Office of Naval Research
Special Missions
Science & Technology
Areas of Interest

Mr. Jim McMains
Director, ONR 303

Combating Terrorism and Naval Enterprise Integration

12 August 2010

Our Mission

The *Office of Naval Research* invests in innovative science and technology (S&T) that ensures our warfighters have the *technological edge.*

ONR Mission **— "to plan, foster, and encourage scientific research in recognition of its paramount importance to future Naval power and national security." — Public Law 588 of 1946**

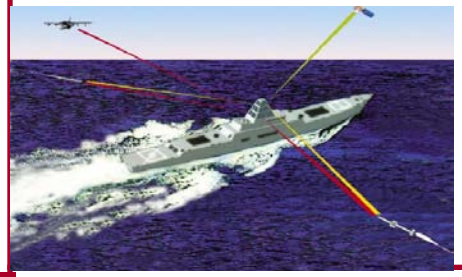
ONR S&T Departments

Code 30

Expeditionary Maneuver
Warfare & Combating Terrorism

Code 31

C4ISR



Code 32

Ocean Battlespace Sensing

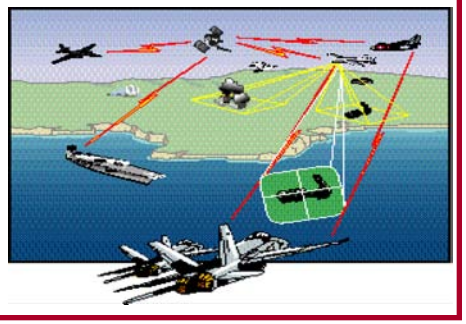
Sea Warfare and Weapons

Code 33

Warfighter Performance

Code 34

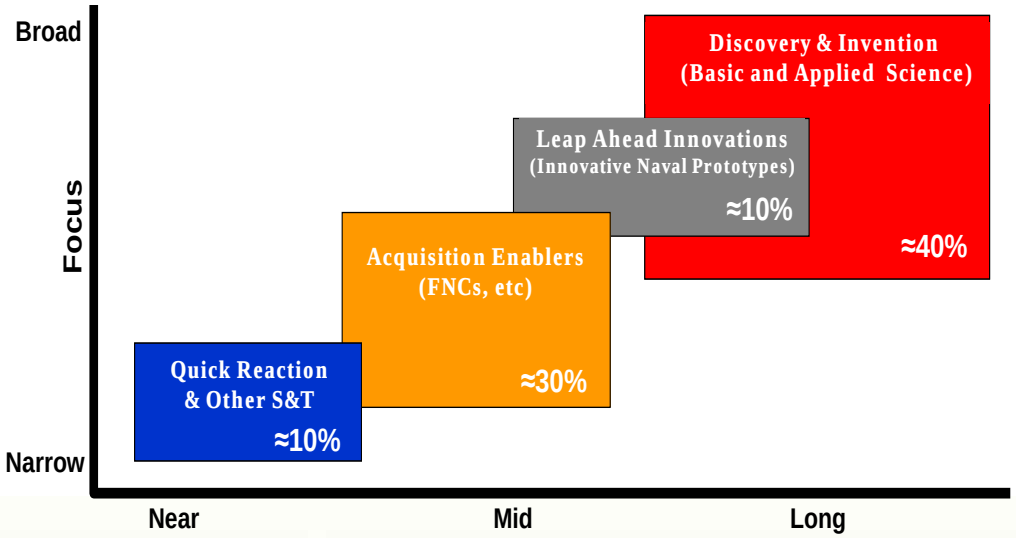
Air Warfare and Weapons



Code 35

Naval S&T Strategic Plan

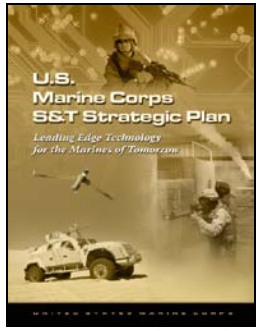
Resource Allocation

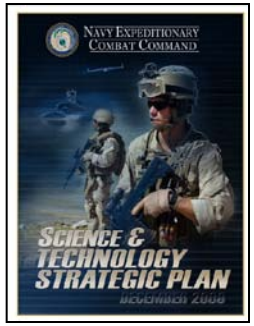


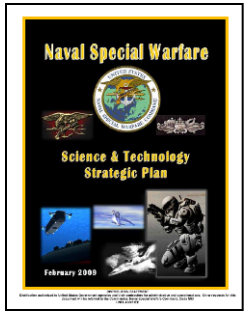
Focus Areas

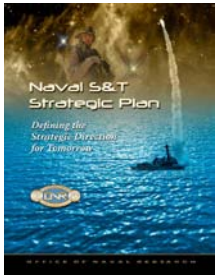
- Power and Energy
- Operational Environments
- Maritime Domain Awareness
- Asymmetric & Irregular Warfare
- Information Superiority and Communication
- Power Projection
- Assure Access and Hold at Risk
- Distributed Operations
- Naval Warfighter Performance
- Survivability and Self-Defense
- Platform Mobility
- Fleet/Force Sustainment
- Total Ownership Cost

Science &Technology Requirements Process "Top Down"

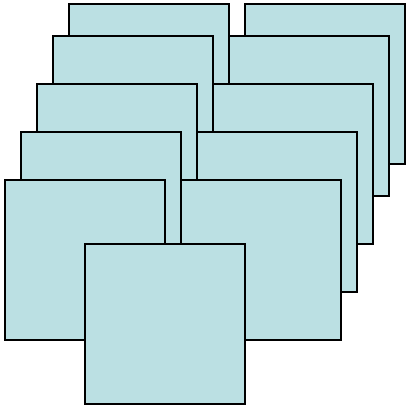




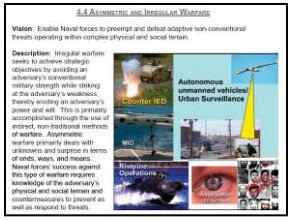




13 Focus Areas



ONR 30 Leads 2 Focus Areas



Asymmetric Irregular Warfare (AIW)

Distributed Operations (DO)

Focus on the warrior as a system, rather than the platform!

Align:
- **What we do**
- **What we need to do it**
- **How do we measure our effectiveness?**

Department Head
Mr. G. W. Solhan

Align with our customers:
- **USMC, NECE, SPECWAR**
- **Combat Developers, Material Developers, Operating Forces**

Deputy Programming, Planning & Operations
Ms. L. Worcester
Capt Thom Bellamy

Deputy Department Head
COL T. M. Williams

ExFOB
LT V. Cruz

Hybrid Complex Warfare Sciences Division (301)

Director
Dr. R. Pohanka
Deputy
Maj B. Short

Non-Linear Physics
Dr. M. Shlesinger

Basic Research Counter IED
Dr. D. Prono
CAPT M. Stoffel

Applications Division (302)

Director
Mr. A. G. Johnson

FITE JCTD
Mr. C. Lethin

IDD
Ms L. Albuquerque

Combating Terrorism & Integration Division (303)

Director
Mr. J. McMains

Maritime Irregular Warfare

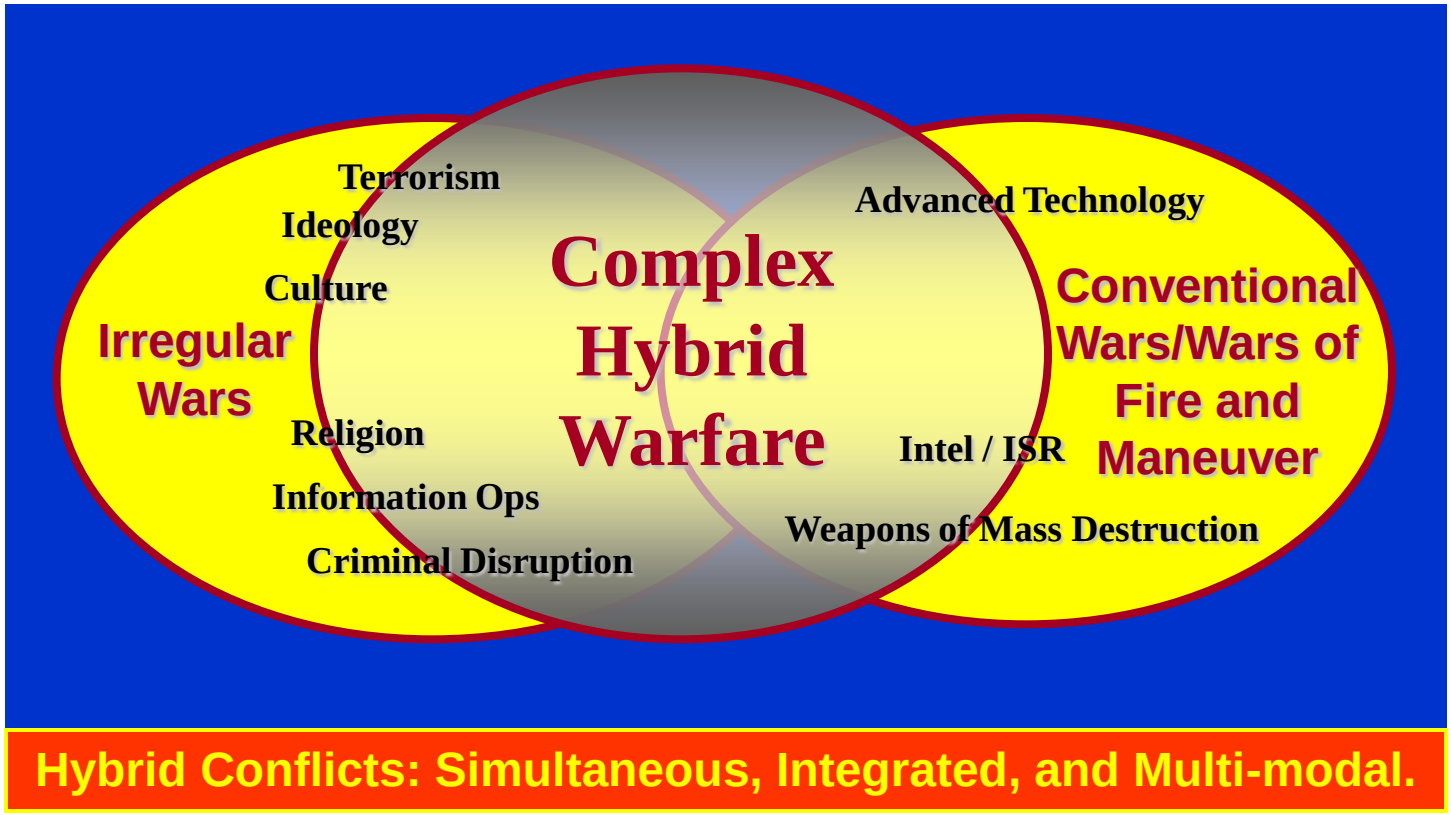
Operational Adaptation

Integrate inter departmental & interdisciplinary within ONR and with external activities

Human Performance Training & Education	C4	ISR	Fires	Logistics	Maneuver	Force Protection	Human, Social, Cultural, Behavioral Sciences
Dr. R. Stripling	Mr. J. Moniz	Mr. M. Kruger Ms. M. Rubeiz Maj F. Filler	Mr. D. Simons Mr. M. Tepaske	Mr. C. Anderson	Mr. J. Bradel Mr. G. Doerrer Mr. K. Hammack	Mr. L. Mastroianni	Dr. I. Estabrooke

Changing Character of Conflict:

Irregular and Traditional warfare are not mutually exclusive…



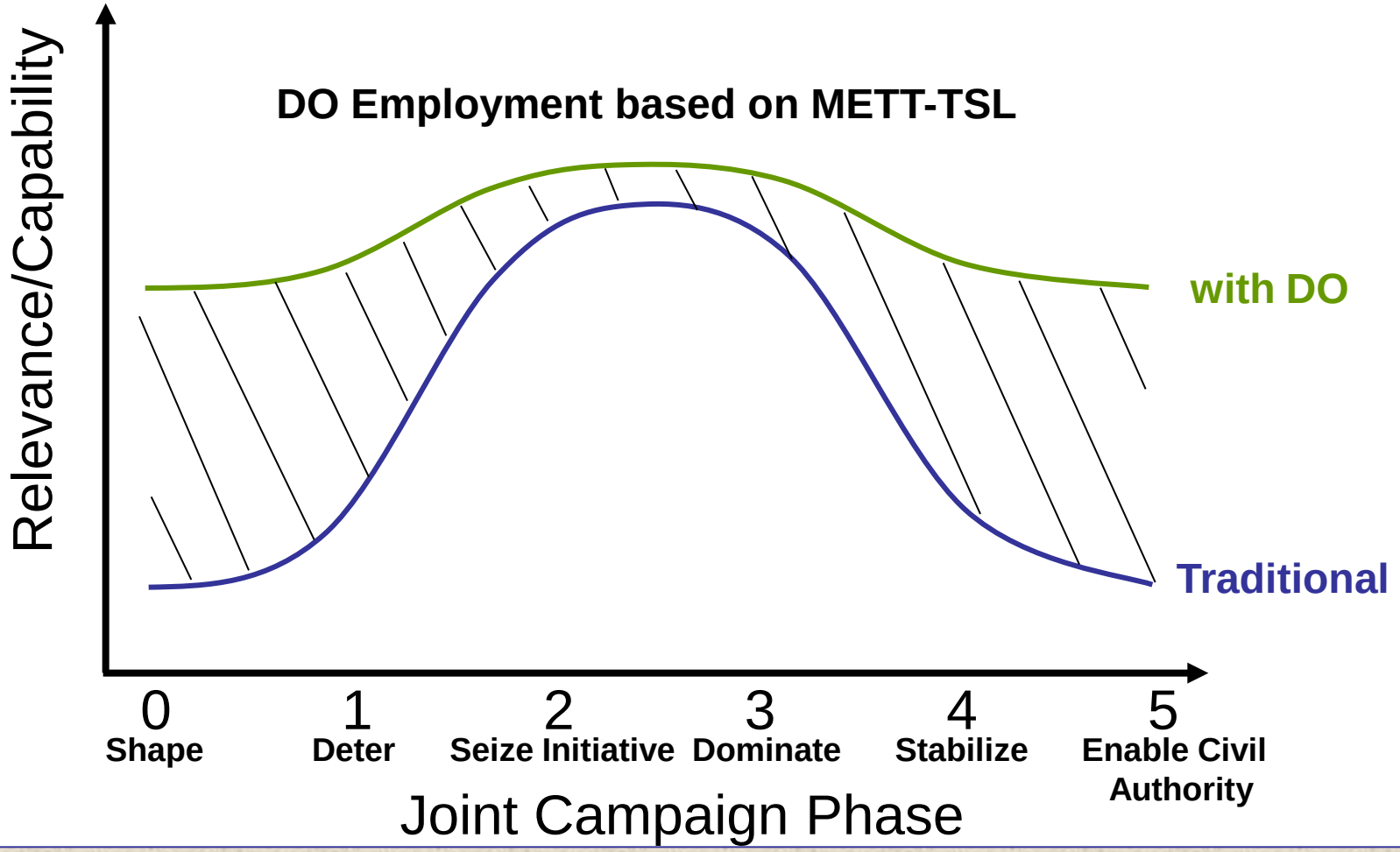
Source: Patterns, Trends, Future Conflicts, & Force Implications, SVG Brief, Presented by: Col. Zotti

Traditional Warfare vs. Irregular Warfare

IW Definition: A violent struggle among state and non-state actors for legitimacy and influence over the relevant populations. IW favors indirect and asymmetric approaches, though it may employ the full range of military and other capabilities, in order to erode an adversary's power, influence, and will. – IW JOC

	Traditional Warfare	***Irregular Warfare***
1	The center of gravity is often the adversary's ***military forces and political leadership***	The center of gravity is usually the ***indigenous population***
2	Influencing the ***physical terrain*** is key.	Influencing the ***social & cultural terrain*** is key
3	Conducted by ***regular forces*** of ***nation states*** that are ***separate and distinct*** from the civilian population	Often conducted by ***irregular forces*** of ***state or non-state networks*** that are ***embedded*** (not distinct) from the civilian population
4	***Focused kinetic effects -- Physical***	***Distributed non-kinetic effects -- Psychological***
5	***Symmetrical –*** less opportunity to adapt forces and material	***Asymmetrical*** – more opportunity to adapt forces and material
6	Focus on the ***kinetic destruction*** of the adversaries warfighting material from ***stand-off*** distances	Focus on the ***non-kinetic influence*** of local and regional populations requiring ***face-to-face*** interaction.
7	***Tactical competence*** is critical	***Cultural and tactical competence*** is critical
8	Organizational cohesion maintained through training, leadership, and sense of ***nationalism***	Organizational cohesion maintained through ***ideology***
9	Threat forces and relationships ***easily templated***	Threat forces and relationships ***difficult to template***
10	***d i M e (Diplomatic, Information, Military, & Economic with emphasis on the Military)***	***D I m E – High interagency (Emphasis on Diplomatic, Information, and Economic)***
11	***Metrics of success are easily defined***	***Metrics of success are not easily defined***
12	***Technology provides direct and proven advantage***	***Technology still proving its ability to dominate Irregular opponents***

DO Relevance of General Purpose Forces in Joint Operations

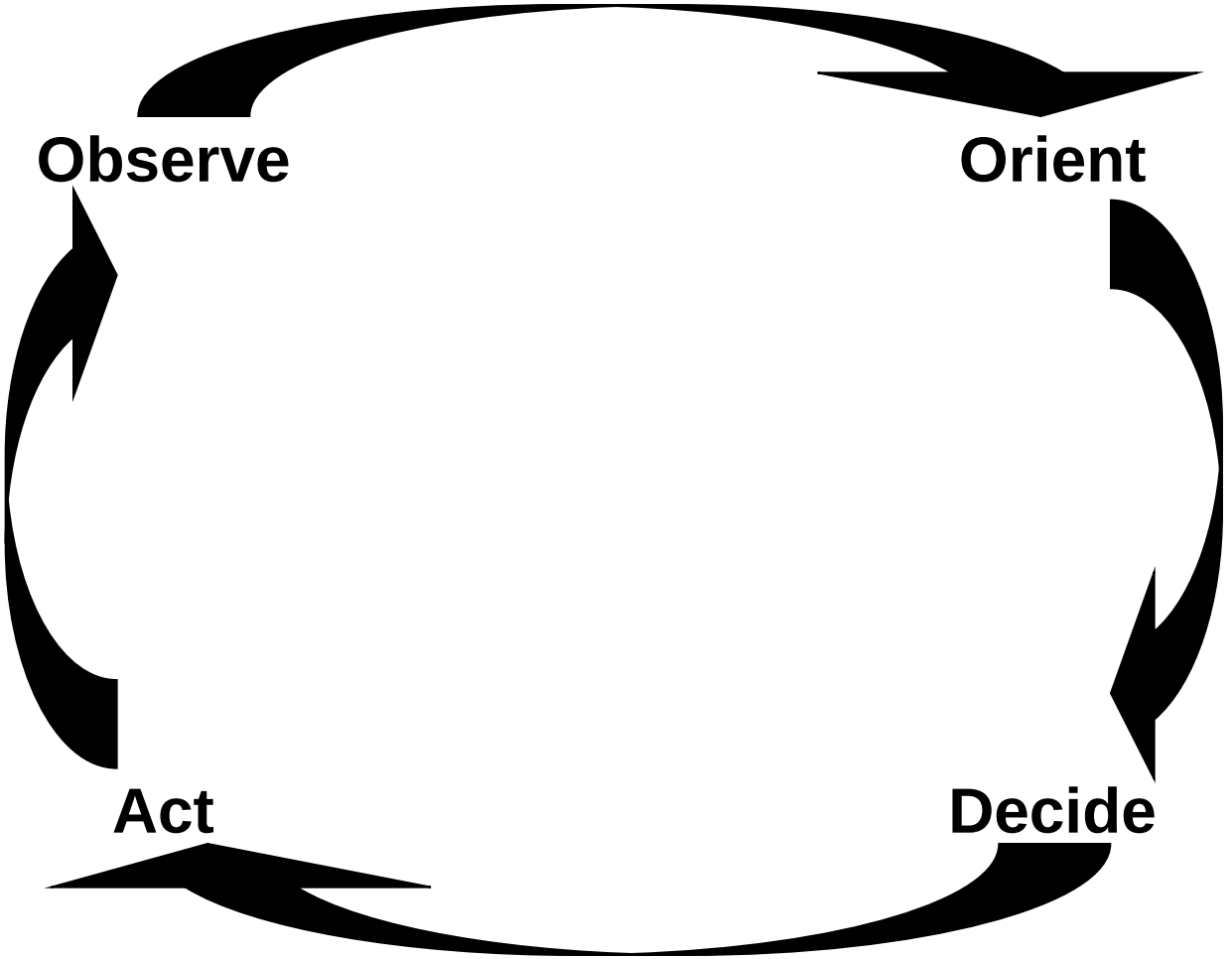


"Armies do not win wars by means of a few bodies of super-soldiers but by the quality of their standard units"

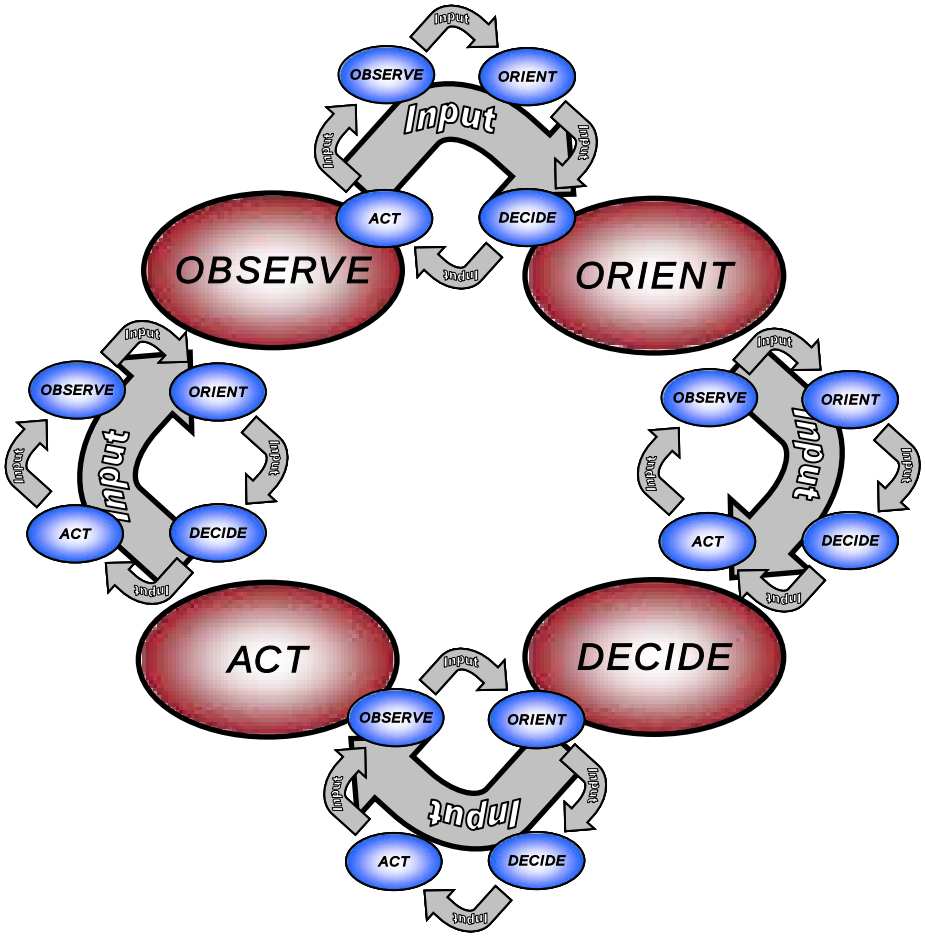
Field Marshall Sir William Slim

Decision Cycle for High Tempo and Adaptability

Allowing warfighters to adapt faster and more effectively by enabling a more rapid decision/action tempo.



Forewarning and the OODA Loop



Decision Cycle (or OODA Loop) Dominance

Temporal + Qualitative + Capacity advantage allows multiple correct and relevant decision to be made before the enemy can complete a single cycle.

The threat decision cycle is disrupted and overwhelmed.

Ultimately the threat decision cycle is manipulated and shaped.

"Dominate the enemy's OODA Loop"

Decision Cycle for High Tempo and Adaptability

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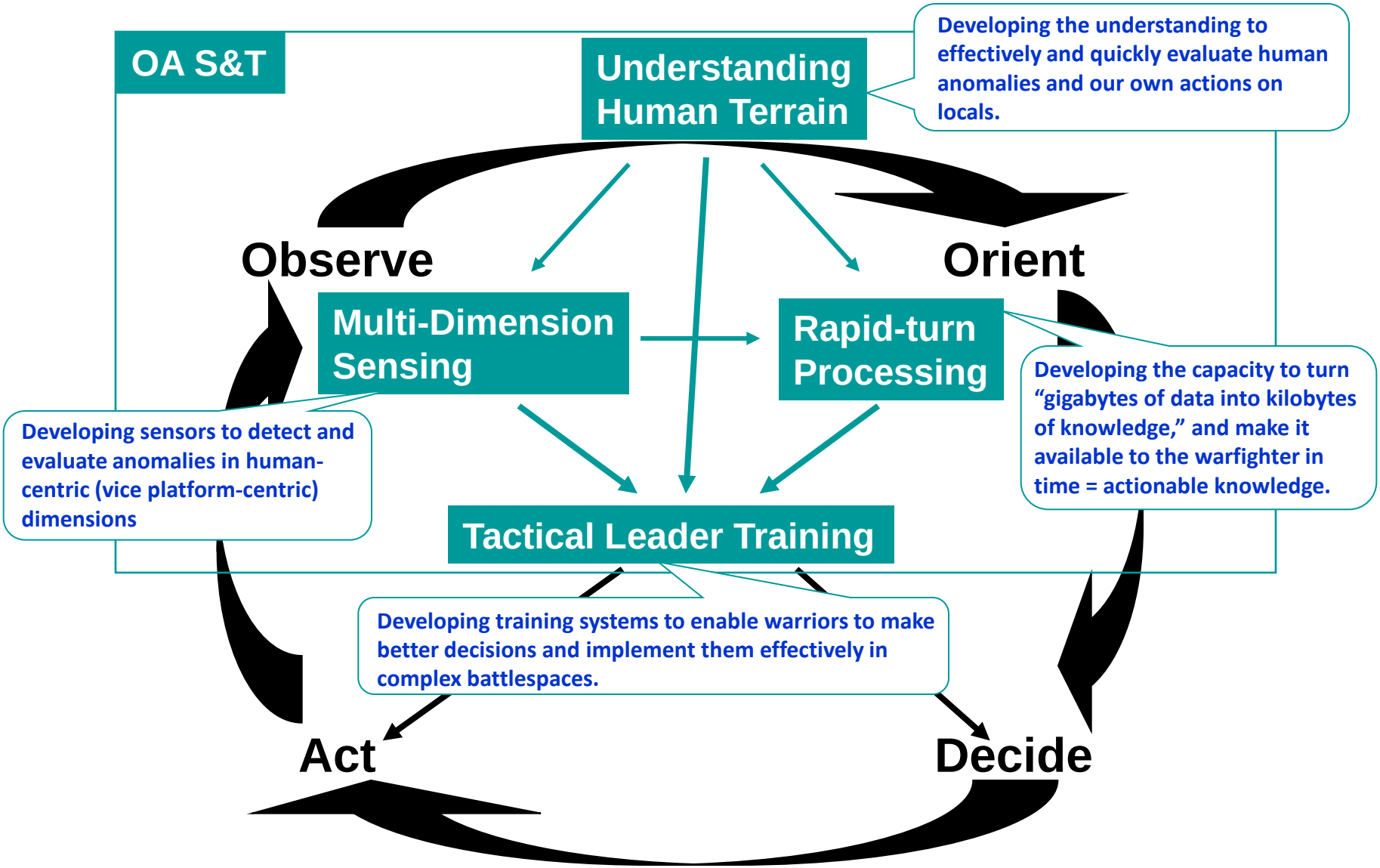


Operational Adaptation

- Environment
  - **V**olatile
  - **U**ncertain
  - **C**omplex
  - **A**mbiguous
- Pro-active vs. reactive
- Active vs. passive
- Offensive vs. defensive
- Forecasting vs. Templating
- Tempo vs. BDA (destruction)
- Knowledge vs. data
- Intel drives operations

- **Forewarning provides the opportunity to increase the effectiveness of decisions made and to maximize the time available to make these decisions.**
- **Existing US Military technologies and processes are extremely effective when faced with a conventional opponent who cooperates by engaging in traditional forms of warfare and is easy to template.**
- **Today's evolving irregular threats are exceptionally difficult to template and will require a significant shift in technology and process foci in order to regain our accustomed advantage in the decision cycle competition.**

OA Concept/Objectives

REACTIVE

INCREASING PRO-ACTIVE EFFECTS

Mission

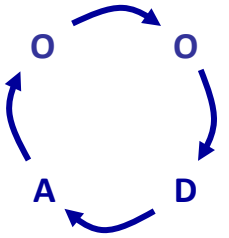
Probe → **Shape** → **Dominate**

Defeat the enemy

Win the population

Mission Success

Stabilize Pol-Mil Situation



Observe
Orient
Decide
Act

Description

The hybrid complex battlespace is full of signals, many of which are noise – probe to sense its nature and composition

- Increasing situation awareness
- ***Stimulate signals to improve signal to noise ratio (SNR)***

With meaningful signals identified, we can stimulate signatures (and stimulate functions) to:

- Set conditions favorable to us
- Anticipate and counter enemy actions
- ***Stimulate signatures to Shape the battlefield***

Stimulate responses to :

- Manipulate the enemy, the situation, or the enemy's actions to achieve our objectives
- Influence the local population to make choices that we prefer

Metric

Probing results in detection of enemy presence, actions, and capabilities

Shaping results in ability to predict enemy actions and intent

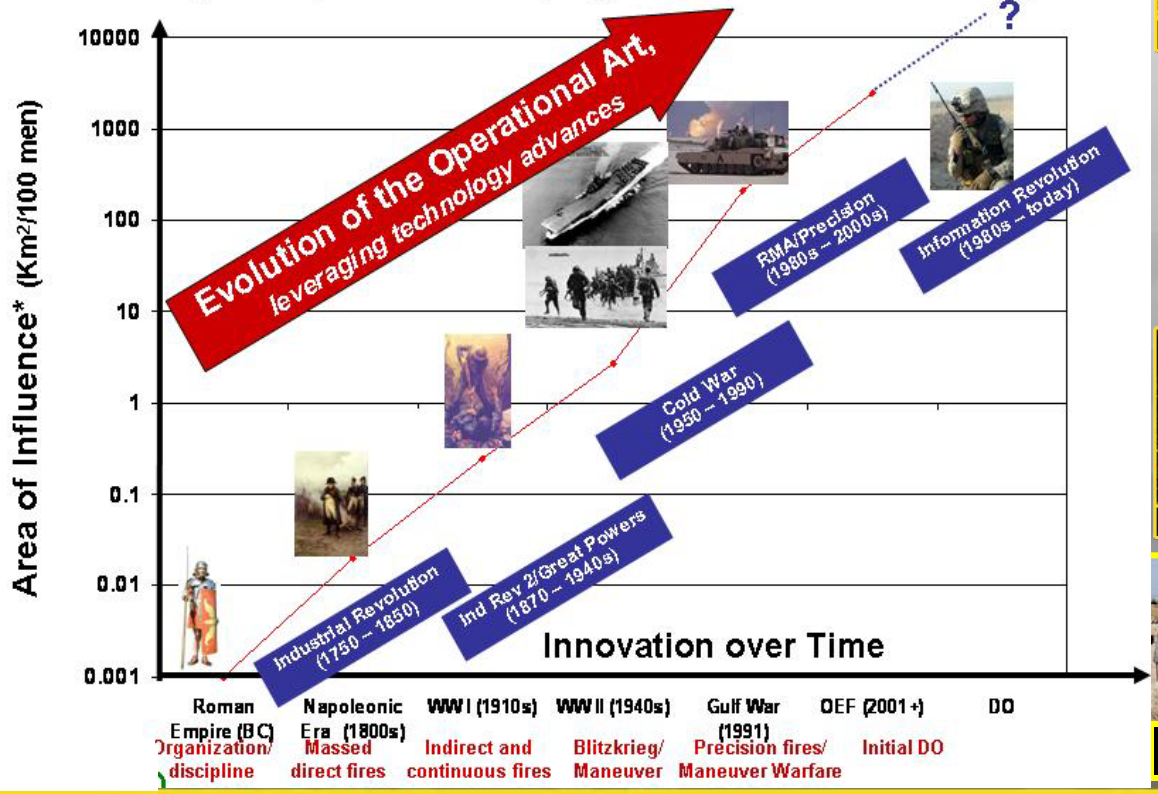
Influencing (locals) and Manipulating (enemy) results in ability to seize and maintain the initiative = Dominate the situation

Dominate = Destroy
= Control
= Out-tempo

HISTORICAL CONTEXT
Operational Adaptation Is Not A New Concept

Distribution Evolution

DO is the next logical step in a historical progression toward increased dispersion.




Battle of Marathon: 400 BC


Gettysburg: 1863


Fulda Gap IPB: 1972


Anywhere, Any time: Current

Overcoming The Challenges Of Today's Modern, Hybrid Battlespace And Staying Two Steps Ahead

INTERDICT ENEMY ACTIVITIES FURTHER UP THE "KILL CHAIN"

OA TECHNOLOGIES WILL ENABLE COMMANDERS TO EXTEND THEIR CAPABILITIES UP THE KILL CHAIN


ORGANIZE


FINANCE


SUPPLY

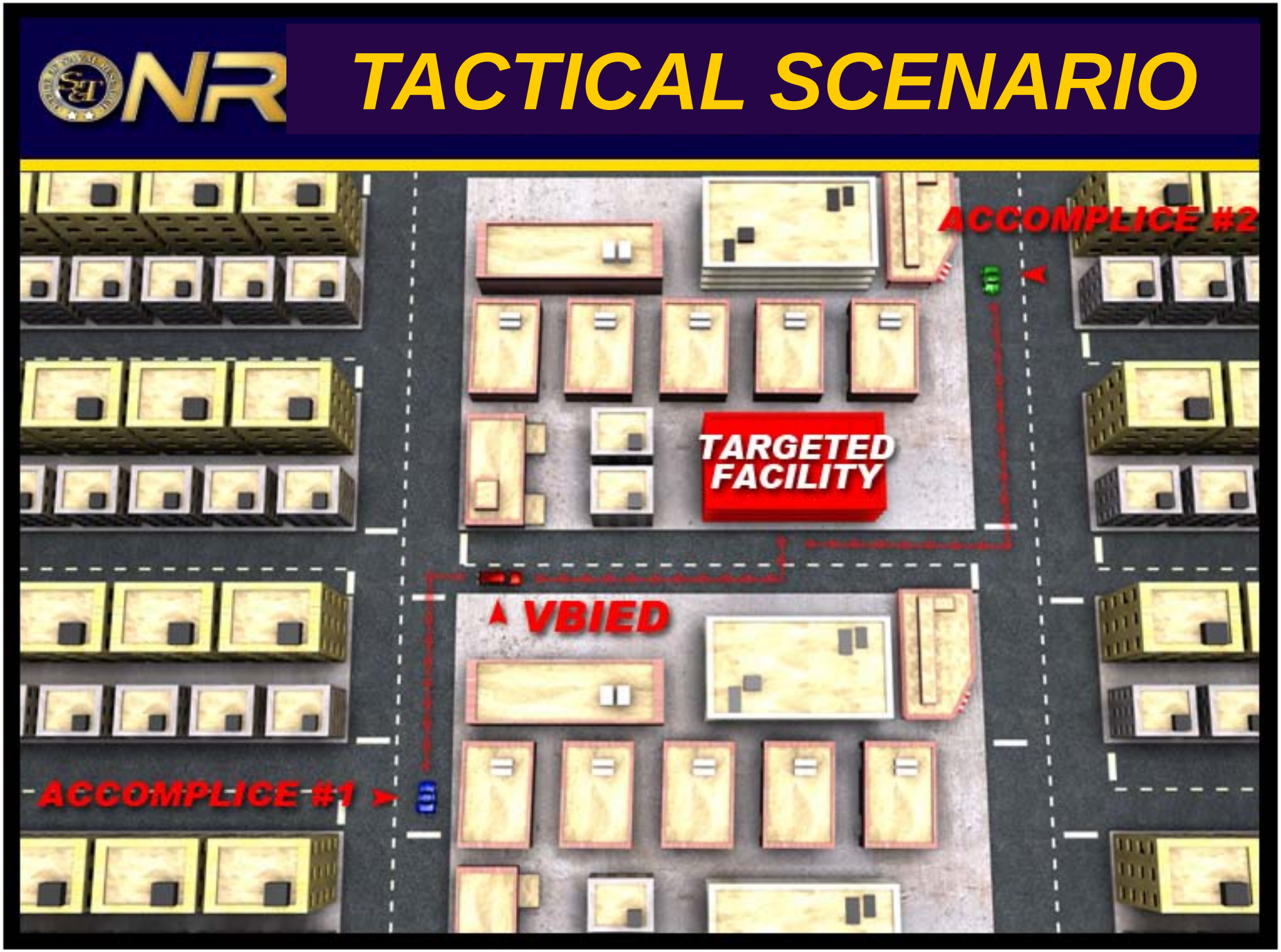

BUILD

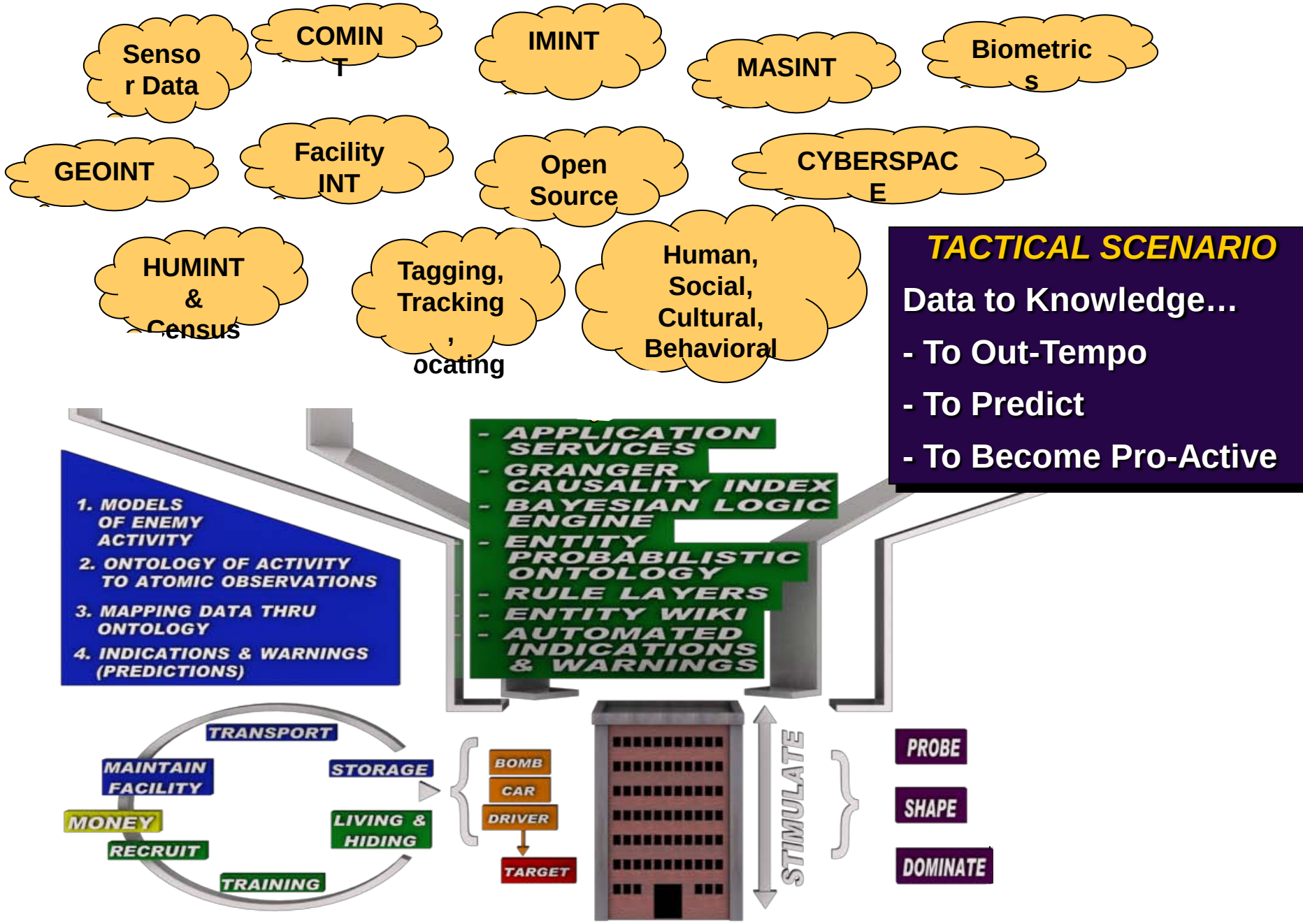

PREP


EXECUTE

CURRENT CAPABILITIES TEND TO BE REACTIVE

TACTICAL SCENARIO




Senso r Data
COMIN T
IMINT
MASINT
Biometric s
GEOINT
Facility INT
Open Source
CYBERSPAC E
HUMINT & Census
Tagging, Tracking , ocating
Human, Social, Cultural, Behavioral
TACTICAL SCENARIO
Data to Knowledge…
- To Out-Tempo
- To Predict
- To Become Pro-Active
1. MODELS OF ENEMY ACTIVITY
2. ONTOLOGY OF ACTIVITY TO ATOMIC OBSERVATIONS
3. MAPPING DATA THRU ONTOLOGY
4. INDICATIONS & WARNINGS (PREDICTIONS)
- APPLICATION SERVICES
- GRANGER CAUSALITY INDEX
- BAYESIAN LOGIC ENGINE
- ENTITY PROBABILISTIC ONTOLOGY
- RULE LAYERS
- ENTITY WIKI
- AUTOMATED INDICATIONS & WARNINGS
TRANSPORT
MAINTAIN FACILITY
STORAGE
MONEY
LIVING & HIDING
RECRUIT
TRAINING
BOMB
CAR
DRIVER
TARGET
STIMULATE
PROBE
SHAPE
DOMINATE

TACTICAL SCENARIO

Stimulate/Probe, Shape, and Dominate Opportunities

…***Moving to the left of the attack***

- Announce investigations in foreign banking and financing
- Announce intensive UAS search (with new sensor capable for detecting explosive materials)
- Announce and conduct high intensity searches of local storage facilities for explosives, detonating devices
- Utilize Facility INT capabilities to determine sudden structure changes and or building demographics
- Utilize TTL capability to determine if outsiders from known enemy provinces are present
- Utilize long range biometrics to identify known terrorists
- Conduct Computer Network Exploitation to look for email, blogs, chat rooms etc…that are referencing a future attack IOT identify, map, and track terrorist networks and terrorist activity
- Set up road blocks around probable targets

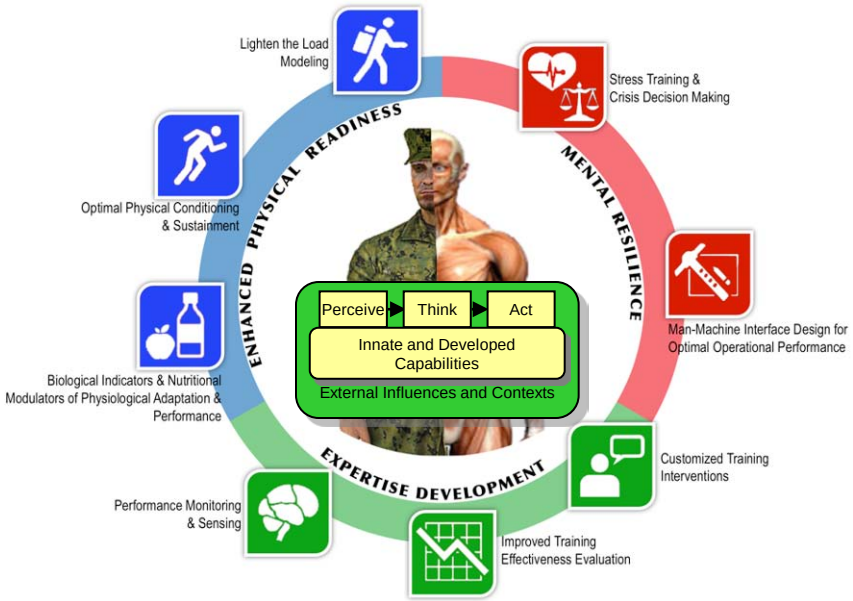
Human Performance, Training, and Education (HPT&E)

Vision

Expeditionary Warfighters that are physically, mentally, emotionally, and cognitively ready to deploy anywhere in the world on short notice, to serve within their team, or take on leadership roles as needed, and to complete their mission efficiently and effectively under any extremes of condition.

Mission

Pursue and maintain an integrated S&T portfolio that focuses on technologies and methods for
- attaining optimal strength, endurance, agility, and resilience, and sustaining these attributes throughout deployment
- becoming impervious to heat, cold, elevation, fatigue, and stress,
- being optimally trained and prepared for any mission, and
- being able to adapt to any situation.



Objectives

(1) Deliver strategies that optimize physical performance and resilience in Expeditionary Warfighters (EWs) deployed to austere environments of all types for extended periods of time.

(2) Improve the cognitive agility, flexibility, and capacity of EWs by making them mentally tough, resilient to stress, and well adapted to chaotic, irregular environments

(3) Develop advanced training technologies and methods that enable rapid skill acquisition and development to the expert level in both individual and team tactics, techniques, and procedures for conventional and asymmetric warfare.

Key Research / Technology Investment Areas

(1)Enhanced Physical Readiness
- (a) Optimal physical conditioning and sustainment
- (b) Biological indicators and nutritional modulators of physiological adaptation and performance
- (c) Lighten the Load Modeling

(2)Mental resilience and cognitive agility
- (a) Stress training and crisis decision making
- (b) Man-Machine Interface design for optimal operational performance

(3)Expertise development
- (a) Performance monitoring and sensing
- (b) Customized training interventions
- (c) Improved training effectiveness evaluation

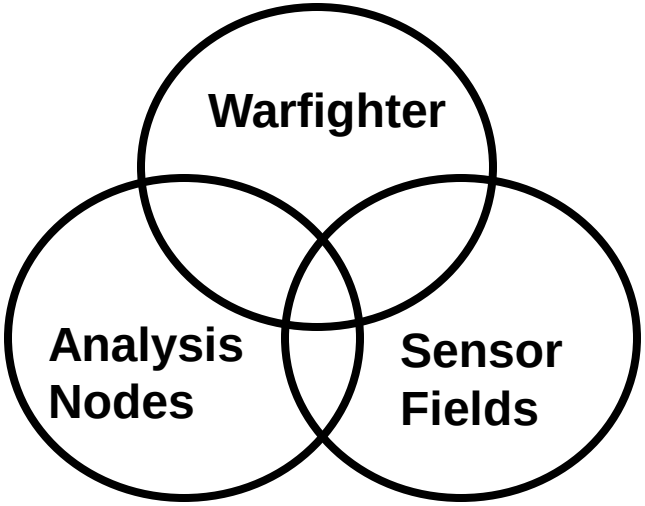
Intelligence, Surveillance and Reconnaissance Thrust

Vision

Enhance situational awareness and understanding to enable real time tactical decision making for Distributed Operations and provide proactive and predictive capabilities for Asymmetric and Irregular Warfare.

Objectives

- Develop new sensors to address sensor data collection and networking gaps by developing higher information content advanced sensors, urban structure sensors, sensors that can establish identity (biometrics) and tactical sensors that can maintain surveillance over wide areas. Enable the warfighter to detect and track entities of interest.
- . Develop a capability to maintain awareness of all available sensors and the mission relevance of their capabilities. Develop tools that allow the warfighter to expose enemy structure, determine intent and leverage cultural intelligence. Develop decision aids that allow the warfighter to understand how to disrupt, influence and stimulate human networks and their behavior (cognitive IO).
- Address capability gaps associated with the tactical processing of sensor data in order to enable indications and warnings. Address capability gaps associated with the translation of information to actionable intelligence, the ISR to C2 interface and ISR in direct support to C2.



Key Research/Technology Investment Areas

- **Persistent Intelligence, Surveillance and Reconnaissance**
  - Agile sensors and signal processing
  - Networked sensor fields
- **Knowledge Generation**
  - Application services
  - Knowledge management and distribution
- **ISR to Command and Control**
  - Warfighter as a Sensor
  - Automated indications and warnings and knowledge subscription

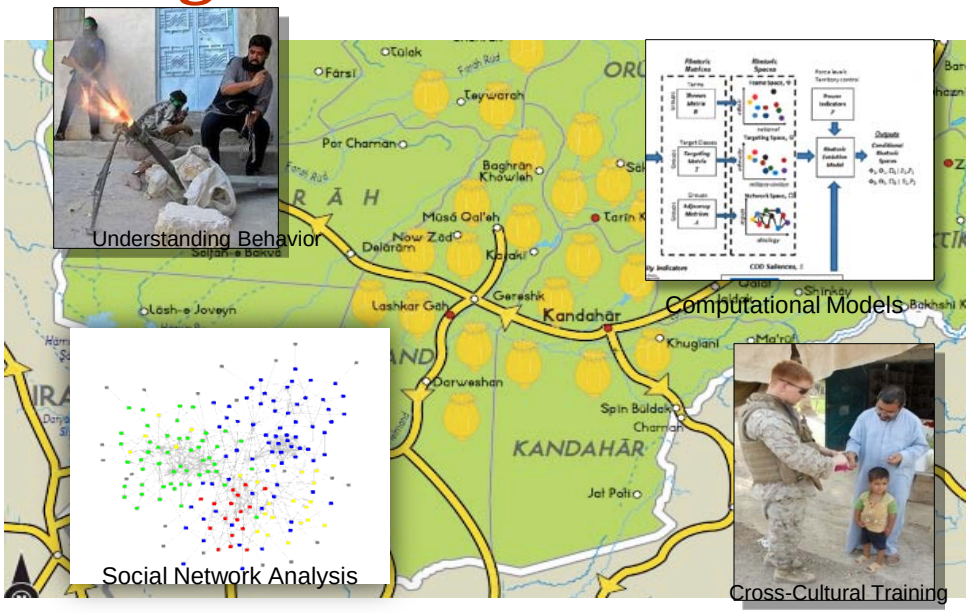
Human, Social, Cultural & Behavioral Modeling

Vision

Mastery of the social, cultural and cognitive factors that optimize the warfighter's ability to influence human behavior in the full range of military operations.

Mission

Integrated portfolio to study influence of cultural, social and cognitive factors on human behavior, develop data collection methods, build computational models, and validate operationally applicable tools.



Objective

(1) Advance the state of the art in social science theory to apply to Naval missions and challenges.
(2) Develop methods and tools to enable socio-cultural data collection and generation for a range of mission and environmental conditions.
(3) Provide analysis methods and computational models to support course of action decisions and operational planning.
(4) Produce training and education tools and materials to support cross cultural interaction in support of Naval missions.

Key Research and Technology Investment Areas

(1) Theory and Understanding
(2) Date Generation
  (a) Methods to collect socio-cultural data in new and austere environments
  (b) Methods and tools to generate data
(3) Analytics and Modeling
  (a) Analysis techniques and tools to support decision makers
  (b) Computational Models that incorporate socio-cultural data and knowledge
(4) Socio-Cultural Training & Education
  (a) Methods and materials to support cross-cultural T&E
  (b) Tools for training generalizable cross-cultural skills
  (c) Methods and tools to improve warfighter adaptability in cross cultural

IED Detector Dog (IDD) 2.0

(Quick Reaction)

- **IDD 2.0 is not new experimentation**
  - Provides “replacement” IDDs
  - Re-focuses efforts on highest standards and protocols
    - Selection, conditioning, training
    - Handler Selection
    - Certification
  - Re-introduces quality assurance from IDD SMEs
- **Lead: ONR Code-30**
- **MCWL in support, MOU in place**

- **Key Objectives for IDD 2.0**
  - OEF focus
  - Homemade Explosives
    - Imprinted for a range of specific threat HME
    - Imprinted on components to support cache searches
  - IDD stamina for OEF
  - Handler selection and training focused on unique IDD parameters
  - Quality assurance at all levels

- **Process for IDD 2.0**
  - Update protocols (interim), OEF focus
  - Train dogs and handlers
  - Track progress, evaluate performance
  - Collect and assess user satisfaction
  - Final protocol change recommendations to PP&O
- **MCOTEA IDD assessment in AFG**
  - MARCENT request 222001Z Apr 10
  - Report due 31 Jul 2010

QUESTIONS