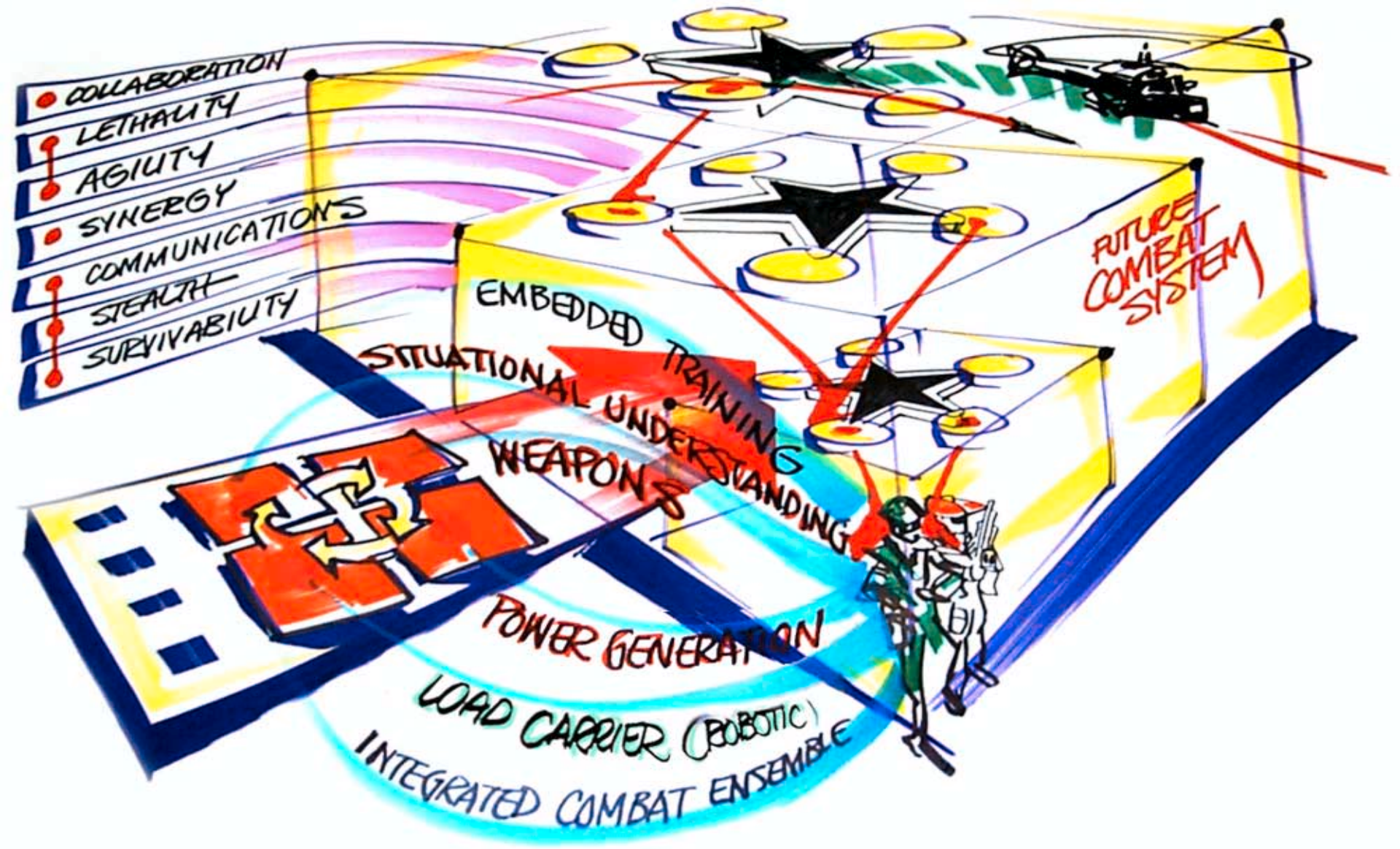
- Collaborative Situational Understanding
  - Netted Communications
- Apply/Mass FCS Combat Multipliers to Overmatch
  - Netted fires
  - OCSW critical
- Reduce Weight
  - UGV load-carrier now
  - Lighter equipment technologies
- Individual Survivability
  - Integrated combat ensemble
  - Lighter, stronger ballistic protection
- Power
  - Best possible advanced fuel cell by 2010 fielding
- Collaborative Training Integration

This graphic portrays a powerful Objective Force Warrior capability as part of the Objective Force concept, hinged on the six “Must Do” technology components.


MUST DO TECHNOLOGIES
OBJECTIVE FORCE
OFW
SITUATIONAL AWARENESS
EMBEDDED TRAINING
NETTED FIRES
FUEL CELL POWER
LOAD CARRIER (ROBOTIC)
INTEGRATED COMBAT ENSEMBLE

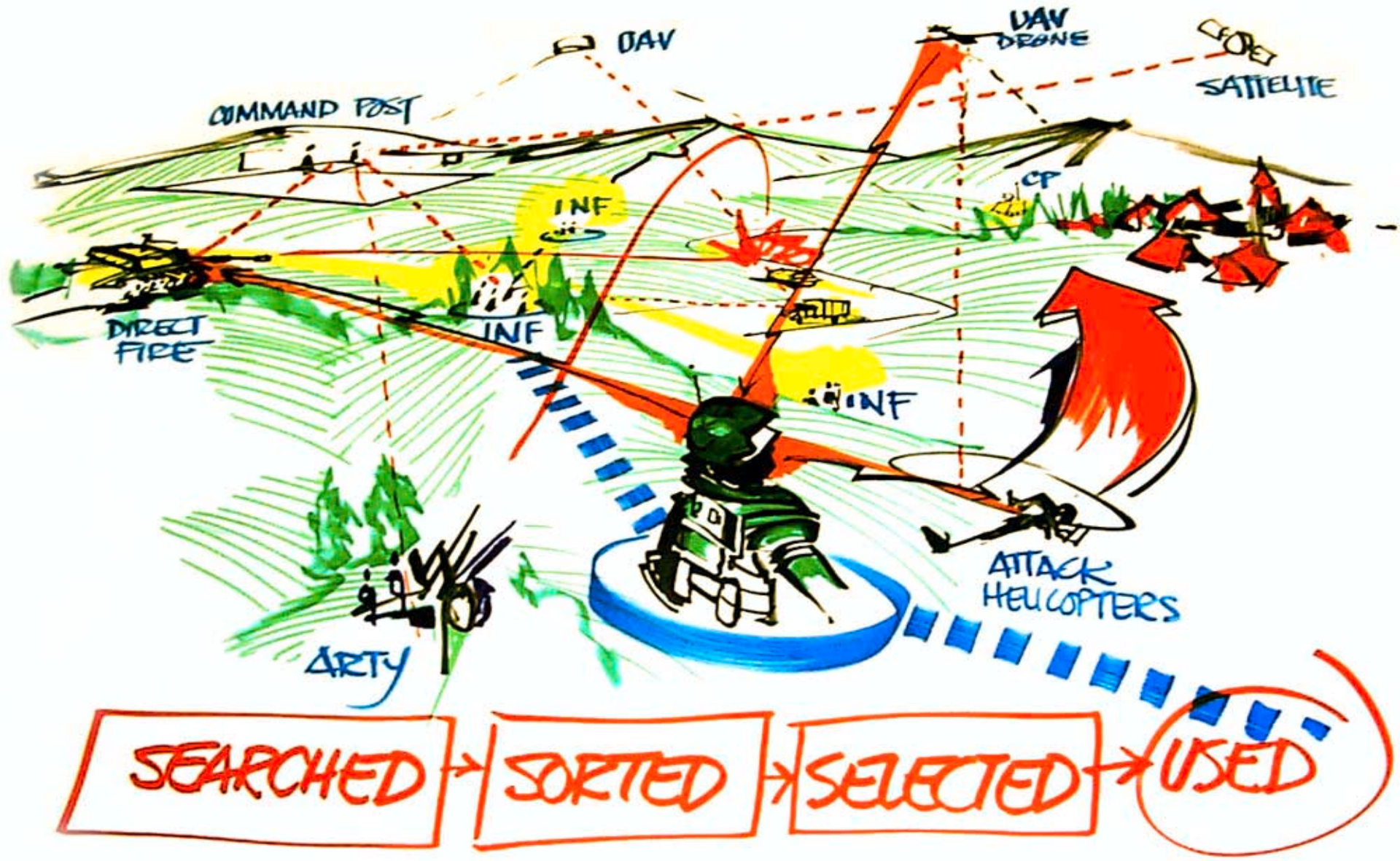
These critical components allow the Objective Force Warrior to operate within the unit of action and Future Combat System structures to optimize the capabilities of the whole force and produce output “ilities” at a higher scale.

GENERATING THE PAYOFF

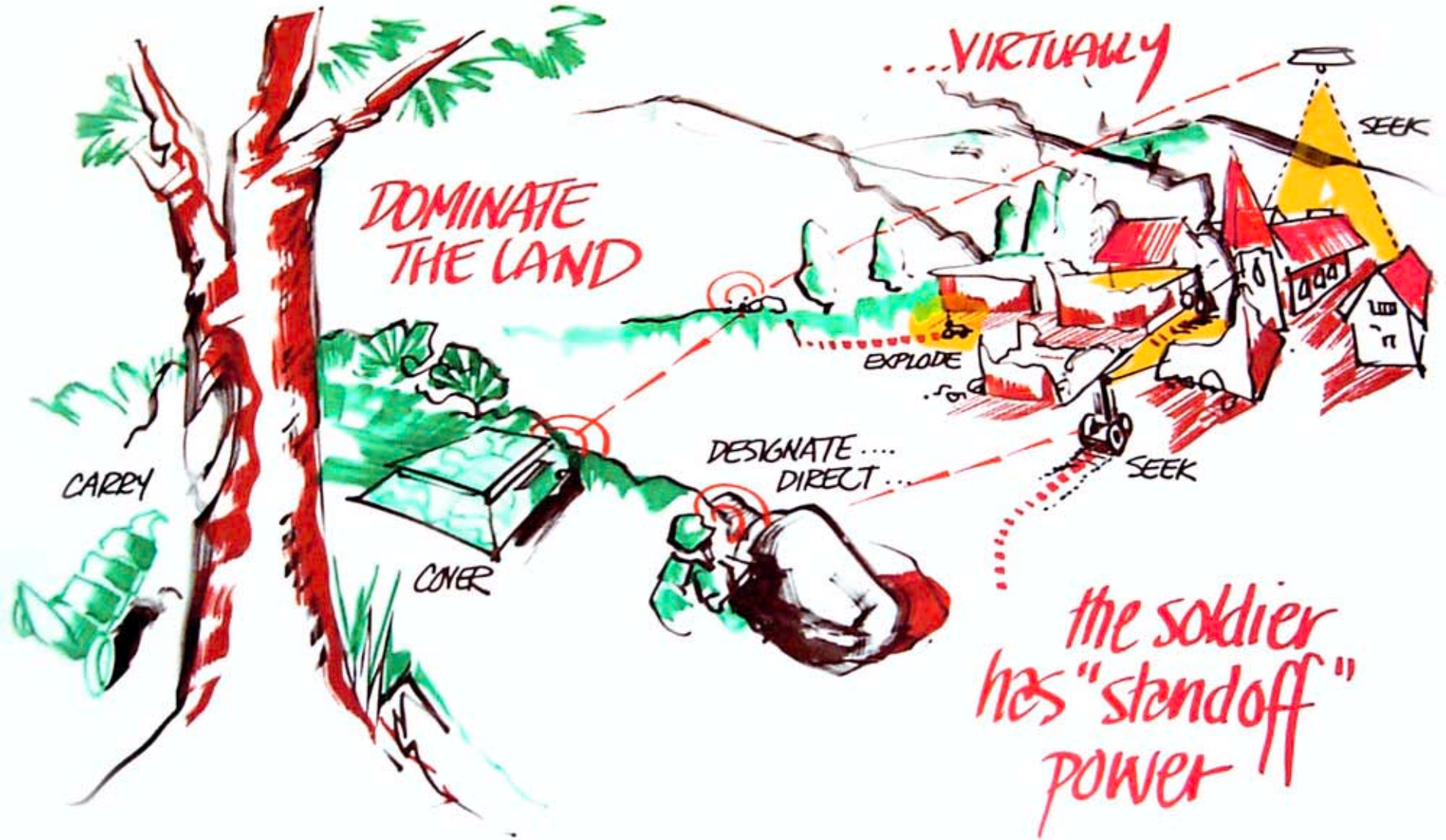


For Objective Force Warrior 2010, it is essential that we field an initial capability to search data sources, sort the information, and select the pieces that fit the query. This must be done at machine speed using intelligent agent technologies. This capability then allows the assets of the force to be used to create the mass effects. We have then vastly expanded the soldiers' battle space.

THE 2010 WARRIOR

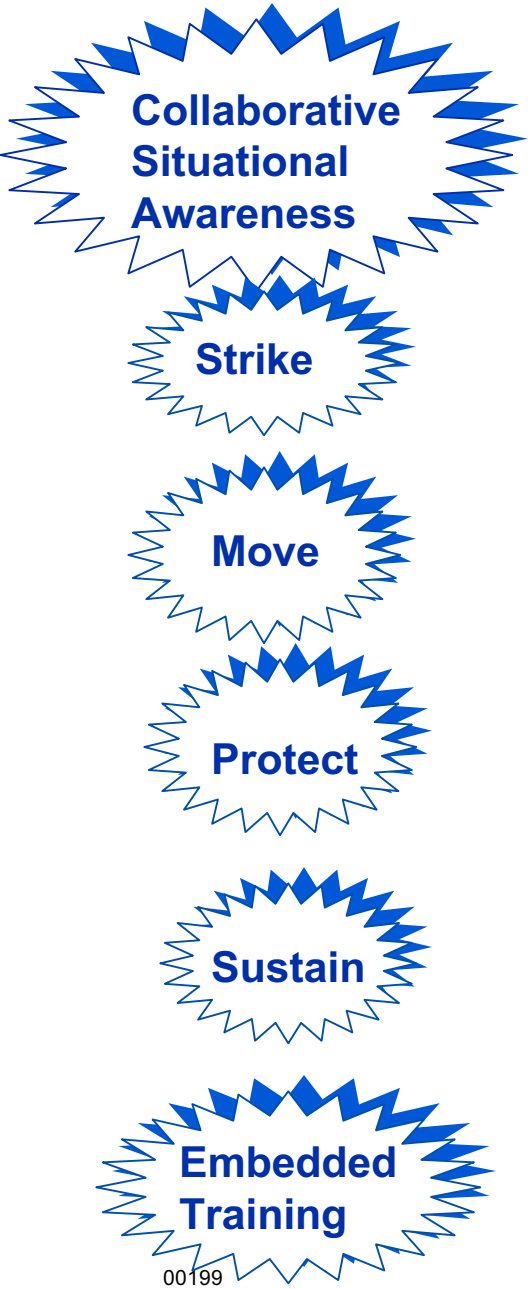


As this capability for netted communications and netted fires is achieved, we see fewer and fewer instances where the soldier actually has to "close with" the enemy to defeat him. This advantage ripples through all the aspects of survivability, mobility, and lethality, reinforcing each proportionally.


....VIRTUALLY
SEEK
DOMINATE
THE LAND
EXPLODE
DESIGNATE ....
DIRECT ...
SEEK
CARRY
COVER
the soldier
has "standoff"
power

Each of the Objective Force Warrior "must have" components is composed of a set of prioritized enabling technologies. These will be discussed component by component.

"MUST HAVE" OFW COMPONENTS



- Collaborative Situational Understanding
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  - UGV load-carrier now
  - Lighter equipment technologies
- Individual Survivability
  - Integrated combat ensemble
  - Lighter, stronger ballistic protection
- Power
  - Best possible advanced fuel cell by 2010 fielding
- Collaborative Training Integration

This is the most important capability to achieve in Objective Force Warrior; it produces the common relevant operational picture. It is understood that some aspects of these technologies might not be achieved by the 2010 Objective Force Warrior. However, the maximum possible in this area must be achieved through focused effort, priority, and resourcing.

Netted communications establishes the baseline. This capability must be mobile ad hoc (continuously reconfiguring) communications that does not require any infrastructure or fixed antenna locations. These communications are reinforced by the ability to search, sort, and find specific information needs at machine speed from available data (satellite, UAV, sensor, reports, adjacent unit, reconnaissance elements, etc.). The association, linkage, and portrayal of this information produces the understanding we seek.

Integration of this information portrayal into a helmet system with voice activation software and multi-spectral vision is important to the concept.

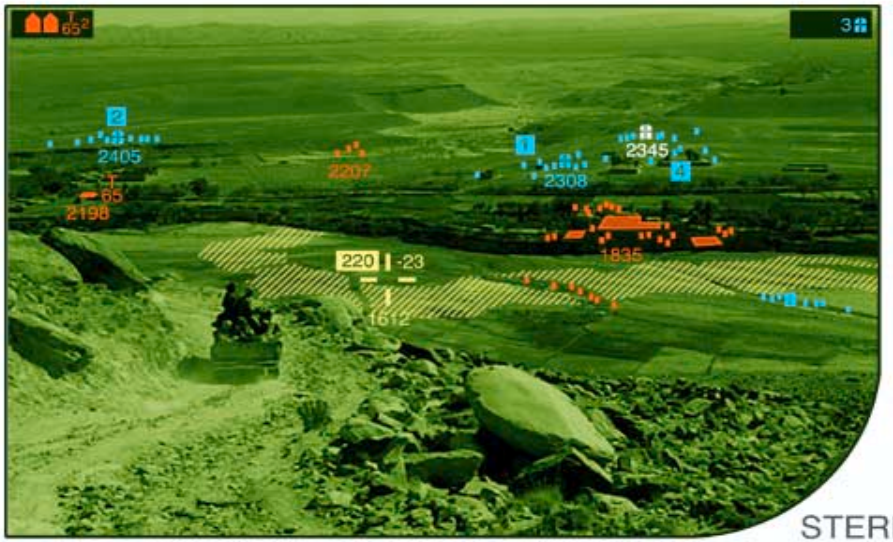
COLLABORATIVE SITUATIONAL AWARENESS
(Common Relevant Operational Picture)

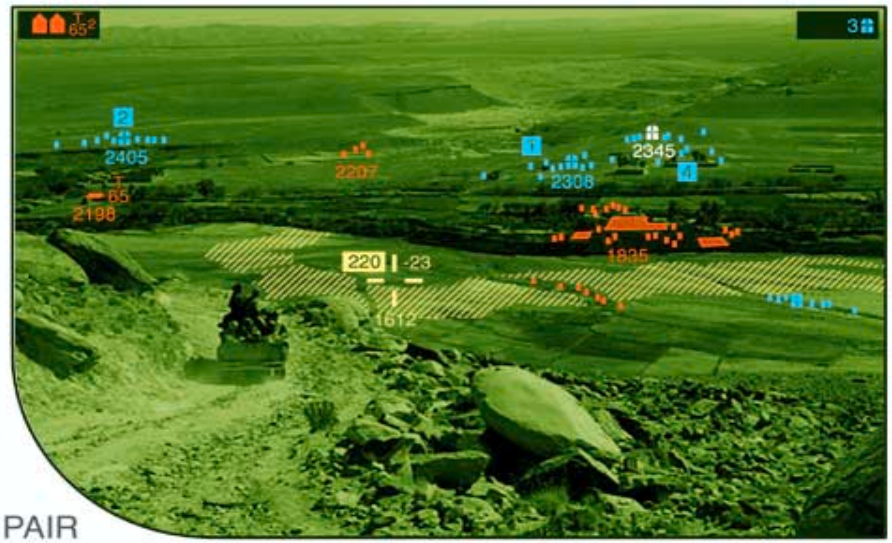
ENABLERS

- Distributed and Integrated Communications Network
  - Mobile ad hoc networks (urban and contingency)
- Phased Integrated Helmet with Display (180º field of view)
  - Voice control command software
- Video/Data Links to Networked Sensors
- Wireless Link to Tactical Internet
- Information Integration Software/Decision Aids
  - Intelligent agents
- Multi-spectral Vision
- Integrated position/navigation plus combat ID
- Multi-path Broadband (Voice and Data)
- Battlefield Sensors (Sensor to Shooter)
  - Through-the-wall RF
  - Mine detection sniffer
- UAVs

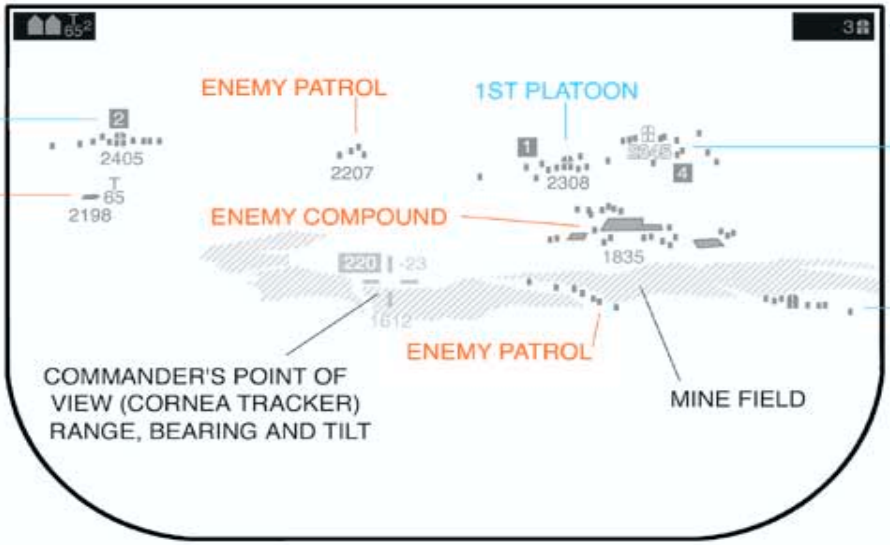
This night view is illustrative of the kind of coded information replication that is possible. Enemy, friendly, and terrain coding are visible without destroying the panoramic context of the view.

POTENTIAL VIEW





STEREO PAIR



The second most important capability is the ability to use our situational understanding to achieve massed effects in a collaborative fashion from the total networked suite of Future Combat System fires and combat multipliers. This should include smart munitions and a full BLOS/NLOS capability.

The Objective Individual Combat Weapon and Crew Served Weapon are crucial to the fight across the spectrum and should be fielded as soon as available.

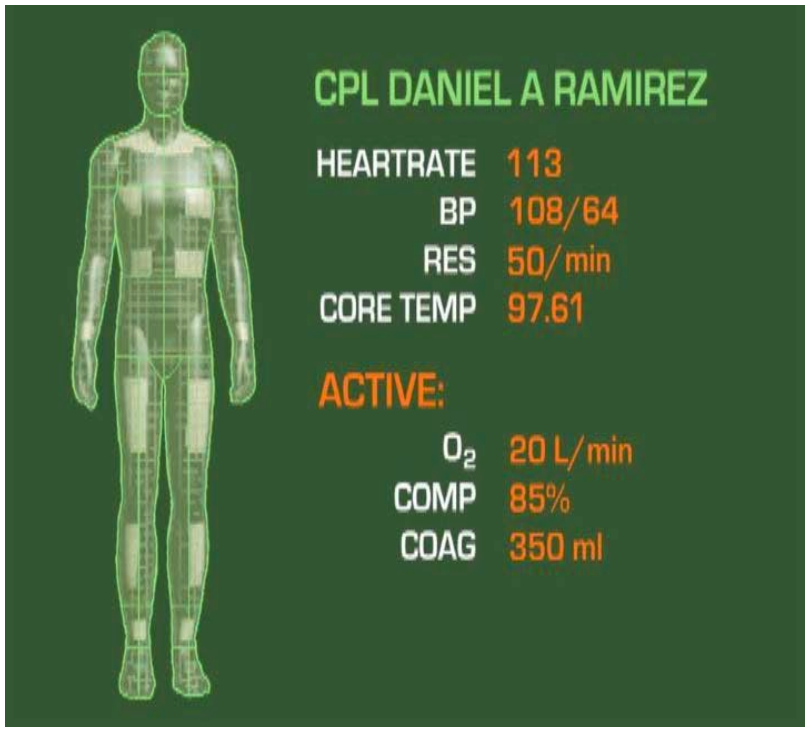
STRIKE
(Apply Full FCS Combat Multipliers)

ENABLERS

- Real-time Distributed Networked Fires (direct, BLOS, NLOS)
- OICW/OCSW
- Improved Munitions/Explosives
- Smart Ammo
- Scalable Lethality

The soldier of tomorrow needs a fighting ensemble that is designed for functionality. It should include, in an integrated way, all the sensors and protective capabilities that are ready for fielding by 2010. First priority should go to lighter, stronger ballistic protection for the close and urban fight.

PROTECT
(Individual Survivability)



ENABLERS

- Integrated Soldier Ensemble
  - Lighter ballistic protection
  - Chem/bio protection
  - Thermal management and temperature control
  - Biometric sensors
  - Hemorrhage control
- Situational Awareness
  - Integrated sensor access

The single most important mobility dynamic is the need to reduce the soldiers' load. It must be a mixed strategy of offloading (80%) and lighter materials (20%) for Objective Force Warrior 2010. There is an immediate need for a robotic follower within the next 2-3 years, which the panels believe technology will allow.

Each device or sensor employed or worn by the soldier should have its own internal power source instead of having to draw from one large source. This allows optimization of current miniaturization capabilities and reduces demand. Multi-function integration also gives us excellent economy of scale potential and weight savings.

MOVE
(Reduce Soldier Load)

ENABLERS

- Robotic Ground or Aerial "Mule" — Offload
- Lighter Advanced Materials
- Integral Power Source for Devices/Sensors
- Multi-function Integration (suit, helmet, sensors, radio, computer, antennas)

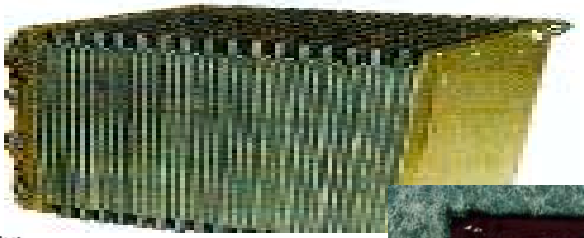
The most important challenge in this area is solving the power problem and the associated weight aspects. The most advanced hybrid fuel cell possible appears to be the best candidate for Objective Force Warrior. Resources and effort should be focused on the power, weight, configuration, and fuel aspects to optimize the potential in the next 4-5 years.

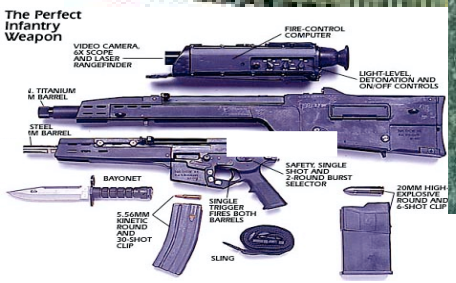
The technology exists to purify water from almost any source. The capability needs to be engineered and miniaturized to optimize size and on-person distribution. A larger unit of action capability can mature even faster and could possibly be integrated on a robotic follower.

A contingency for solving resupply in terrain too difficult for robotic followers was an unmanned GPS air-cargo delivery system that would enable delivery of supplies to specific coordinates using low cost, precision aerial vehicles.

SUSTAIN
(Power and Weight Advances)

Fuel Cells





Weapon System

Meals Ready to Eat (MREs)

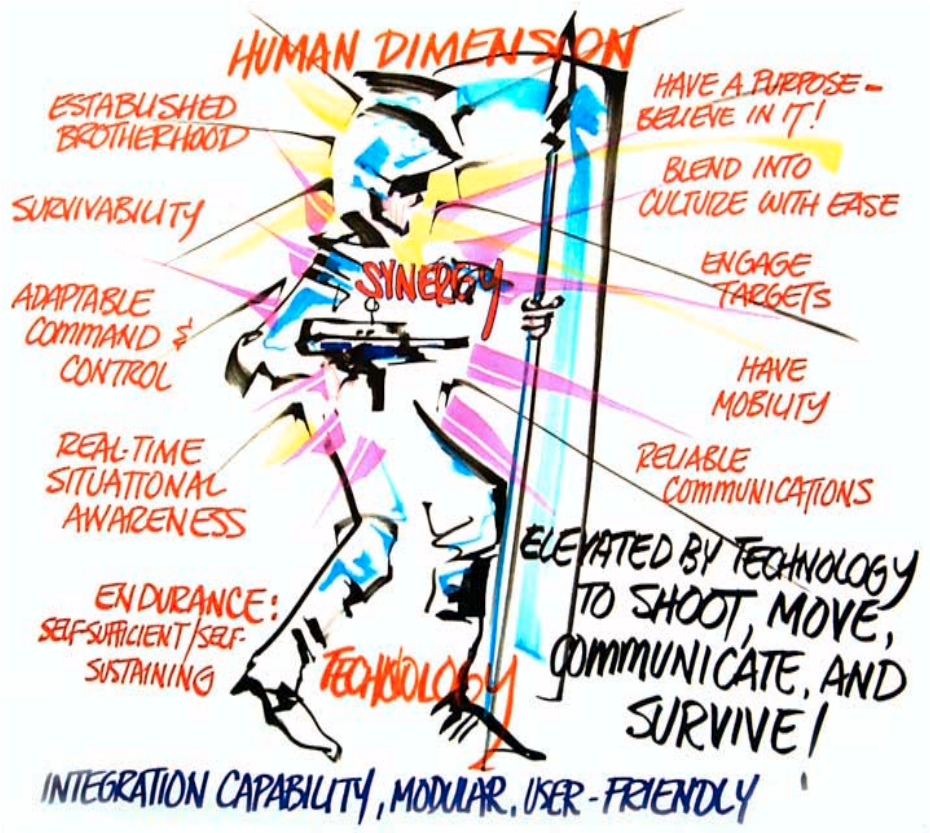
ENABLERS

- Advanced Hybrid Fuel Cells (72+ hours)
- Lightweight Weapons and Ammunition
- Water Generation, Purification, and On-person Distribution
- Low Cost, Precision Resupply
  - Flying “mules”
- Improved/Efficient Rations

Several critical training multipliers should be achievable for Objective Force Warrior. Most important is collaborative mission rehearsal and 3D-visualization software that allows virtual training at the small unit level.

A ready visual reference on demand to display the essential doctrinal components of tactics, techniques, and procedures (TTP)is also important.

EMBEDDED TRAINING



ENABLERS

- Virtual Reality/3D Visualization Software
- Geographic Information System
- Tactics, Techniques, and Procedures (TTP) Recall
- Collaborative Mission Rehearsal

Reasonably robust achievement of netted communications, collaborative situational understanding, and netted fires can produce an Objective Force Warrior twenty times more capable than the 2004 Land Warrior. Realization of these capabilities allows the soldier and the unit of action to leverage the entire power of the Force and the Future Combat System of systems. We are not just improving the individual's capability on the margin in a local battle space. We are expanding it dramatically in all three dimensions and in time.

The integrated fighting ensemble and helmet is important to efficient management of these capabilities and to survival and endurance. As illustrated in this chart, these three aspects should be the focus of effort and investment in Objective Force Warrior because they provide the huge growth in potential.

Clearly, the last two areas of emphasis, reducing the load through robotic offloading and achieving a more efficient and potent power source, are important and should be pursued for Objective Force Warrior. However, their contribution to end-state capability is on a smaller scale proportionally.

OFW COMPARED TO LW 2004

Achieves Soldier Overmatch (20X LW)

- Robust Communications Networked with 3D Situational Awareness
- Exploits Power of FCS Force (Integrated Application of Combat Multipliers, Sensors)
- Integrated Fighting Ensemble and Helmet

Improves Move and Sustain

- Reduced Weight — Robotic Vehicle for Offload and Lighter Materials
- Advanced Hybrid Power Source

For each of the essential components of the vision, metrics achievable by the enabling technologies are listed. In some cases, these metrics are quantitative. In other cases, the achievement of the capability is the important factor.

KEY COMPONENT METRICS (2010 OFW System)

Collaborative Situational Awareness/Understanding

Collaborative Situational Awareness

Metrics

- Tailored Common Relevant Operation Picture Accessible at all Levels of Command
- Compatible with Joint Service Systems
- Networked Using Mobile Ad Hoc Architecture (Wireless, Continuously Reorganizing)
- Architecture Supports Beyond Line of Sight Communications (BLOS)
- Open Architecture

Strike

Application of All Combat Multipliers

Metrics

- Direct/Indirect Netted Engagement (Integrate with FCS)
- Automated (Intelligent Agent) ISR Control with Sensor Integration at all Levels
- Compatibility with FCS and Joint Service Systems
- Open Architecture

Move

Reduce Weight Robotics

Metrics

- Reduce Soldier Fighting Load Below 40 Pounds (offload & lighter materials)
- Robotic Load Bearing System (follower)

KEY COMPONENT METRICS (cont.)

Individual Survivability

Protect

Metrics

- Protective Equipment Provides Full Spectrum Protection from Ballistic, Chem/Bio Threats
- Fully Integrated Combat Ensemble
- Health Status Monitoring of Vital Biological Functions

Power

Sustain

Metrics

- Safe, Reliable, Light, Power Source
- Sufficient Power Available to Support OFW System for 72 hours

Embedded Training

Embedded Training Integration

Metrics

- Embedded Individual and Collective Training Simulations with Visualization Software
- Integrated Mission Rehearsal Capability Embedded in OFW system

Equipment development feedback from the panels is reflected on this slide. The open architecture development strategy and a lead system integrator linked to the Future Combat System integrator are the two most important points.

The panels felt strongly that we had to move away from the force-wide fieldings with periodic block upgrades. Instead, we should develop open architectures in key areas and field in unit sets. We can manage matching the suitable unit with the right mission.

EQUIPMENT DEVELOPMENT THOUGHTS

- Keep It Small and Simple
- Spiral Development (Deploy with Tech Teams for first units)
- Field by Unit Sets
- Economically Reproducible in Mass
- Open Architecture to Maximize off the Shelf (Moore's Law)
- Modular Mission Payloads (Soldier and Vehicle)
- Minimize Logistics Tail
- OFW Lead System Integrator Linked to FCS Integrator

By a fielding date of 2018, truly exponential leap-ahead potential is achievable with a focused effort in the right areas. Full collaborative situational understanding supported by intelligent agents and netted communications can allow the soldier to know everything the "system" knows. Fully netted fires and the next generation of weaponry and smart munitions can take lethality to the next level.

New ballistic protective materials and total environmental management with a fully integrated combat ensemble will produce a new dimension in survivability for the warrior. The next generation of power sources will allow miniaturization and one-source power. Robotic systems from sensor to load carrying and fighting functions will allow the soldier maximum flexibility with minimum burden.

New dimensions of individual performance can be reached with performance-centric design and fully collaborative virtual training software. At this point, the soldier may no longer need to close with the enemy to destroy him.

EXPONENTIAL LEAP-AHEAD POSSIBLE BY 2018

More Options to "Close With" and "Destroy"

These technologies provide a specific recommendation for the major focus and investment areas for the 2018 Future Warrior. These technologies will provide the maximum combat payoff for the investment.

2018 TECHNOLOGIES - WHERE TO INVEST

- Distributed Collaborative Self-organizing, 3-D Network Architecture
  - Intelligent Agents
  - Ultra-Wide Band
  - Stratospheric, Terrestrial, Space Based Nodes
  - 3-D Graphics on Demand
  - Networked Fire Control with FCS and other Shooters (BLOS/NLOS) and sensors
  - Soft-launch, Smart Munitions
- Robotics
  - Remote sensing using Micro UAV & UGV
  - Autonomous Supporting Robots
- Directed Energy Weapons
  - Lasers
  - Radio Frequency
  - Intensity Focused Ultrasound
  - Lethal and Non-lethal Effects
- Integrated Warrior Ensemble (Advanced)
  - Nanofibers for Lighter Materials, Armor, and Signature Management
  - Active/reactive Ballistic Protection (solve energy dissipation problem)
  - Environmental Protection
  - Directed Energy Protection
  - Micro Climate Conditioning
  - Signature Management
  - Chem/Bio Detection and Protection
  - Biomonitoring/Triage
  - Exoskeleton Components
  - Forward Counter Mine
- Advanced Training
  - Enhanced Embedded Training and Rehearsal Processes
  - Enhanced Distributed Learning
  - Neural Entrainment

The Objective Force Warrior is more than a list of technology “eaches” to improve individual soldier capability. It is a concept that allows the soldier to bring the total power of the Force to bear through knowledge, netted communications, and netted fires. The resulting collaborative massed effects generate a twenty-fold increase in capability.

SUMMARY

The Old Wisdom Endures —	Move, Shoot, Communicate, Along with Survive and Endure, Still Wins
The Future Champion —	Netted Communications Leading to Situational Awareness, Collaboration, Massed Effects, Sensing, and Synergy is the Key to the Future
The Over-Arching Gestalt —	Exploit the Power of the Entire Force
Four Technology Imperatives —	Information, Power, Miniaturization, and Robotics
The Urgent Cry —	Passionate Call for a “MULE” like Tool
The “OTHER FORCE” —	The Human-centric Battlefield Dynamics of the WARRIOR CULTURE are Key Combat Multipliers

Key to producing and maintaining such an overmatch is the necessity to visualize architecture for the 2018 end-state. Design it now and field it with Objective Force Warrior in 2010. This open architecture approach will allow us to build to the full 2018 capability as technology matures without a new design or a new fielding.

CLOSING THOUGHTS

- The paradigm shift in warrior capabilities must be mirrored across Army programs: recruiting, training, retention, and personnel management.
- Human factors research is critical to shape the array of information and technological tools envisioned for OFW.
- System architecture, operational architecture, standards and specifications must be engineered/approved by the Army. Do not allow industry to steer this course.
- Acquisition processes have never been more critical than they are now…paradigm shifts resulting from leap ahead technology have tremendous potential if we can design architectures to accept these capabilities as they become available.