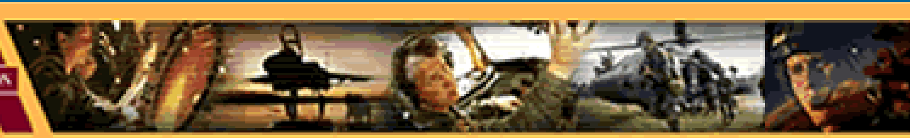


Pacific Operational Science & Technology Conference

14 – 17 July 2008

Honolulu, HI

Agenda

MONDAY, 14 JULY 2008

"INTERNATIONAL AND LONG-TERM PERSPECTIVES"

Commander's Priorities & Challenges

Commander Overview:

- **Lt Gen Douglas Fraser**, USAF, Deputy Commander, USPACOM

Issues around the Asia-Pacific Region

- *Singapore:* **Mr. Kong Pheng** SOH, Chief Executive, Defence Science and Technology Agency
- *Australia:* **Dr. D. Nandagopal**, Deputy Chief Defence Scientist for Policy and Programs, Defence Science and Technology Organisation
- *Japan:* **Mr. Yasuhisa Ishizuka**, Director of Plans, Technical Research and Development Institute
    - Technical Research and Development Institute video .wma format
- *Korea:* **Dr. C. K. Park**, President, Agency for Defense Development
- *India:* **Dr W Selvamurthy,** Distinguished Scientist and Chief Controller (R&D), Defence Research and Development Organisation

Vision and Future Opportunities

- **The Honorable Dr. Jacques Gansler**, former Under Secretary of Defense, Acquisition, Technology & Logistics, Office of the Secretary of Defense

TUESDAY, 15 JULY 2008

"ISSUES AND CHALLENGES IN THE REGION"

Homeland Security Perspective

- **The Honorable Jay M. Cohen,** Under Secretary for Science and Technology, Department of Homeland Security

HQ USPACOM Senior Leader Perspectives

- *USPACOM J3,* **RADM Charles Martoglio,** USN, USPACOM Director of Operations

LISTEN UP! Warfighter's Perspective

- **CMSgt James Roy**, USAF, PACOM Senior Enlisted Leader

USPACOM Service Components & Sub-Unified Command Perspectives

- *PACAF:* **Lt Gen Loyd Utterback,** USAF**,** Commander, 13th Air Force
- *USPACFLT:* **RDML Thomas Copeman,** USN, Deputy Chief of Staff for Operations, Training and Readiness, U.S. Pacific Fleet

WEDNESDAY, 16 JULY 2008

"SOLUTIONS TO PACOM CHALLENGES"

Office of the Secretary of Defense

- **Dr. Charles Perkins,** Principal Assistant Deputy Under Secretary of Defense, Advanced Systems and Concepts
- **Mr. Donald Loren,** Deputy Assistant Secretary of Defense, Homeland Security Integration

U.S. Joint Forces Command Perspective

- **LTG John Wood,** USA, Deputy Commander, U.S. Joint Forces Command, "*The Art and Science of Joint Warfighting*"

Commanding Officers' Perspectives – Services S&T

- **MG Fred Robinson,** USA, Commanding General, U.S. Army Research, Development and Engineering Command (RDECOM)
- **RADM William Landay,** USN, Chief of Naval Research
- **Maj Gen Curtis Bedke,** USAF, Commander, Air Force Research Laboratory

Keynote Speaker:Dr. Tony Tether, Director, DARPA

Other Agency Perspectives

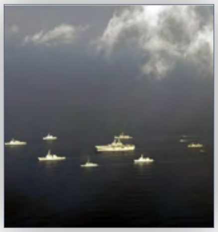
- **Dr. Dana Christensen**, Associate Lab Director, Energy & Engineering Sciences, Oak Ridge National Laboratory
- **Dr. Peter Nanos,** Associate Director of Research Defense Threat Reduction Agency
- **COL Kathleen Hithe,** USAF, Deputy Director, Coalition Warfare Program, OUSD (AT&L)/International Cooperation

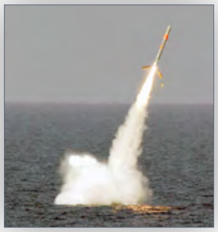
Emerging Technologies
Moderator: **Dr. Richard Van Atta**, Institute for Defense Analyses
Panelists:

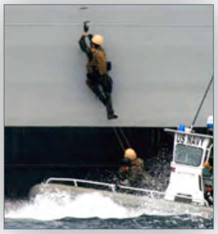
- **Ms. Ellen Purdy,** Director, Joint Ground Robotics Enterprise, Office of the Secretary of Defense
- Ground Robotics Update – Congressional Robotics Caucus
- The Role of Robots in National Security

- **Dr. Leo Volfson,** Chief Executive Officer, Torrey Pines Logic

MONDAY 14 JULY 2008: INTERNATIONAL AND LONG-TERM PERSPECTIVES







10:00 a.m. - 5:30 p.m. — Registration Sign-in and packet pickup
Coral Ballroom Lounge
Hilton Hawaiian Village

1:20 p.m. - 1:30 p.m. — Welcome/Administrative Remarks / Conference Overview
Coral Ballroom 3

1:30 p.m. - 2:00 p.m. — **Commander's Priorities & Challenges**
Commander Overview
Lt Gen Douglas Fraser, USAF
Deputy Commander, USPACOM

2:00 p.m. - 3:40 p.m. — **Issues around the Asia-Pacific Region**
***Moderator:* Brig Gen Sam Angelella, USAF**
USPACOM/J5
Deputy Director for Strategic Planning and Policy

2:00 p.m. *Singapore* — **Mr. Kong Pheng SOH**, Chief Executive, Defence Science and Technology Agency

2:20 p.m. *Australia* — **Dr. D. Nandagopal**, Deputy Chief Defence Scientist for Policy and Programs, Defence Science and Technology Organisation

2:40 p.m. *Japan* — **Mr. Yasuhisa Ishizuka**, Director of Plans, Technical Research and Development Institute

3:00 p.m. *Korea* — **Dr. C. K. Park**, President, Agency for Defense Development

3:20 p.m. *India* — **Dr W Selvamurthy**, Distinguished Scientist and Chief Controller (R&D), Defence Research and Development Organisation

4:00 p.m. - 5:30 p.m. — **Vision and Future Opportunities**
Moderator: **Lt Gen Daniel Leaf**, USAF (Ret.)
former Deputy Commander, US Pacific Command

The Honorable Dr. Jacques Gansler,
former Under Secretary of Defense, Acquisition, Technology & Logistics, Office of the Secretary of Defense
Mr. Richard Halloran,
Columnist, The Honolulu Advertiser
Dr. Ray O. Johnson, Senior Vice President and Chief Technology Officer, Lockheed Martin
Mr. Benjamin P. Riley,
Director, Rapid Reaction Technology Office, Office of the Secretary of Defense (DDR&E)

MONDAY 14 JULY 2008:

INTERNATIONAL AND LONG-TERM PERSPECTIVES (CONTINUED)

5:30 p.m.	Reception in Exhibit Area *Coral Ballroom Lounge*
6:30 p.m. - 8:30 p.m.	**Banquet** *South Pacific Ballroom (upper level)* *Keynote Speaker:* **Dr. Patrick Dixon,** "Europe's Leading Futurist" Founder & Chairman, Global Change, Ltd.

TUESDAY 15 JULY 2008:

ISSUES AND CHALLENGES IN THE REGION

7:00 a.m. - 5:00 p.m.	Registration Sign-in and packet pickup **(continues)** *Coral Ballroom Lounge*
7:00 a.m. - 7:50 a.m.	Continental Breakfast - Exhibit Area *Coral Ballroom Lounge*
7:50 a.m. - 8:00 a.m.	**Administrative Remarks**
8:00 a.m. - 8:45 a.m.	**Homeland Security Perspective** **The Honorable Jay M. Cohen** **Under Secretary for Science and Technology, Department of Homeland Security**
8:45 a.m. - 10:30 a.m.	**HQ USPACOM Senior Leader Perspectives** ***Moderator:* MG Stephen Tom, USA** USPACOM Chief of Staff
USPACOM J2,	**RDML Michael Rogers, USN** USPACOM Director of Intelligence
USPACOM J3,	**RADM Charles Martoglio, USN** USPACOM Director of Operations
USPACOM J40,	**CAPT Robert Bronson, USN** USPACOM Deputy Director of Logistics, Engineering & Security Assistance
USPACOM J50,	**Brig Gen Sam Angelella, USAF** USPACOM Deputy Director of Strategic Planning and Policy
USPACOM J6,	**BG Ronald Bouchard, USA** USPACOM Director of Communications System
USPACOM, J8,	**Dr. George Ka'iliwai, SES** USPACOM Director of Resources and Assessment
10:30 a.m. - 11:00 a.m.	Coffee Break *Coral Ballroom Lounge*

"SCHEDULE AT A GLANCE"

MONDAY 14 JULY 2008

INTERNATIONAL AND LONG-TERM PERSPECTIVES
HILTON HAWAIIAN VILLAGE

TUESDAY 15 JULY 2008

ISSUES AND CHALLENGES IN THE REGION
HILTON HAWAIIAN VILLAGE

WEDNESDAY 16 JULY 2008

SOLUTIONS TO PACOM CHALLENGES
HILTON HAWAIIAN VILLAGE

THURSDAY 17 JULY 2008

CLASSIFIED:

SOLUTIONS TO PACOM CHALLENGES
HICKAM AFB THEATER

EXHIBIT HOURS:

MONDAY, JULY 14

5:30 PM - 6:30 PM

PRE-DINNER RECEPTION IN EXHIBIT AREA

TUESDAY, JULY 15

7:00 AM - 11:00 AM EXHIBITS OPEN
CONTINENTAL BREAKFAST & COFFEE BREAK IN EXHIBIT AREA

12:30PM - 2:00 PM EXHIBITS CLOSED FOR LUNCH

2:00 PM - 5:00 PM EXHIBITS OPEN

REGISTER TODAY AT: WWW.NDIA.ORG/MEETINGS/8540

HIGHLIGHTS:

USPACOM SERVICE COMPONENTS & SUB-UNIFIED

COMMAND PERSPECTIVES

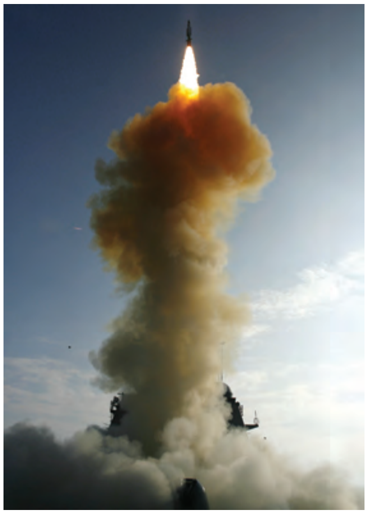


EXHIBIT HOURS:

TUESDAY, JULY 15

5:00 P.M. - 6:30 P.M.
RECEPTION IN EXHIBIT AREA

TUESDAY 15 JULY 2008 (CONTINUED):

ISSUES AND CHALLENGES IN THE REGION

11:00 a.m. - 12:30 p.m.

LISTEN UP! Warfighter's Perspective
Moderator: CMSgt James Roy, USAF,
PACOM Senior Enlisted Leader

Panel Members:

- MSG Luis Colon, USA
- SSG (P) Randall Reed, USA
- SGT Sean Martin, USA
- CPL Luke Solorzana, USA
- SSgt Michael R. Kaylor, USMC
- Sgt Daniel T. Kreitzer, USMC
- TSgt Mark L. Farmer, USAF
- TSgt James E. Gardner III, USAF

12:30 p.m. - 2:00 p.m.

Luncheon
Coral Ballroom Lounge 4-5

Keynote Speaker:

RADM Donna L. Crisp, USN
Commander,
Joint POW/MIA Accounting Command
Home to the largest forensic anthropology laboratory in the world

2:00 p.m. - 4:30 p,.m.

USPACOM Service Components & Sub-Unified Command Perspectives
Coral Ballroom 3

Moderator: Lt Gen Daniel Leaf, USAF (Ret.)
Former Deputy Commander,
U.S. Pacific Command

2:00 p.m. – PACAF **Lt Gen Lloyd Utterback, USAF**
Commander, 13th Air Force

2:30 p.m.– USARPAC **LTG Benjamin Mixon, USA**
Commanding General, U.S. Army Pacific

3:30 p.m. – USPACFLT **RDML Thomas Copeman, USN**
Deputy Chief of Staff for Operations,
Training and Readiness, U.S. Pacific Fleet

4:00 p.m. – SOCPAC **CAPT Robert Gusentine. USN**
Director of Operations, Special Operations
Command Pacific

4:30 p.m. Adjourn for the Day

4:30 p.m. - 6:30 p.m.

Networking Reception in Exhibit Area
Coral Ballroom Lounge

WEDNESDAY 16 JULY 2008:

SOLUTIONS TO PACOM CHALLENGES

7:00 a.m. - 5:00 p.m.	Registration Sign-in and packet pickup (continues) *Coral Ballroom Lounge*
7:00 a.m. - 7:50 a.m.	Continental Breakfast *Coral Ballroom Lounge*
7:50 a.m. - 8:00 a.m.	Administrative Remarks *Coral Ballroom 3*
8:00 a.m. - 9:00 a.m.	**Office of the Secretary of Defense**
8:00 a.m.	**Dr. Charles Perkins** Principal Assistant Deputy Under Secretary of Defense, Advanced Systems and Concepts
8:30 a.m.	**Mr. Donald Loren** Deputy Assistant Secretary of Defense, Homeland Security Integration
9:00 a.m. - 9:30 a.m.	**U.S. Joint Forces Command Perspective** **LTG John Wood, USA** Deputy Commander, U.S. Joint Forces Command "The Art and Science of Joint Warfighting"
9:30 a.m. - 10:00 a.m.	Coffee Break *Coral Ballroom Lounge*
10:00 a.m. - 12:00 Noon	**Commanding Officers' Perspectives – Services S&T** *Coral Ballroom 3*
10:00 a.m.	**MG Fred Robinson,USA** Commanding General, U.S. Army Research, Development and Engineering Command (RDECOM)
10:40 a.m.	**RADM William Landay, USN** Chief of Naval Research
11:20 a.m.	**Maj Gen Curtis Bedke, USAF** Commander, Air Force Research Laboratory
12:00 Noon – 1:30 p.m.	Luncheon *Coral Ballroom Lounge 4-5* ***Keynote Speaker:*** **Dr. Tony Tether, Director, DARPA**

HIGHLIGHTS:

Office of the Secretary of Defense

Commanding Officers' Perspectives – Services S&T

Industry Perspectives

EXHIBIT HOURS:

7:00 am - 11:00 am Exhibits Open

Continental Breakfast & Coffee Break in exhibit area

REGISTER TODAY AT:
WWW.NDIA.ORG/MEETINGS/8540

WEDNESDAY 16 JULY 2008 (CONTINUED):

SOLUTIONS TO PACOM CHALLENGES

HIGHLIGHTS:

OTHER AGENCIES

INDUSTRY PANEL

EMERGING TECHNOLOGIES

1:30 p.m. - 2:30 p.m.

Industry Perspectives
Moderator: **Dr. Amy Alving,**
Chief Technology Officer, SAIC

Panelists:

- **Dr. Ruth David,** President and CEO, Analytic Services
- **Dr. Ray O. Johnson,** Senior Vice President and Chief Technology Officer, Lockheed Martin
- **Dr. David F. McQueeney,** Chief Technology Officer, IBM Federal Systems

2:30 p.m. - 3:30 p.m.

Other Agency Perspectives
Coral Ballroom 3

2:30 p.m. - 3:00 p.m.

Dr. Dana Christensen
Associate Lab Director,
Energy & Engineering Sciences
Oak Ridge National Laboratory

3:00 p.m. - 3:30 p.m.

Dr. Peter Nanos
Associate Director of Research
Defense Threat Reduction Agency

3:30 p.m. - 5:00 p.m.

Emerging Technologies

Moderator: **Dr. Richard Van Atta,**
Institute for Defense Analyses

Panelists:

- LTG John Wood, USA
  Deputy Commander,
  U.S. Joint Forces Command

- Ms. Ellen Purdy
  Director, Joint Ground Robotics Enterprise
  Office of the Secretary of Defense

- Dr. Leo Wolfson
  Chief Executive Officer
  Torrey Pines Logic

5:00 p.m.

Adjourn (unclassified sessions)

THURSDAY 17 JULY 2008:

CLASSIFIED: SOLUTIONS TO PACOM CHALLENGES HICKAM AFB THEATER

6:30 a.m.	Attendee Shuttle Buses depart Hilton for Hickam AFB Theatre -- at hotel Bus & Tour Transportation Center -- Make sure you have your photo ID (driver's license or U.S. passport on you before boarding).
7:00 a.m. - 5:00 p.m.	Registration & Security Check-in *Hickam Theatre foyer*
7:00 a.m. - 7:50 a.m.	Continental Breakfast *Hickam Theatre foyer*

CLASSIFIED SESSIONS: Hickam Theatre Audditorium

8:00 a.m. - 8:45 am.	**PACOM Operational and Planning Challenges** *Brig Gen Sam Angelella, USAF* USPACOM Deputy Director for Strategic Planning and Policy
8:45 a.m. - 9:15 a.m.	**Special Operations Command Pacific -- Operational Challenges** *CAPT Robert Gusentine, USN* Director of Operations, Special Operations Command Pacific
9:15 a.m. - 9:45 a.m.	**Nuclear Threat briefing** *Dr. Peter Nanos* Associate Director of Research, DTRA
9:45 a.m. - 10:00 a.m.	Coffee Break *Hickam Theatre foyer*
10:00 a.m. - 4:15 p.m.	**Solutions to Critical Operational Challenges**

For each operational challenge area, the following S&T organizations will present their most significant relevant activities to the PACOM directors:

- Air Force Research Lab, Maj Gen Curtis Bedke
- Defense Advanced Research Projects Agency, CAPT William Hoker
- Department of Energy/Oak Ridge National Laboratory, Ms. Oneta Fiorvanti
- Defense Threat Reduction Agency, Dr. Peter Nanos
- Office of Naval Research, RADM William Landay
- Office of the Secretary of Defense/Advanced Systems and Concepts, Dr. John Wilcox
- Research, Development and Engineering Command, MG Fred Robinson

"U.S. ONLY"

THURSDAY 17 JULY 2008

CLASSIFIED:

SOLUTIONS TO PACOM CHALLENGES

HICKAM AFB THEATER

SECURITY

REMINDER

The following items are NOT allowed in the briefing rooms: cell phones, notebooks, briefcases, backpacks or any other large bags or containers, cameras, audio/visual recorders, PDAs, pagers, laptops, other transmitting devices, food and/or drink. Storage space is limited - please DO NOT bring these items with you. Note-taking is not allowed. NDIA will not be held responsible for any items left in the concession stand area of the Hickam Theatre and/or Officer's Club. You are advised to utilize your hotel's bell stand for luggage storage. Personal items such as purses are subject to inspection prior to being allowed in the conference rooms. Speakers (identified with a speaker ribbon) will be allowed to carry in their presentation materials; these items are still subject to inspection.

THURSDAY 17 JULY 2008 (CONTINUED):

CLASSIFIED SESSIONS CONTINUE:
SOLUTIONS TO PACOM CHALLENGES
HICKAM AFB THEATER

10:00 a.m. - 4:15 p.m.	**Solutions to Critical Operational Challenge**
10:00 a.m. - 10:30 a.m.	Brig Gen Sam Angelella, USAF USPACOM Deputy Director of Strategic Planning and Policy
10:30 a.m. - 12:00 noon	RDML Michael Rogers, USN, PACOM/J2, USPACOM Director of Intelligence
12:00 noon - 1:00 p.m.	Lunch Break
	Attendee Shuttle Buses depart Hickam AFB Theatre for Hickam AFB Officer's Club & return to Theatre
1:00 p.m. - 3:00 p.m.	**RADM Charles Martoglio, USN** PACOM/J3 USPACOM Director of Operations
3:00 p.m. - 3:15 p.m.	Coffee Break *Hickam Theatre foyer*
3:15p.m. - 3:45 p.m.	**BG Ronald Bouchard, USA** PACOM/J6 USPACOM Director of Communications System
3:45 p.m. - 4:15 p.m.	**CAPT Robert Bronson, USN** PACOM/J40 USPACOM Deputy Director of Logistics, Engineering & Security Assistance
4:30 p.m.	**Adjourn (classified sessions)**
5:00 p.m.	**Attendee Shuttle Buses depart Hickam AFB for Hilton**

*PACOM thanks you for attending &
we look forward to seeing you again next year.*

The National Defense Industrial Association (NDIA) thanks you for your participation in this year's conference, and wishes you a safe trip home.

Addressing The Energy Challenge: Resource Resilience

Presented to:
PACOM

Dana Christensen
Associate Laboratory Director
Energy and Engineering Sciences

July 16, 2008

Managed by UT-Battelle
for the Department of Energy

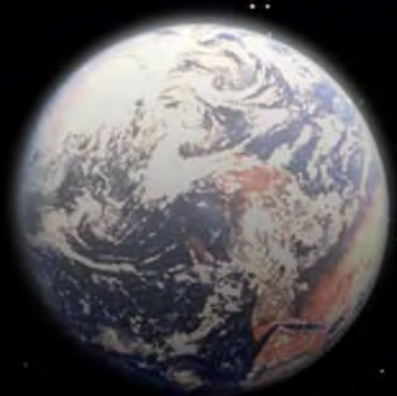
Oak Ridge National Laboratory

Regional Profile: Southeast Asia

- **Energy has been the driver of Asia's record growth, stability and development since WW II**
- **Many diverse cultures with strong cultural heritage**
- **Fastest growing energy consumer region in the world**
  - **Five of the Top Ten Energy Users-**
    - **Japan, China, Taiwan, South Korea, India**
  - **Four of Top Ten US Export Partners-**
    - **China, Taiwan, Japan, South Korea**
  - **Four of the Top Ten US Import Partners-**
    - **Japan, China, Taiwan, South Korea**
  - **Five of the Top Ten Highest Populations-**
    - **China, India, Indonesia, Bangladesh, Russia, Japan**

Energy

- **The world's largest industry**
- **The** number one **challenge facing humanity**
- **A principal driver for global stability**
  - **Climate change**
  - **National security**
  - **Economic competitiveness**
  - **Quality of life**



- **Compels nation-state behavior**
- **Creates Environmental concerns**
- **Stresses Trade Relationships**
- **There will be an "Energy Trip-wire"**

Resource Resilience

- **Balance the resource equation:**

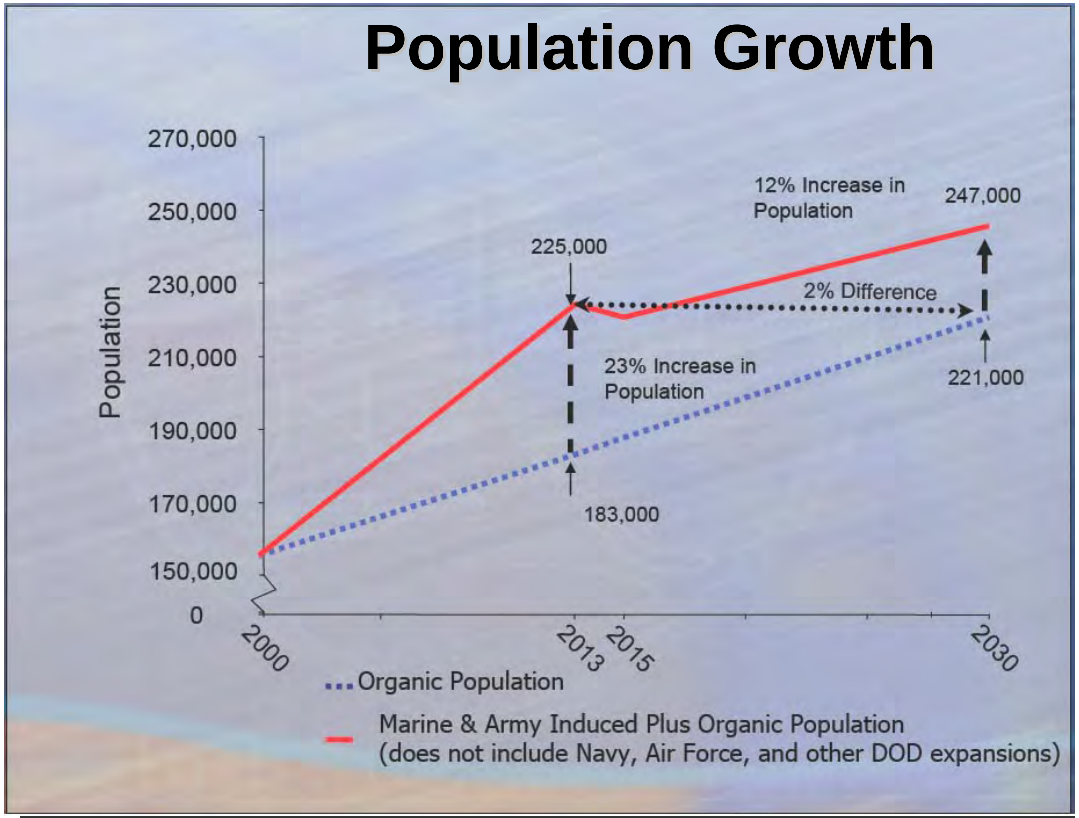
  Environment / Energy / Water / Waste

  – **Tailored to the target (country, region, etc.)**

- **Guam as a microcosm of the Resource Resilience Challenge**
  – **Native Population**
  – **Seaport Functions**
  – **Airport and Tourism**
  – **Ecological Balance**
  – **PACOM Plans (Marine, Air Force, Navy, Army)**

General Geography

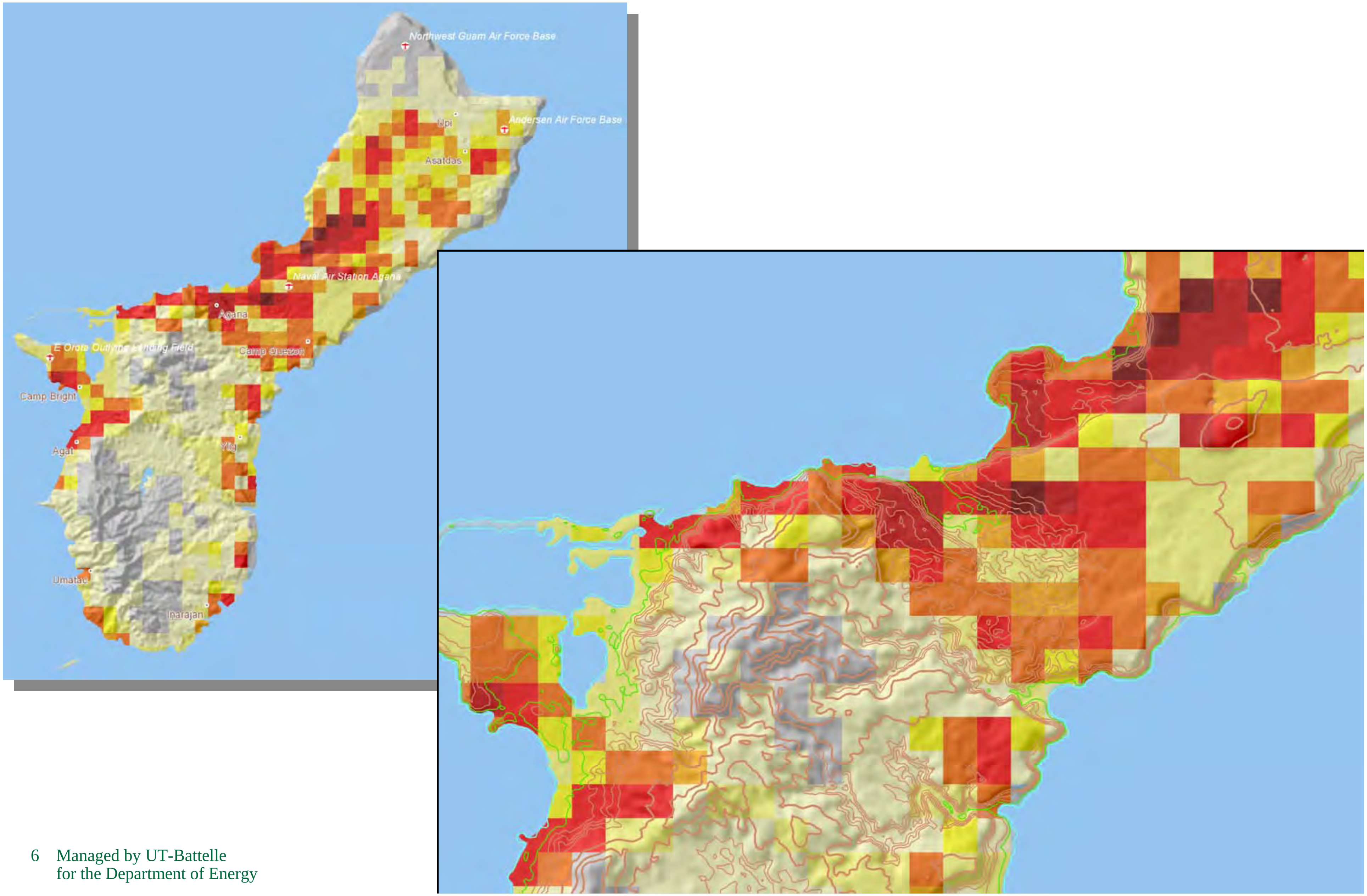
- **Population: 175,877**
- **Elevation: sea level to 406 m**
- **Economy: US military spending and tourism from Asia**
- **Area 541.3 sq. km**
  - Approximately 3 times the size of Washington, D.C.



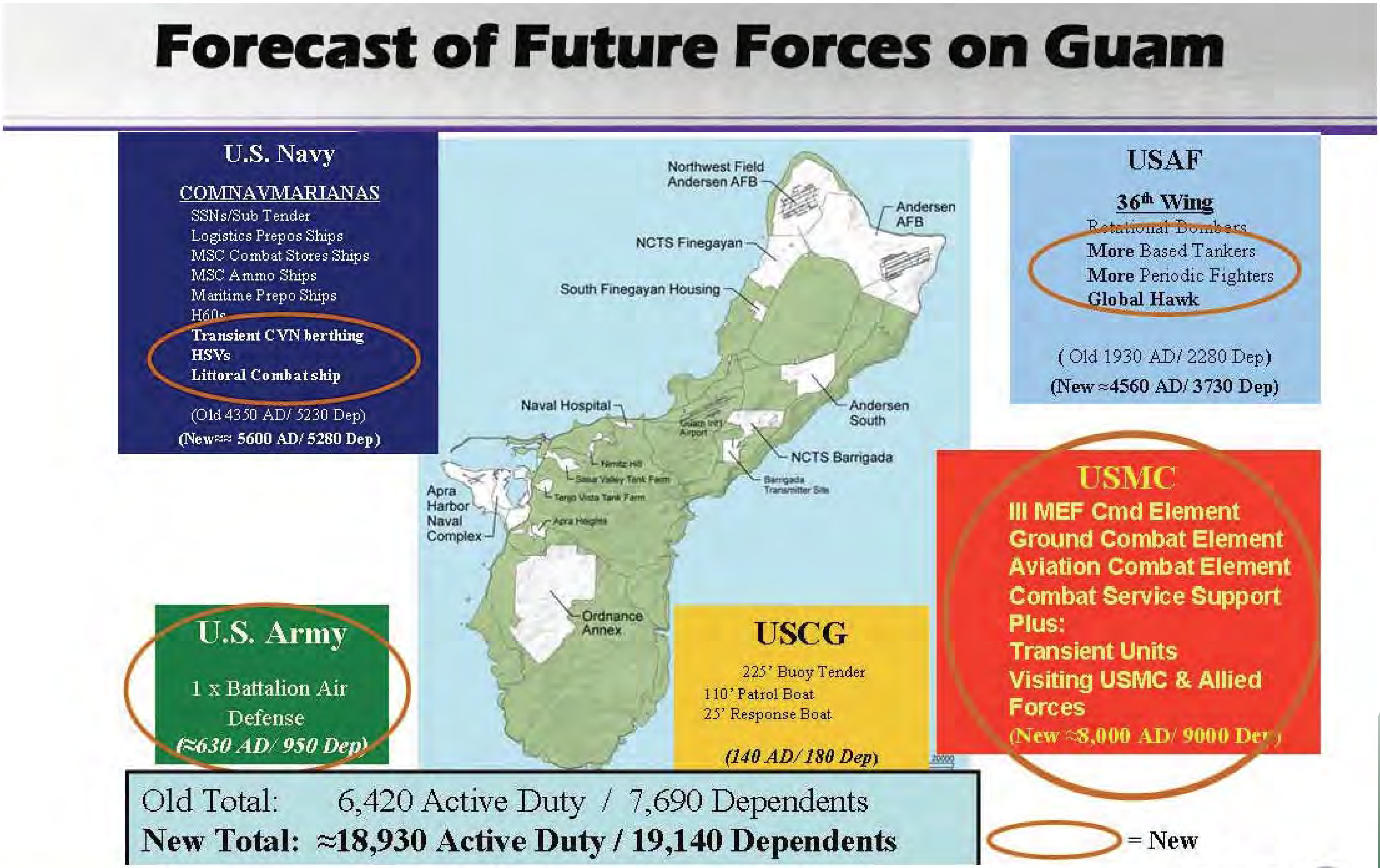
http://www.guamindustryforum.com/publications/GuamIndustryForum-II-Infrastructure.pdf

Population of D.C = 588,292

Guam: Population Distribution

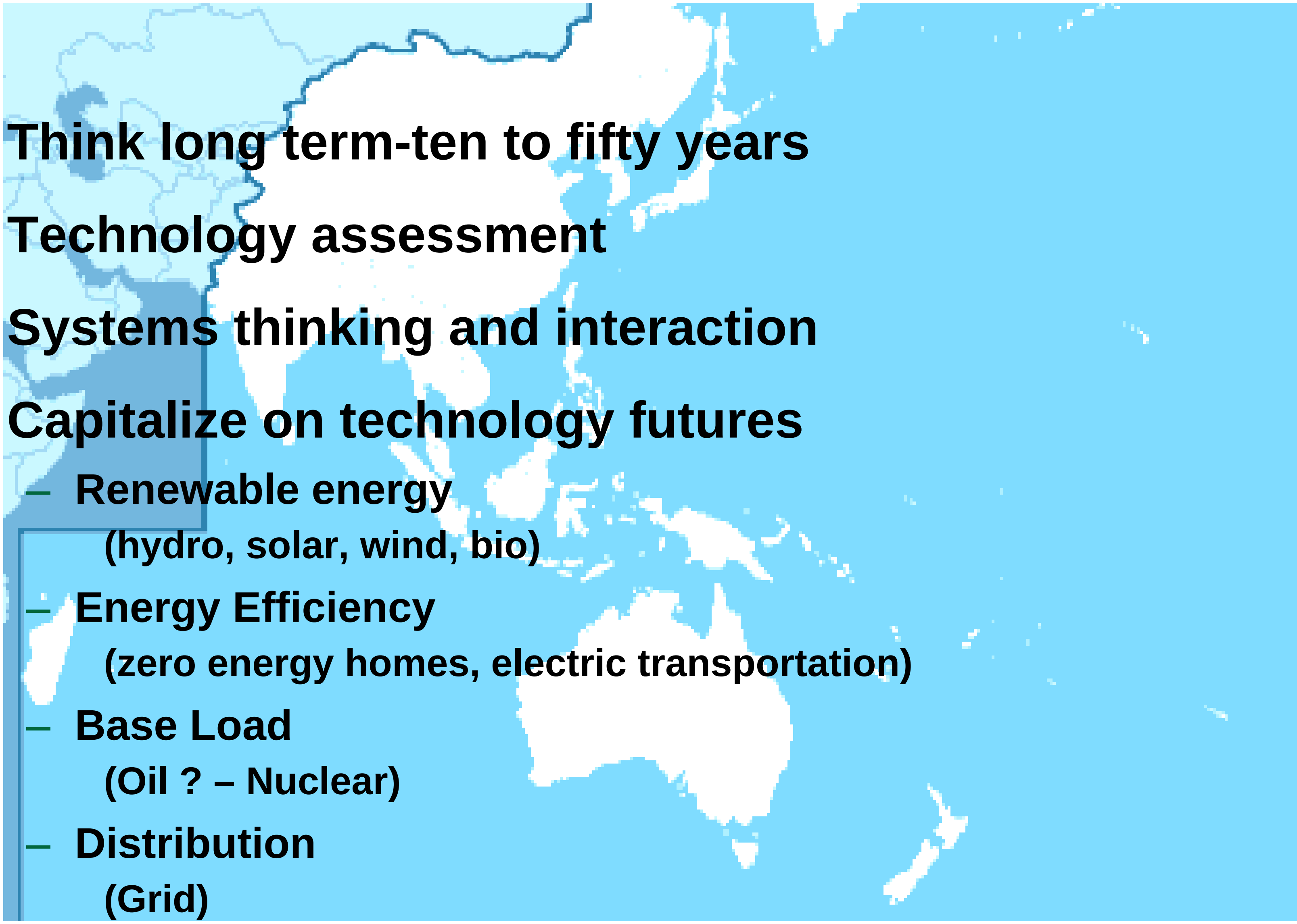


Guam: Military Realignment



Source: http://www.guamindustryforum.com/publications/GuamIndustryForum-II-RealignmentProgramUpdate.pdf

Energy Opportunity Options across the PACOM AOR

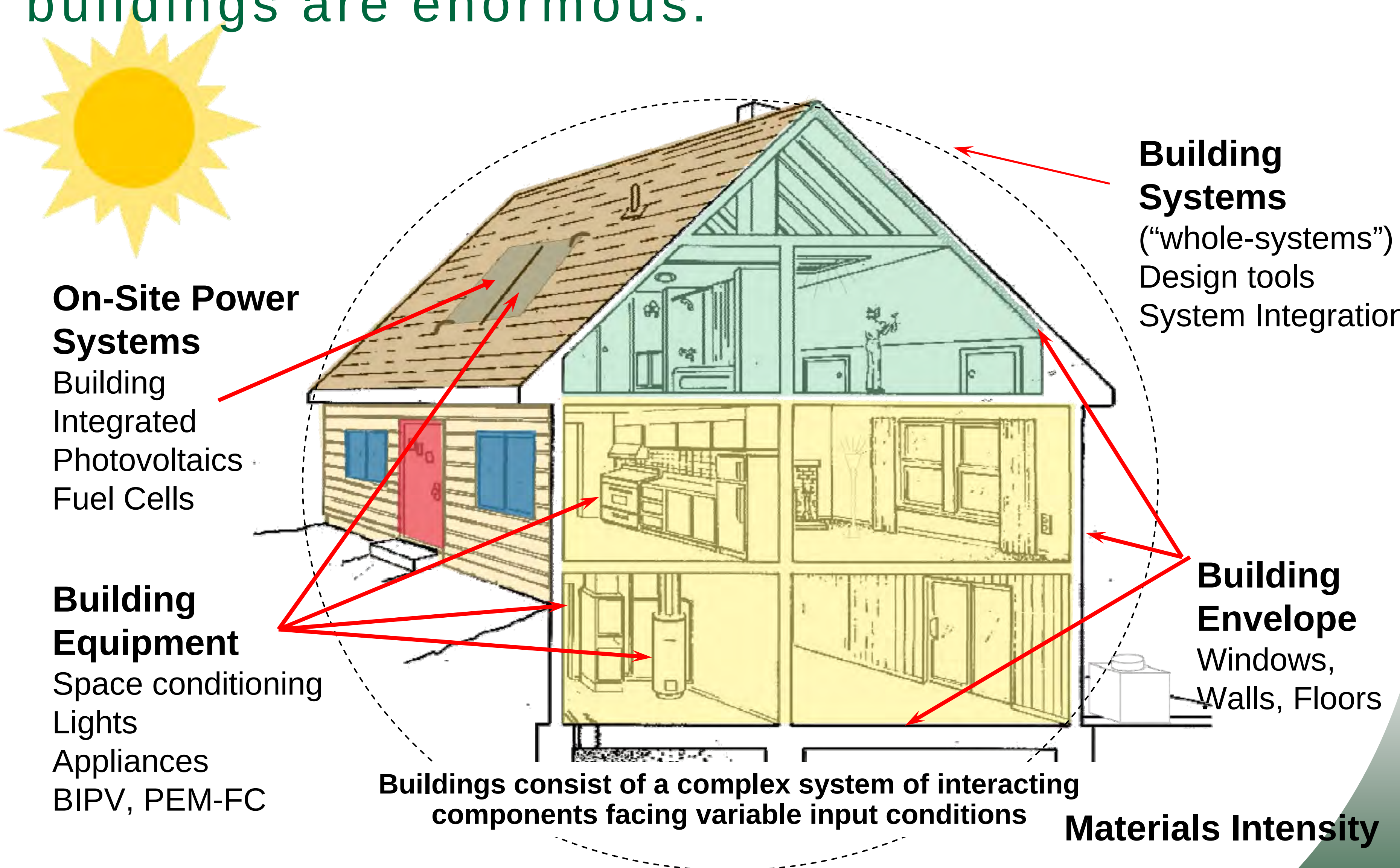


- **Think long term-ten to fifty years**
- **Technology assessment**
- **Systems thinking and interaction**
- **Capitalize on technology futures**
  - **Renewable energy**
    (hydro, solar, wind, bio)
  - **Energy Efficiency**
    (zero energy homes, electric transportation)
  - **Base Load**
    (Oil ? – Nuclear)
  - **Distribution**
    (Grid)

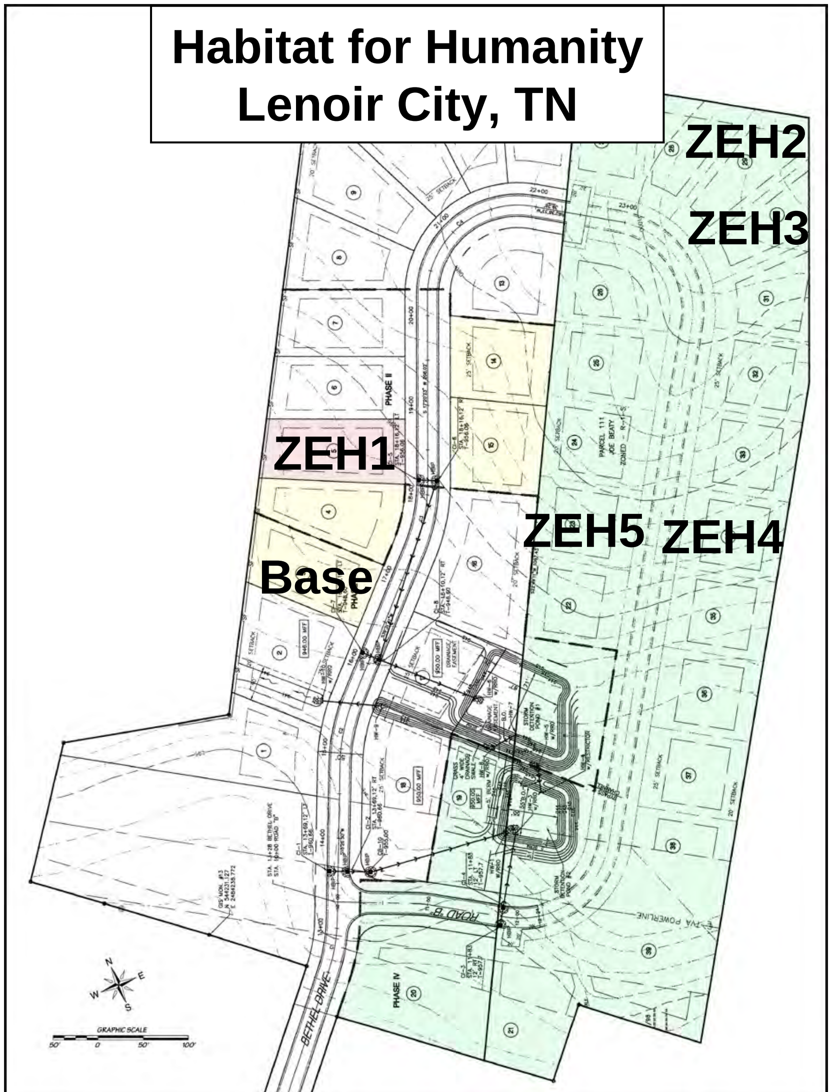
Guam Military Housing
Typhoon Resistant Construction

- **Concrete masonry construction**
  - **Well sealed walls, windows and doors**
  - **Homes typically have:**
    - **Low natural ventilation rate (e.g. < 0.1 ACH, leakage < 1 ft^2)**
    - **Negative shell pressure relative to outdoors (e.g. (-) 2 - 4 Pascals)**
  - **As a result:**
    - **Moisture control problems leading to mold/mildew**
    - **Poor indoor air quality**
    - **High indoor radon levels**
    - **Efficient construction but energy efficiency opportunities exist**

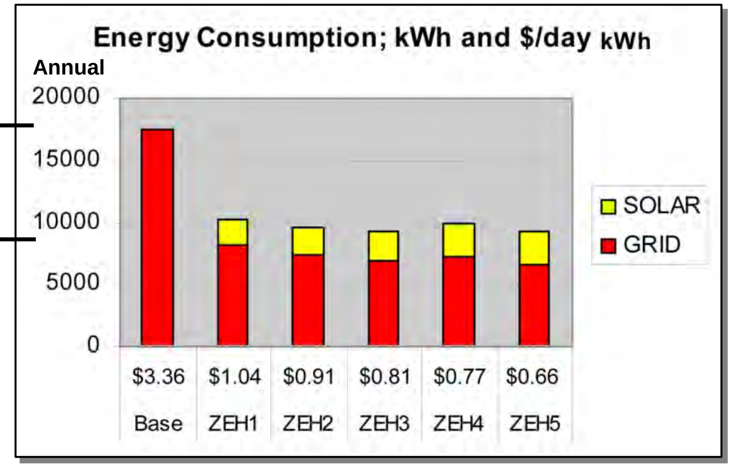
Opportunities for improved efficiency in buildings are enormous.



Five Years (2002-07) Five Homes
Building America 40% Savers in Mixed-Humid Climate



40% Savers



Buildings: Partner to develop deep-savings components to enable zero-energy, demand-responsive buildings

Whole-house energy savings:
40% use;
40% peak periods

Integration of today's technology

Heat pump water heater: 50% energy savings

Ground-source IHP: Saves 50% on H, C, WH, D

Air-source IHP: Saves 50% on H, C, WH, D in mild areas

Partner Sensitive

Appliances, suites, whole-home E-mgmt

ZEHcore wall and SIPs save energy and cost

Partner TBD

Whole-house energy savings:
70% use;
80% peak periods

Integration of emerging technologies from partners

Zero-energy homes shown (zero-energy buildings similar)

ZEH5 two story, 54% energy saver without solar, 67% with solar

Deploy proven technologies in schools and commercial buildings

- **Cool roofs**
  - **Georgia elementary school: Energy savings of $14,500 per year**
  - **Converting 2,366 Tennessee K–12 schools would save $19M per year**
- **Ground source heat pumps**
  - **All Sumner County schools are using geothermal technology**
  - **Converting 2,366 Tennessee K–12 schools would save $122M per year**
- **These and other upgrades can be readily deployed in commercial buildings**
  - **Projects routinely save 20%**
  - **Payback from savings: 10 to 15 years**
  - **Total savings in Tennessee could exceed $500M per year**

ORNL has conducted Radon Measurement and Mitigation Projects for the DoD in the Asia-Pacific Region since 1995

- **> 20,000 Radon <u>measurements</u> and > 1,000 Radon <u>mitigations</u> in residential and nonresidential buildings located in:**
    - **Hawaii**
    - **Guam**
    - **South Korea**
    - **Mainland Japan, and**
    - **Okinawa**

ORNL Federal Energy Management Program Team Have Experience in Supporting Island Needs

- **Combined Heating, Cooling, and Power Assessments:**
  - **Hawaii: Fort Shafter (03), Schofield Barracks (03), Marine base (05 & 06)**
  - **Dominican Republic: US Embassy (03)**
  - **St. Thomas: GSA Airport (03)**
  - **Puerto Rico: Fort Buchanan (03), Roosevelt Roads Naval Station (03), GSA federal buildings in San Juan and Hato Ray (02)**
- **Energy Security Planning technical assistance to Fort Buchanan, Puerto Rico (04)**
- **Energy Services Performance Contracting technical assistance:**
  - **Fort Buchanan Puerto Rico (03)**
  - **GSA Postal Service and Courthouse (04)**

Sustainability Considerations for Islands

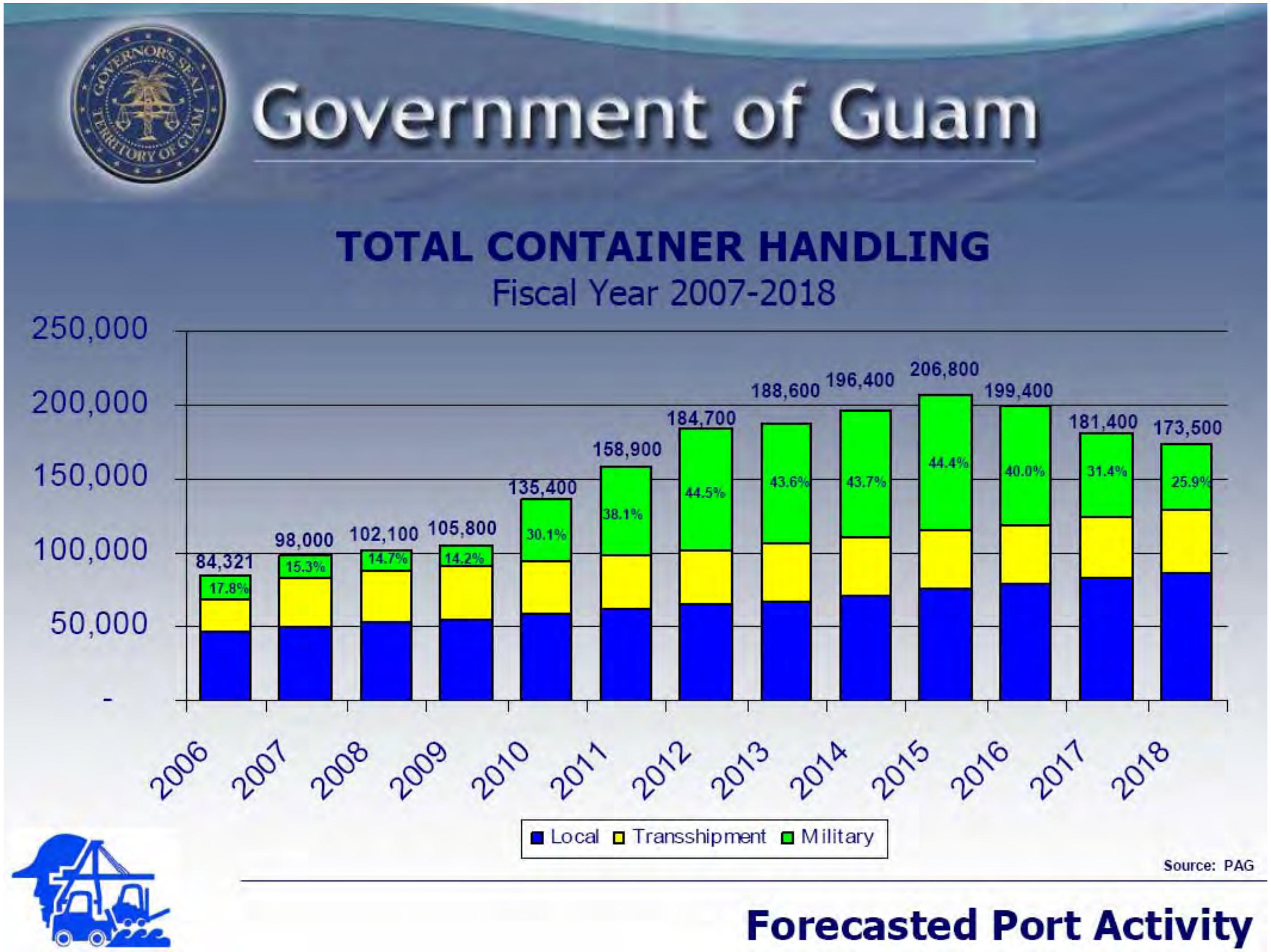
- **Islands have finite resources that present unique engineering challenges:**
  - **Specifically limited**
    - **land,**
    - **energy and potable water sources,**
    - **waste disposal options, and**
    - **on-island technical and logistical support**
    - **environmental impacts**
- **Therefore, not all emerging technologies will be suitable for island applications**

Ports: Seaport

- **Current Facilities**
  - **2 main pier areas**
  - **Container yard = 26.5 acres**
  - **2 fuel piers operated by Mobil and Shell**
  - **Served by a 2-lane paved highway**
- **Operations (FY 2007)**
  - **1,281 vessel calls**
  - **99,630 total containers handled**
    - 120,000 containers estimated capacity
    - Already at capacity for break-bulk
    - Near capacity of cement handling

Source: Port Authority of Guam
http://www.portofguam.com

Guam Ports: Seaport (cont.)



As a result of DoD build-up, the port forecasts increasing demand at the port, peaking in 2015 before beginning a decline. They also anticipate more than double demand for break-bulk goods (i.e..-construction materials) and bulk cement.

***Source: 2007 Guam Industry Forum (http://www.guamindustryforum.com)*.**

Guam Seaport Expansion

Comparison of North American Ports for Current and Forecasted Activities

2007 Rank	Port Name, State	TEUs	Containers Handled
1.	Los Angeles, CA	8,355,039	4,638,733
2.	Long Beach, CA	7,316,465	3,072,949
…	…	…	…
23	Altamira (Mex.)	407,625	264,626
Forecast →	**Apra (Guam)**	**372,240**	**206,800**
24	Wilmington, DE	284,352	142,176
…	…	…	…
33.	Wilmington, NC	191,070	104,292
34.	**Apra (Guam)**	**165,429**	**99,630**
35.	Kahului, HI	147,569	87,786

	Altamira	Guam (after expansion)
Wharf Length	**2,952 ft.**	**2,875 ft.**
Storage/Handling Area	**Approximately 110 acres**	**38.5 acres**

Source: American Association of Port Authorities (AAPA), 2007;
Forecasted containers from the Port Authority of Guam.
Forecasted TEUs = 80% makeup of 40 ft. containers, 20% from 20 ft. containers at peak volume of containers in 2015.

Guam Commercial Airport Expansion

Comparison of North American Airports for Recent and Forecasted Activities

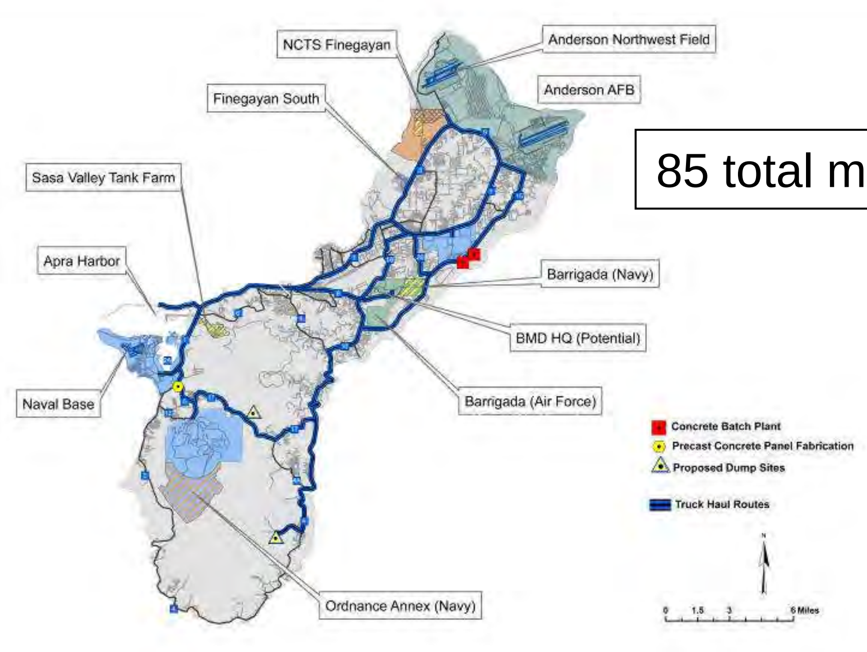
2006 Rank	Airport, State (Code)	Enplanements
1.	Atlanta, GA (ATL)	41,352,038
2.	Chicago O'Hare, IL (ORD)	36,825,097
...	...	...
27	Reagan National, VA (DCA)	8,973,410
...	...	...
58	Jacksonville Intl., FL (JAX)	2,971,953
Forecast	**Guam Intl. (GUM)**	**2,832,708**
	Buffalo Niagara Intl., NY (BUF)	2,522,123
	...	...
79	**Guam Intl. (GUM)**	**1,416,354**
...	...	...
93	McGhee Tyson, TN (TYS)	815,130

- Jacksonville International Airport (JAX)
  - 2 runways (10,000 and 7,701 feet)
  - 23 gates
  - More parking and terminal area than currently at GUM

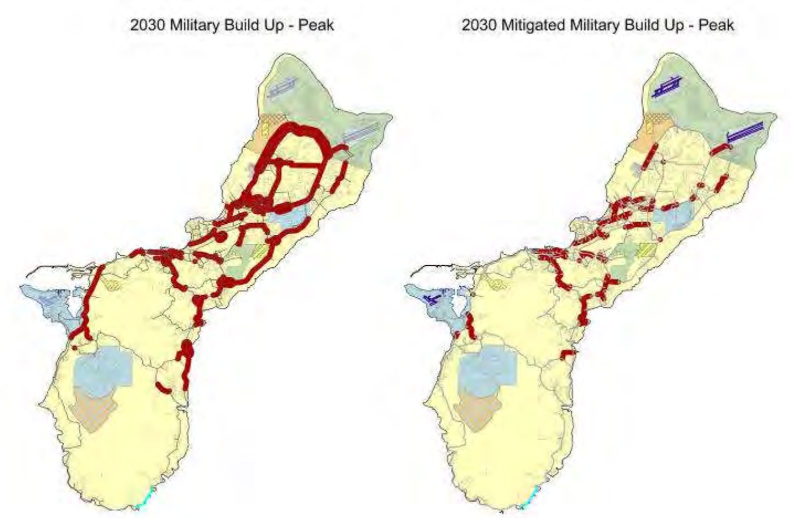
Source: FAA Passenger Boarding and All-Cargo Data, 2006 (http://www.faa.gov/)
Forecasted enplanement assumes double the current boarding.

Surface Transportation Infrastructure

- **Roads**
  - **Upgrades needed to handle increased population and increased truck traffic**
  - **Upgrades needed prior to military build-up**



85 total miles



Congestion without Improvements

55% decrease in congestion with improvements

Source: Guam Industry Forum 2008
http://www.guamindustryforum.com/publications/GuamIndustryForum-II-Infrastructure.pdf

OAK RIDGE National Laboratory

Transportation: Developing multifaceted solutions

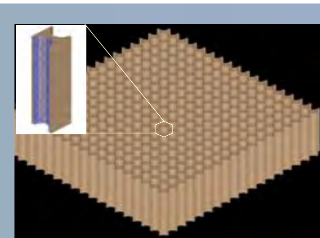
Scientific discovery

Modeling and simulation

Alternative energy sources

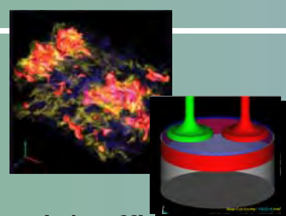
Oil shale

Non-petroleum fuels



Nanocomposite membranes

Efficient vehicle technology



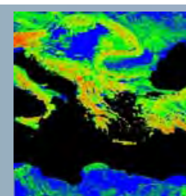
High-efficiency clean combustion

Advanced materials

Electrification

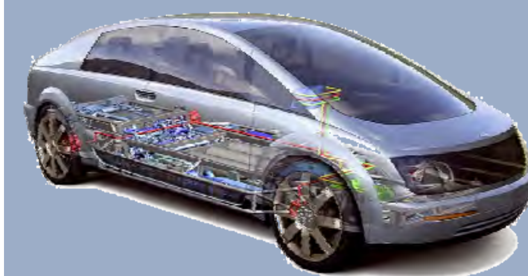
Transportation logistics, planning, and analysis

Intelligent transportation systems



Graphical information systems

- 100 mpg_e automobiles
- Drive-by-wire
- Adaptive control
- Intelligent safety features



- Renewable energy
- Improved mobility
- Transportation security
- National competitiveness

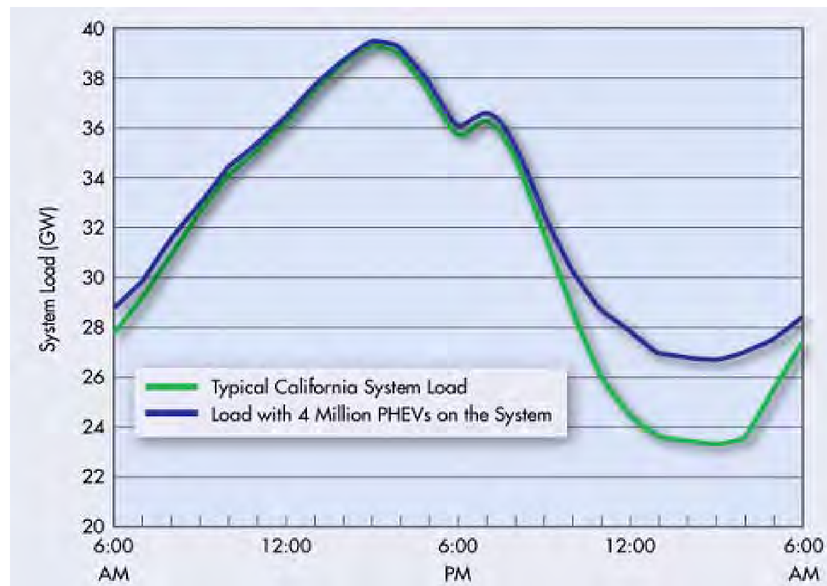
Technology innovation

Adaptive decision tools

ORNL employee transportation: One vision

"Plugging in" for integration and innovation

- **Direct solar charging**
- **Off-peak charging**
- **Smart metering**
- **Energy storage for the grid**
- **User incentives/convenience**

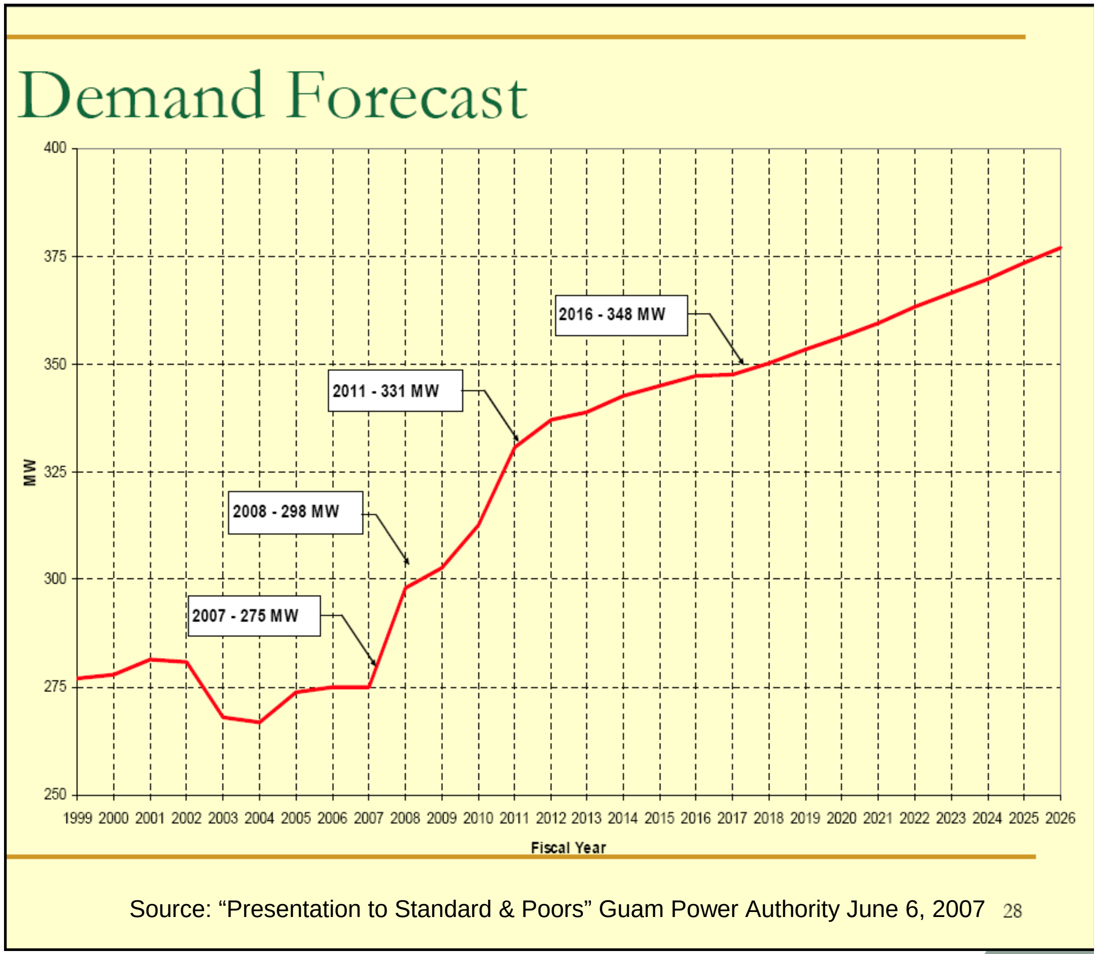


The U.S. grid has significant excess capacity (off-peak)

Energy Demand Forecast

- **Energy**
  - **552.2 MW gross generation capacity**
  - **29 substations**
  - **663 miles of transmission/distribution lines**
  - **100% Petroleum based**
  - **Currently exploring alternative energy and conservation strategies**
    - Wind farm (20 MW)
    - Seawater-cooled air conditioning for major hotels

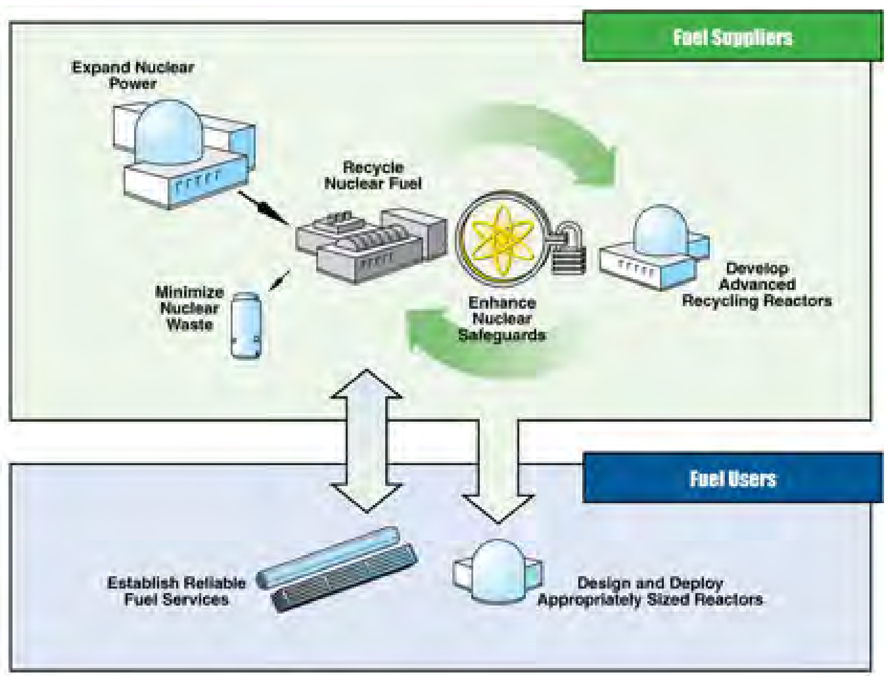
http://www.guampowerauthority.com



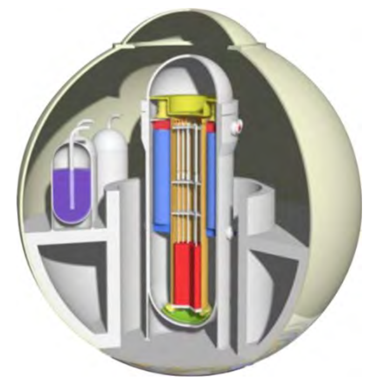
Safe and secure expansion of nuclear power

> **"Promoting the growth of clean, carbon-free nuclear power to meet the growing electricity demand that enhances energy security while promoting non-proliferation is a must in the U.S. and internationally."**
>
> **– George W. Bush**

- **Advanced proliferation-resistant reprocessing**
- **Advanced burner reactors for waste transmutation**
- **Advanced safeguard technologies**
- **Reliable fuel services**
- **Small exportable reactors**



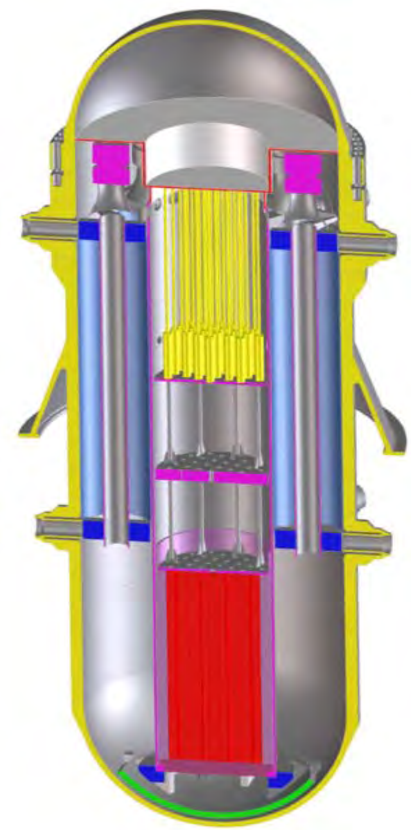
Fuel lease concept



Exportable, right-sized nuclear reactor

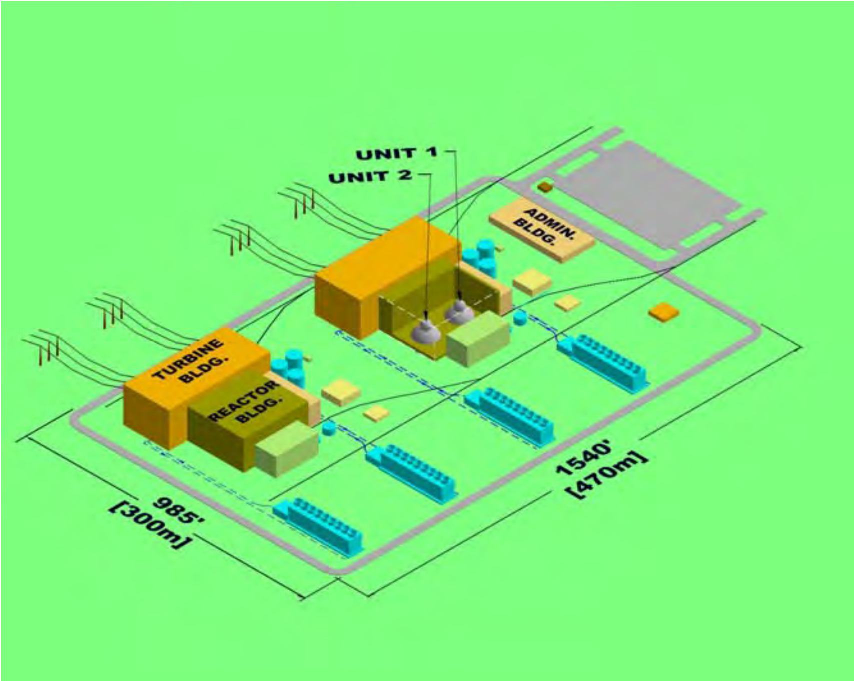
Integral Components Offer Simpler Design and Improved Performance

Steam generators	**Tubes in compression. Tensile stress corrosion cracking eliminated (responsible for over 70% reported failures)**
Primary coolant pumps	**Axial, fully immersed. No seal leaks. No shaft breaks. No maintenance.**
Internal CRDMs	**No RV head penetrations, no seal failures, no head replacements (with ~$800M cost) a la Davis Besse**
Pressurizer	**Much larger volume/power ratio gives much better pressure transients control. No sprays.**
1.7m thick downcomer	**Vessel fast flux 10^5 times lower. Cold vessel. Almost no outside dose. No embrittlement, no surveillance. "Eternal" vessel. Simpler decommissioning.**
Fuel assembly	**Almost the same as standard W PWR, but can have extended cycle up to 48 months**



IRIS – International Reactor Innovative and Secure

- **Advanced integral light water reactor**
- **1,000 MWt (~335 MWe) per module**
- **Innovative, simple design**
- **Enhanced Safety-by-Design™**
- **International development team**
- **Anticipated competitive economics**
- **Cogeneration potential (desalination, district heating, process heat)**
- **Modular installation to match demand growth**
- **NRC pre-application underway**
- **Design Certification testing program underway**
- **Interest expressed by several countries**
- **Projected deployment target: 2015 to 2017**



Multiple twin-units
(2 twin-units: 1340 MWe)

Electric grid analysis and situational awareness

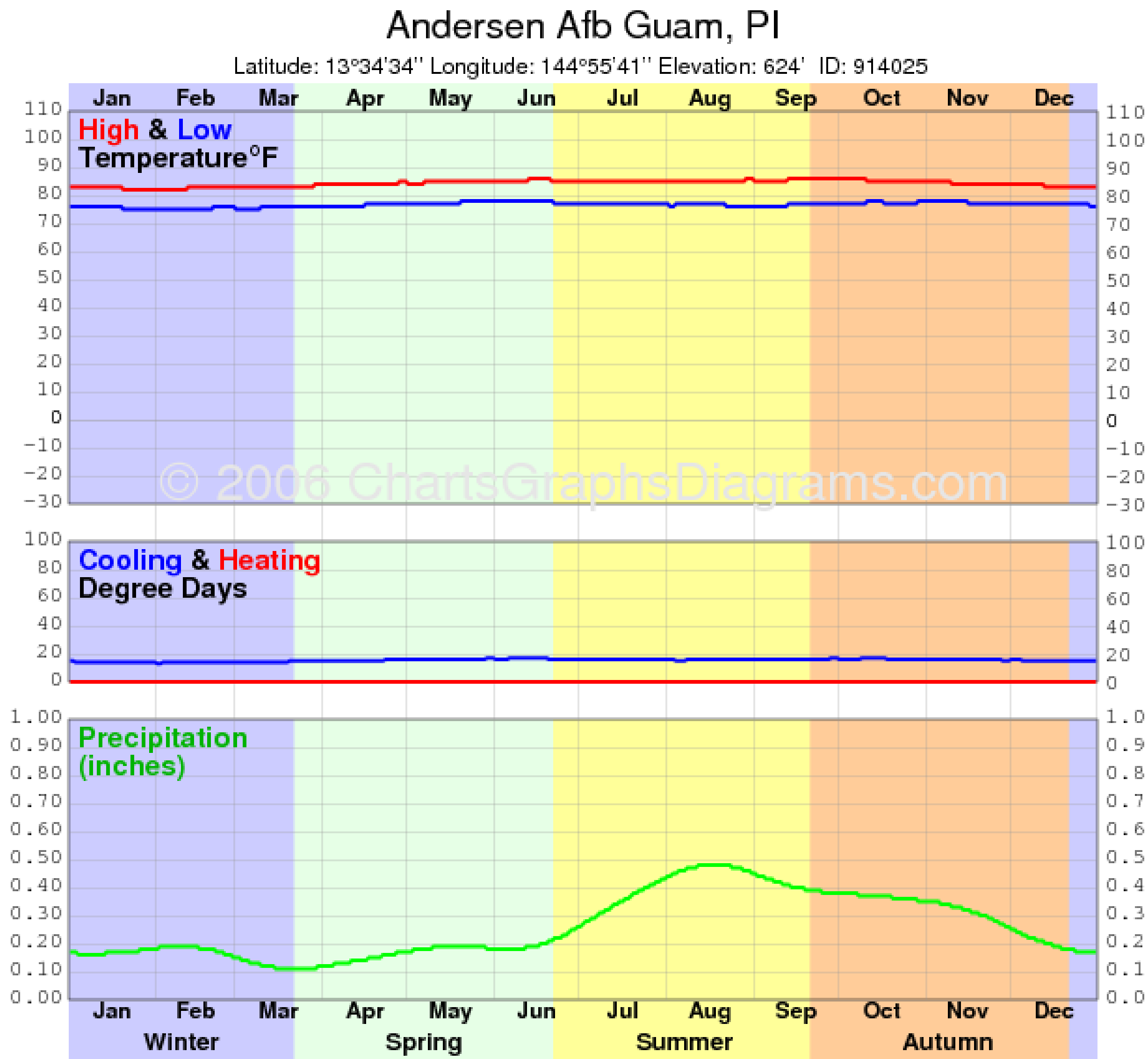
- **Major power outages over the past decade have resulted from a lack of wide-area situational understanding**
- **ORNL and TVA are developing tools to:**
  - **Monitor real-time status of the electric grid**
  - **Assess interdependences with critical energy infrastructure**
  - **Assist in coordination of federal response to natural disasters or major events**
  - **Visualization and prediction**

VERDE
Visualizing Energy Resources Dynamically on Earth


VERDE
© 2007 Europa Technologies

Climate Variables

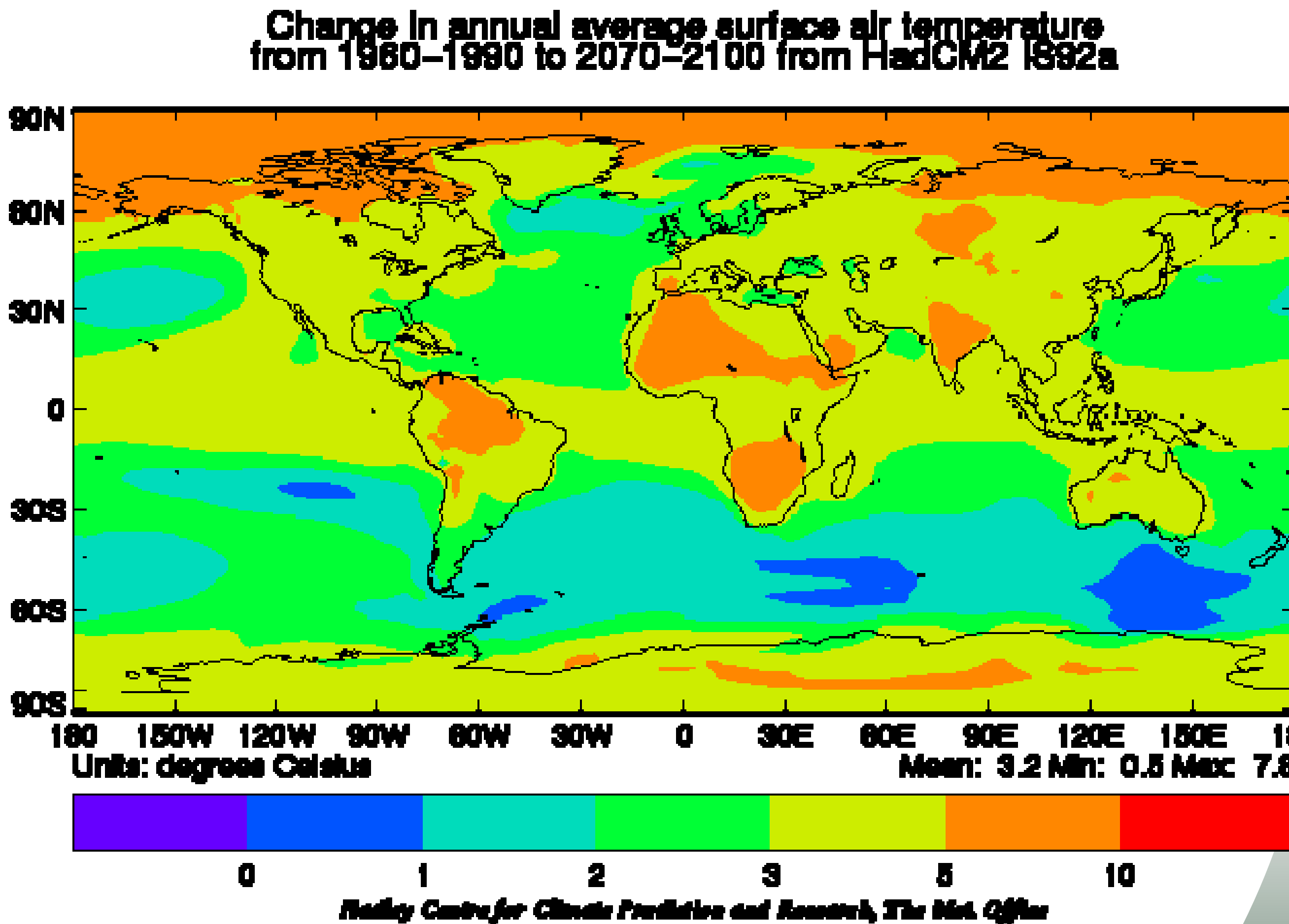
- **Temperature**
  - **Current: Mean 26ºC**
  - **Warming Rate < 2 degree Celsius per 10 years**
  - **Projected: 2010–26ºC; 2015–27ºC; 2030–29ºC**
- **Rainfall**
  - **Current Annual Mean: 96 in (2.4 m) / yr**
  - **Current: 70% in Jul-Dec; 12% from Typhoons**
  - **Mean Change till 2030: Marginal (<0.1m); Uncertain**
  - **Change in Typhoons: Marginal; Uncertain**



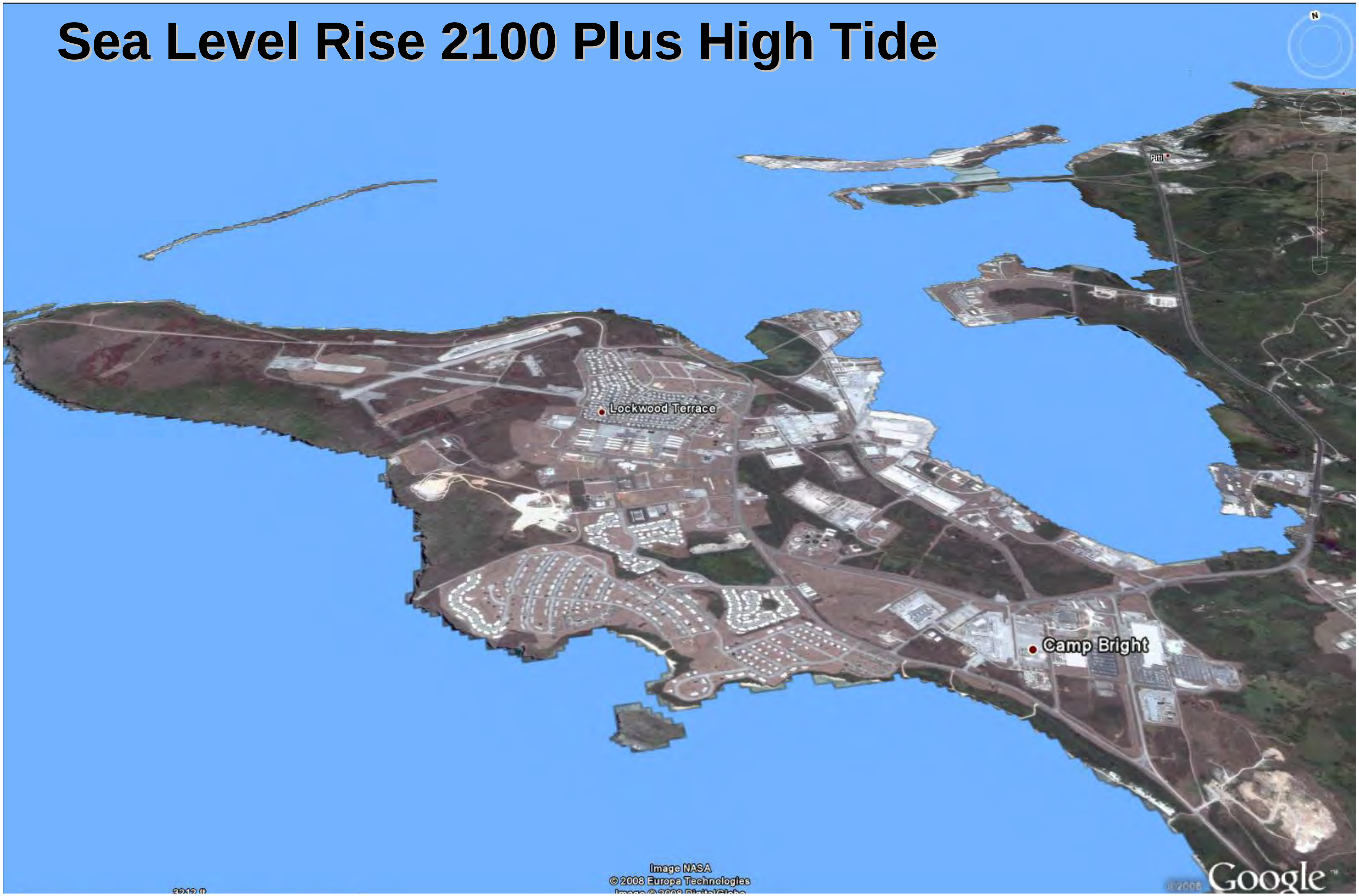
Source:
U.S. Global Char
http://www2.eastwestcenter.org/climate/assessment/climate_draft2a.html

Change in Climatic Variable

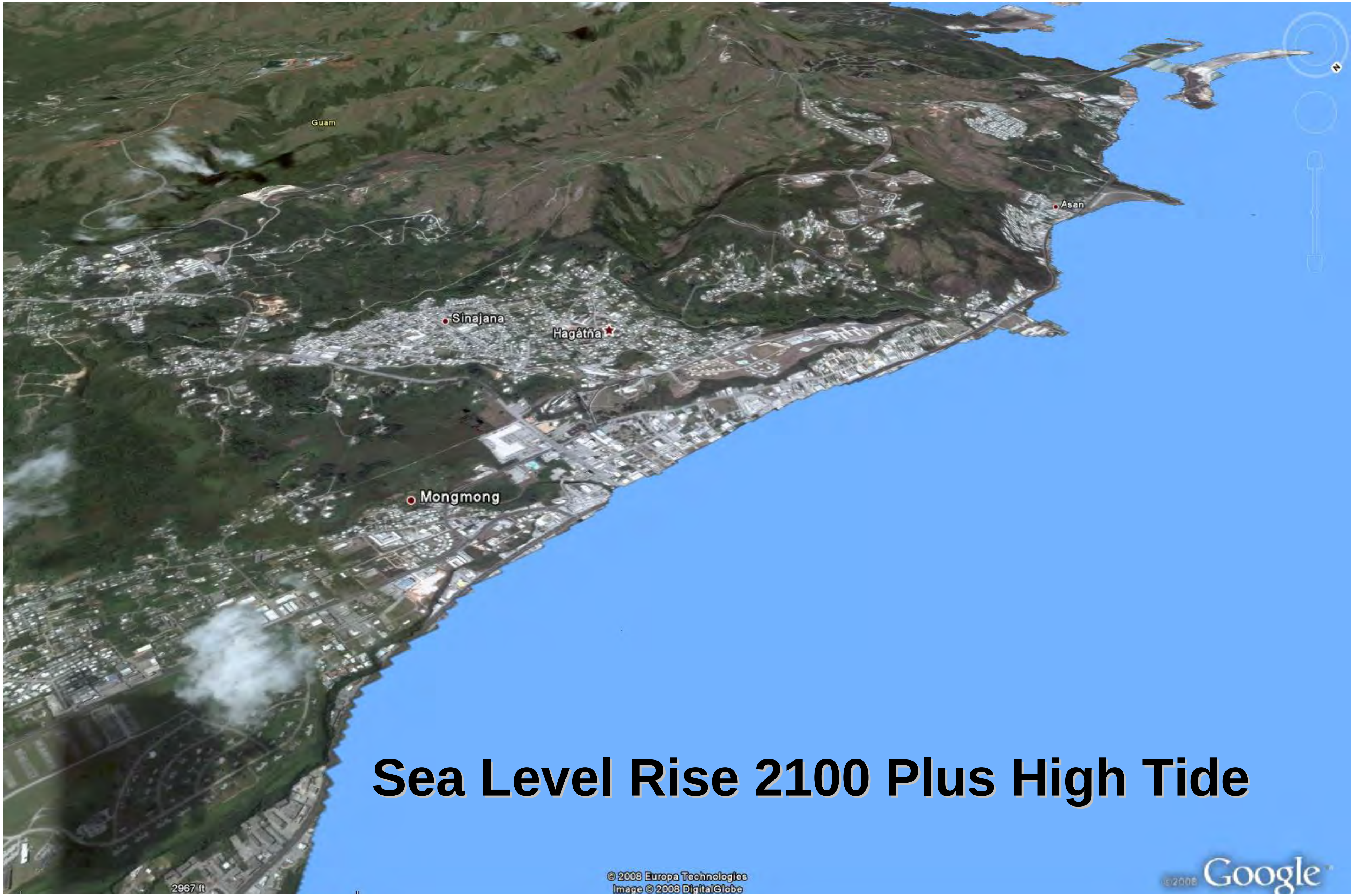
- **Temperature**
  - Warming Rate
    < 2 degree Celsius
    per 10 years
  - Projected:
    2010–26oC
    2015–27oC
    2030–29oC
- **Rainfall**
  - Mean Change
    till 2030:
    Marginal (<0.1m)
    Uncertain
  - Change in
    Typhoons:
    Marginal
    Uncertain



Impact of Sea Level Rise in 2100



Impact of Sea Level Rise in 2100

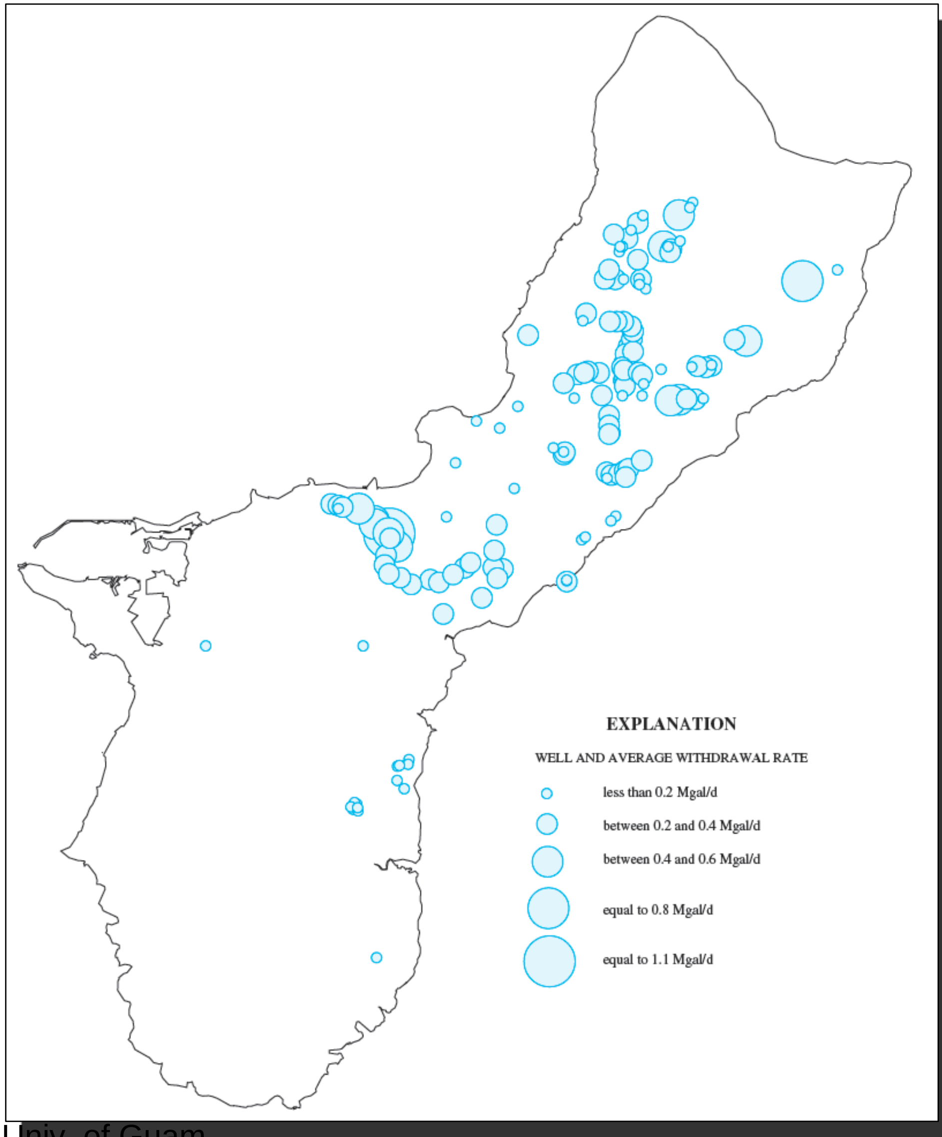


Tsunami

- **A 10 m surge can potentially have drastic impact on population and key critical infrastructure such as port operation.**

Surface Water Infrastructure

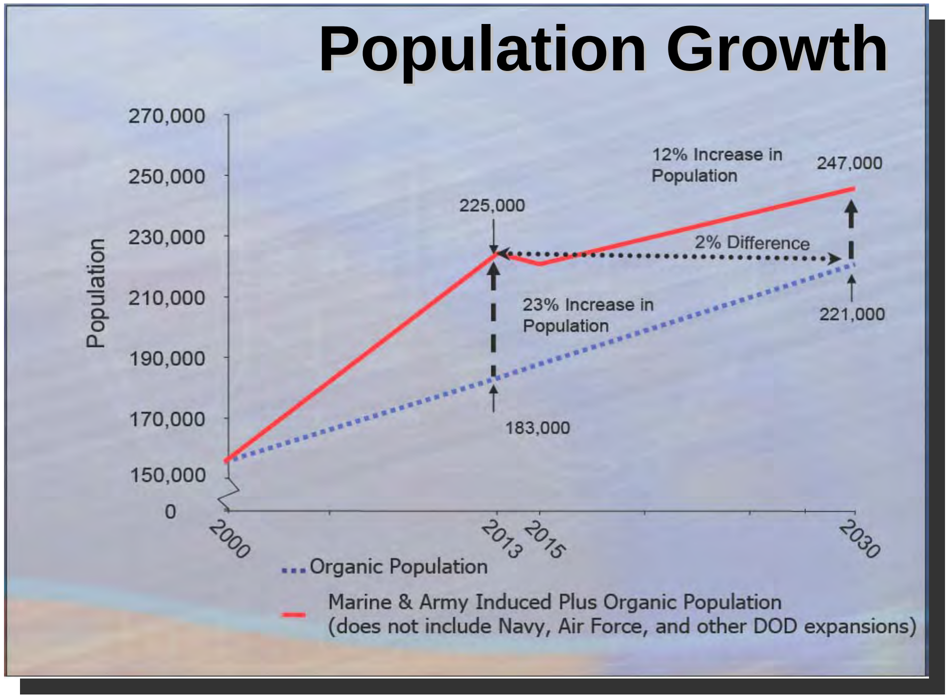
- **Water**
  - 80% drinking water from ground water
  - North: 180 wells
  - South: Surface runoff
    - Surface water runoff over weathered volcanic rock
    - Occurs locally only after intense rain (high permeability)
  - Possibility of future rainfall collection



USGS Hydrologic Resources of Guam (2003)
http://pubs.usgs.gov/wri/wri034126/

Water and Environment Research Institute of Western Pacific, Univ. of Guam
http://www.weirguam.org

Projected Fresh Water Scenario



- **Residential Demand**
  - 2010: ~ 53 Mgal/d
  - 2015: ~ 65 Mgal/d
  - 2030: ~ 72 Mgal/d
- **Water Supply**
  - Wells: Current = 35 Mgal/d
  - Surface runoff: Current = 9.9 Mgal/d
    - Limited projected change under climate change
- **Potential Shortfalls: None till 2030**
  - Total sustainable supply: 79.9 Mgal/d
  - Estimated demand in 2030: 72 Mgal/d

Source: Western Pacific Institute of Guam http://www.weriguam.org/v2/projects_ground.php

Resource Resilience: Considerations for Islands

- **Sustainable solutions, in addition to being cost effective must be low maintenance and require minimal support from the mainland. With proper planning and training this is readily achievable.**
- **Some existing emerging technologies for energy generation (PV) and conservation (super insulation) are promising, but are untested in an island setting. Applied research and engineering is needed to identify the problems before wide-scale implementation.**
- **Other critical technologies essential for island sustainability still require significant research and development (e.g. desalinization, waste processing and disposal).**
- **Sustainable base-load electricity is essential.**

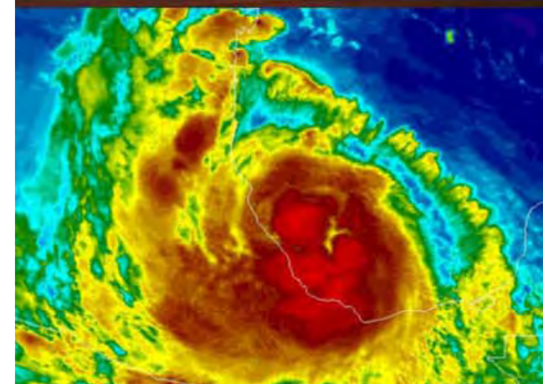
Conclusions

- **Energy Issues will significantly impact our global relationships**
- **Systems analyses will better guide our decisions (**
- **Islands represent “golden” opportunities as test-beds for integrated thinking**
- **Picking energy winners is premature**

Resource Resilience requires balancing the resource equation

Environment / Energy / Water / Waste

Pacific Operational Science and Technology Conference



DHS Science and Technology Directorate Brief

Honolulu, Hawaii • July 15, 2008

Jay M. Cohen
Under Secretary for Science and Technology
U.S. Department of Homeland Security

Homeland Security

When Natural Disasters Strike

Impacts on Pacific Rim/Asian Nations

Typhoon Fenghen- Philippines


Floods/Mudslides – NE India



Earthquake – NE Japan



Cyclone Nargis - Burma

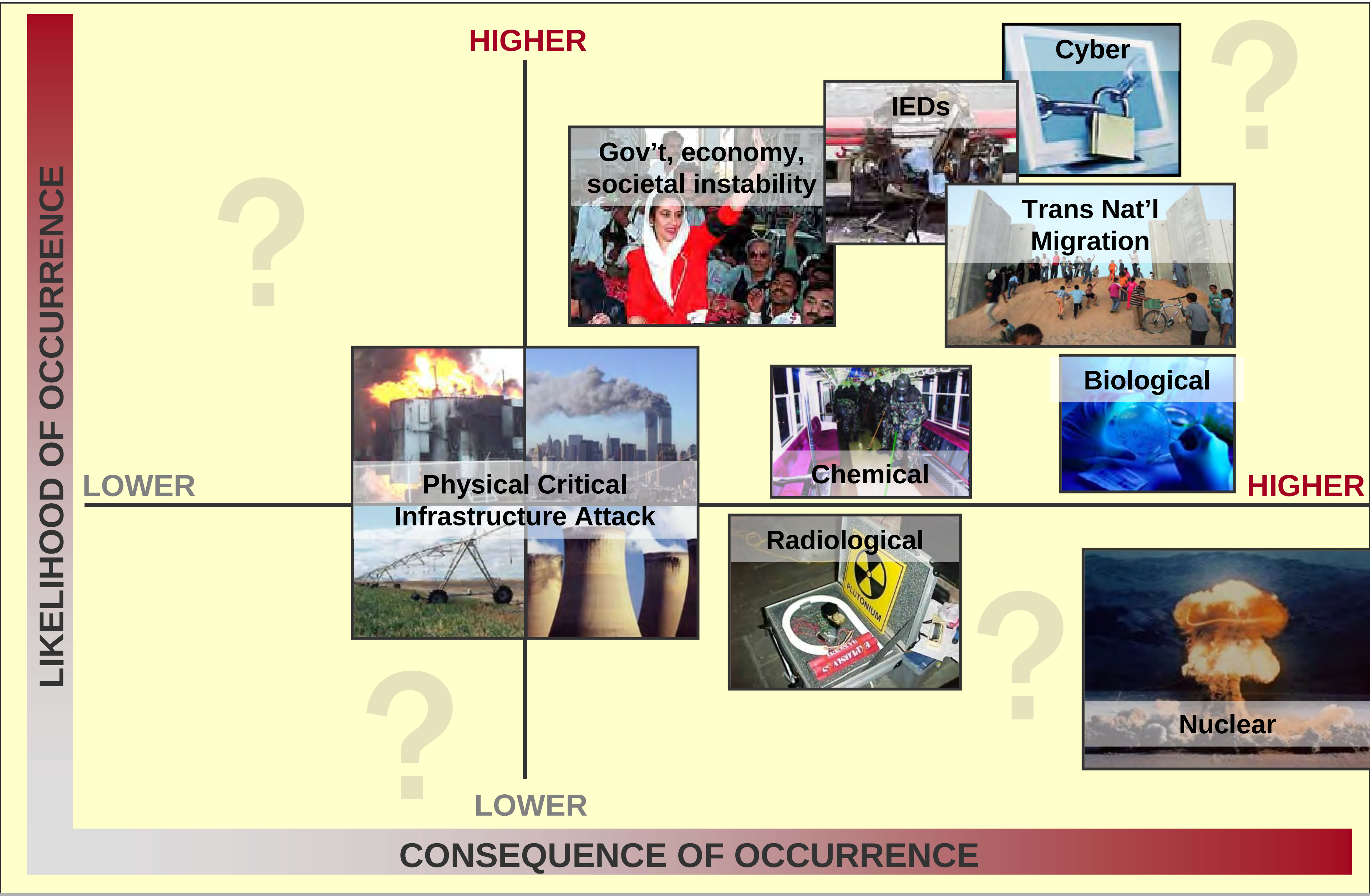


Asian Tsunami - 14 countries


Sichuan Earthquake - China



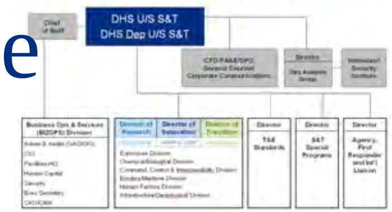
TERRORIST ROADMAP

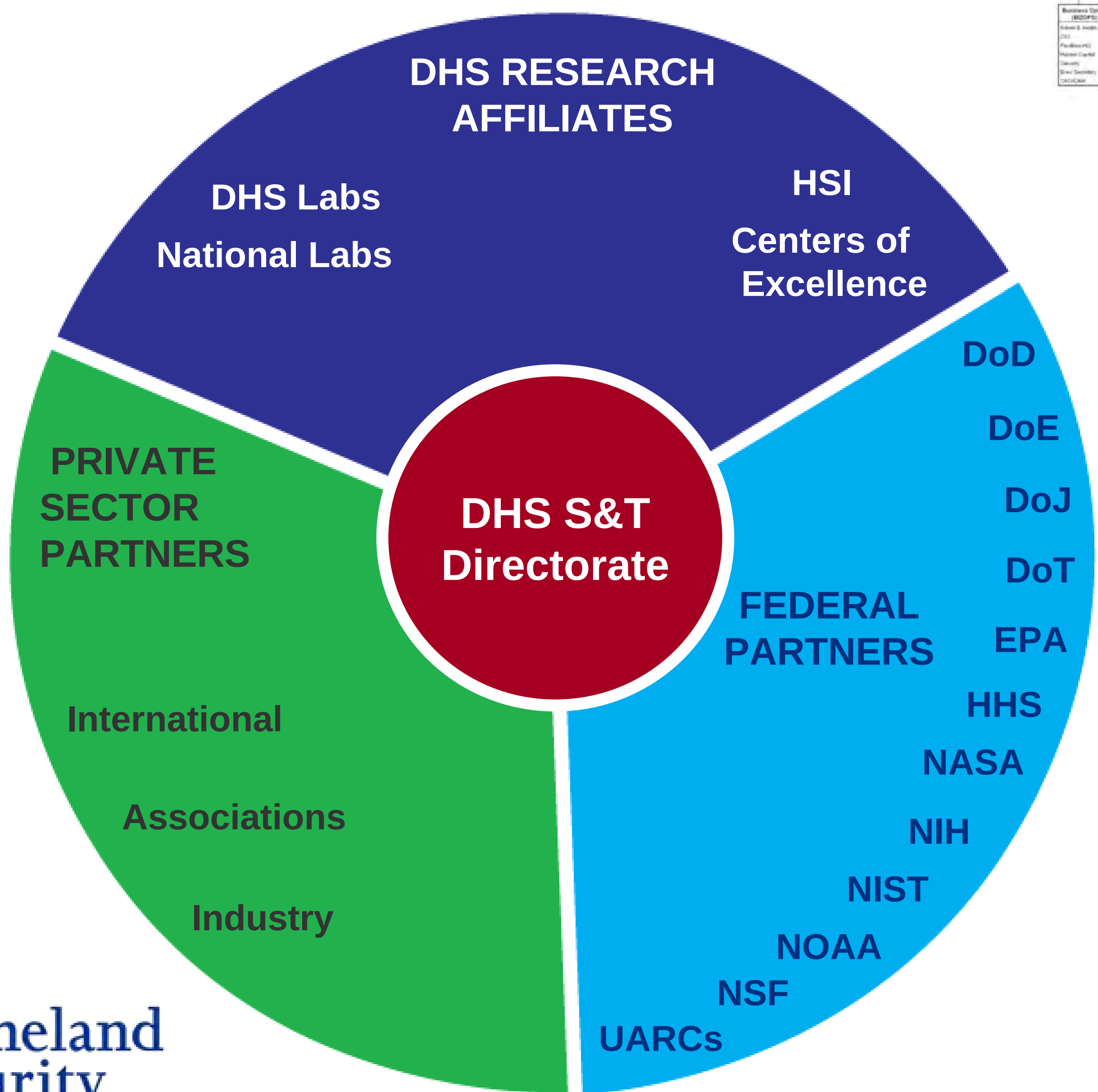


BOMBS, BORDERS, BUGS, BUSINESS, BODIES & BUILDINGS

Homeland Security S&T Enterprise

DHS S&T Directorate



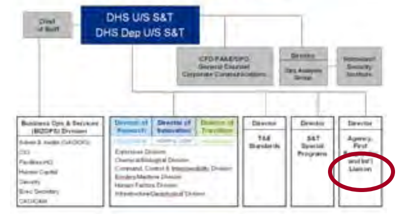


Homeland Security

Partner Countries

Formal Bilateral Agreements:

DHS S&T Directorate

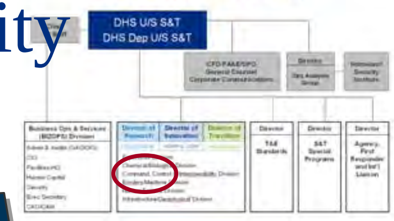


- Canada
- Australia
- Sweden
- Israel
- UK
- Singapore
- Mexico

Homeland Security

S&T Challenge: To Address Interoperability Across Disciplines and Jurisdictions

DHS S&T Directorate



Homeland Security

Get People Right
Get Books Right
Get Organization Right
Get Content Right

Bombs
Borders
Bugs
Business
Bodies
Buildings

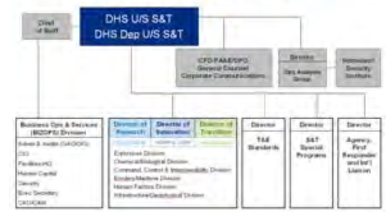
People + Process + Partnerships = Product

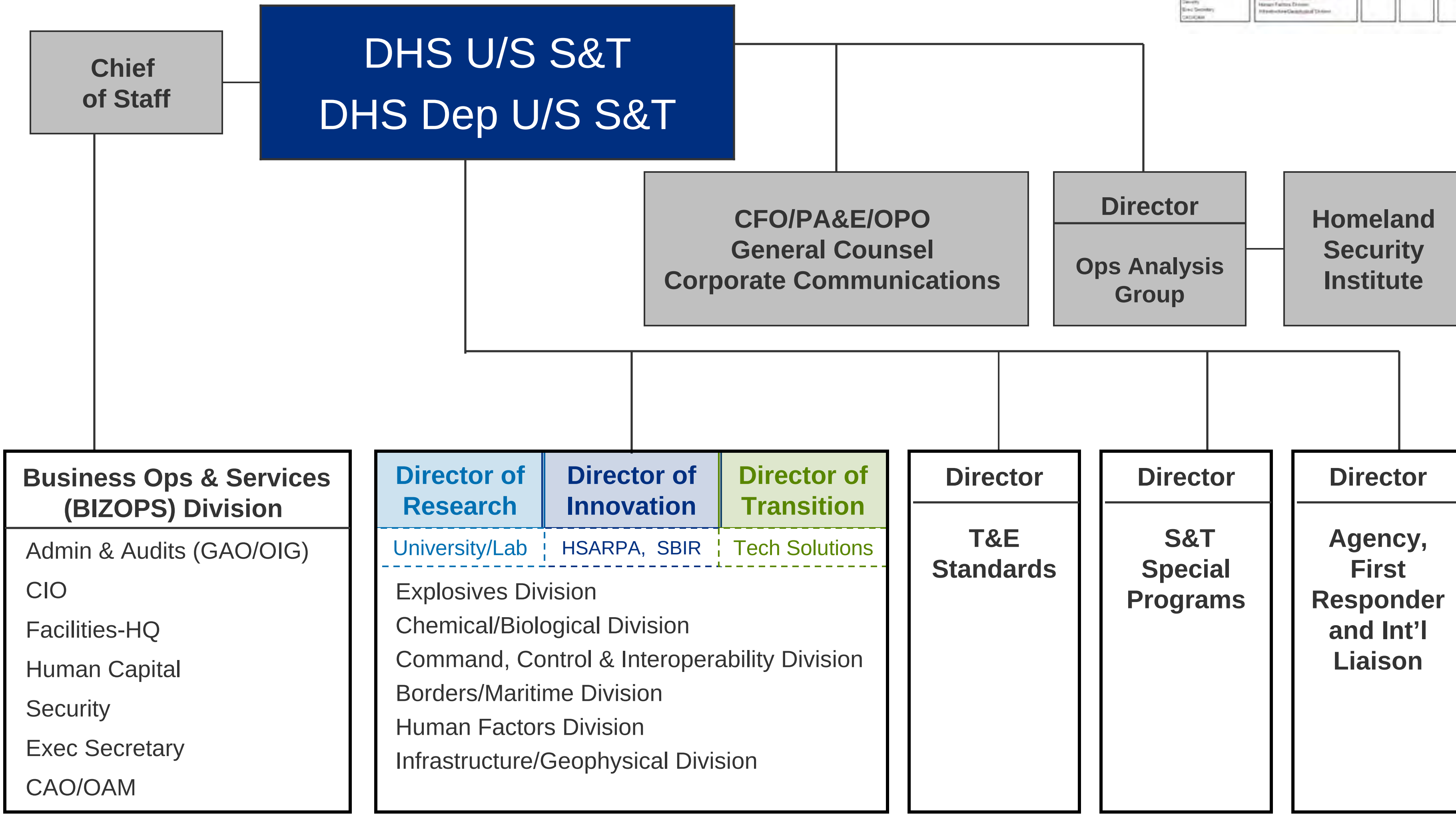
Product is Job One!

Homeland Security

DHS S&T Organization

DHS S&T Directorate





Homeland Security

DHS S&T Investment Portfolio FY 2009

Balance of Risk, Cost, Impact, and Time to Delivery

Product Transition (0-3 yrs)

- Focused on delivering near-term products/enhancements to acquisition
- Customer IPT controlled
- Cost, schedule, capability metrics

Goal: 50%
FY07: 45%
FY09: 49%

Innovative Capabilities (2-5 yrs)

- High-risk/High payoff
- “Game changer/Leap ahead”
- Prototype, Test and Deploy
- HSARPA

Goal: 10%
FY07: 7%
FY09: 8%

Basic Research (>8 yrs)

- Enables future paradigm changes
- University fundamental research
- Gov’t lab discovery and invention
- Homeland Security Institute

Goal: 20%
FY07: 11%
FY09: 20%

Other (0-8+ years)

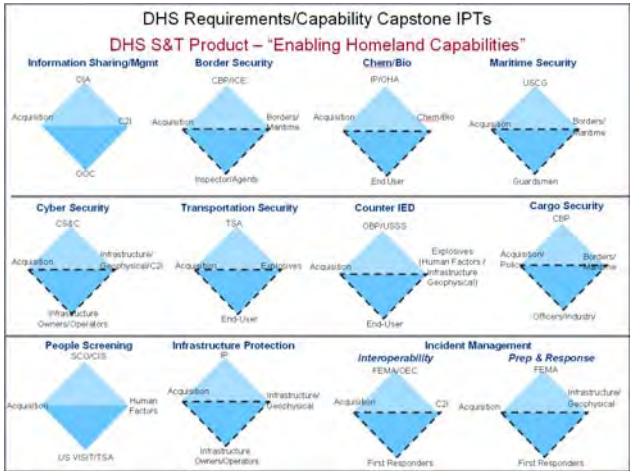
- Test & Evaluation and Standards
- Laboratory Operations & Construction

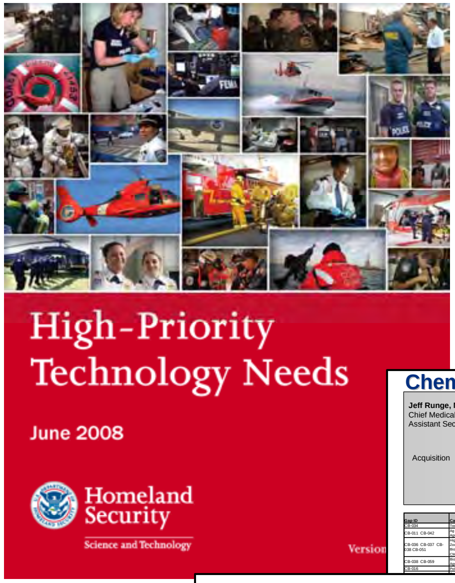
FY07: 37%
FY09: 23%

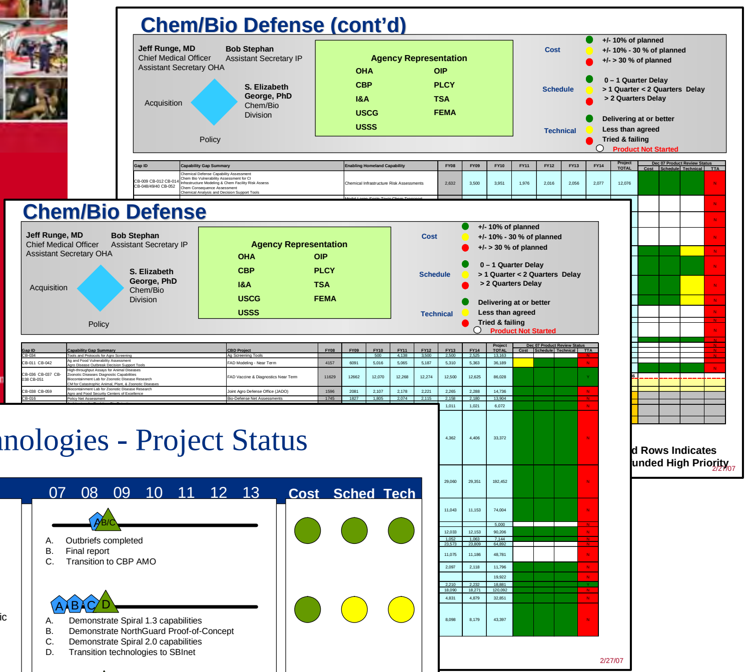
Customer Focused, Output Oriented

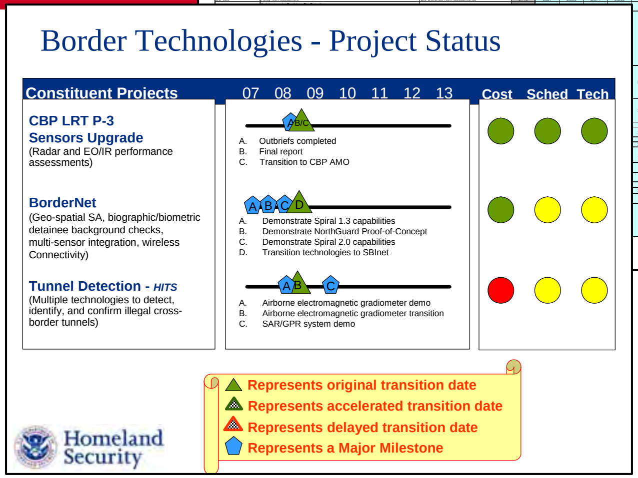
Homeland Security

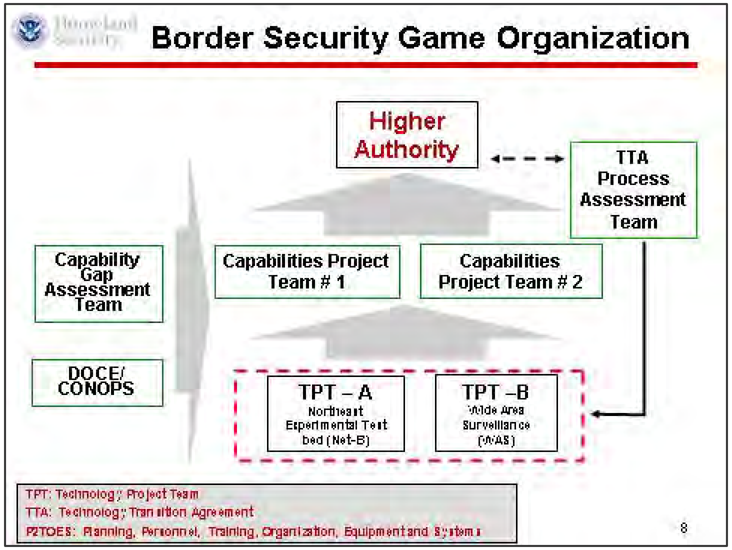
Product Transition





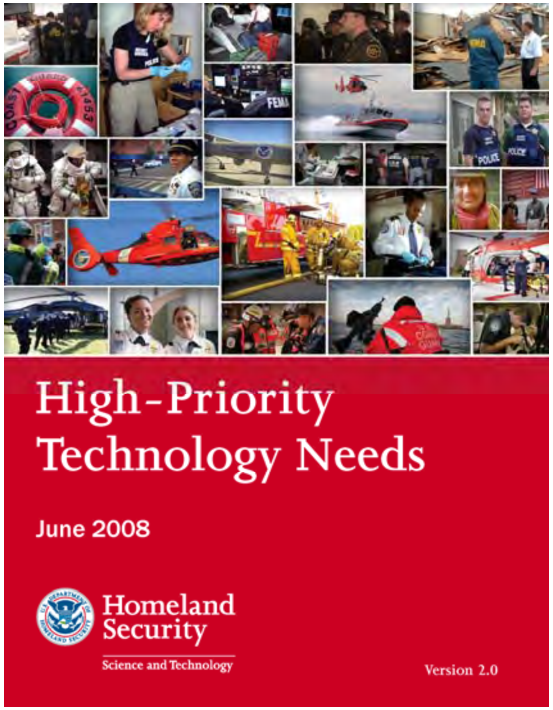






High Priority Technology Needs

- S&T investments are tied directly to the technology needs of our customers, represented by leadership of DHS components, and *their* customers on the front lines of homeland security
- Requirements are updated on annual cycle aligned with DHS funding and acquisition processes
- ***New!*** Updated High Priority Technology Needs brochure identifies 94 technology needs of DHS components and their customers



- Brochure is posted online:
  http://www.dhs.gov/xlibrary/assets/High_Priority_Technology_Needs.pdf

Customer Focused…Output Oriented

Maritime Security IPT:
Representative Technology Needs

- Wide-area surveillance from the coast to beyond the horizon; port and inland waterways region - detect, ID, and track
- Data fusion and automated tools for command center operations
- Improve capability to continuously track contraband on ships or in containers
- Develop improved ballistic personal protective equipment for officer safety
- Vessel compliance through less-lethal compliance methods
- Detect and identify narcotics, chemical warfare agents, toxic industrial chemicals, explosives and contraband – identify multiple threats with one unit and be able to sample for and detect contraband without direct contact

S&T Lead Division: Border/Maritime

Homeland Security

Centers of Excellence Alignment

S&T DIVISIONS

Explosives	Chemical/Biological	Command, Control & Interoperability	Borders/Maritime	Human Factors	Infrastructure/ Geophysical
COE for Explosives Detection, Mitigation & Response	National Center for Food Protection and Defense – A Homeland Security Center of Excellence	IDS-UACs	*COE for Border Security & Immigration*	START	PACER – A Homeland Security Center of Excellence
COE for Transportation Security	FAZD Center – National Center for Foreign Animal and Zoonotic Disease Defense	RVACs	*COE for Maritime, Island & Port Security*		*COE for Natural Disasters, Coastal Infrastructure & Emergency Management*
	CAMRA – Center for Advancing Microbial Risk Assessment	*Consolidated CCI Center*			

Consolidated Chem/Bio Center

Operations Analysis,
Risk Sciences Branch & HSI Risk Modeling

CREATE
HOMELAND SECURITY CENTER

New DHS Centers of Excellence

Explosives Detection, Mitigation and Response

- Northeastern University (Research)
- University of Rhode Island (Education)

Border Security and Immigration

- University of Arizona (Research)
- University of Texas at El Paso (Education)

Maritime, Island and Port Security

- University of Hawaii (Ocean and Islands – Research & Education)
- Stevens Institute of Technology (Port Security – Research & Education)

Natural Disasters, Coastal Infrastructure and Emergency Management

- University of North Carolina at Chapel Hill (Research)
- Jackson State University (Education)

Transportation Security

- University of Connecticut (Research)
- Tougaloo College (Education and Training)
- Texas Southern University (Petro-Chemical Transportation Security)

DHS National Biodefense Analysis and Countermeasures Center (NBACC)

- Primary Focus: Threat characterization and bioforensics
- New facility at Fort Detrick, MD will be operational in Winter 2009
- Currently operates with limited capability in DOD facilities at Fort Detrick
- First new lab developed by DHS
- An FFRDC; science and research program managed by Battelle
- Will provide nation with an enduring capability to protect against biological threats

Homeland Security

Homeland Security Act of 2002

"Support basic and applied homeland Security research to promote *revolutionary* changes in technologies; advance the development, testing and evaluation, and deployment of critical homeland security technologies; and accelerate the prototyping and deployment of technologies that would address homeland security vulnerabilities."

EVERY
TRULY
GREAT
ACCOMPLISHMENT
IS AT FIRST
IMPOSSIBLE!

(FORTUNE COOKIE)

Homeland Security

Why Federal R&D Investment?

ONLY the Federal Government can take "game-changing" risks that benefit society, create leading-edge AMERICAN technology, AMERICAN *JOBS* and assure AMERICAN security!

Nautilus
SSN 571
~ 1954

Navy Nuclear Submarine

Hyman G. Rickover

Civilian Nuclear Power

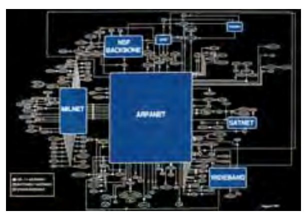
~ 1955

KC-135

Curtis LeMay

Boeing 707

1960's



ARPANET

World Wide Web

> 2000

DDG 1000
"Electric Navy"

AMSC - 50,000 SHP (36.5MW)
HTS AC Synchronous Motor

Countering the IED Threat

Breaking the links in the IED Delivery Chain

Homeland Security
Science and Technology

Homeland Innovative Prototypical Solutions (HIPS)

FY-08 Planned Demonstration Timeline

LEVEE STRENGTHENING

September 30, 2008 & October 21, 2008 – New survey methods demonstration using a variety of geophysical sensors on multiple platforms and address weak levees at the Army Corps of Engineers, Vicksburg, MS

REG

September 17-19, 2008 – Laboratory demonstrations of fault limiting superconducting cable at Oak Ridge National Laboratory, TN

CHLOE

September 9, 2008 – Live-Fire Counter-Manpads Detection demonstration at White Sands Missile Range

RESILIENT TUNNEL

August 2008 – Trial prototype inflatable tunnel device testing in a transit tunnel environment

MagViz

August 8, 2008 – Liquid explosives field demonstration of a screening prototype for TSA 3-1-1 bags in a coin size tub at Los Alamos National Laboratory, NM

TUNNEL DETECTION

July 2, 2008 – Field experiments for improved airborne wide area surveillance system to increase the accuracy of detection

FAST M2

June 24 & September 17 & 18, 2008 – Non-invasive sensor demonstration, validation and metrics at MIT Draper Laboratory

CRITICAL INFRASTRUCTURE CHANGE DETECTION

Summer 2008 – Examine technical characteristics of a new ultra high resolution optical sensor in lower Manhattan in coordination with the New York Police Department

High Impact Technology Solutions (HITS)

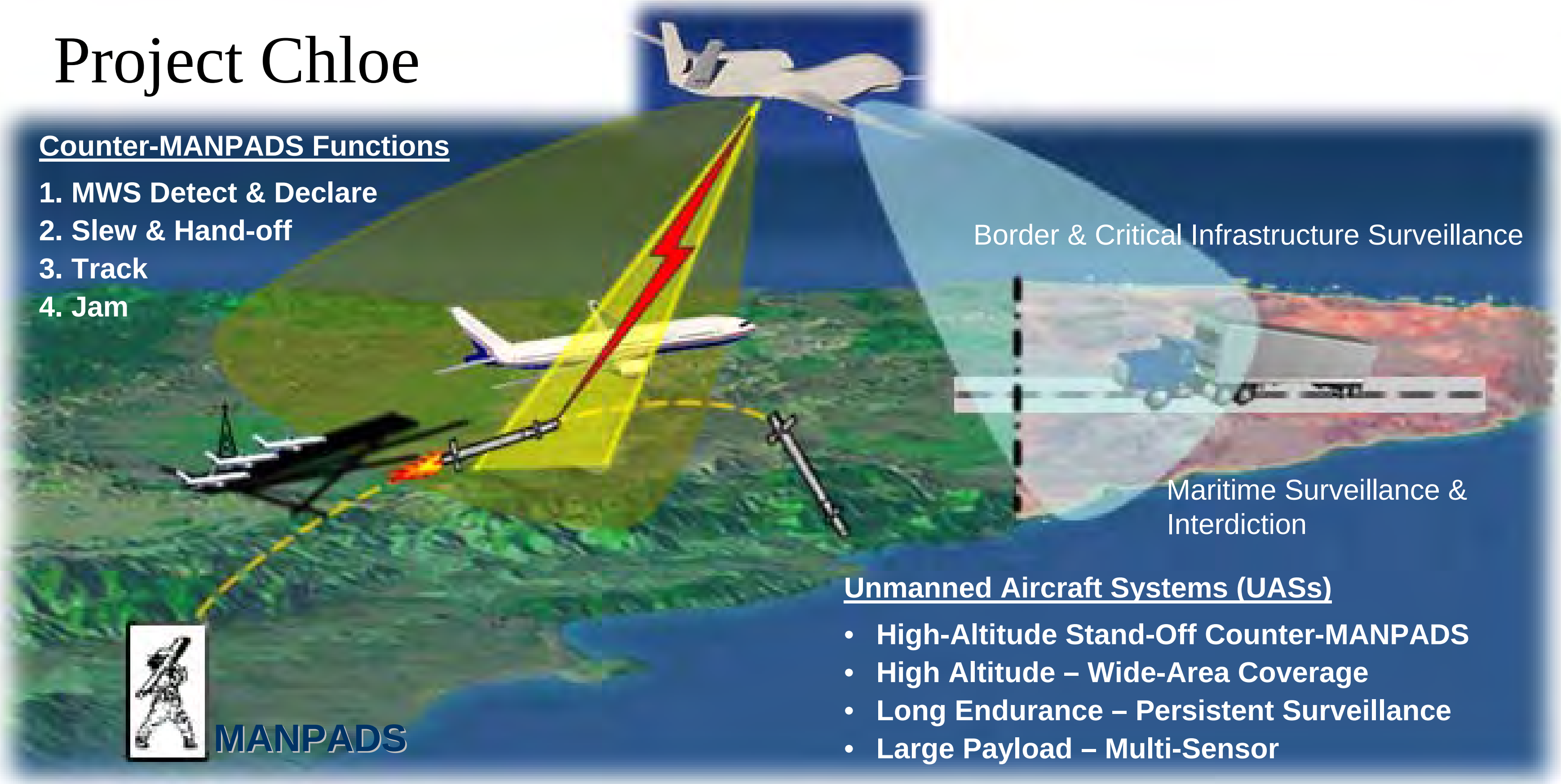
Science & Technology
Innovation Portfolio
HSARPA

July 3, 2008

Counter-MANPADS/Persistent Surveillance

Office of Innovation - Homeland Innovative Prototypical Solutions

Project Chloe



Operational Characteristics

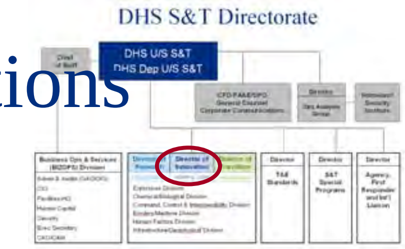
- Real-time sensor fusion/dissemination
- Multi-user / border surveillance requirements
- Commercial Aircraft MANPADS protection
- Automatic target detection/recognition
- Persistence (24/7, all-weather coverage)

Homeland Security


Project CHLOE
High Altitude Unmanned
Counter-MANPADS / Persistent Surveillance

Homeland Innovative Prototypical Solutions

HIPS FY 2008 Planned Demonstration Timeline



HUMAN FACTORS

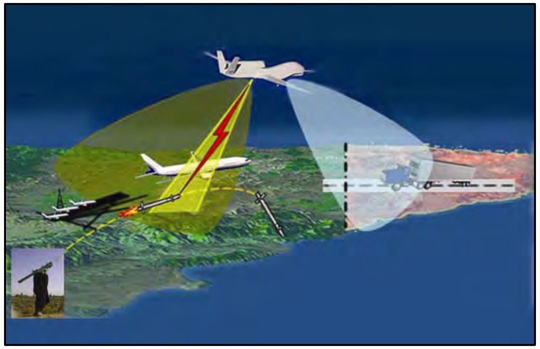
FAST M2

EXPLOSIVES DETECTION

MagViz

CRITICAL INFRASTRUCTURE PROTECTION

Resilient Electric Grid
REG

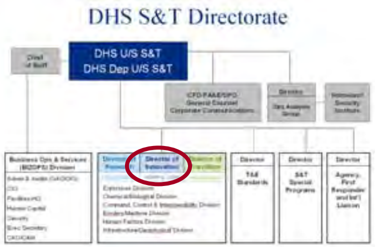


CHLOE

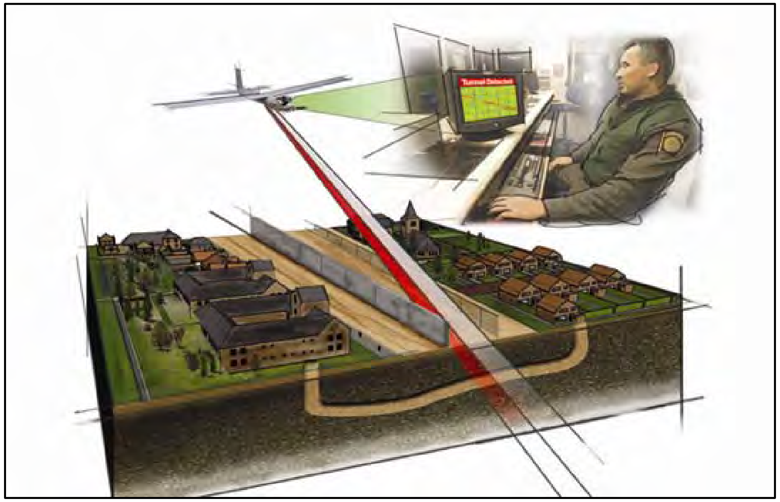
Levee Strengthening

High Impact Technology Solutions

HITS FY 2008 Planned Demonstration Timeline



CRITICAL INFRASTRUCTURE PROTECTION



Tunnel Detection

Resilient Tunnel

Critical Infrastructure Change Detection

Maritime Security/Maritime Domain Awareness

Leveraging Capabilities through Inter-Agency Collaborations

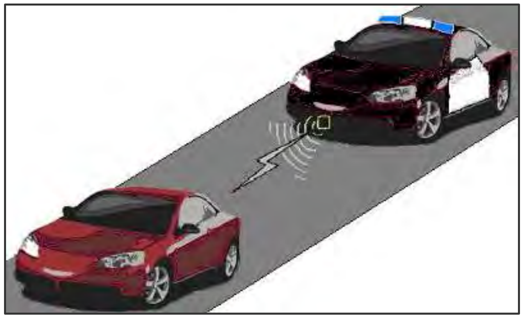
Seahawk - multi-agency intermodal task force, fusion and T&E center, Charleston Harbor, SC (DHS, DOJ, DOD, DOS, state/local)

Persistent wide-area surveillance technologies for USCG detection, identification and tracking (DHS S&T, USCG)

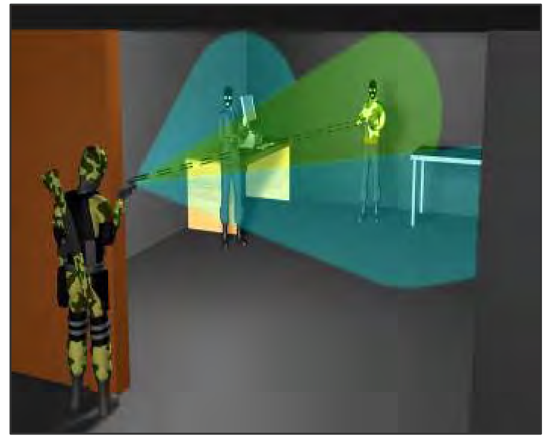
Improved low cost port and coastal radar systems with sophisticated signal processing (DHS S&T)

Semi-submersible technologies to support Joint Task Force requirements (DOD, Intel communities, DHS-S&T, CBP, USCG)

Border Officer Tools and Safety



Microwave Vehicle Stopper



Light Emitting Diode Incapacitator

Officer Safety Load Carriage System

Integration of Mobile Biometrics

Homeland Security

USCGC Bertholf
First National Security Cutter

Amphib Alaska

Homeland Security

Scalable Common Operating Picture Experiment (SCOPE) Global Observer Joint Capability Technology Demonstrations

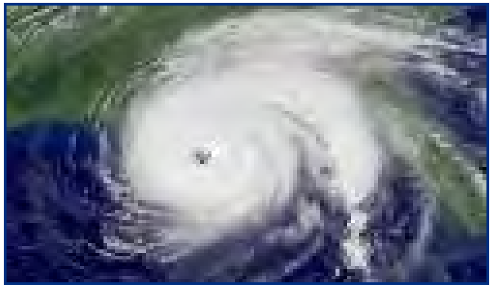
High Impact Technology Solutions

Customs and Border Patrol

- Persistent wide area surveillance of land and maritime borders to detect & characterize individuals, vehicles, and low flying aircraft
- Relay of Predator B links
- RF emitter geolocation platform

FEMA

- Pre-disaster evacuation route monitoring
- Post-disaster damage assessment/mapping
- Post-disaster communications relay
- Surveillance for National Special Security Events



National Oceanic and Atmospheric Administration

- Weathersonde/hurricane tracking
- Fisheries protection
- Satellite calibration/validation

U.S. Coast Guard

- Persistent wide area surveillance of maritime areas and ports to detect & characterize vessels

S&T Outreach

2008 Schedule

- ***S&T Stakeholders West***, Los Angeles, January 14-17
- ***ChemBio Conference***, January 28-February 2
- ***Second Annual DHS University Network Summit***, Washington, DC, March 19-21
- ***S&T Stakeholders East***, Washington, DC, June 2-5
- ***S&T Stakeholders PacAsia***, Hawaii, October 7-10

2009 Plans

- ***S&T Stakeholders West,*** Bellevue, WA, February 23-26
- ***Global Security Asia***, Singapore, March 17-19
- ***S&T Stakeholders East***, Washington, DC, May
- ***S&T Stakeholders Eurasia***, Sweden, Fall

Homeland Security

DHS S&T Directorate

Organized for Success…

Enabling DHS Missions…

Ready for Transition…

Questions?

Homeland Security


Homeland Security
FROM SCIENCE...SECURITY
Explosives
Chemical/Biological
Command, Control, & Interoperability
Borders/Maritime
Human Factors
Infrastructure/Geophysical
FROM TECHNOLOGY...TRUST

Back-Up Slides

Low Vapor Pressure Chemical Detector

Objective:

- Stand-off surface detection of persistent chemical threat substances having low vapor pressures ($<10^{-4}$ Torr)

<u>Advantages</u>:

- UV-Raman for stand-off detection – no need to collect/transfer analyte to spectrometer for detection and identification
- Leverages extensive DoD development
  - Joint Contaminated Surface Detection-Advanced Concept Technology Demonstration (vehicle mounted)
  - LISA-Laser Interrogation of Surface Agents Inspector (cart mounted)
- No consumables

Backpack < 18 kg

- LISA Manportable: UV-Raman Sensor

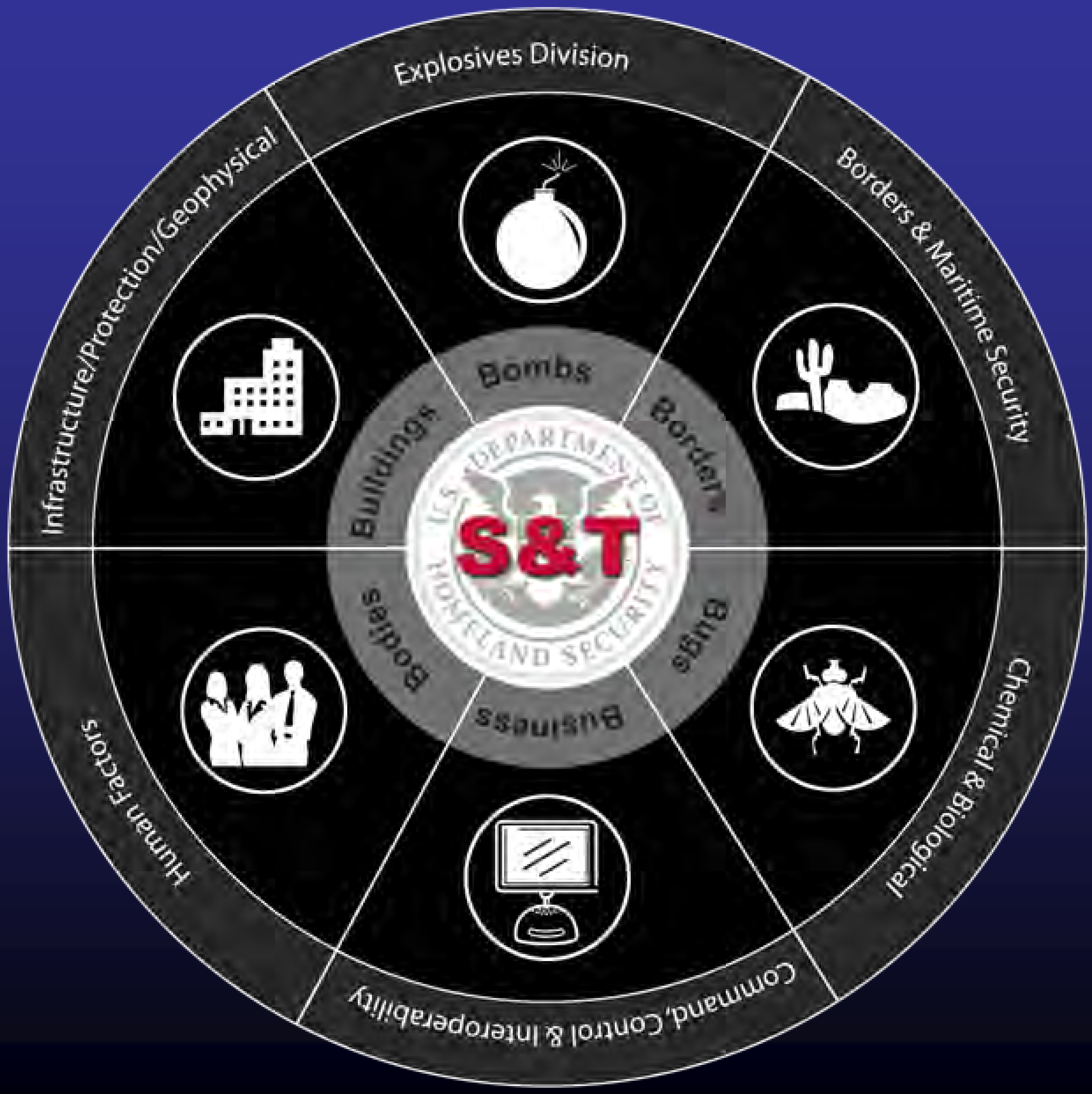
<u>Challenges</u>:

- Miniaturization
- Time to scan large surface areas when contaminant location is unknown
- Fluorescent surfaces

<u>Schedule:</u>

- FY06 - Project Initiation
- FY07 - Prototype developed
- FY09 - Engineering Development Model
- FY10 - Development, Test & Evaluation

S&T Division Alignment with the Six B's

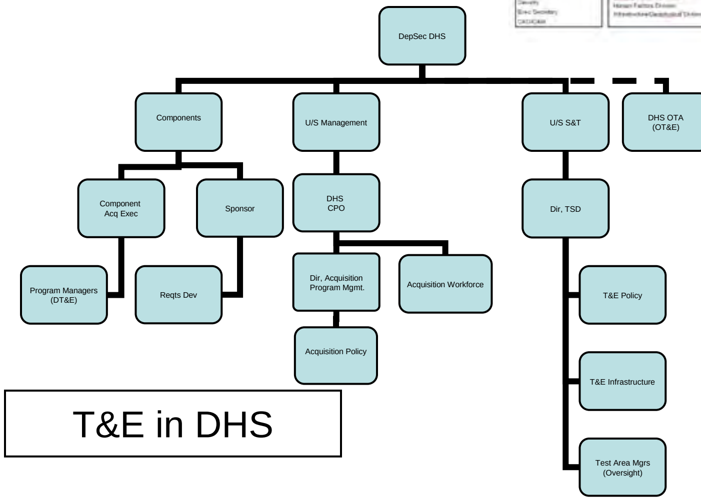


Test & Evaluation and Standards

- T&E and Standards organization coordinates and integrates all research, development, demonstration, testing, and evaluation activities of the Department
  - T&E – Policy, Modeling and Simulation, Infrastructure and Test Area Managers
  - Standards – Deputy for Standards, Standards Development Program Manager and Standards Policy
- DHS T&E Program Involvement
  - Transportation Worker Identification Credentialing, SBInet, Western Hemisphere Travel Initiative, S&T Integrated Product Team programs, National Incident Management System Support Center, Counter-MANPADS
  - Advanced Spectroscopic Portal Operational Test Authority
- S&T Office of Standards serves as Standards Executive for all of DHS

T&E Standards

Sec. 302 (12) coordinating and integrating all research, development, **demonstration**, testing, and evaluation activities of the Department



- T&E and Standards Organization established
  - T&E – Policy, M&S, Infrastructure and Test Area Managers
  - Standards – Deputy for Standards, Standards Development PM and Standards Policy
- T&E Policy – MD is being developed in alignment with updated MD 1400
- DHS T&E Program Involvement
  - TWIC, SBInet, WHTI, S&T IPT programs, NIMS SC, CounterManpads
  - ASP – OTA
- S&T Office of Standards serves as Standard Executive for all of DHS

- Supports development and adoption of relevant consensus standards for equipment, training and systems – for both DHS and grant recipients
- Leverages federal agency, standards development organizations and industry relationships
  - ANSI, INCITS, UL, IEEE, ASTM, NIST, DOJ, HHS, EPA, NIOSH
- TSD Councils
  - Standards Council – DHS wide standards needs/adoption
  - T&E Council – Policy IPT (policy and OTA development) and T&E Infrastructure (DHS Current Infrastructure and requirement then gaps)

Tech Solutions for First Responders

The Dazzler Wins TIME Magazine Award!


Law & Order

Blinded by the Light

The hunt for better non-lethal weaponry gained new urgency when several people died in recent years after being shocked by a Taser. The LED Incapacitator, funded by the Department of Homeland Security, is a novel alternative. When officers shine the flashlight-like device in a person's eyes, high-intensity LEDs, pulsating at varying rates, will make the suspect temporarily blind and dizzy.

Available: 2008

Homeland

TechSolutions Projects

Next Generation Breathing Apparatus

Ocular Scanning Nerve Agents/Toxic Gases

3-D Location

Biometric Identification

Fire Ground Compass

Carrizo Cane – Bio Agent

TechSolutions

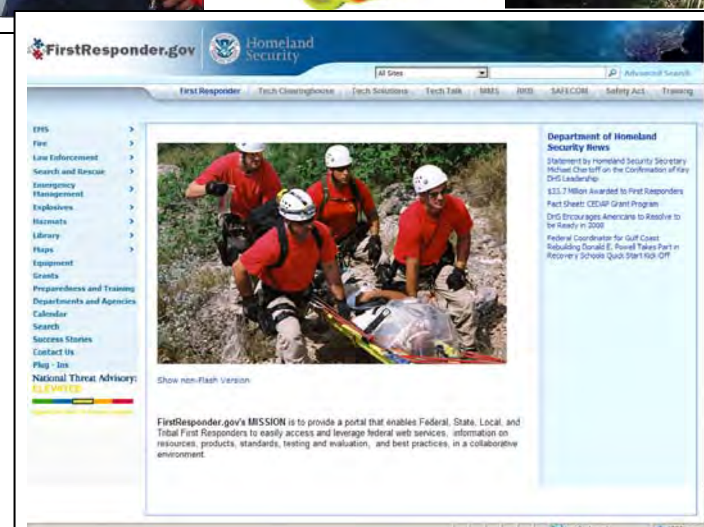
Mission: To rapidly address technology gaps identified by Federal, State, Local, and Tribal first responders

- Field prototypical solutions in 12 months
- Cost should be commensurate with proposal but less than $1M per project
- Solution should meet 80% of identified requirements
- Provide a mechanism for Emergency Responders to relay their capability gaps
- Capability gaps are gathered using a web site (www.dhs.gov/techsolutions)
- Gaps are addressed using existing technology, spiral development, and rapid prototyping
- Emergency Responders partner with DHS from start to finish

Rapid Technology Development

Target: Solutions Fielded within 1 year, at ~<$1M

Homeland Security



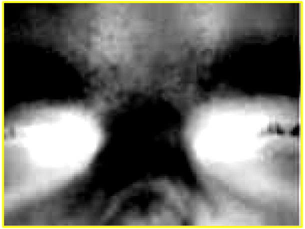
Homeland Security

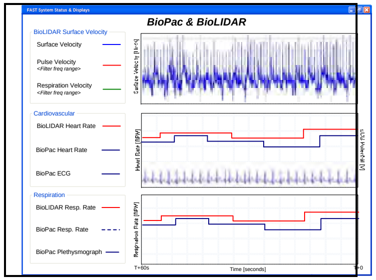
Putting HIPS to the Test

First in a Series of Technology Demonstrations

Demo of Sensors for Physiological Cues, Draper Laboratory, Cambridge, MA

- Purpose of Demo – To exhibit progress in sensor selection and validation of **physiological** cues in real time that may be indicative of a person who intends to do harm (Malintent Theory)
- Sensors measure various autonomic nervous system reaction and includes Cardiovascular and Electrodermal measurements
- Goal is to use a suite of sensors to increase the accuracy and validity of identifying people who may require additional screening.

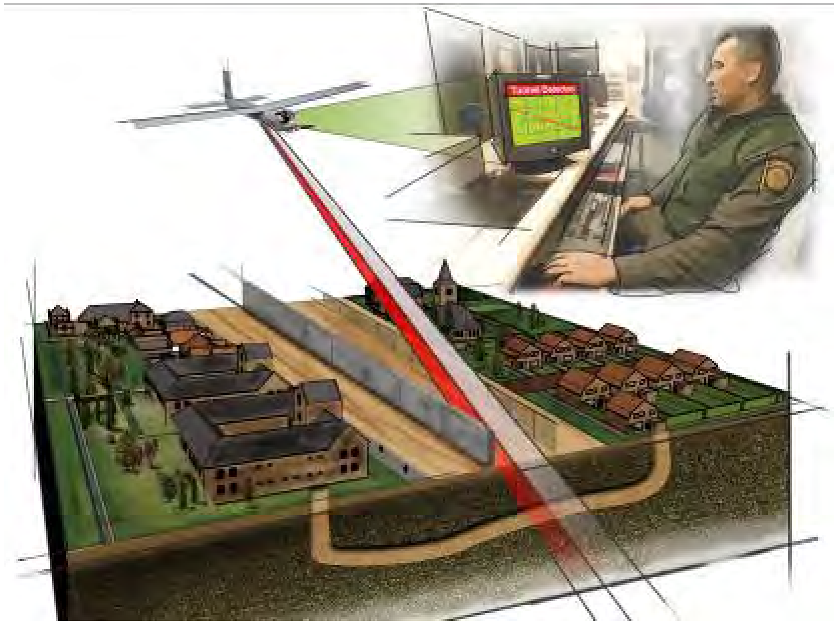




Putting HITS to the Test

Summer 2008 Series of Technology Demonstrations

Tunnel Detection Demo of UAV-Mounted Sensors



- Purpose of Demo – To demonstrate a tunnel detection capability from an Unmanned Aerial Vehicle
- To be carried out on a simulated border tunnel in soil conditions similar to those found at the Southwest border
- Part of a larger effort to demonstrate a game changing approach to the detection of tunnels that ranges from wide-area surveillance to more sensitive ground validation and long-term deterrence

DHS S&T Laboratories

Environmental Measurements Laboratory

National Biodefense Analysis and Countermeasures Center (NBACC)

Transportation Security Laboratory

Plum Island Animal Disease Center

… DHS S&T has four labs and access to 10 DOE National Labs

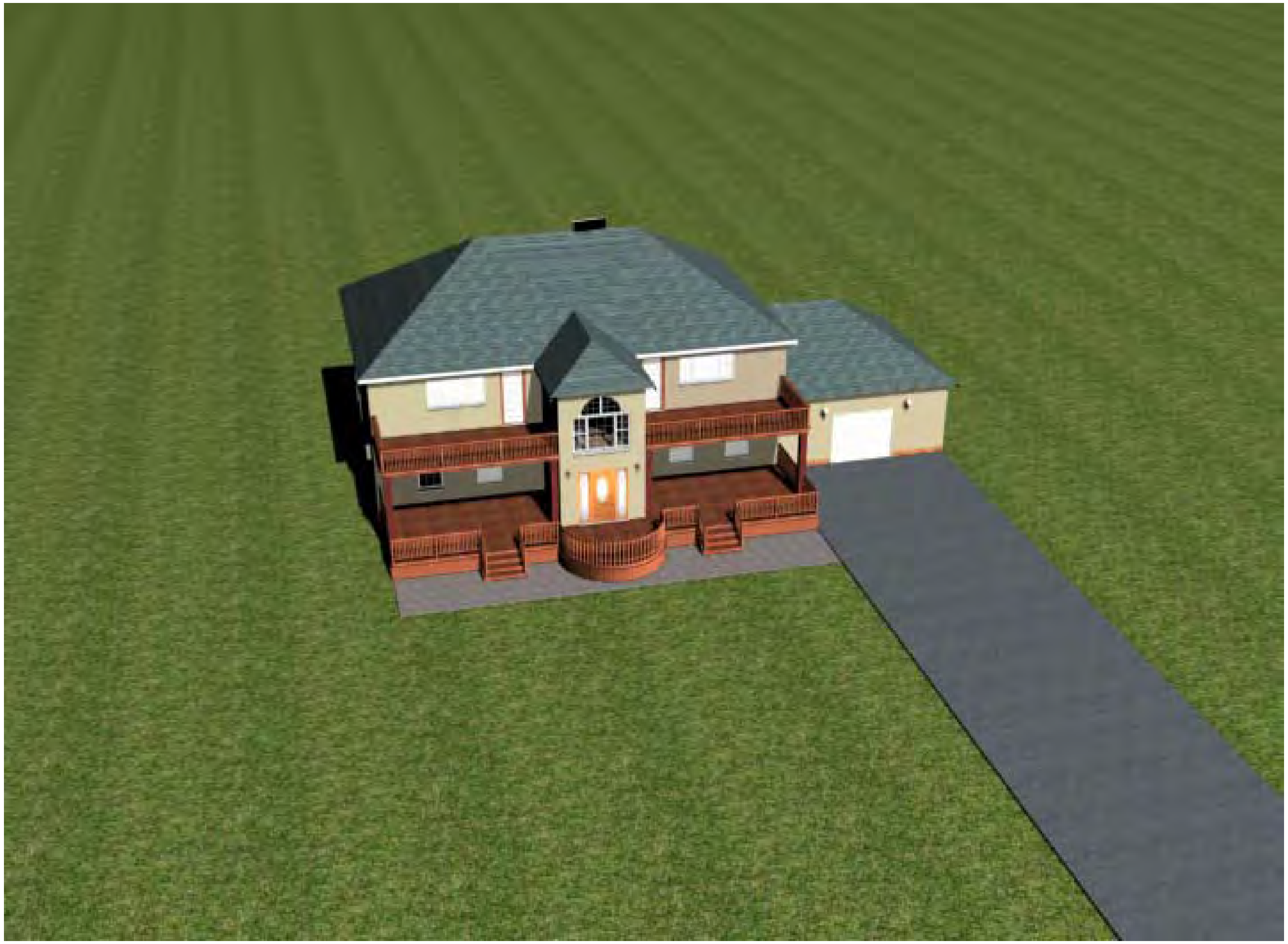
Homeland Security

SAFE

Secure Against Fires and Embers

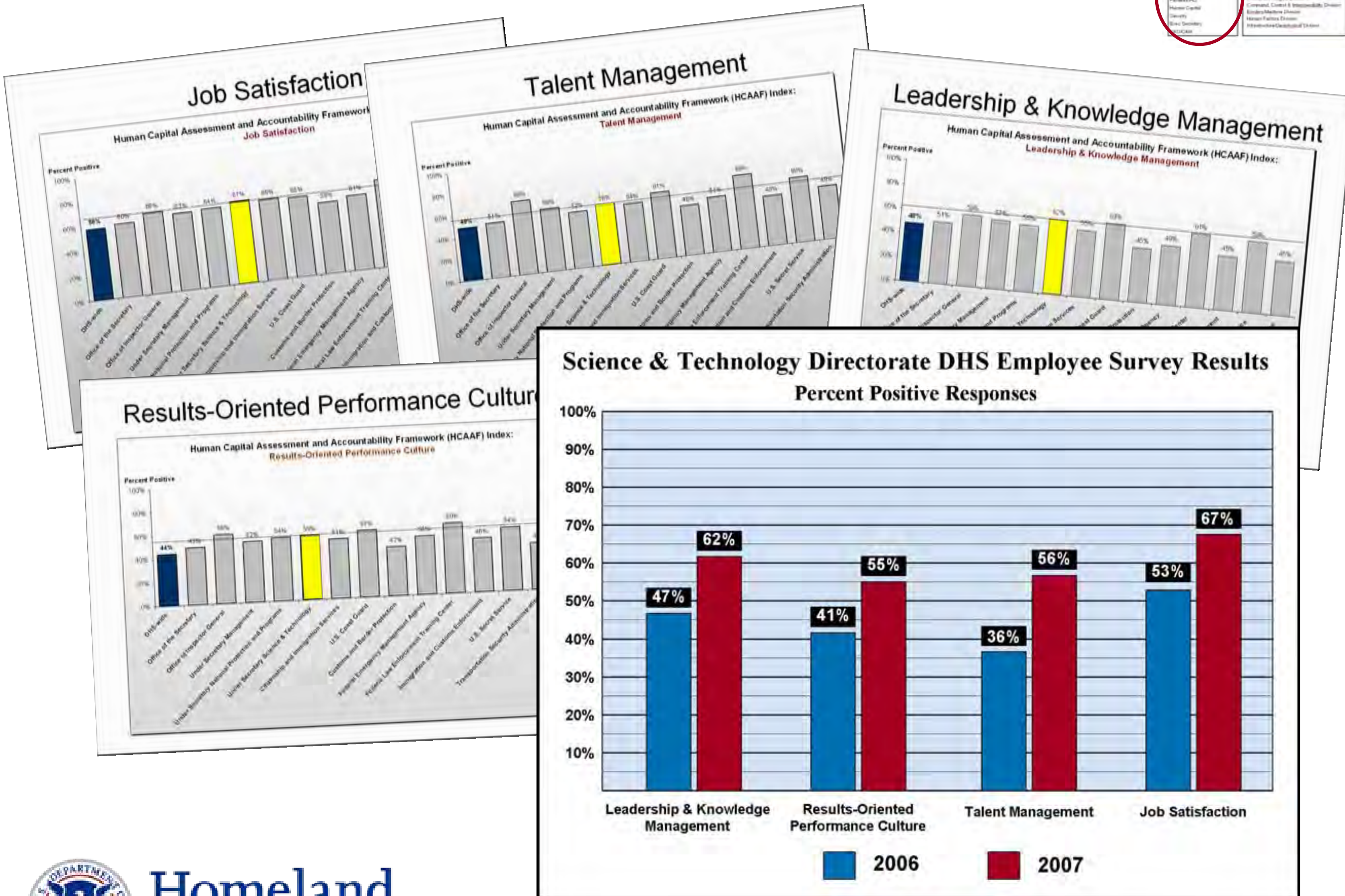
Homeland Security

Homeland Security



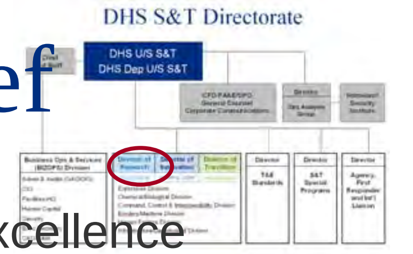
Homeland Security

Getting the People Right



Homeland Security

DHS University Programs in Brief



- 13 Homeland Security Centers of Excellence aligned with six DHS S&T divisions
- Nearly 160 U.S. colleges and universities, including several Minority Serving Institutions (MSIs)
- Nearly 30 other partners from laboratories, private industry and think tanks
- HS-STEM career development grants to institutions; pilot programs for middle and high school STEM education
- New scholarships and fellowships in 16 research areas
- Naval Postgraduate School Ph.D. program in homeland security
- Scientific leadership grants, workshops and summer research teams at Centers of Excellence for MSIs

National Bio and Agro-Defense Facility (NBAF)

- Proposed replacement for the Plum Island (PIADC) facility
- Provides needed BSL 3/4 livestock research capability to protect from foreign animal and zoonotic diseases
- Provides research for countermeasure and vaccines development
- Diagnostics and response
- Coordination with USDA
- Feasibility Study = 500,000 sf

- **Environmental Assessment Process for Six Sites**
  - Athens, Georgia
  - Manhattan, Kansas
  - Flora, Mississippi
  - Plum Island, New York
  - Butner, North Carolina
  - San Antonio, Texas

Development Schedule

Select Site: Oct 2008
Detailed Design: Jan 2009
Start Construction: 2010
Facility Operational: 2015

Homeland Security

Getting the Books Right

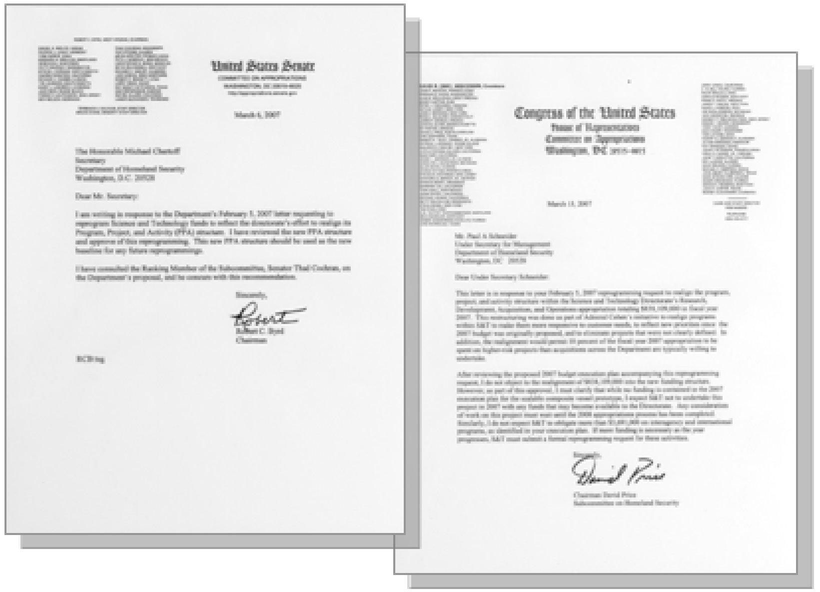
"This component {DHS S&T} is a rudderless ship without a clear way to get back on course."
– FY 2007 Senate Appropriations Report

Established 'One Set of Books'

Consolidated all financial functions under the S&T CFO

Produced the first S&T 5-Year R&D Plan

Established detailed Spend Plans and Performance Metrics


United States Senate

Congress of the United States
House of Representatives
Committee on Appropriations

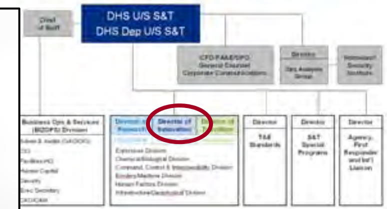
Congress Approves FY 07 OMNIBUS S&T Realignment ($839M– March 2007

"The Committee is pleased with the rapid progress S&T appears to be making toward resolving past deficiencies."
– FY 2008 Senate Appropriations Report

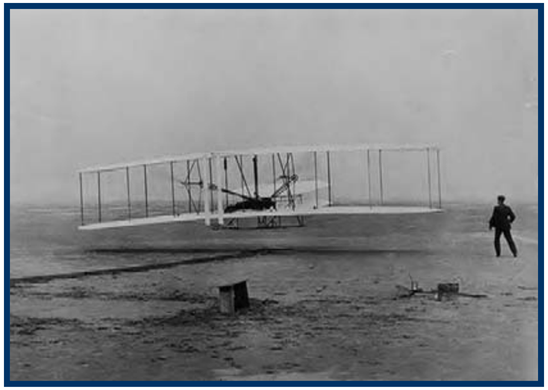
Homeland Security

KNOW **Risk**
KNOW **Reward**

DHS S&T Directorate



Robert Goddard & First Liquid-Fueled Rocket



The Wright Brothers First Flight

Boeing 787 Dreamliner

NASA Goddard Rocket Launch

First Man on Moon

Homeland Security

Way Ahead - Transition

- T&E – DNDO (ASP) OPEVAL OCT 08
- National Bio- and Agro-Defense Facility (NBAF) selection NOV 08
- National Biodefense and Analysis Countermeasures Center (NBACC) dedication OCT 08
- Chemical Security Analysis Center (CSAC) NOV 08
- PEO – Counter-IED Program (HSPD 19)
- Cyber Security Research (HSPD 23)
- Interoperability Technology and Governance Initiatives

Bottom line – "Transition is……..Cohen 'who'?……."

Homeland Security

Welcome to Pacific Fleet

Commander

United States Pacific Fleet

Vision

A credibly led, combat-ready and surge-ready Fleet prepared in peace, crisis or war to advance Asia-Pacific regional security and prosperity through cooperation with common-purpose navies, by responding rapidly to crises, by deterring, or by defeating threats to security through decisive naval, joint, and combined operations.

Mission

U.S. Pacific Fleet advances Asia-Pacific regional security and prosperity by employing credibly led, combat-ready forces in naval, joint and combined operations in support of U.S. Pacific Command.

Guiding Principles

Credible Leadership. Warfighting Focus. Naval, Joint and Combined. Aligned.

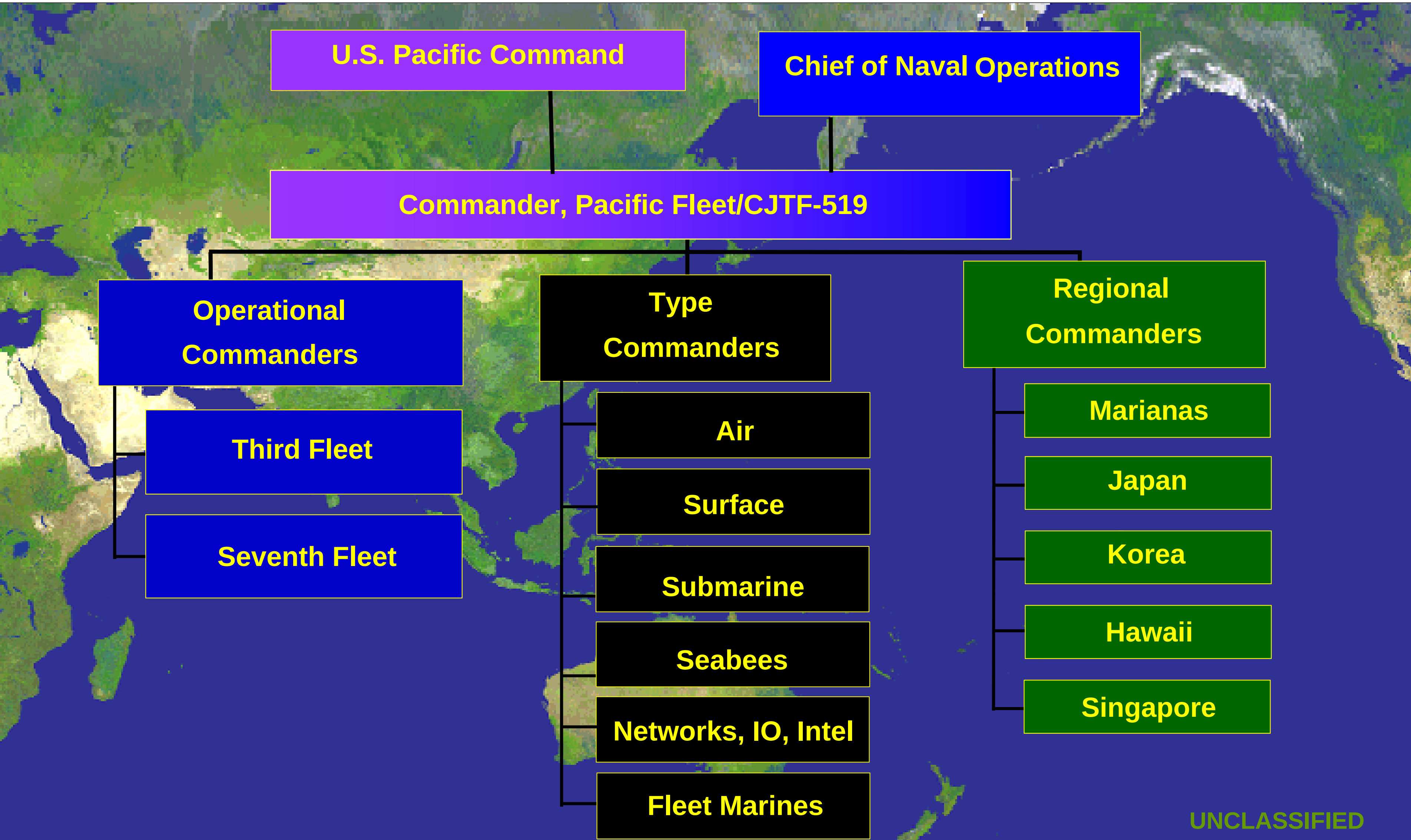
Pacific Fleet Priorities

Strengthen Warfighting Readiness.
Advance Regional Maritime Relationships.
Posture Forces for Agile Response.

The U.S. Pacific Fleet

- 76 USN Ships
- 34 Submarines
- 62 MSC Ships
- 1,296 Aircraft
- 91,528 Navy Personnel
- 93,000 Marines
- 9,724 Reserves
- 18,463 Civilians

U.S. Pacific Fleet Organization



Type Commanders

Air

Surface

Submarine

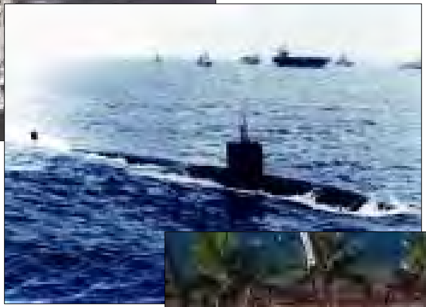
Seabees

Networks, IO, Intel

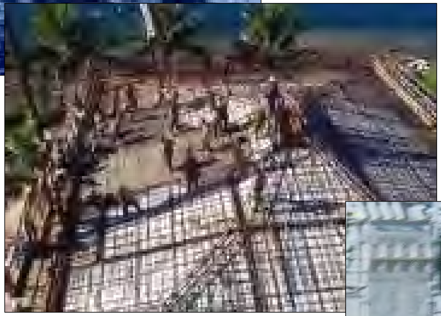
Fleet Marines

1296 Aircraft

76 USN/ 62 MSC Ships



34 Submarines



2,301 Seabees

80,748 Fleet Marines

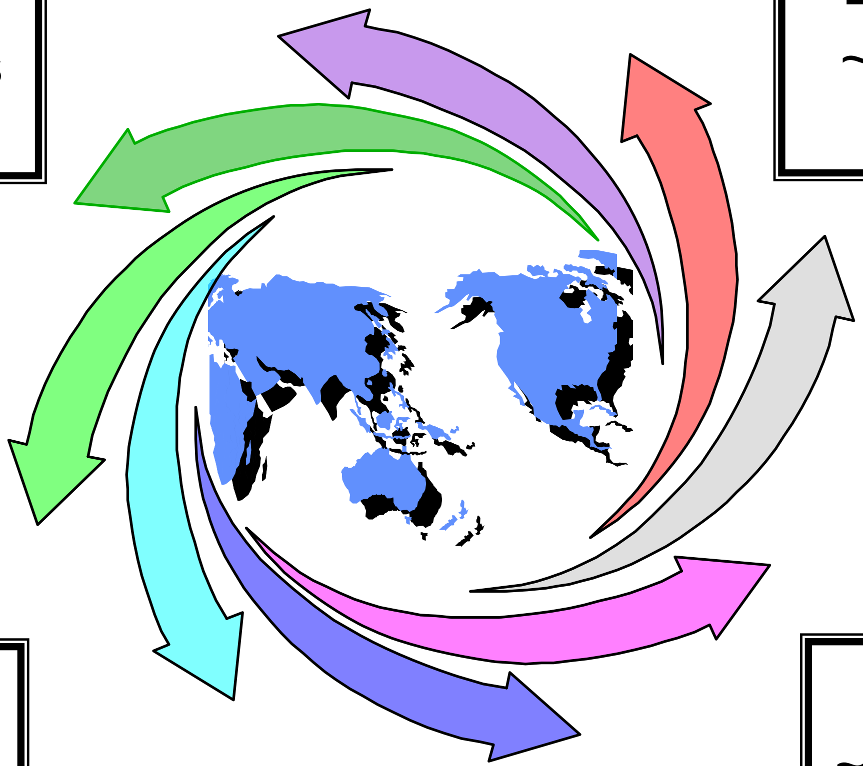
"The Pacific Century"

Geography

~ ½ of the earth's surface

Demographics

~ 56% of world's population



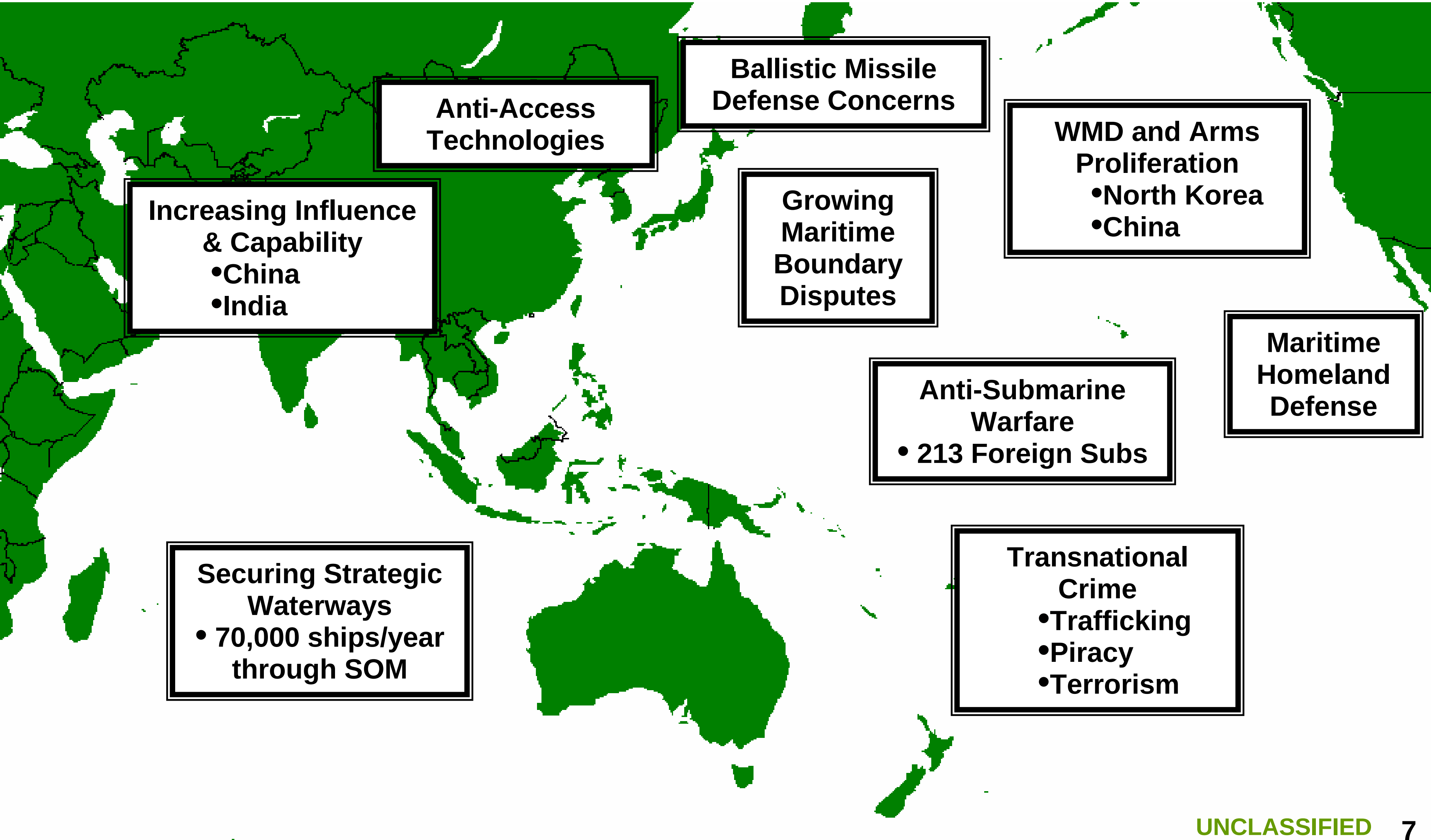
Economics

~ 33% of U.S. two-way trade

Security

~ Six largest military forces in the world

Strategic Environment



PACFLT Priorities

Guiding Principles

Credible Leadership
Warfighting Focus
Naval, Joint and Combined Aligned

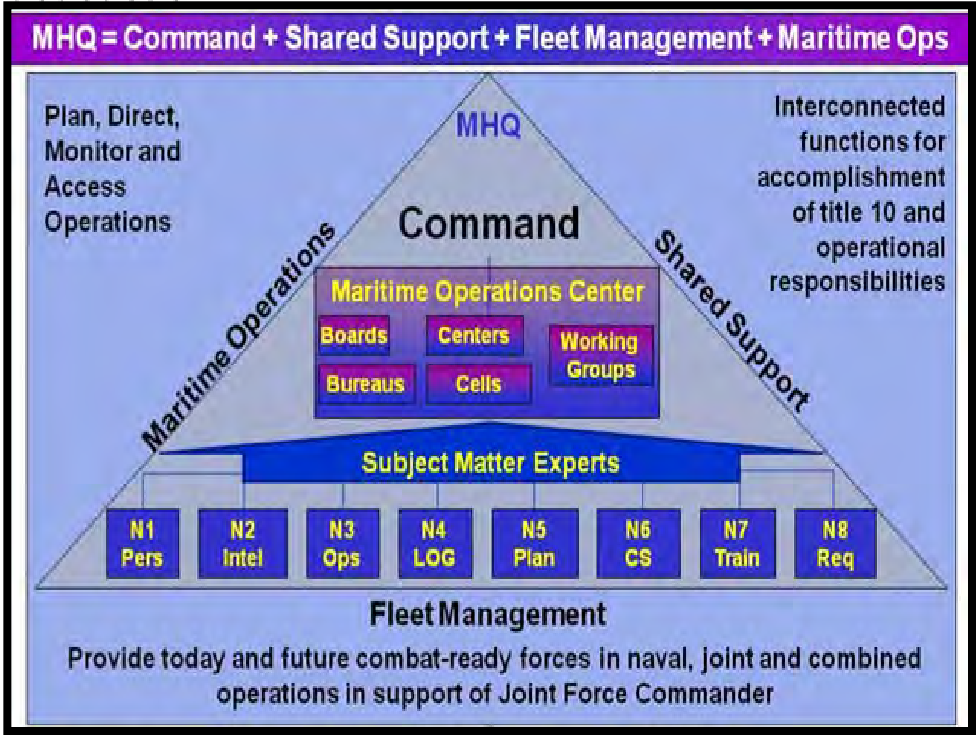
Strengthen Warfighting Readiness

Advance Regional Maritime Relationships

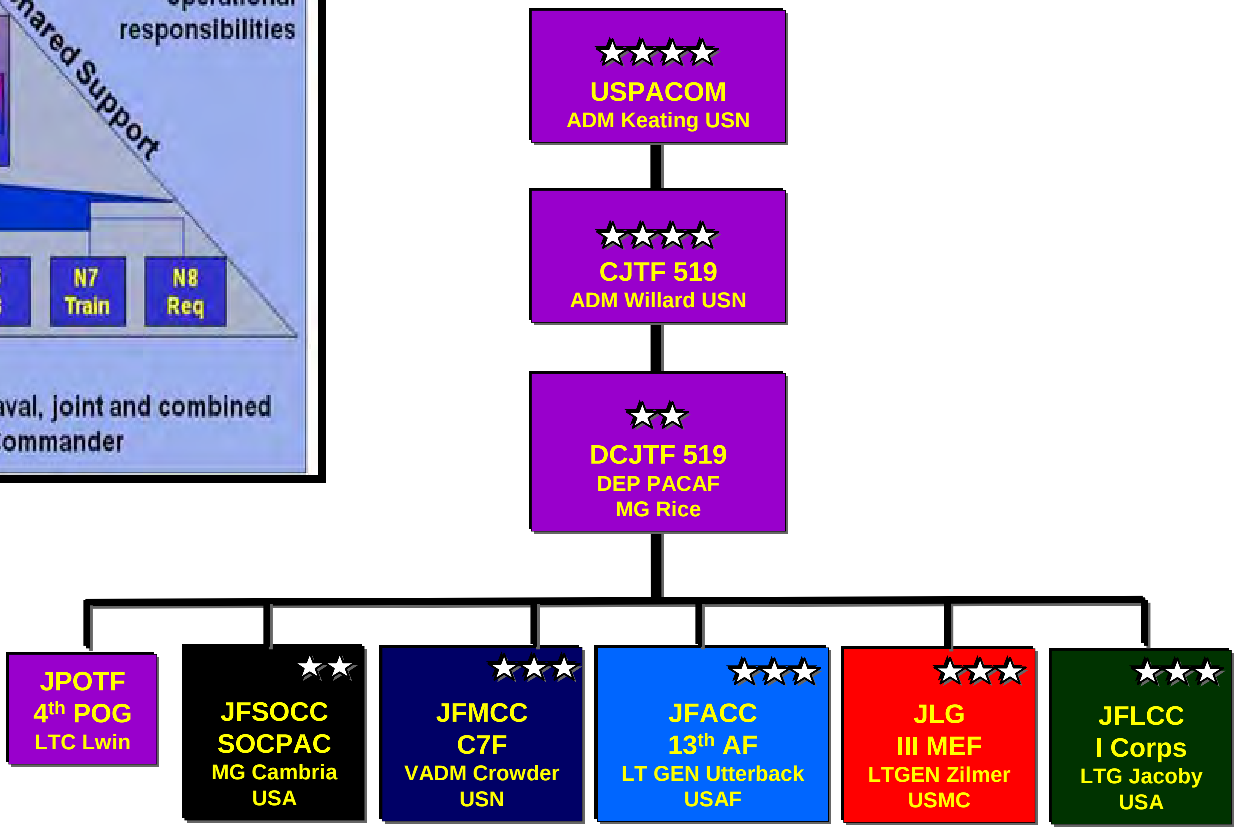
Posture Forces for Agile Response

Strengthen Warfighting Readiness

CPF MHQ with MOC – JTF 519



- **Only 4-star led JTF in PACOM**
- **Truly joint construct**



- **People**
- **Process**
- **Infrastructure**

Technology Interest Areas

ASW capabilities
-ASW Wide area cueing (UDNS)
-ASW Weapon Techologies
-Torpedo Defense
-ASW Synthetic Training

Networking Technologies
-Information sharing/ Multi-level security
-Alternative COMMS (SATCOM Vulnerability)

Electronic Warfare
-Counter IADS/ Counter ASCM
-Counter ISR
-Information Operations

Technology Interest Areas

Timely Intel reporting

-Red Situational Awareness

-Sense, Share Analyze, Report

-Operational Level Command and Control

MIW capabilities

-Rapid detection and avoidance

Surface Warfare

-Improved Anti-Ship Cruise Missile

-Persistant ISR/ OTH-T

Marine Mammals

-Mitigation Technologies

-Mammal behavioral science

Questions?

Preparing for the 21st Century: Militarily and Industrially

The Honorable Jacques S. Gansler*
Professor and Roger C. Lipitz Chair
Center for Public Policy and Private Enterprise
School of Public Policy
University of Maryland

Dr. Gansler served as Under Secretary of Defense (Acquisition, Technology, and Logistics), 1997-2001

The Challenge

Adapting the Forces (people and equipment) for the 21st Century Security world in the presence of a likely declining national security budget

- Focus on new and expanded missions (including homeland)
- Create the capability to analyze the alternatives at the portfolio level
- Exploit new technologies and systems-of-systems
- Prepare for joint and coalition operations
- Reequip after Iraq (with 21st Century systems, in sufficient quantities)
- Recognize and integrate the role of contractors in expeditionary operations

Changes Driving Security Transformation

Holistic View of Security – World-wide terrorism; pandemics; weapons proliferation; rogue nuclear states; energy dependence; insurgencies; environment; mass migration; regional conflicts; transnational threats; resource access (i.e., water, critical materials); political/military (vs. military only)

New Missions – Homeland security; missile defense; counterinsurgency; stability and reconstruction; civilian cybersecurity; non-kinetic situational influence of operations

Unpredictability – Requiring agility, rapid responsiveness, broad-based capability

Defense Budget Changes – From Equipment to Personnel, O&M and Homeland Security; frequent changes cloud spending outlook and planning (e.g., 50% procurement drop in 1990s, then doubling in 2000s)

Technological Changes – Info. tech, biotech, nano-tech, robotics, high-energy lasers, etc. - - and every warfighter and platform a "node" in a system-of-systems

Warfighting Changes – Net-centric Warfare; Asymmetric warfare (bio, cyber, IEDs); Systems-of-Systems; Joint and coalition operations; evolving doctrine requiring frontline decision-making

Intelligence Changes – Integrated data; open-sources; Language and cultural understanding; real-time intel flow between soldier/sensors and command structure

Industrial Changes – Horizontal & vertical integration; commercial high-tech advances; open networked innovation; off-shore manufacturing; changing capital markets

Globalization – Technology and industry are globalized; geo-politics and scope of threats requires security coalitions; DoD no longer the leader in all military technologies; global financial markets enable borderless investing

Isolationist/Protectionist Constraints – "Buy-American"; Berry Amendment; ITAR, export controls; restrictions on foreign scholars, students, and S&T workers

China – Future adversary, Economic Competitor, or Global "Partner"

Russia – Resurgent (with oil and gas money)

Domestic Economics – Health care; demographics; budget and trade deficit

Government Workforce – Aging; wrong skill mix; rules vs. judgment; "managers" vs. "doers"; difficult to attract and retain top people

Industry Workforce – Aging, eroded systems engineering skills; difficult to attract and retain top S&T people

Recent Congressional Reaction to "Scandals" – Personal abuses (Druyun, Cunningham, Abramoff); sole-source "abuses" (leading to risk averse behavior); over 90 fraud cases in current conflict

Four Key Findings from a Recent Defense Science Board Report

DoD policies, processes, and management of the Defense Acquisition Enterprise (broadly defined) impede the transition to an effective, agile, and affordable overall, joint military force for the 21st Century.

U.S. Government policies, practices, and processes do not facilitate the development, deployment, and support of the innovative, affordable, and rapidly acquired weapons, systems, and services needed for the 21st Century forces.

The absence of many of the needed skills, (e.g., systems engineering, biotech, advanced IT) in DoD's acquisition workforce, combined with the retirement of a large share and significant overall acquisition workforce reductions, significantly impedes the development, production, support, and oversight of the military capabilities needed for the 21st Century.

Government acquisition policies and Industry trends (e.g., further horizontal and vertical consolidations) will not produce the required competitive, responsive, efficient and innovative National Security Industrial Base.

Assumptions for the 21st Century

1. Our Security needs will continue to change and be difficult to predict
2. Defense dollars will likely decline in real terms and significant supplementals will no longer be the norm
3. Technology will continue to change rapidly and will be increasingly global
4. There will be significant shifts in resource allocations (e.g., toward net-centric systems-of-systems, toward intel, and unmanned systems; toward homeland security, etc.)

This is a Critical Period

- Similar to the period following the launch of Sputnik or the fall of the Berlin Wall
- Today the security world is changing dramatically—especially since 9/11/01 (geopolitically, technologically, threats, missions, warfighting, commercially, etc.) – and a holistic perspective is required (including DHS and DNI, as well as coalition operations)
- Moreover, a decade of solid budget growth – which will almost certainly change – has deferred difficult choices (between more 20th Century equipment vs. 21st Century equipment)
- However, the controlling acquisition policies, practices, laws, etc. and the Services' budgets and "requirements" priorities <u>have not been transformed</u> sufficiently to match the needs of this new world (in fact, there is still an emphasis on "resetting" vs. "modernization")
- The last two decades have seen a <u>consolidation</u> of the Defense Industry around 20th Century needs - The next step is DoD leadership in <u>transforming</u> to a 21st Century National Security Industrial Structure.

FINDING 1: DoD Must Drive Transformation to a 21st Century Military

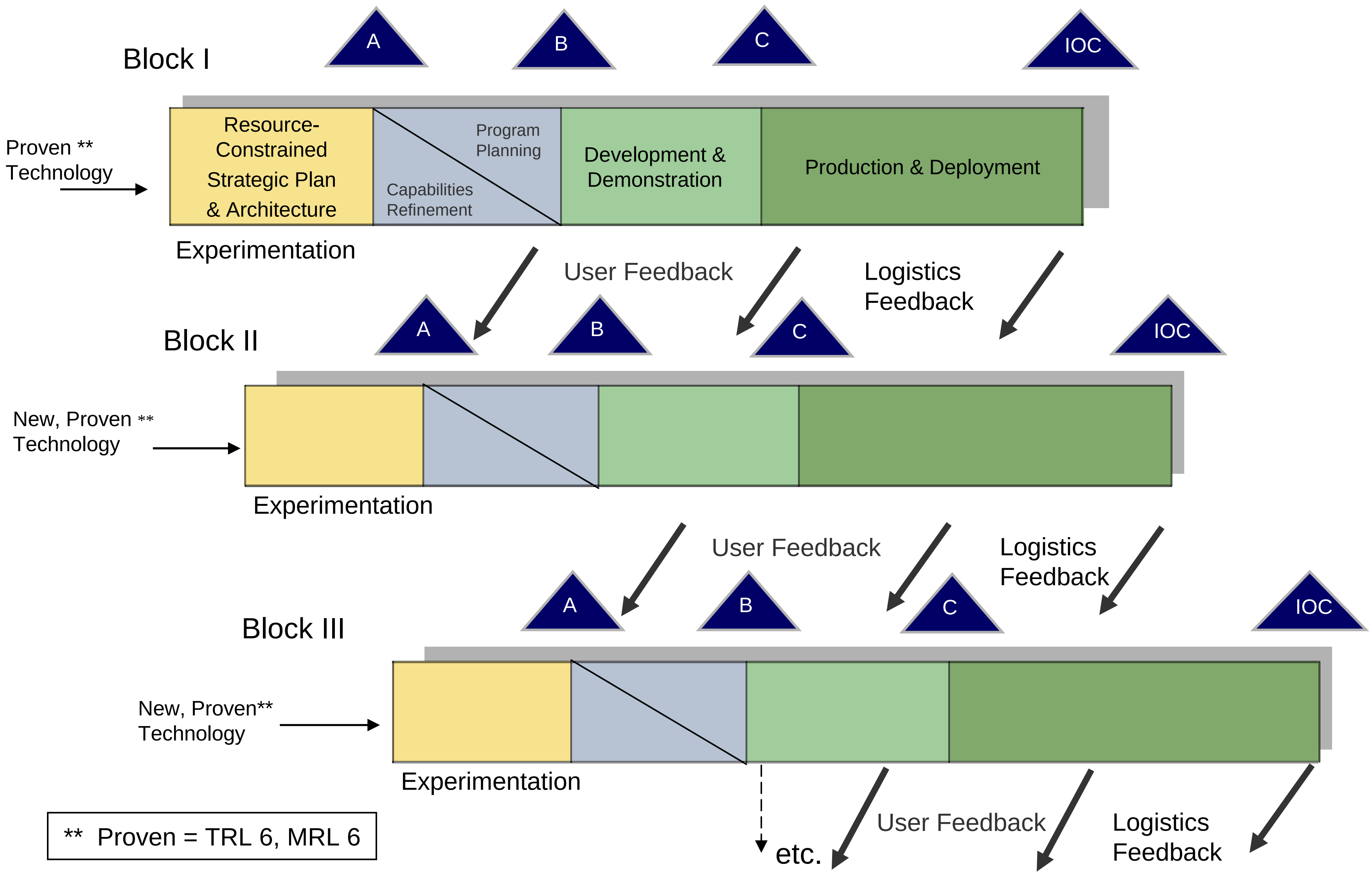
Recommendations: Responses to Findings

1. Focus (“requirements” and resources) on joint, interoperable, Net-Centric Systems-of-Systems (with independent “architects” and enhanced government management and engineering capability).

2. Train as we fight: Recognize the political-military nature of future conflicts (and the role of the State Dept.), and recognize the role of contractors on the “battlefield.”

3. Achieve lower costs and faster-to-field capabilities, while still achieving better performance. (Make costs and schedules “requirements”; and fully utilize “spiral development.”)

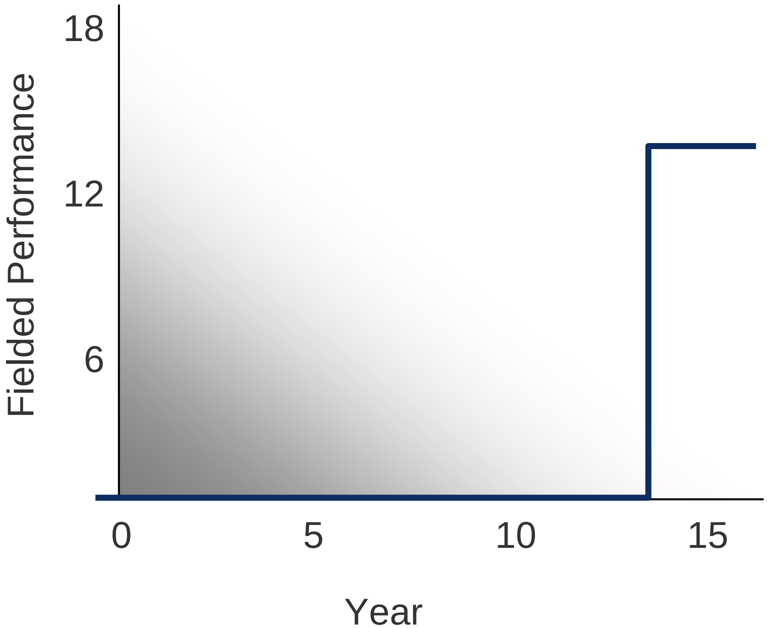
Spiral Development



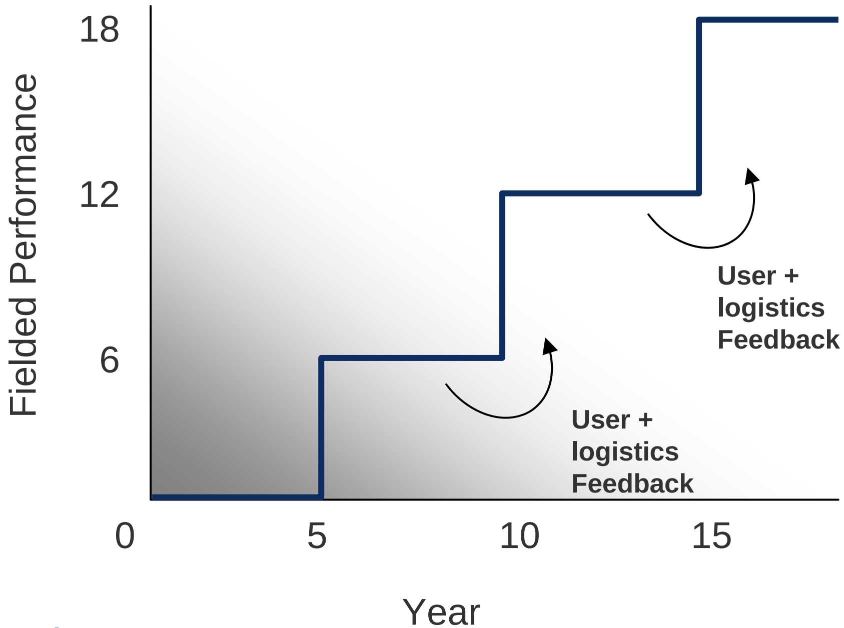
** Proven = TRL 6, MRL 6

Near-Term Fielded Capability

CLASSICAL "BIG BANG" PROCESS



RECOMMENDED (SPIRAL) PROCESS



- **1/3 Less Cost**
- **Less Risk (technical, schedule, cost)**
- **Provide fielded capabilities earlier**
- **Greatly reduces technological obsolescence**
- **Allows for a more robust and competitive industrial structure**

Recommendations: Responses to Findings

4. Focus on "staying ahead", by adequately funding "Engines of Innovation."
5. Understand and realize the benefits of globalization. (Requires changes in ITAR, EAR, etc.)
6. Achieve far greater use of "best value" competitions and foster long-term competitive dynamics. (Reward industry for higher performance at lower costs)
7. Transform the DoD logistics system to a modern, world-class, Information-Based, Data-Centric Logistics System.

Examples of Performance Based Logistics Availability and Response Time

	Material Availability*		Logistics Response Time**	
Navy Program	**Pre-PBL**	**Post-PBL**	**Pre-PBL**	**Post-PBL**
F-14 LANTIRN 	73%	90%	56.9 Days	5 Days
H-60 Avionics 	71%	85%	52.7 Days	8 Days
F/A-18 Stores Mgmt System 	65%	98%	42.6 Days	2 Days CONUS 7 Days OCONUS
 Tires	81%	98%	28.9 Days	2 Days CONUS 4 Days OCONUS
 APU	65%	90%	35 Days	6.5 Days

*Klevan, Paul, NAVICP, UID Program Manager Workshop Briefing, 5 May 2005

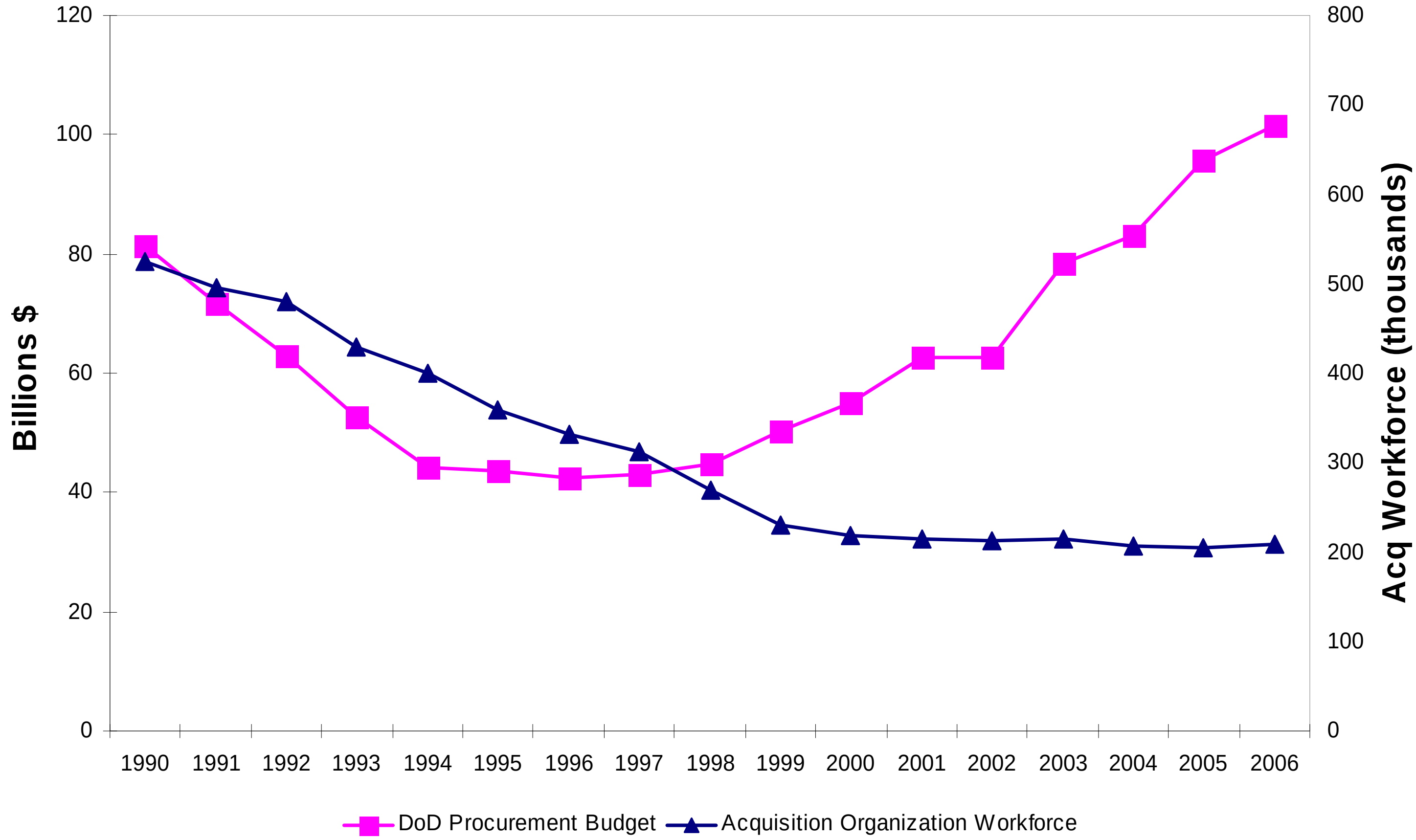
**Kratz, Lou, OSD, Status Report, NDIA Logistics Conference Briefing, 2 Mar 2004

FINDING 3: Weakened DoD workforce impedes the acquisition of military capability and government oversight

Recommendations: Responses to Findings

8. Move aggressively to strengthen the future high-quality, high skill, Government Acquisition Workforce. (Follow recommendations of Oct. 31, 2007 Commission Report)

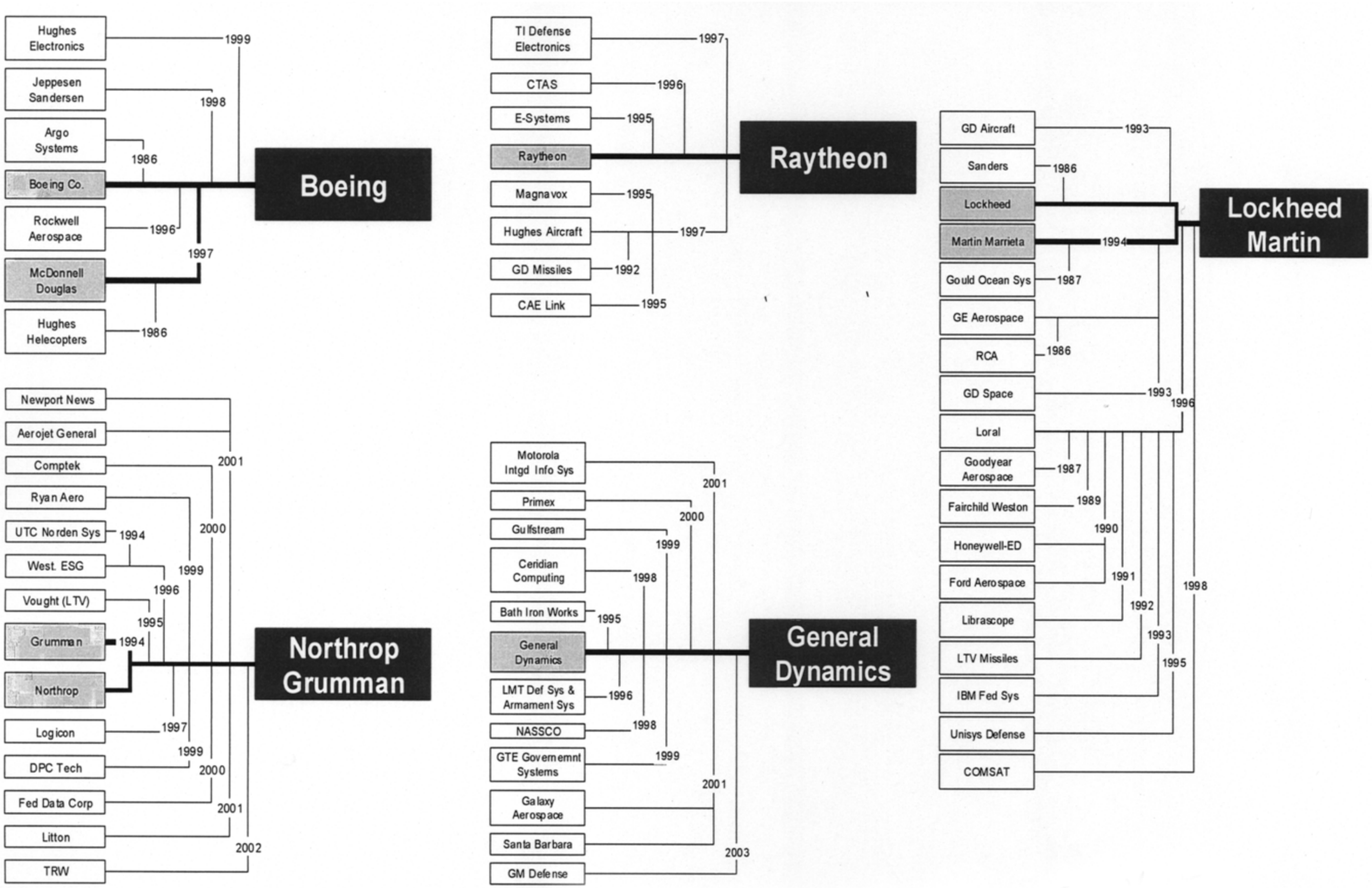
Overall Acquisition Workforce Declined Even as Procurement Budgets Increased



Source of workforce data: DoD IG Report D-2000-088 Feb 29, 2000 & DoD IG Report D-2006-073 April 17, 2006

Source of budget data: Annual Defense Reports, available at http://www.dod.mil/execsec/adr_intro.html. Procurement supplementals for FY2005 and FY2006 not yet reflected in Annual Defense Reports were obtained from Congressional Research Service Reports.

During Budget Decline (and subsequently): Defense Industry Consolidations



FINDING 4: Current trends/policies will not result in an effective industrial base

Recommendations: Responses to Findings

9. Articulate a National Security Industrial Vision; adopt government policies to implement the Vision; structure incentives for industry to achieve the Vision; and monitor ongoing industrial dynamics (from M&As through Program decisions) to ensure its realization.

10. Remove the barriers to commercial and global technologies and products. (e.g., Modernize ITAR, EAR, etc.)

Summary

- Future military operations are likely to be:
  - Expeditionary
  - Joint
  - Irregular
  - Coalition
  - Political/Military

- Future Defense Budgets are likely to be smaller (and without large supplementals).
- Significant changes in military and industry are required, but they can be expected to be fiercely resisted.

Strong leadership (military and political) is required to successfully achieve the needed changes.

This must be a high and continuing priority, or it will not happen!

Coalition Warfare Program

briefing to

PACOM Operational S&T Conference

Colonel Kathleen Hithe, USAF
Deputy Director, Coalition Warfare Program
OUSD(AT&L)/International Cooperation

July 2008

Overview

The Coalition Warfare Program (CWP):

Enables:

- Cooperative international research and development
- More effective operation of U.S. and friendly armed forces across the full spectrum of multinational operations.

By:

- Soliciting nominations on an annual basis for projects from COCOMs, Services, Defense Agencies, OSD staff, or other government sponsors
- Awarding seed money for collaborative R&D projects with foreign partners to selected projects
  - $200k-$700k per year for 2 years
  - Equitable financial or non-financial commitment from foreign partner

History and Funding

- Coalition Warfare Program was formally instituted within OUSD(AT&L)/International Cooperation in Fiscal Year 2000
  - Evolved from “NATO Cooperative Research and Development” (“Nunn funds”)
- FY08 budget increase, anticipated increase in FY09
  - Increase a result of PBD 709 (“Building Partnership Capacity”) during FY08-13 POM process

Fiscal Year	Budget ($M)	Proposals Received	New Starts
FY04	5.704	15	7
FY05	5.643	20	9
FY06	5.777	35	8
FY07	5.669	47	7
FY08	10.047	48	15
FY09	14.030 (in PBR)	67	15

Coalition Warfare Team

Under Secretary of Defense for Acquisition, Technology and Logistics
Mr. John Young

Director, International Cooperation
Mr. Al Volkman

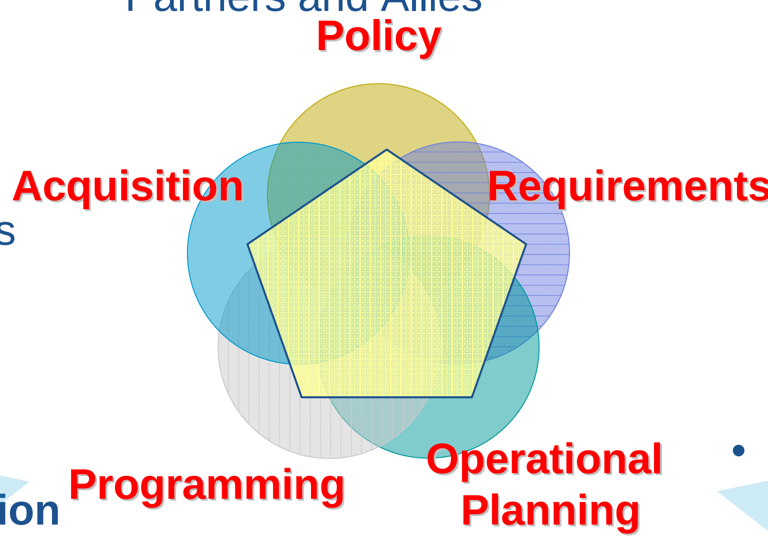
- **Director, International Negotiations** — Mr. Frank Kenlon
- **Director, Planning & Analysis** — Mr. Steve Austin
  - **Deputy Director, Coalition Warfare Program** — Col Kathy Hithe
    - **Ms. Merry Lutz (Contractor)** — Army, PACOM, SOUTHCOM, TRANSCOM
    - **Ms. Christa Cochran (Contractor)** — Air Force, EUCOM, NORTHCOM, STRATCOM
    - **Mr. John Noulis (Contractor)** — Navy, Marine Corps, AFRICOM, CENTCOM, JFCOM, SOCOM
- **Director, Pacific Armaments Cooperation** — Mr. Bruce Bade
- **Director, Armaments Cooperation Atlantic** — Col Mark Price (Acting)

Strategy-Driven Process

- **Provides impetus to fulfill coalition interoperability requirements**
- **Enables and guides use of best practices**
  - –Common standards and architectures
  - –Information exchanges
  - –International agreements
  - –Technology control

- **Responds to Strategic objectives**
  - –Implements QDR findings including Building Partnership Capacity
  - –Develops relationships with Partners and Allies

- **Addresses:**
  - –Objective and orphan coalition requirements
  - –Priority needs of the COCOMs
  - –Capability gaps identified with Partners and Allies



- **Promotes U.S. Service actions to include coalition requirements in POM**
- **Influences scope and timing of Partner and Allied investments in capabilities**

- **Supports regional security cooperation activities**
  - –Responds to COCOM lessons learned
  - –Supports the Global Defense Posture

Global Partnerships through CW Projects

CWP Proposal FY10 Timeline

31 Aug	"Call Memo" released	**Project Manager** identifies partners, begins work on necessary agreements
Sep	CWP Kickoff Conf	
16 Jan	Executive Summaries due	
27 Feb	Final Submissions due	**CW Team** consults Embassies, COCOMs, Services, and other SMEs to determine project viability and utility
Mar-May	Evaluation process	
Jun	"Results" memo released	
15 Sep	Fiscal documentation due	**PM** submits project plan, SOW to CWP
Oct-Feb	Funding disbursed	**CW Team** disburses funding, **PM** obligates
Oct 09-Sept 11	Project execution	**PM** submits monthly financial reports and quarterly progress reports

Initial CWP Proposal Requirements

Sponsors submit proposal abstracts with the following:

- Overview (abstract, objective, deliverable, jointness)
- Status of required elements of international projects
  - Disclosure/export control issues
  - International agreement
  - Engagement with project's foreign partners
  - Equitability
  - Benefits/Risks
- Description of product
  - RDT&E content
  - Demonstration and testing plan
  - Portability
  - Transition aim
  - Current and proposed technical maturity level
  - Metrics for success
- Financial Information
- Points of Contact

CWP Website and CWP Management Plan (with proposal format requirements): http://www.acq.osd.mil/ic/cwp.html

Evaluating a CWP Proposal

Does the proposal:

- ✓ **Show RDT&E content?**
- ✓ **Have a government sponsor?** COCOM support?
- ✓ **Show firm foreign commitment?** (Has the foreign partner agreed to equitable financial or non-financial contributions?)
- ✓ Show agreement from an IPO? (I.e., has an IPO looked at disclosure/ export control/international agreement issues?)
- ✓ Request funds commensurate with the proposal's scope?
- ✓ Identify a transition aim?
- ✓ Have practical metrics for success?
- ✓ Have congressional or high-level interest?

Will the project:

- ✓ **Benefit the Warfighter?**
- ✓ **Have a tangible outcome?**
- ✓ **Have any necessary international agreements in place in time to start?**
- ✓ Meet an identified U.S. mission need, COCOM shortfall or IPL, or a JROC-approved need?
- ✓ Have value to other COCOMs or Services?
- ✓ Provide a unique solution to a problem? (I.e., does it offer a solution different from other, similar products either in the U.S. or elsewhere?)

Project Management Responsibilities

- After a project is selected for funding, the project manager agrees to provide:
  - Refined spend plan and project plan
  - Monthly budget reporting
    - Funds execution metrics
  - Notification of major events and demonstrations
  - Quarterly program report
  - Final report of project completion

FY09 Portfolio: Funds Collaboration with 24 Foreign Partners

	Bilat.	Multilat.		Bilat.	Multilat.
UK	2	8	Turkey	0	1
Canada	3	4	Singapore	2	0
Australia	1	6	Japan	1	0
Italy	0	3	Argentina	0	1
France	1	3	Honduras	0	1
New Zealand	0	3	Chile	0	1
NATO	0	5	Panama	0	1
Germany	0	3	Sierra Leone	0	1
Sweden	0	2	Ghana	0	1
Norway	0	1	Israel	1	0
Bulgaria	0	1	Finland	0	1
Romania	0	1	Spain	0	1

Past PACOM AOR Project Examples

FY02-03: Coalition Wide Area Network

- Objective: To provide a secure, reliable WAN for coalition support to escort and maritime interdiction missions for Operation ENDURING FREEDOM. To enable PACOM Coalition Networking Initiative strategy & exploit Asia Pacific Network

FY02-03: Coalition Readiness Management System

- Objective: To provide U.S. and coalition forces interoperability training and combined mission rehearsal capability.

FY06-07: US/ROK Ground Battlefield Simulation Interoperability

- Objective: To achieve interoperability in ground combat simulation models as a first step toward enabling broader interoperability between the US family of battlefield simulation models and those being developed by KS

Ongoing PACOM Projects Examples

US-Singapore Unmanned Vehicle

Start: 2008

Sponsor: PACOM

Foreign Partner: Singapore

US Partner: US Navy

<u>Objective:</u> To develop and integrate a remotely operated small arms mount with two SPIKE missiles and .50 caliber gun onto the SPARTAN 7-meter RHIB; to expand operations for SPARTAN over-the-horizon by use of a Tactical Unmanned Air Vehicle.

<u>Deliverable:</u> An unmanned boat that integrates the a missile onto the SPARTAN Scout Rigid Hull Inflatable Boat.

New Start PACOM Projects Examples

Global Personnel Recovery System Pilot Implementation Project for New Zealand and Australia-GPRS

Start: 2009

Sponsor: JFCOM Foreign Partner: Australia, New Zealand

US Partner: PACOM

Objective: To demonstrate ability of GPRS to quickly identify, accurately locate, and communicate with warfighters conducting combat operations.

Deliverable: Implementation plan and associated documentation (CONOPS, TTP, etc) at the completion of the military utility assessment.

FY09 New Selections

Funding 15 new start projects in FY09 in two tiers (COALWNW project (JTRS JPEO) pre-approved in previous selection process.) **Tier 2 projects will be funded if DoD Appropriations Bill funds CWP PE at requested level.**

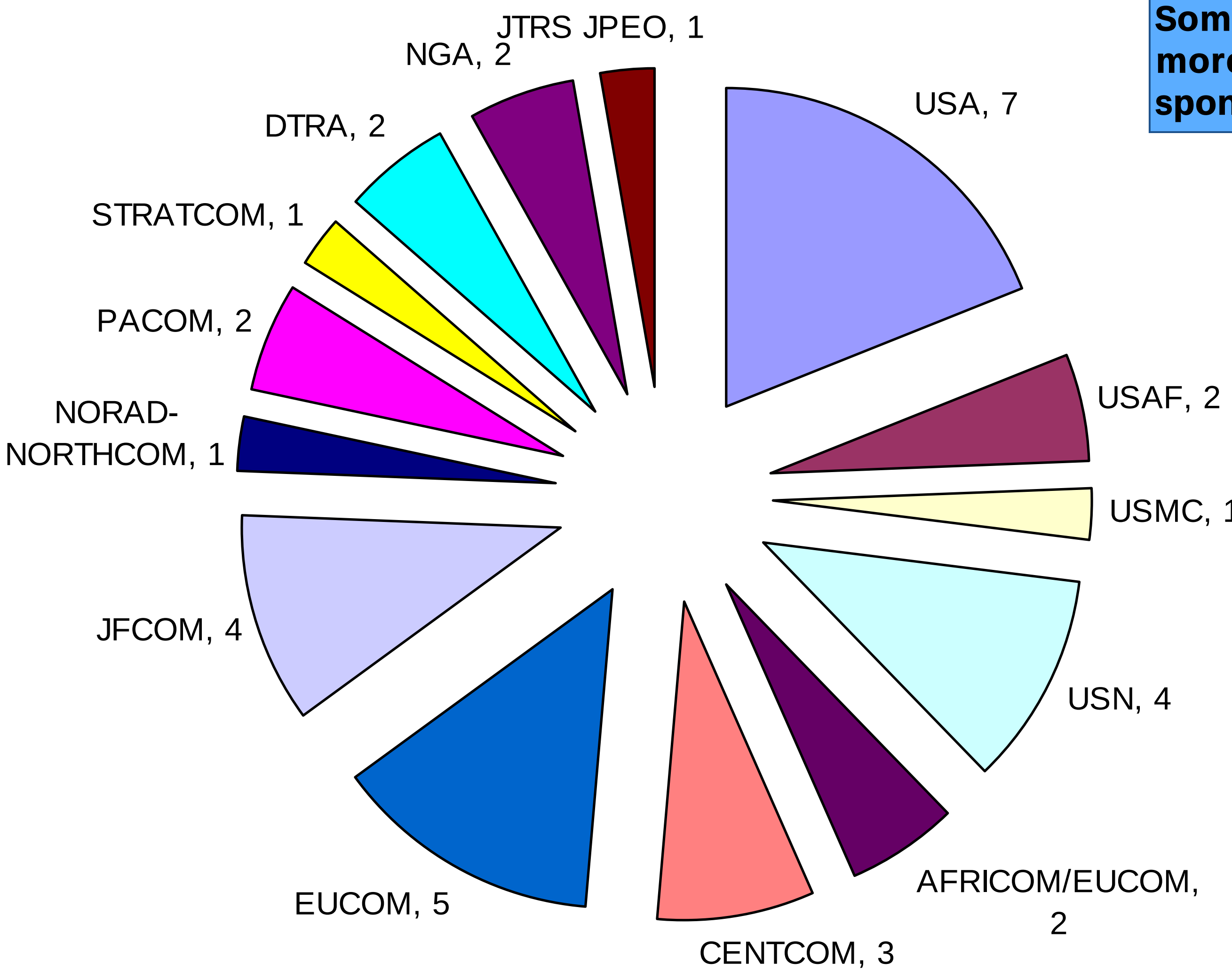
Tier 1:

- The Web Service for All-source Releasability and Dissemination (OUSD (USD(I)), NGA)
- Service Oriented Architecture Development for C2 Gap Filler Block 1 (NORAD-NORTHCOM)
- FBCB2/SIR Interoperability Solution (US Army)
- Pathogen Analysis in West Africa (US Navy)
- Global Personnel Recovery System Pilot Implementation Project for New Zealand and Australia (JFCOM)
- Service-Oriented Architecture Foundation Text-to-Text Machine Translation Services (US Army)
- Passive and Active Detection of Special Nuclear Material (DTRA)

Tier 2:

- Ultra High Performance Concrete Material Properties Characterization (DTRA)
- ADNS Coalition Network Interoperability (US Navy)
- International Recognition of Combat Vehicles (US Army)
- Common Ground (US Army)
- GPS Multinational Receiver Core Development (US Air Force)
- Maritime Domain Awareness Offshore West Africa (US Navy)
- ITA Sensor & Policy Software Tools and Protocols for Networking of Disparate ISR Assets (US Army)

FY 09 New Start Sponsors and Partners



Some projects have more than one sponsor/partner

Wrap-up:
Benefits of Coalition Warfare Program

- Warfighters benefit from having effective coalition partners
  - 2006 QDR Report: Building Partnership Capacity
  - COCOM Theater Security Cooperation Annexes
  - USD(AT&L) aims to increase interoperability with allies and partners
- R&D cooperation with coalition partners helps close capability/ interoperabiity gaps
  - Such gaps have compromised operational effectiveness and jeopardized force protection (e.g., fratricidal incidents)
- Small investments early in the R&D process can yield large dividends (e.g., Joint Strike Fighter)

- **Desire for strategy driven cooperation**
- **Services/COCOMS benefit from support to building their international relationships**

→ **Need for Coalition Warfare Funding**

Contact Information

Obtain more information at:

www.acq.osd.mil/ic/cwp.html

Or by emailing:

Coalition.Warfare@osd.mil

Current Portfolio

Current Projects (FY07-08)

Project Title (Sponsor)	Objective	Foreign Partners
Coalition Communications Interoperability And Data Sharing Using Everything Over IP Technology (EOIP) (DISA)	To develop a migration strategy and network performance metrics that will serve as a guide to the entire Coalition and COCOM Community for achieving net-centricity and to identify obstacles to the operational implementation of EoIP technology.	Canada, UK
INMARSAT System (EUCOM)	To provide two INMARSAT intercept systems to a coalition partner in support of US interests in the EUCOM AOR	Coalition Partners in EUCOM's AOR
Joint Coalition Flight Trials of Mode 5 Identification Friend/Foe Interoperability (US Air Force, US Navy)	To complete jointly sponsored flight trials with collaboration by multiple nations to demonstrate the interoperability of production-ready Mode 5 IFF transponders and interrogators.	France, Italy, NATO, UK
Multinational C4 Network Planning System (MC4NPS) (EUCOM)	To enhance the usability of the C4 Interoperability Planning Guide developed during Combine Endeavor exercises by integrating with a German database tool. This tool will be made available for Coalition Task Forces.	Germany

Current Projects (FY07-08)

Project Title (Sponsor)	Objective	Foreign Partners
Passive, Remote and Open Situation Awareness System (PROSAS) (US Army, US Navy, US Coast Guard, USMC; NGA)	To build network-centric enterprise services system architecture for effective use of netted multi-static RF sensors and UAV-based C4ISR systems to develop an integrated land and surface track management capability. To enable "in-time" decision-making using signature filter techniques and decision timeline analyses.	UK
Preplanned Response and Emergency Action (PREACT) (SOUTHCOM)	To contribute to increased regional stability in the US Southern Command's (SOUTHCOM) Area of Responsibility through the provisioning of a collaborative planning and coordinated response capability (technology and business practices) that enables accurate assessments, situational awareness, dynamic planning, and synchronized response to international disasters.	Belize, Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panama
Dual Signal Processor and Underwater Network (Unet) Common Protocol for Communications (SOCOM, US Navy)	To advance acoustic communications technology and protocols for attaining through-water interoperability amongst coalition maritime assets	Australia, Canada, UK

On-going Projects (FY08-09)

Project Title (Sponsor)	Objective	Foreign Partners
Advanced Dynamic Magnetometer for Static and Moving Applications (US Navy (SPAWAR))	To develop a compact and inexpensive micro-fluxgate magnetometer for use in multiple COCOMs. To continue T&E with joint services and apply lessons learned to provide wide range of surveillance/detection solutions.	Italy, Sweden
Miniature Automated Chemical Agent Detector (MACAD) (US Army (EBRC))	To develop a miniaturized, automated detector that will perform the same function as the current M256A1, with increased user friendliness and decreased detector response time. To communicate agent detection to user via audible, visual and/or physical (vibration) method, and be reusable following decontamination.	Japan
Multi-National Turnkey C2 (JFCOM)	To assist NATO in developing the ability to more rapidly form a Multi-National HQs with robust C2 capabilities that enable effective coalition-wide C2 using Mission Templates to serve as guidelines for determining the required C2 capabilities. The Mission Templates would include historically required capabilities and supporting architectural views.	NATO ACT /C4I

On-going Projects (FY08-09)

Project Title (Sponsor)	Objective	Foreign Partners
Multinational Virtual Learning Environment for International Security Cooperation Objectives (MVLE) (US Navy (SPAWAR))	To establish the South Eastern Europe/Black Sea Region MVLE Training Site and to establish a real-time, online communications that includes a multilingual machine language translation and natural language interface development in support of the Bulgarian, Romanian, and Ukrainian languages.	Bulgaria, Norway, Romania, UK
NATO Friendly Force Information (NFFI) Interface Prototype Standard Project (NIPS) (JFCOM)	To permit US, allied, and/or coalition countries to view personnel and asset position, status, and location information on national or NATO Common Operational/ Tactical Pictures by: 1) improving the current US Joint BFSA XML to permit a robust data exchange with future versions of the NATO Friendly Force Information data exchange standard, 2) permitting transfer of information between the US and partners via secret communications architectures through the use of robust cross-domain solutions, 3) setting the improved JBFSA XML as the interim US standard for position/location information exchange with our coalition and allied partners, and 4) migrating this capability into net-enabled command and control (NECC).	NATO

On-going Projects (FY08-09)

Project Title (Sponsor)	Objective	Foreign Partners
Optimizing Coalition Leader & Team Operational Readiness to Achieve Technical Interoperability in Network Centric Operations (US Navy (NAVAIR))	To define critical knowledge and skills required to work in a multinational net-centric operational environment and develop a repository of NCE human behavior factors for acquisition and operational consideration.	Australia, Canada, UK
Stake Holder Asset-Based Planning Environment (SHAPE) (USA USACE/ RDECOM; SOUTHCOM)	To develop requirements for a joint, interagency, and multi-national response; identify existing and emerging best in class methods and technologies that can support this whole of government and multi-national response; and then deliver those capabilities to the user communities.	Colombia
Tactile Situation Awareness System (TSAS) (US Navy (NAMRL))	To enlarge the surface area of the tactical situation awareness garment to include complete forward flight control (pitch and roll). To deliver a technology to the aviation helicopter community that will reduce the workload of pilots, increase the situation awareness of pilots, and reduce the incidence of brownout mishaps in the desert environment.	Canada

On-going Projects (FY08-09)

Project Title (Sponsor)	Objective	Foreign Partners
US Joint Tactical Radio System (JTRS) & UK Bowman Radio C2 Interoperability through the JTRS-Bowman Waveform (JTRS JPEO)	To port JTRS Bowman Waveform onto a JTRS platform and demonstrate interoperability between JTRS and Bowman radios.	UK
Stabilized Weapons System Installation (US Navy (NSWG))	To design and test a stabilized weapon system module for combatant craft boats, in order to provide increased offensive and defensive fires capacity, improved maintenance, and minimum impact to deck arrangements.	Foreign Partner
Virtual Regional Maritime Traffic Center (VRMTC) (SOUTHCOM)	To develop the capability to: detect, track, identify, and display information on surface vessels 20 meters and longer out to 25 nautical miles from ports, harbors, and critical assets; identify cooperative traffic supporting IMO conventions, such as the AIS; collaborate and share information such as vessel ID, manifest, and cargo, with desired users; enable participation in cross-language information sharing; and eventually, enable Partner Nations to acquire, own, operate, and maintain the capability without US DoD support.	Chile, Panama *Argentina, Colombia, Brazil*

On-going Projects(FY08-09)

Project Title (Sponsor)	Objective	Foreign Partners
Projects That Are Not Yet Complete, But Will Not Receive FY09 Funding		
Coalition Warfare Command & Control Interoperability Enhancement (CWC2IE) (US Army (PEO C3T))	To enhance coalition fire support capability where each Fires Coordination organization of partner nations may coordinate Fires from supporting coalition platforms and other Fires Coordination organizations.	France, Germany, Italy, UK
US-Singapore Unmanned Vehicle (SPARTAN) (PACOM, US Navy)	To develop and integrate a remotely operated small arms mount with two SPIKE missiles and .50 caliber gun onto the SPARTAN 7-meter RHIB; to expand operations for SPARTAN over-the-horizon by use of a Tactical Unmanned Air Vehicle.	Singapore
Pre-approved FY09 New Starts		
Coalition Wideband Network Waveform (COALWNW) (JTRS JPEO)	To commonly develop a specification for a coalition-wide wideband networking waveform and associated crypto to support a NATO STANAG.	Australia, France, Germany, Italy, UK, Finland, Sweden, Spain

New Starts in FY09 (Tier 1)

Project Title (Sponsor)	Objective	Foreign Partners
The Web Service for All-source Releasability and Dissemination (WiSARD) (OUSD (USD(I)), NGA)	To provide a web service for net-centric, SOA-based operations that would improve streamlined, timely releasability of intelligence products to our most trusted allies.	Australia; Canada; NATO; UK
Service Oriented Architecture Development for C2 Gap Filler Block 1 (NORAD-NORTHCOM)	To prove the SOA approach prior to large scale implementation in the C2 Gap Filler JCTD. The SOA C2 Gap Filler initiative's operational objectives are to provide N-NC air defense operations an interoperable coalition C2 integration and data fusion/correlation capability.	Canada
FBCB2/SIR Interoperability Solution (FSIS) (US Army (PM FBCB2))	To reduce the time it takes to exchange C2 data and information between FBCB2 and SIR by enabling the data exchange to occur at a lower echelon in the battlespace while meeting the requisite policy, information assurance, national security constraints.	France
Pathogen Analysis in West Africa (US Navy)	To improve situational awareness and force protection in areas with endemic pathogens through use and demonstration of the Resequencing Pathogen Microarray (RPM) platform, data model and satellite communications.	Ghana, Sierra Leone

New Starts in FY09 (Tier 1)

Project Title (Sponsor)	Objective	Foreign Partners
Global Personnel Recovery System Pilot Implementation Project for New Zealand and Australia (GPRS) (JFCOM (Joint Personnel Recovery Agency))	To demonstrate an operational assessment involving the recovery of isolated US and coalition personnel and interoperability of the GPRS Implementation Project at a) Hardware level; b) Network level; c) Software application d) Security level.	Australia; New Zealand
Service-Oriented Architecture Foundation Text-to-Text Machine Translation Services (SOAF Translation Services) (US Army (CERDEC))	To integrate high-quality machine translation products from multiple MT developers to the SOAF-A, and create accessible and reliable MT web services on a secure network. Improvements are: text-to-text translation of Thai, Korean, Japanese and Indonesian, and Character Recognition (CR) of Arabic, Urdu, and Pashto, and machine translations of Chinese, Indonesian and Malay	Singapore
Passive and Active Detection of Special Nuclear Material (DSNM) (DTRA)	To demonstrate the ability of near-term passive detection systems to achieve stand-off detection of kilogram quantities of special nuclear material and equip boarding party teams to locate and identify small quantities of these materials.	Black Sea Nations; France; Turkey; UK

New Starts in FY09 (Tier 2)

Project Title (Sponsor)	Objective	Foreign Partners
Ultra High Performance Concrete Material Properties Characterization (UHPC) (DTRA)	To fully characterize the material properties of UHPC as it reacts to blast, penetration, Mach Stem and Munroe Effects. This characterization will be accomplished in two concurrent phases and will determine production requirements, material characterization and modeling.	Australia
ADNS Coalition Network Interoperability (ACNI) (US Navy (SPAWAR))	To demonstrate an interoperable, manageable and secure coalition network based on existing and emerging standards, using, where possible, commercial services and products. The end goal is a managed IP network supporting and facilitating C2 between coalition platforms supporting a joint operation.	Australia; Canada; New Zealand; UK
International Recognition of Combat Vehicles (US Army (Night Vision and Electric Sensors Directorate))	To collect and process imagery of coalition platforms for inclusion into Recognition of Combat Vehicles and provide a sharing capacity of the trainer to all participating nations.	Australia, Canada, Germany, New Zealand, UK
Common Ground (US Army (ERDC))	To provide a common geospatial information foundation supporting coalition C2 processes to include planning, intelligence preparation of the battlespace, course of action analysis, mission rehearsal, and execution monitoring.	NATO NC3A

New Starts in FY09 (Tier 2)

Project Title (Sponsor)	Objective	Foreign Partners
GPS Multinational Receiver Core Development (US Air Force)	To enable coalition users to take advantage of commercial, off-the-shelf GPS display and mapping software without relying on the civilian GPS engines.	Canada
Maritime Domain Awareness Offshore West Africa (US Navy)	To expand and improve automation of existing SAR analysis tools and use these software tools to analyze SAR imagery covering the Exclusive Economic Zone of West and Central African nations.	NATO
ITA Sensor & Policy Software Tools and Protocols for Networking of Disparate ISR Assets (US Army (ARL))	To develop a set of sensor & policy algorithms and software tools for networking disparate ISR assets from coalition forces. The resulting sensor & policy networking technology will jointly address the physical constraints of sensor networks and policy of sharing information.	UK

For Future Defense Technology -TRDI OVERVIEW-

Yasuhisa Ishizuka,

Director, Plans Department

Technical Research and Development Institute

Ministry of Defense, Japan

OUTLINE

- TRDI Strategies for Future Defense Technologies
- TRDI Organization and Features
- TRDI Current Major R&D activities
- TRDI International Cooperation Activities

TRDI STRATEGIES FOR FUTURE DEFENSE TECHNOLOGIES
- Medium-to-long term defense technology outlook -

Derivation of Capabilities Needed

Changes in the Security Environment
- Response to Diverse Contingencies
- International Peace Cooperation
- Tight Defense Budget

Trends in Science & Technology
- Progress of COTS Technology
- Emerging Technology

Changes in the Operational Environment
- Joint Operation
- Information Superiority

Capabilities Needed

Derivation of priority in defense technology

Detailed Functions

Core Equipment

Future Weapon System Technologies
- •Technical Areas
- •Direction of Efforts

Potential Technologies

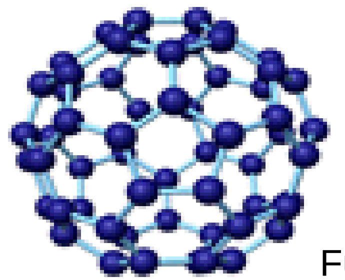
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
- Key Points in the Capability Derivation (Examples)-

Trends in Science & Technology

Advance technologies to contribute defense capabilities

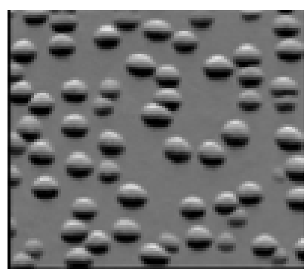
ASIMO

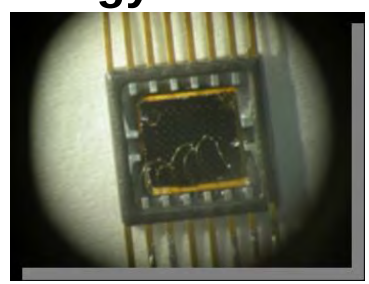
Robot/ Unmanned Technology



Fullerene

Nanotechnology/Biotechnology





QDIP

Sensor/Device Technology

Software Radio

Information Technology

TRDI STRATEGIES FOR FUTURE DEFENSE TECHNOLOGIES
- Medium-to-long term defense technology outlook -

Derivation of Capabilities Needed

Changes in the Security Environment
- Response to Diverse Contingencies
- International Peace Cooperation
- Tight Defense Budget

Trends in Science & Technology
- Progress of COTS Technology
- Emerging Technology

Changes in the Operational Environment
- Joint Operation
- Information Superiority

Capabilities Needed

Derivation of priority in defense technology

Detailed Functions

Core Equipment

Future Weapon System Technologies
- Technical Areas
- Direction of Efforts

Potential Technologies

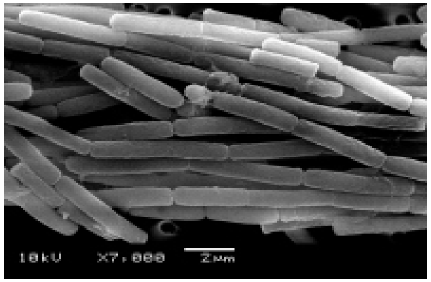
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Key Points in the Capability Derivation (Examples)-

Changes in Security Environment

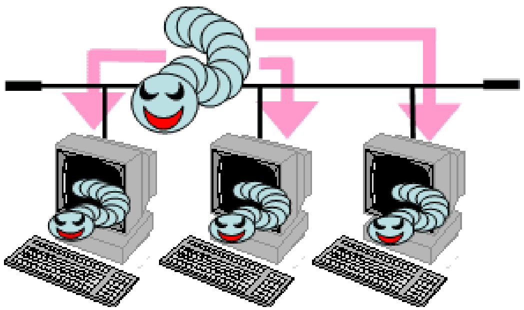
Response to new threads and diverse contingencies

Terrorism

Ballistic Missile



Bacillus
Anthrax



Cyber Attack

International Peace
Cooperation

Armed special
operation vessel

TRDI STRATEGIES FOR FUTURE DEFENSE TECHNOLOGIES
- Medium-to-long term defense technology outlook -

Derivation of Capabilities Needed

Changes in the Security Environment
- Response to Diverse Contingencies
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Core Equipment

Future Weapon System Technologies
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Potential Technologies

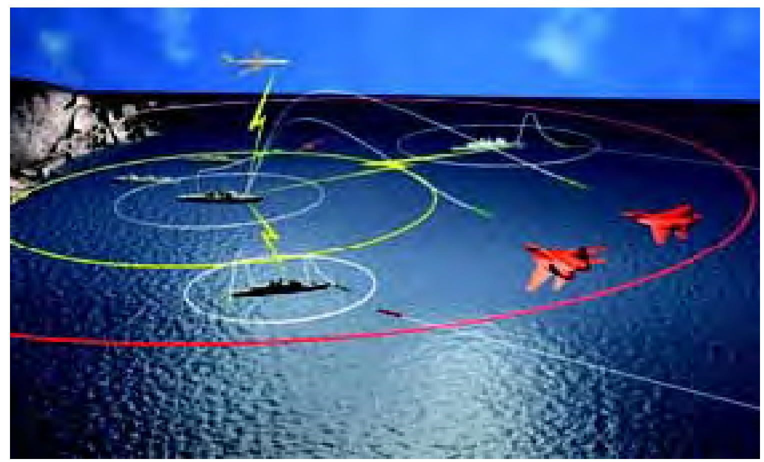
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Key Points in the Capability Derivation (Examples)-

Changes in Operational Environment

Network-Centric Warfare

Joint Operation

The helicopter of JGSDF taking off from DD of JMSDF



Intelligence/Information Sharing

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Capabilities Needed in the Future-

Category	Capability Needed
Response to New Threats and Diverse Contingencies	Defense against Ballistic and Cruise Missiles
	Defense Against Guerrillas and Special Operation Forces
	Counter-terrorism
	Defense against Cyber Attacks
	Counters to Armed special operation Vessels
	Defense against aggression on Offshore Island
	International Peace Cooperation
Network-Centric Warfare	Command & Control
	Intelligence
	Information Sharing
Others	Improved Efficiency of R&D activities

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Deriving Functions and Core Equipment-

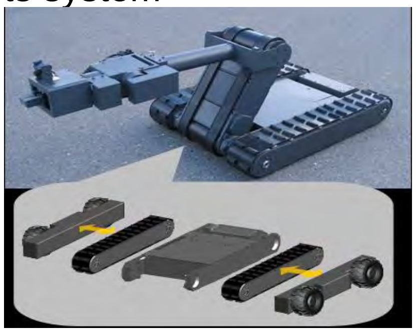
Counter-terrorism

Characteristics

- Mobility
- Surprise attack
- Simultaneous multiple attacks
- Difficulty in sign recognition
- Importance of early warning
- Wide area and multiple fronts surveillance
- Damage assessment
- Communication
- Information sharing
- NBC attack

Functions	Core Equipment
Ground mobility	Platform
Intelligence	Intelligence /Sensors Unmanned Systems
Information sharing	C3I
Counter NBC	NBC Counter measures

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Future Weapon System Technologies 1/4-

Core Equipment	Direction of Efforts
Unmanned System	Formatively operational multiple Robots system 
Technology Area	
1. UGV	

Core Equipment	Direction of Efforts
Unmanned System	High altitude and long endurance; Autonomy in flight/Combat; Portability 
Technology Area	
2.UAV	

Core Equipment	Direction of Efforts
Unmanned System	UUV: Underwater autonomy; Networking with platforms for situation awareness, target detection, judgment, communication and attack USV: Remote control; Autonomous navigation; Mobility; Seaworthiness 
Technology Area	
3. UUV/USV	

Core Equipment	Direction of Efforts
Soldier System	Physical protection from diverse threats; Intelligent munitions; Battle-space situation awareness 
Technology Area	
4. Soldier System	

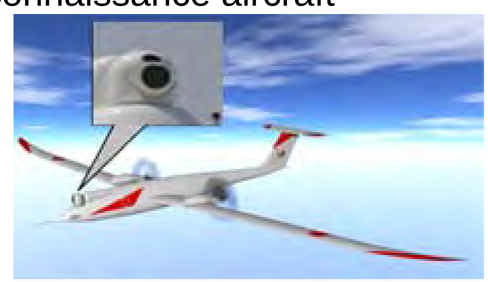
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK -Future Weapon System Technologies 2/4-

Core Equipment	Direction of Efforts
NBC Counter measure	Protection from agents (B in particular); Quick detection & identification; Safe decontamination
Technology Area	
5. NBC protection/ detection/ deconta-mination	

Core Equipment	Direction of Efforts
Platform	Seaworthiness from low to high speed; Signature control of radio, light and sound, Invulnerability to underwater threat; Energy plant to supply high pulse loads
Technology Area	
6. Vessel	

Core Equipment	Direction of Efforts
Platform	Stealthy and agile configuration; Engine for supersonic cruise; Thrust vectoring; Integrated avionics
Technology Area	
7. Fighter Aircraft	

Core Equipment	Direction of Efforts
Intelligence/ Sensor	Radar/optical sensor mounted on endurance UAV and reconnaissance aircraft
Technology Area	
8. Sensor	



MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Future Weapon System Technologies 3/4-

Core Equipment	Future Weapon System Technologies		
	Technology Area		Direction of Efforts
Precision Guided Weapon	**9**	**System**	Interception of small and high speed targets with short to long range
	10	**Components**	High miniaturization; Terrain data-position data-matching; Micro optical seeker; Semi-active millimeter wave seeker; Passive radio seeker; High performance propulsion system; Safe propellant
	11	**Ammunition**	Multifunction and precision guidance; Terminal guidance; Insensitiveness and safety
	12	**Directed Energy Weapon technology**	Lethal or non-lethal destruction by the irradiation of high-power laser or microwave
M&S/ System Integration	**13**	**Integrated Simulation**	Integrated simulation creating battlefield with various types of equipment systems and enabling simulated battles in virtual reality
	14	**Aircraft System Integration**	Sustainment and improvement of technology base for the system integration of small, high-performance aircraft; In-flight demonstrations of advanced technologies

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Future Weapon System Technologies 4/4-

Core Equipment	Future Weapon System Technologies		
	Technology Area		Direction of Efforts
Platform	**15**	**Ground Vehicle**	Remote control; Following drive; Lightweight armor; Stealth; Electrical drive; Generator; Electromagnetic suspension; Long cruising range
	16	**Helicopter**	Load handling capacity; Crashworthiness; All-weather operation; High performance and efficiency
Intelligence /Sensor	**17**	**Sonar**	Sonar for shallow waters
Counter Electronic Attack	**18**	**Information Electronic Warfare**	Highly secure and encrypted command and communication system; Information EW system for protecting communications
	19	**Counter Electromagnetic attack**	Countermeasures against electromagnetic attacks
C3I	**20**	**Network**	Software radio; Wideband and high-power device; Robust and large capacity field digital communication network system

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
- Potential Technologies and Applications 1/2 -

Potential Technologies

- Power Storage
- CNT Device
- Human Power Amplifier
- Power MEMS
- Terahertz Application
- Bio-Sensor

CNT: Carbon Nano-Tube

Expected Capabilities

- Small lightweight power source for the extension of operational endurance and range
- Electronic parts for micro and high performance UAVs
- Small lightweight power source for the extension of operational endurance and range
- Information and communication device embedded in lightweight soldier suits
- Portable power source for human loads reduction and long operations
- Assistance of elaborate works and high mobility for quick operations, long operations and the increase of firearms and armors
- Quick detection of B and C agents in wide areas; Remote sensing for personel protections
- Improvement of B agent detections for quick intelligence and analysis; Small detector
- Small lightweight guidance and control unit for the extension of the missile range

Core Equipment

- Unmanned System
- Soldier System
- NBC Countermeasure
- Precision Guided Weapon(1/2)

MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
- Potential Technologies and Applications 2/2 -

Potential Technologies

- □Nano-Composite Material
- □Superconductive Electromagnetic Propulsion
- □Functional Composite
- □Image Sonar
- □Photonic Crystal
- □Digital Watermarking
- □Quantum Cryptography

Expected Capabilities

- Lightweight missile body for the improvement of agility and the extension of range
- Lightweight aircraft body for the improvement of agility and the extension of range
- Submarine powerplant for the improvement of mobility and the reduction of detectability
- Heat-resistant material for lightweight and long-life engine parts
- Efficient small lightweight image sonar for the improvement of target classifications and identifications
- High performance computing for quick and accurate intelligence
- Long, low-noise and robust optical communication for efficient joint operations and quick and accurate intelligence
- Highly secured network system
- Highly secured network system

Core Equipment

- Precision Guided Weapon(2/2)
- Platform
- Intelligence/Sensor
- C3I

TRDI ORGANIZATION AND FEATURES
-Organization of OD-

Cabinet
Prime Minister

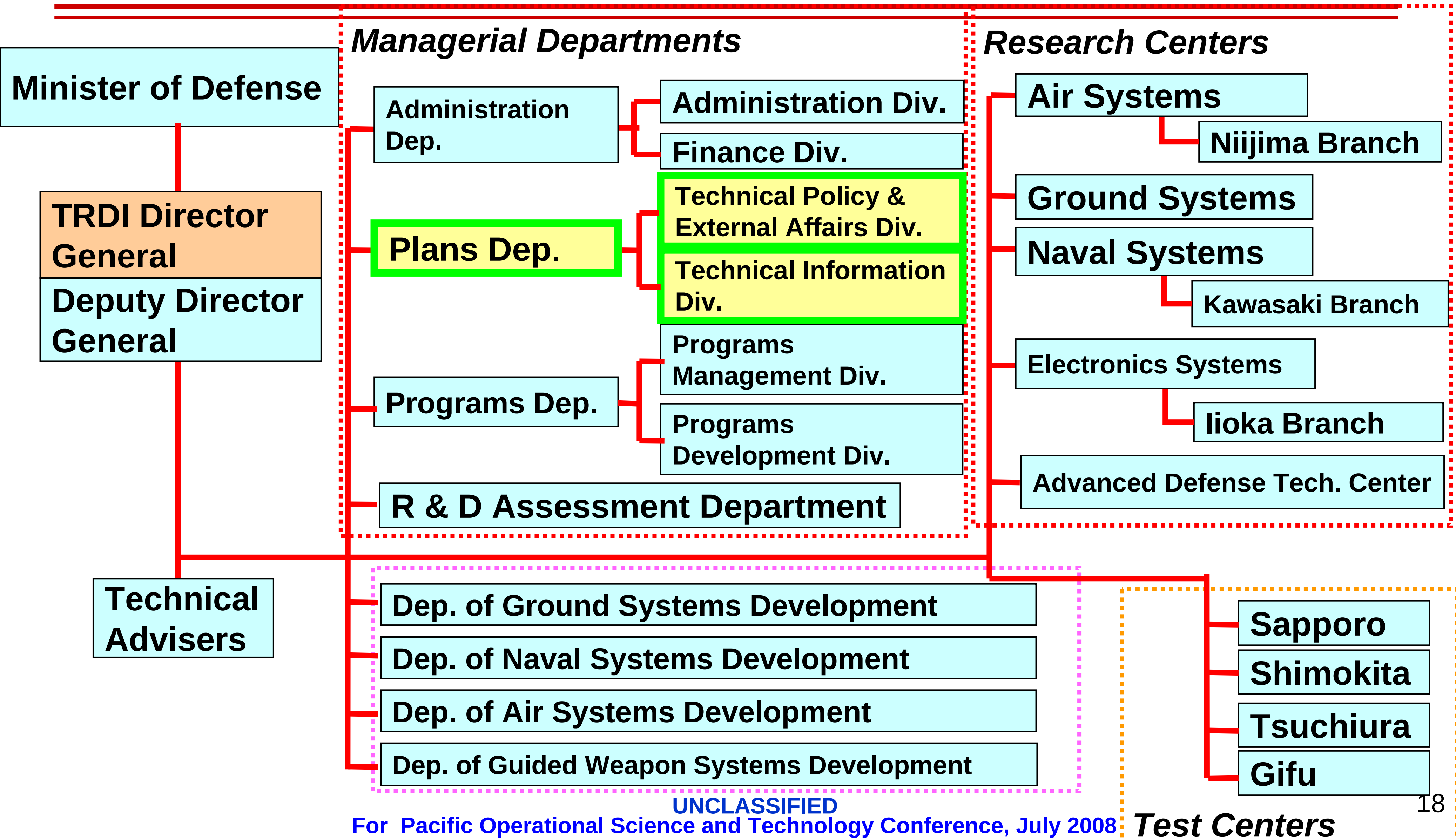
Minister of Defense

Internal Bureau

- Joint Staff Office
- Ground Self Defense Force
- Maritime Self Defense Force
- Air Self Defense Force
- Defense Intelligence HQ
- Equipment Procurement & Construction Office
- **Technical Research and Development Institute (TRDI)**
- Local Bureaus
- The Inspector General's Office of Legal Compliance
- National Institute for Defense Studies
- National Defense Academy
- National Defense Medical College

Since September 1, 2007

TRDI ORGANIZATION AND FEATURES
-TRDI Organization-



TRDI ORGANIZATION AND FEATURES
-TRDI Features-

Established as sole organization for R&D for Japan Self Defense Forces

Developments conducted based on requirements from each services

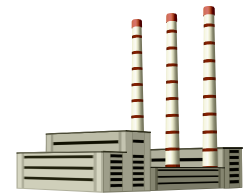
No Production Capability

JSO/DIH

Requirement

Basic Research
Prototype T & E

Contract

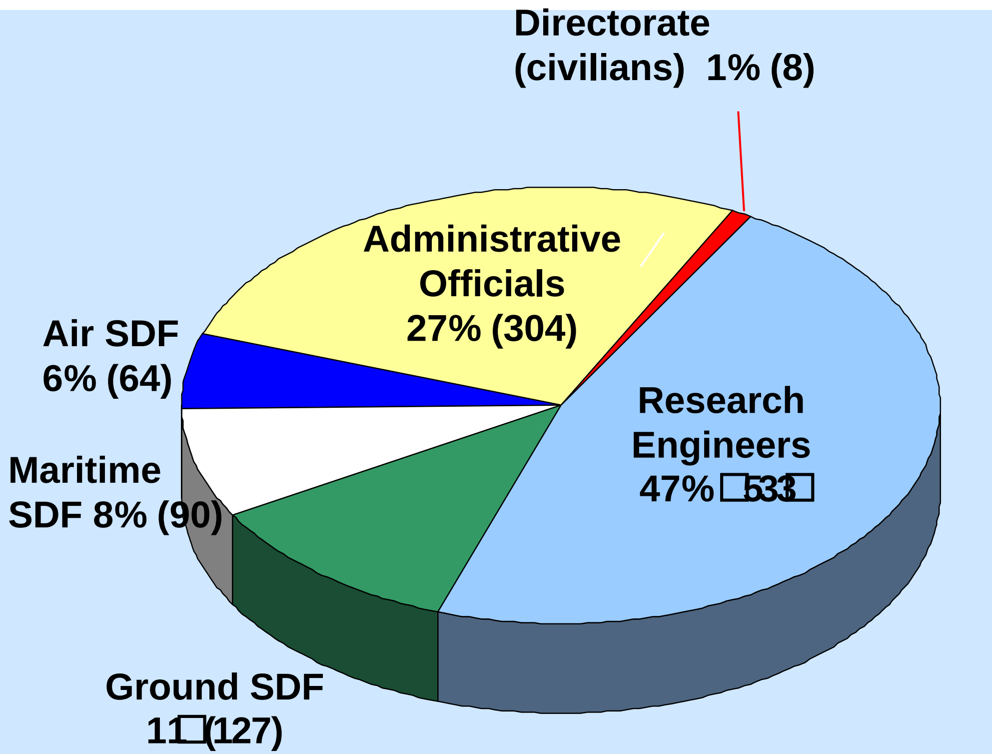


Private Industries

Eng. Model & Prototype
Manufacturing

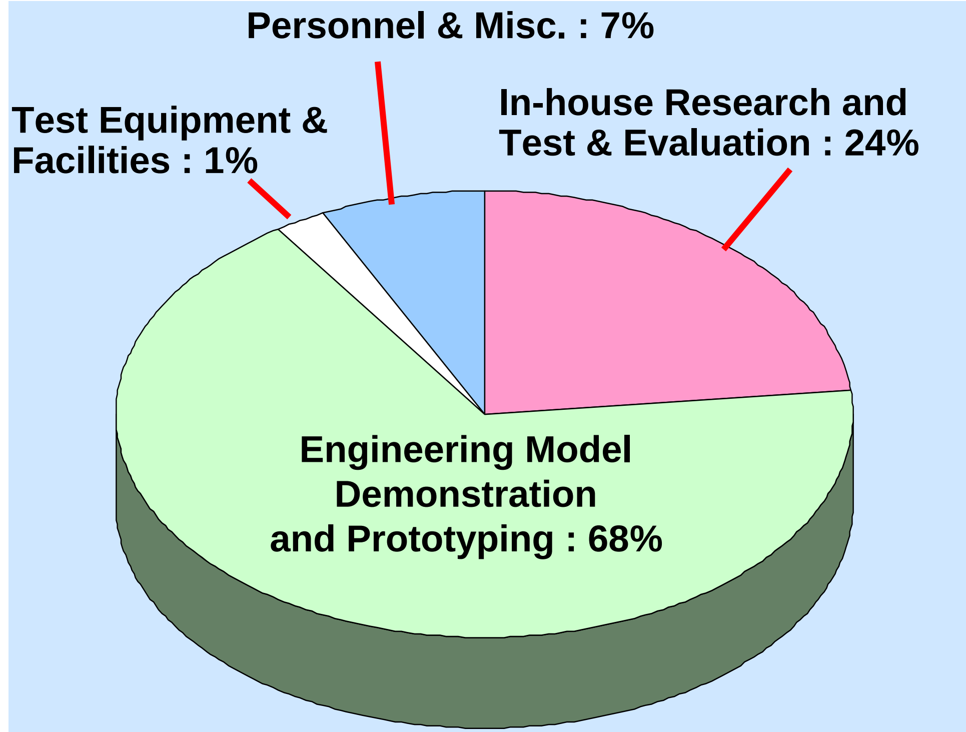
TRDI ORGANIZATION AND FEATURES

-Authorized strength and Budget Classification (JFY08)-



<u>Total : 1,126 (JFY2008)</u>

Civilian 75%
Uniform 25%



<u>Total Budget : \ 183 Billions</u>

Approximately $ 1,620 Million and
3.9 % of Defense Budget

TRDI CURRENT MAJOR R&D ACTIVITIES
-New Tank-

Successor to the current MBT

Features:

- Improved firepower, protection and mobility
- Advanced C4I system
- Light weight

TRDI CURRENT MAJOR R&D ACTIVITIES
- XP-1 / C-X -

Next-Generation Patrol Aircraft (XP-1)

Used for persistent broad area maritime surveillance and patrol as the replacement of the P-3C.

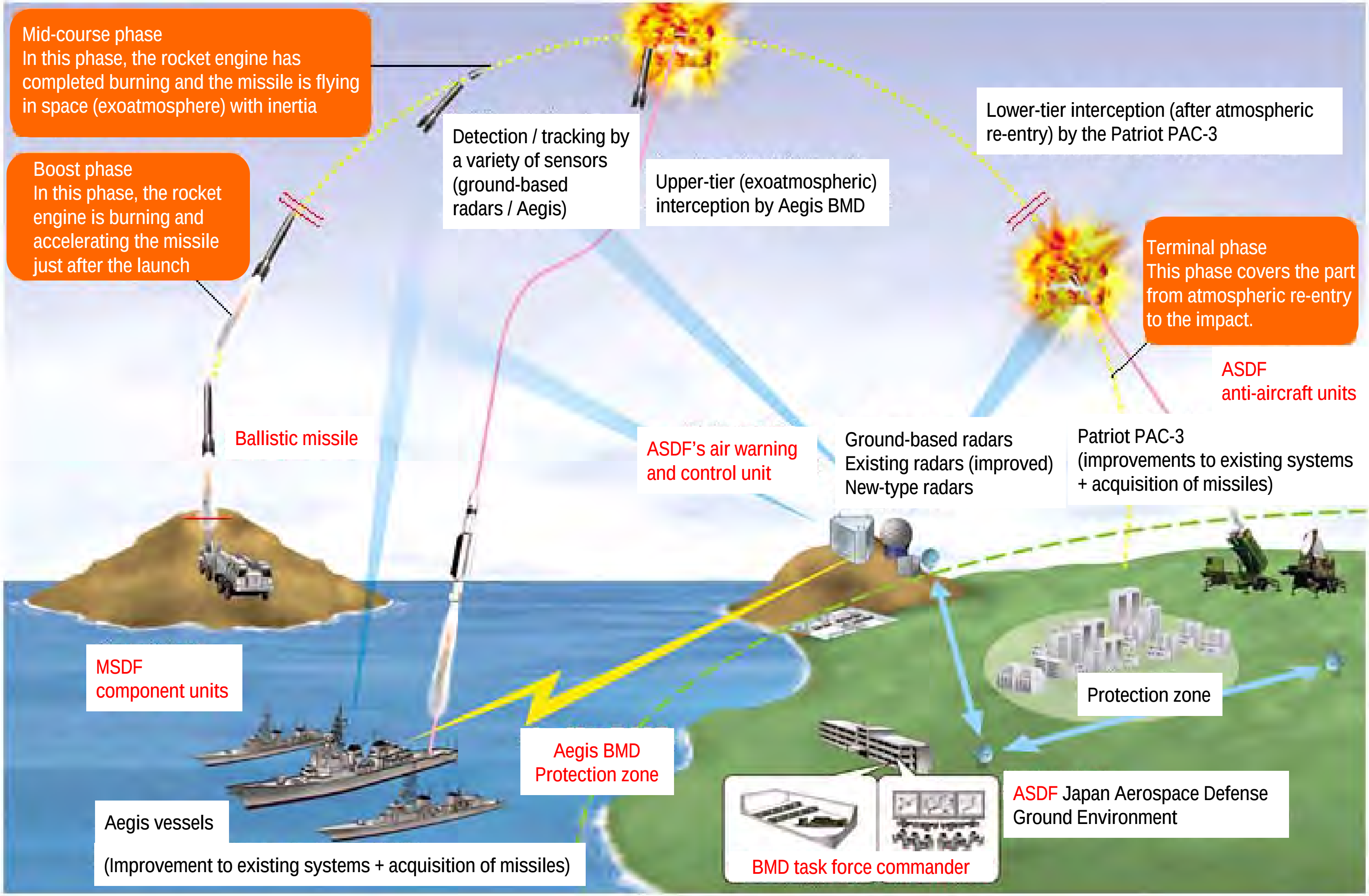
Next-Generation Cargo Aircraft (C-X)

Used for domestic and international airlift as the replacement of the C-1.

Commonality

To reduce life-cycle cost by using common structures and subsystems

TRDI CURRENT MAJOR R&D ACTIVITIES
-Concept of BMD Deployment and Operation (image diagram)-



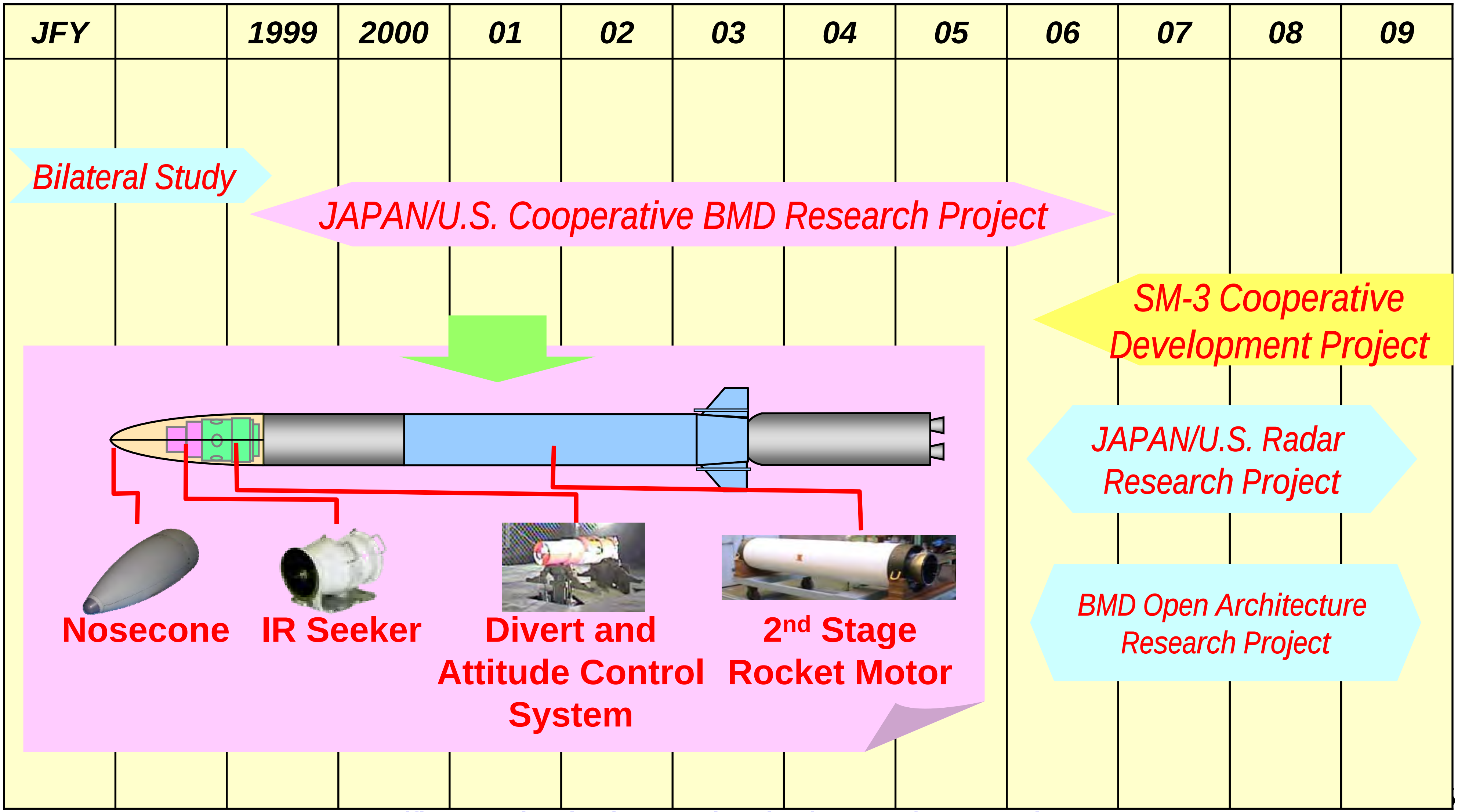
TRDI CURRENT MAJOR R&D ACTIVITIES

-Current Effort for BMD-

JFTM-1 (the KONGO firing test) Overview
- Video -

UNCLASSIFIED

TRDI CURRENT MAJOR R&D ACTIVITIES
- BMD Related Project Activities -



For Pacific Operational Science and Technology Conference, July 2008

TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Transition of US-JP Technology Cooperation-

	1950s	1960s	1970s	1980s	1990s	2000s	2010s

Framework

- Treaty of Cooperation and Security / Mutual Defense Assistance Agreement (1954)
- Data Exchange Agreement (DEA) (1962)
- Three Principles of Arms Export (1967)
  - Exemption of Cooperative BMD Development and Production (2004Dec10)
- Systems & Technology Forum (S&TF) (1980)
- E/N Concerning the Transfer of Military Technologies (1983)

Technology Transfer

ONE Way Flow from US to JP → **Two Way Flow**

ONE Way Flow from US to JP:

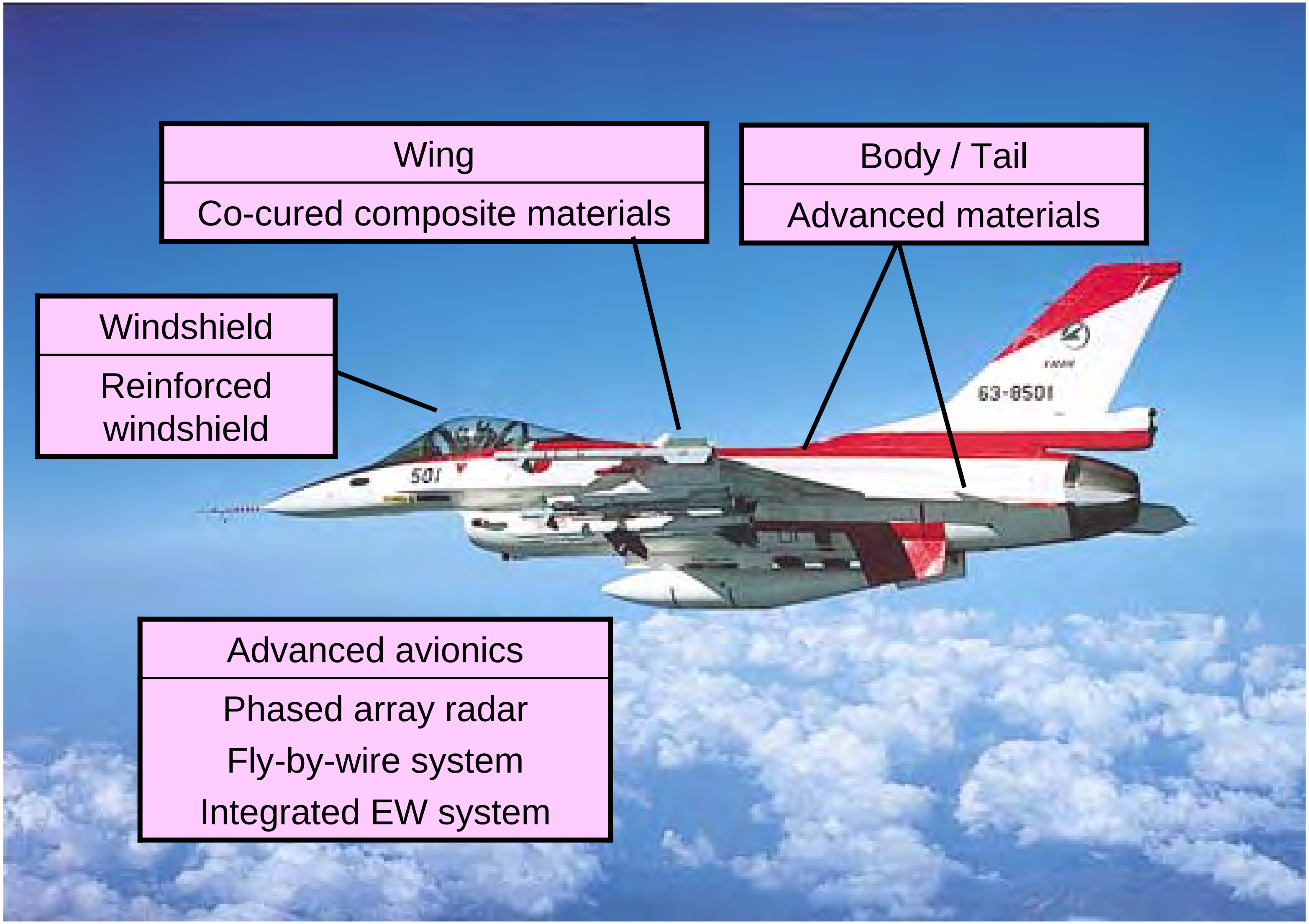
- -MAP
- -FMS
- -License Production

Two Way Flow:

- -FS-X
- -Cooperative R&D
- -ESEP

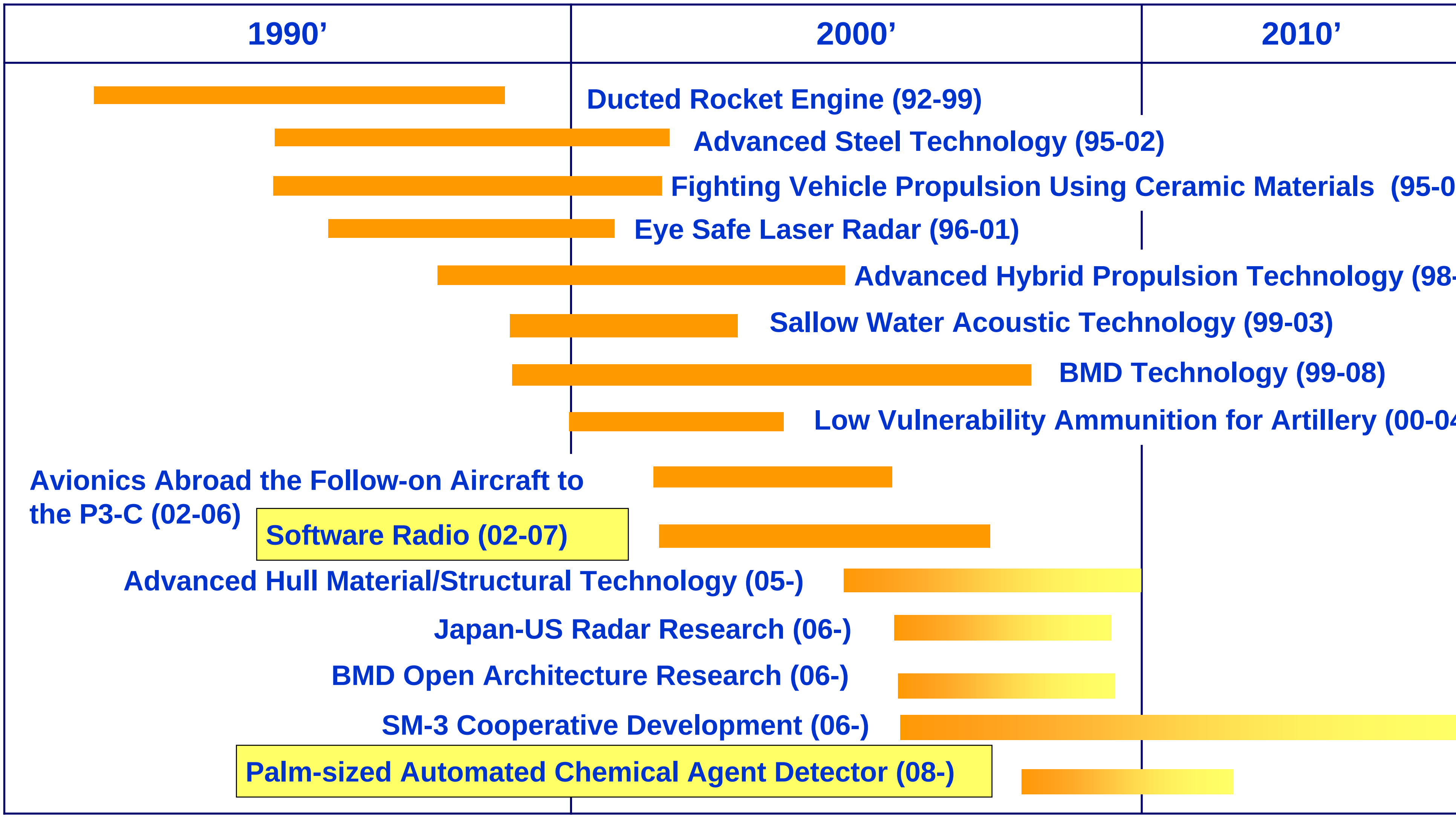
TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Advanced Technologies adapted in F2 Cooperative Development-



TRDI INTERNATIONAL COOPERATION ACTIVITIES

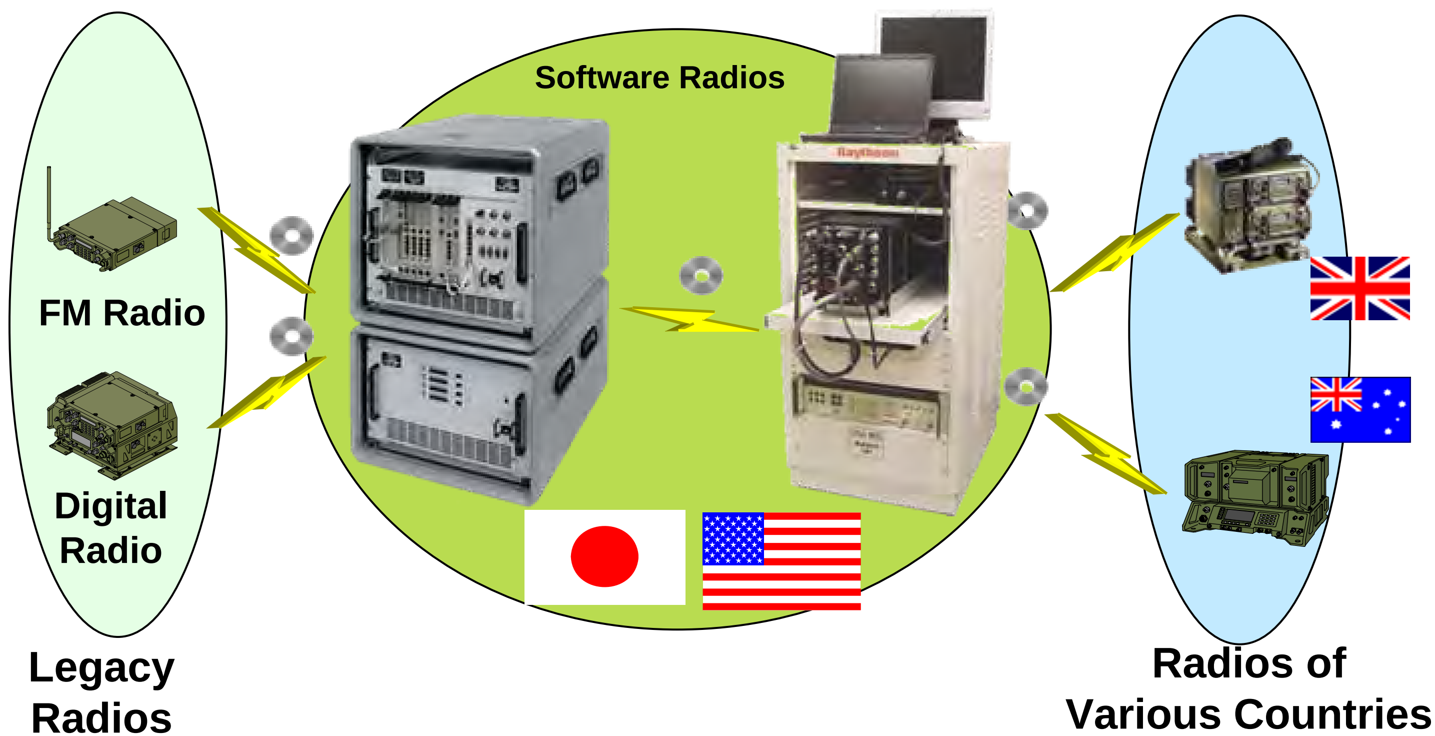
-Overview of Cooperative Projects between US DOD And TRDI-



TRDI INTERNATIONAL COOPERATION ACTIVITIES
-Software Radio-

Research on the Software Radio which change optimum communication mode easily by software downloadable function. **Project conducted from 2002 to 2007**

US: Joint Tactical Radio System (JTRS) JPO, DoD *JA: 2nd RC (current Electronic Systems Research Center), TRDI*



Features:

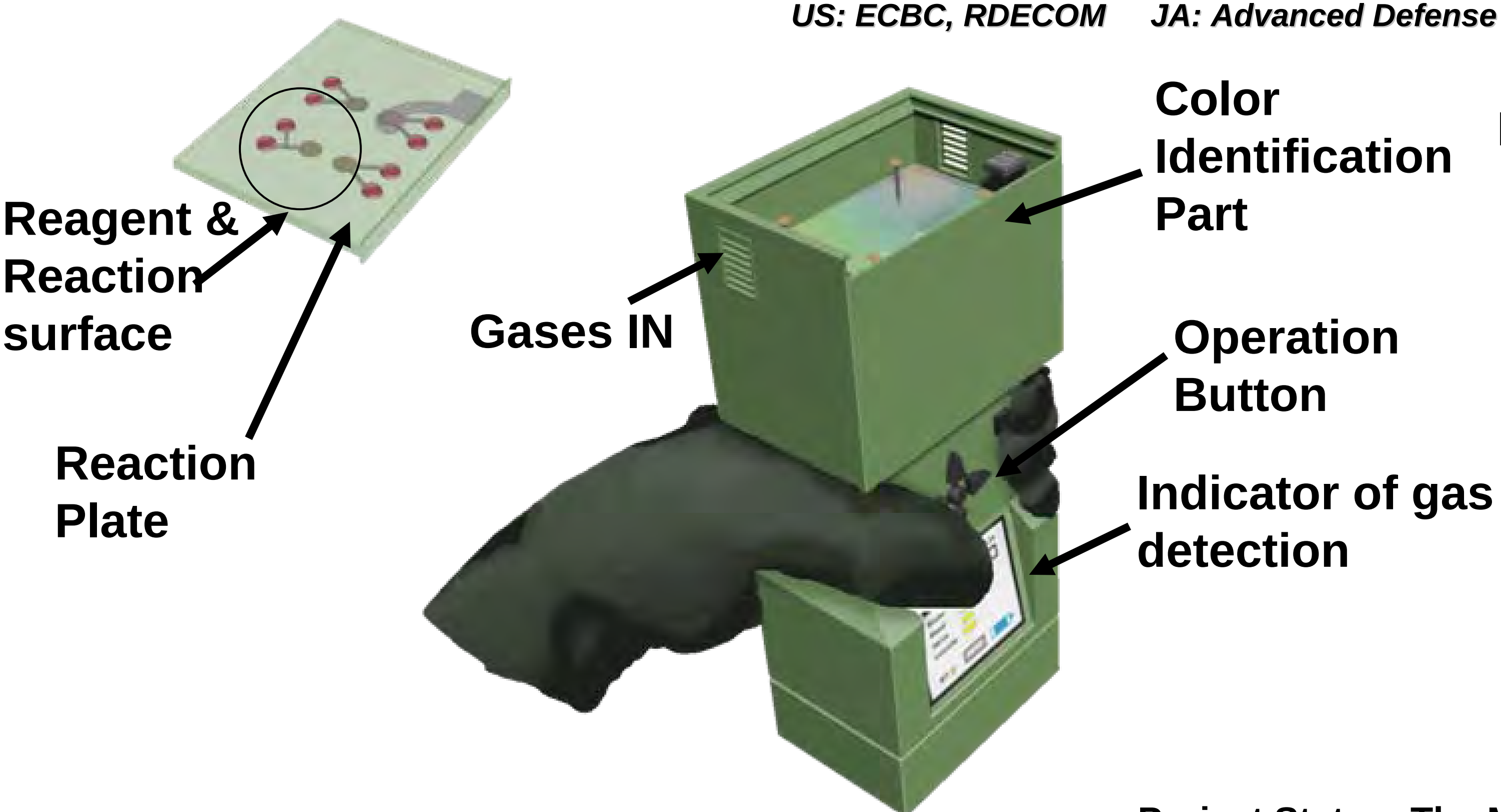
- -Software Communication Architecture
- -Wideband Antenna & RF module
- -Ensure interoperability and invulnerability

TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Palm-sized Automated Chemical Agent Detector (PACAD)-

Research on Palm-sized/All-in-one automated chemical agent gas detector based on the chemistry of the M256A1 chemical agent detector.

US: ECBC, RDECOM *JA: Advanced Defense Technology Center (ADTC), TRDI*



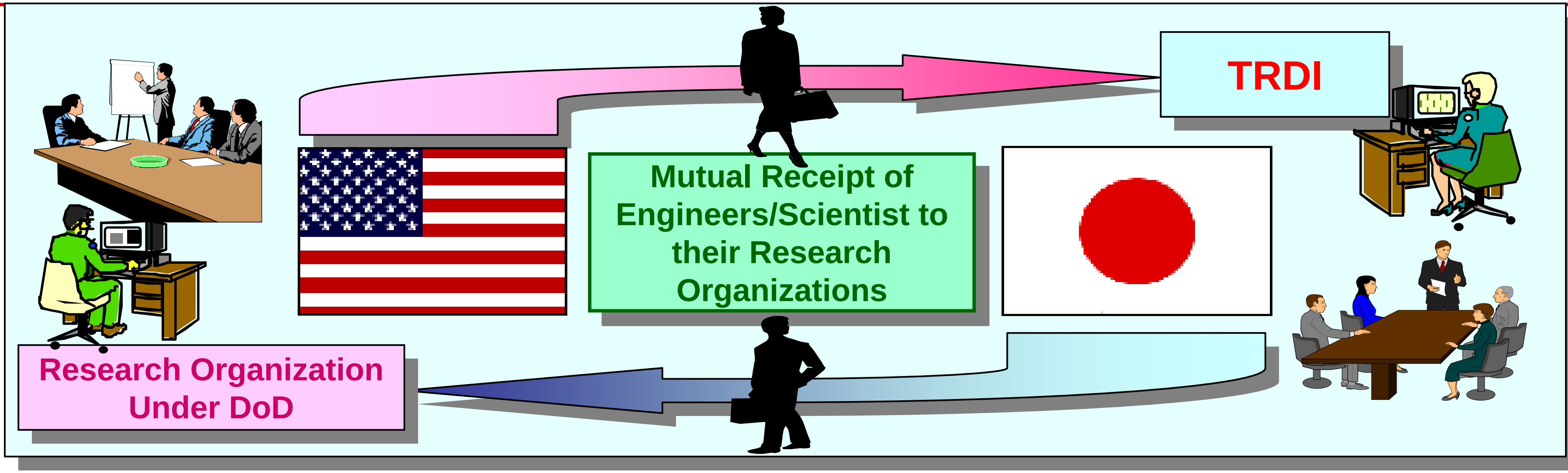
Features:

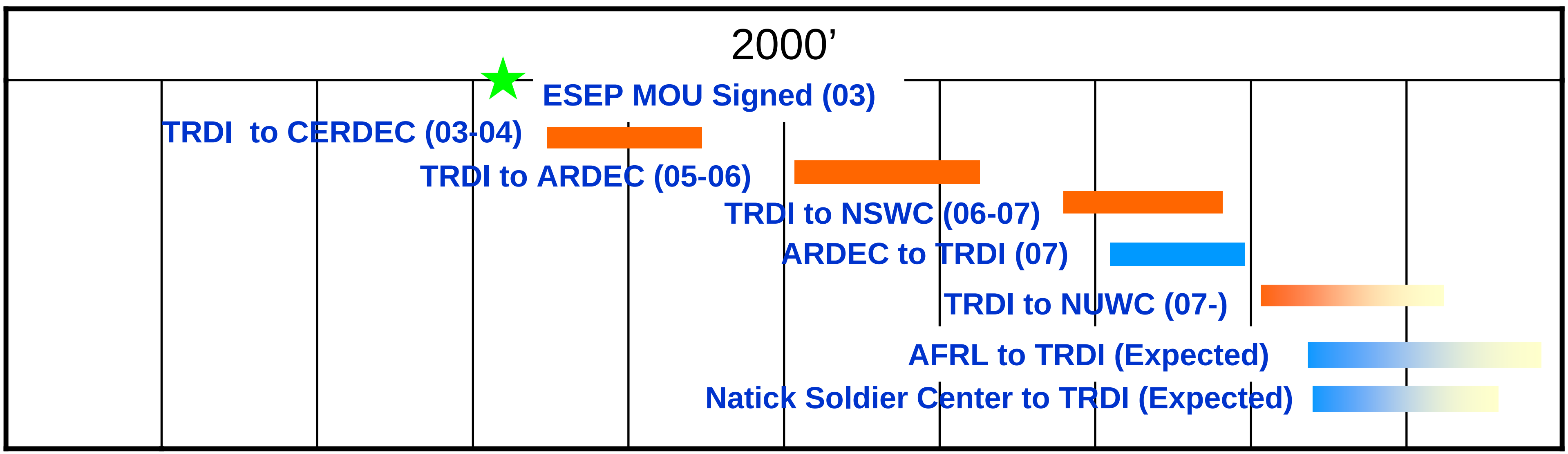
- -High sensitivity and low false detection by the chemistry of M256A1
- -Automated Detection by using EO device
- -Small and lightweight
- -One-man Operation
- -Enable Day/Night Operation

Project Status: The MOU was signed in March, 2008

TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Engineers and Scientists Exchange Programs (ESEP)-





TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Promotion of International Technology Cooperation-

Country	Organization	Technical cooperation status
France	DGA	▪ Unclassified Technical Information Exchange ▪ Conducting Mutually Hosting Technical Seminar ▪ Research Cooperation - Comparative Testing of Large Cavitation Channels
Sweden	FOI	▪ Unclassified Technical Information Exchange ▪ Research Cooperation - Attachment of Post Doc Researcher
UK	DSTL	▪ Unclassified Technical Information Exchange ▪ Reciprocal Visit
South Korea	ADD	▪ Unclassified Technical Information Exchange ▪ Reciprocal Visit
Germany, Australia, Canada		▪ Unclassified Technical Information Exchange

ONR

OFFICE OF NAVAL RESEARCH

S&T

Revolutionary Research . . . Relevant Results

Pacific Operational Science and Technology Conference

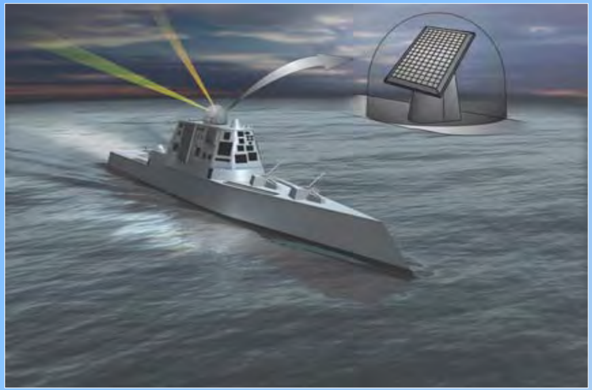
RADM Bill Landay
Chief of Naval Research

ONR S&T Departments

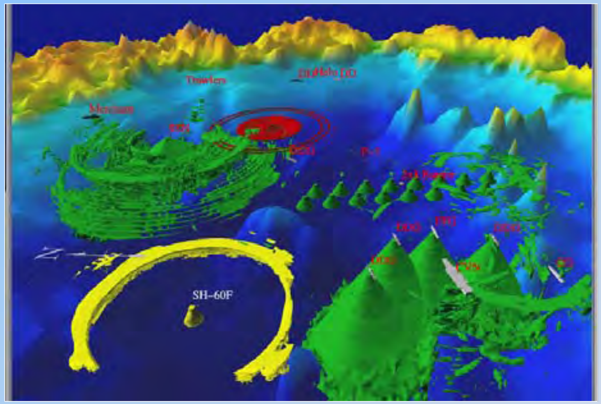
Revolutionary Research . . . Relevant Results

Code 30 Expeditionary Warfare and Combating Terrorism

Code 31 Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR)



Code 32 Ocean Battlespace Sensing

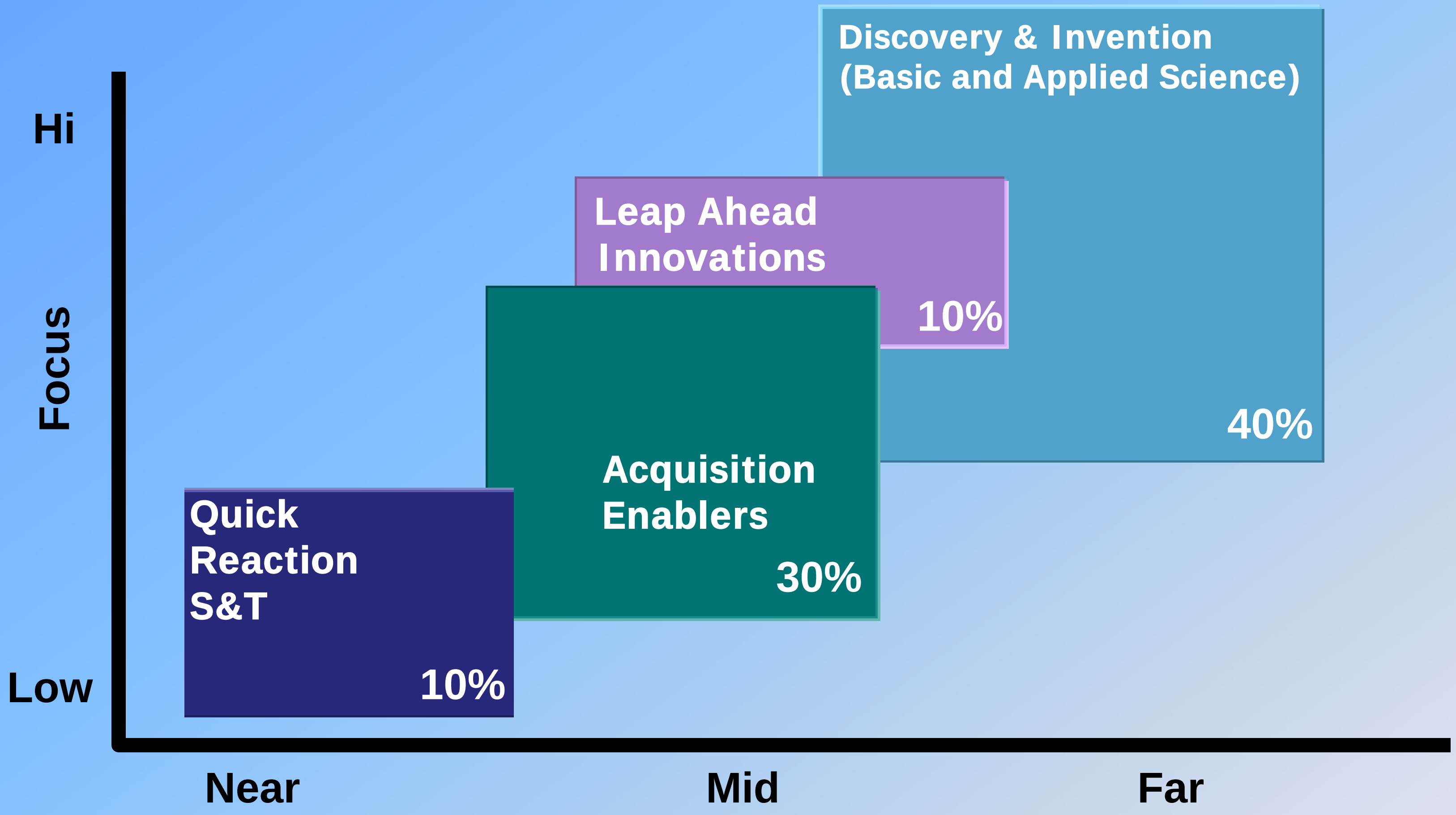


Code 33 Sea Warfare and Weapons

Code 34 Warfighter Performance

Code 35 Air Warfare and Weapons

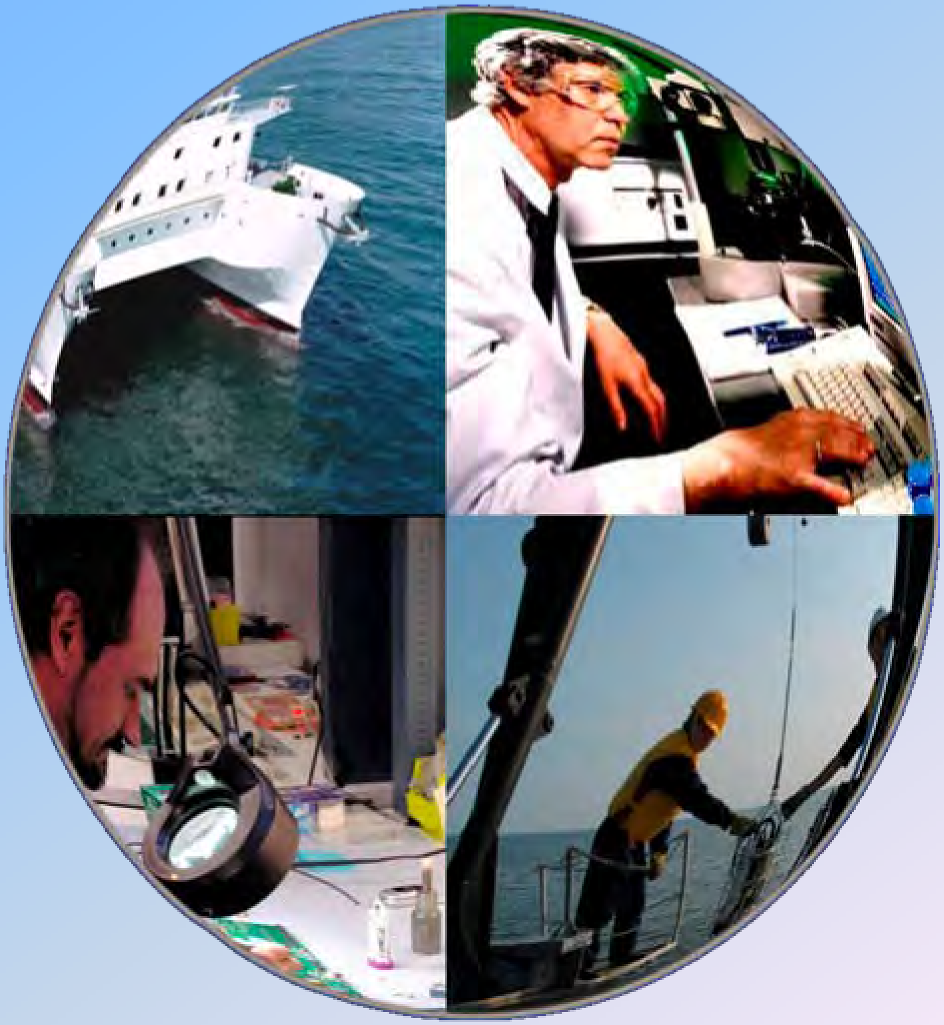
ONR's Balanced S&T Portfolio



S&T has a long-term focus but is responsive to near-term Naval needs

S&T Enterprise Span

- **50 States**
- **70 Countries**
- **1,035 Universities and Non-Profit Entities**
- **914 Companies**
- **3,340 Principal Investigators**
- **3,000 Grad Students**



Naval Science and Technology Worldwide Engagement

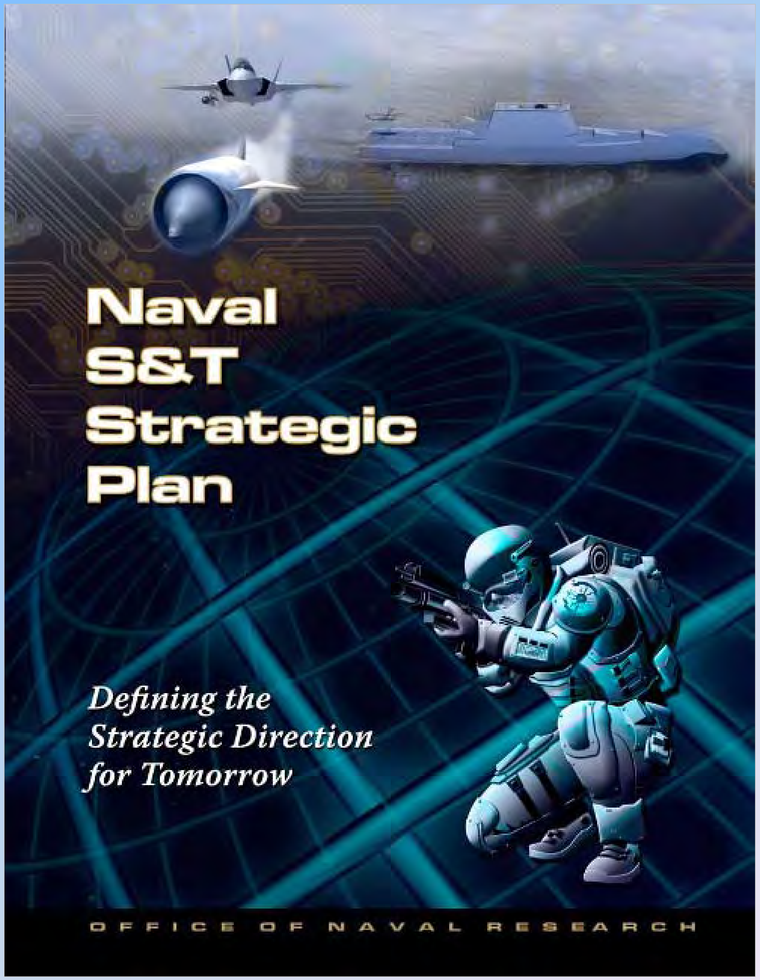
ONR
Revolutionary Research . . . Relevant Results

OFFICE OF NAVAL RESEARCH

Naval S&T Focus Areas

Revolutionary Research . . . Relevant Results

- Power and Energy
- Operational Environments
- Maritime Domain Awareness
- Asymmetric and Irregular Warfare
- Information, Analysis, and Communication
- Power Projection
- Assure Access and Hold at Risk
- Distributed Operations
- Naval Warrior Performance and Protection
- Survivability and Self-Defense
- Platform Mobility
- Fleet/Force Sustainment
- Affordability, Maintainability, and Reliability



www.onr.navy.mil

S&T Transitions

Revolutionary Research . . . Relevant Results

Command & Control
- Monitor (2 D&I)
- Decide / Direct (3 FNC; 6 D&I)
- Organize (2 D&I)
- Operational Planning (1 FNC; 1 D&I)
- Understand (1 FNC; 1 D&I)

Net-Centric
- Information Assurance (1 FNC)
- Dissemination (4 FNC)
- Network Management (4 FNC; 1 D&I)
- Enterprise Services (3 FNC)

Force Application
- Engagement (8 FNC; 1 SW; 30 D&I)
- Maneuver (31 FNC; 6 INP; 1 SW; 19 D&I)

Battlespace Awareness
- ISR (8 FNC; 3 INP; 21 D&I)
- Integration (5 D&I)
- Situation Awareness (8 FNC; 1 INP; 1 TS; 24 D&I)
- Friendly Disposition (1 FNC)

Logistics
- Logistic Services (6 FNC)
- Supply Chain (9 D&I)

Force Support
- Training (6 FNC; 1 SW)
- Installation Support (12 D&I)
- Force Preparation (7 D&I)
- Human Capital Mgmt (3 FNC)
- Health Readiness (29 FNC; 7 D&I)

Force Protection
- Mitigate (2 FNC; 3 SW; 8 D&I)
- Prevent Non-Kinetic Attack (5 FNC; 40 D&I)
- Prevent Kinetic Attack (36 FNC; 3 TS; 1 SW; 40 D&I)

Traumatic Brain Injury Mechanisms

Product Description:

Knowledge Products.

Products that will provide greater understanding of causes of traumatic brain injury related to exposure to blast energy.

TRL at Start: 2
TRL at Transition: 4

Planned Demos/ Deliverables/Transitions:

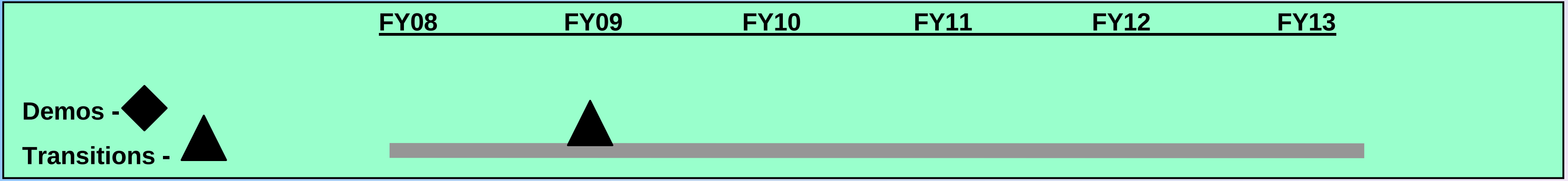
• FY09: Technical report on risk of exposure to blast energy during dynamic entry training.

FY10: Report on ability of IED-associated EMP to cause TBI.

•FY11: Report on thresholds for mild-TBI for primary blast exposure, repetitive exposure to free-field blasts, and exposure to complex blast waves.

Warfighting Payoff:

These research efforts will fill important gaps in knowledge regarding the effects of exposure to blast overpressure on the brain. Once mechanisms are known then appropriate interventions can be identified. Development of a new therapeutic option for management of traumatic brain injury which reduces cerebral perfusion pressure, maintains oxygenation and reduces cerebral edema.



Integrated IMAT Training & Performance Support for Theater-Level ASW Operations

Revolutionary Research . . . Relevant Results

Product Description

CNO ASW Task Force Team Bravo recommended the development of a high fidelity physics-based training and mission support environment to properly prepare commanders and senior staff for the incredibly complex tasks involved in the conduct of ASW operations using modern C4ISR systems.

TRL at Start: 4, TRL at Transition: 7

Planned Demos/ Deliverables/Transitions

Demos in PAC Theater-level exercises.

- Theater Course of Action Analysis Training
- Theater Model Implementation Optimization
- Integrated ASW Curriculum and Simulation-Based Training

Transition to: Naval Mine and ASW Command (NMAWC); C7F/CTF74

Warfighting Payoff

- Provides critical training for highest priority PACFLEET warfighting requirement
- Metrics are NMAWC certification criteria for theater staffs
- Payoffs = greater detection rates and ranges, lower false alarm rates, increased contact time

	FY08	FY09	FY10	FY11	FY12
Product Funding ($K)	3248	3100			
Demos -					
Transitions -					

Revolutionary Approach to Time-Critical Long Range Strike – RATTLRS

Flight Demonstration Program Objectives

- Develop and flight demonstrate (TRL 6+), payload flexible, multi-mission high speed system with a cost goal of under $600K AUPC/ 2500 missiles

Minimum Objectives

- At least one Mach 3 Flight Demonstration in FY2008
- Subsonic Air Launch, No Booster
- Transonic Acceleration: 0.25 g or Greater in Level Flight
- Mach 3.0+ Cruise
- Cruise Time: 5-minutes or Greater
- Joint Tactical Weapon System Traceability
- Demonstrate Sub/Supersonic Submunition and Penetrator

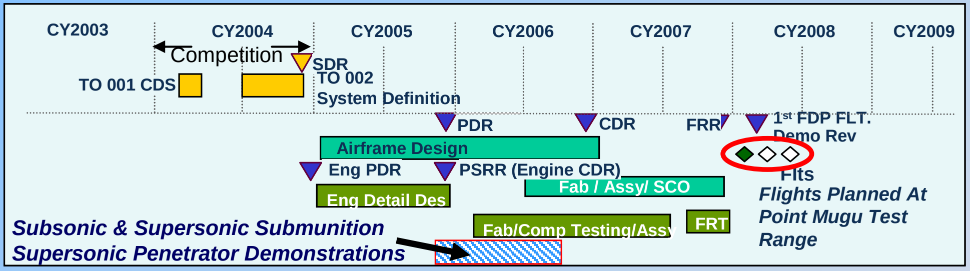
Enabling Technologies/Challenges

- Non-afterburning Mach 3+ Turbine Engine
- High Temperature Nozzle and Airframe Materials
- High Speed Inlet with Payload Integration
- High Lift/Drag Configurations
- Aero-propulsion Integration

RATTLRS FDV

Warfighter Capability Need / Objective

- Flexible, Multi-Mission Weapons With Ability to Engage Time-Critical and Hard/Buried Targets
- Joint Warfighter Platform Compatibility (Strategic and Tactical Aircraft, Ship & Submarine)
- Able to Trade Speed for Range Increase w/ Potential Loiter Capabilities
- Highest Range & Weapons Payload For High-Speed Solution – from 500 - 1000lb payload up to 1000nm, depending on the variant



Notional Tactical Weapon System

High Rate Vertical / Horizontal Material Movement

Product Description:

- Seamless horizontal to vertical to horizontal material movement
- Enabling technology for strike-down to occur at the rate of receipt (UNREP), achieve required sortie generation rate, and reduce workload (i.e. manning) overall.

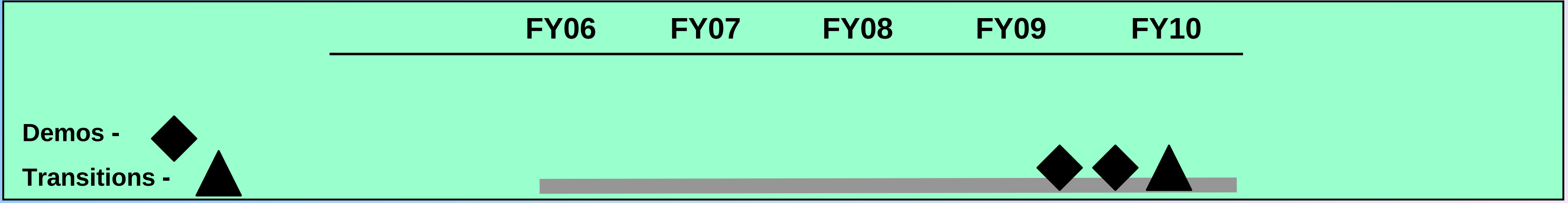
TRL at Start: 2
TRL at Transition: 6

Planned Demos/Deliverables/Transitions

- Three projects in Phase I Q3 FY06
- Down-select to one Phase II project Q2 FY08
  - Federal Equipment Company Selected
- Full-Scale Proof of Principle Land Based Demonstration Q2 FY09
- Relevant Environment Full-Scale Proof of Principle Demonstration Q3 FY10
- Transition to MPF(F)/PMS-385 Q3 FY10

Warfighting Payoff:

- Supports Sea Base Pillar - Sea Based Mobility and Interfaces
- Enables at-sea arrival and assembly
- Selective offload / total asset visibility
- Greater cargo transfer throughput
- Workload reducer

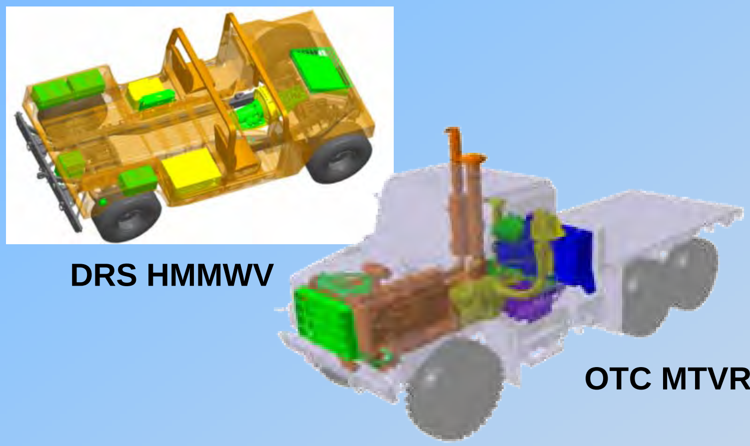


Battlefield Power Generation

Product Description:

On-board Vehicle Power (OBVP): Provide vehicle-integrated exportable utility quality 60 Hz electric power for mounted and stationary applications that have high electrical power needs

•TRL at Start: 4
•TRL at Transition: 7

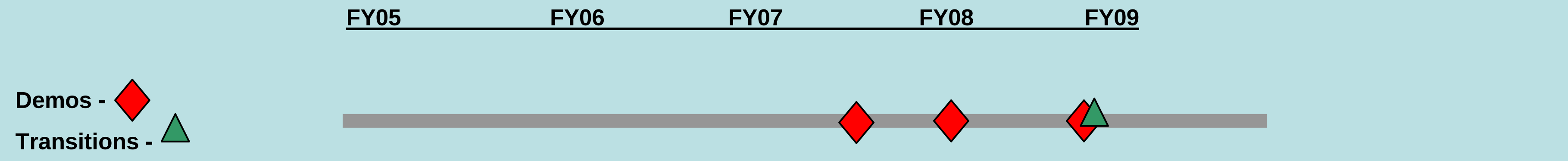


Planned Demos/Deliverables/Transitions:

- FY-07 MTVR w/120kW stationary, 20kW mobile export power capability
- FY-08 HMMWV w/30kW export power capability
- Full Government MTVR/HMMWV testing during FY08 @ ATC
- Transition to MCSC – FY09

Warfighting Payoff:

- Support missions with dedicated vehicles that currently use APUs, non-standard generators, or towed generators
- Applications include Mobile C2, Radar, Air Defense Sensors, NBC, and Ops Centers
- Replacing towed systems reduces logistical footprint, improves power mobility, and saves fuel
- **Gap addressed**: PR09-31 Advanced Electrical Power Systems
- **Metrics:** 6X (HMMWV) & 20X (MTVR) on-board, electrical power generation; parallelable with another vehicle or TQG; minimum +/- 5% THD power quality

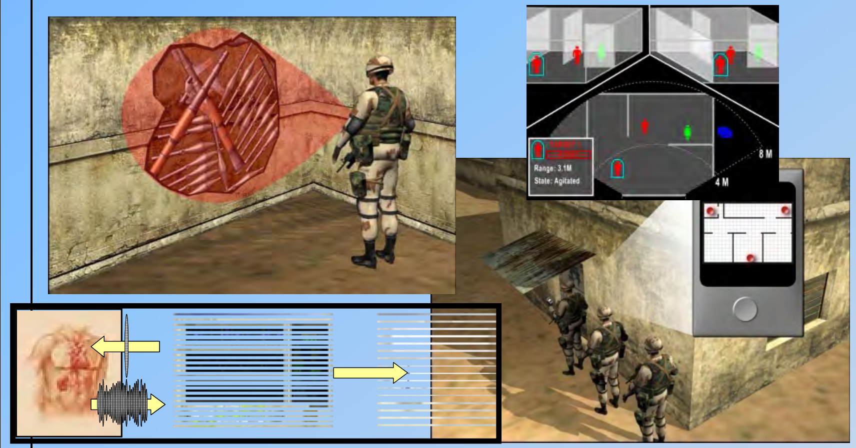


Sensing Through Walls

Product Description: Hand-held or small-UGV mounted wall-penetrating sensors capable of detecting and classifying personnel (moving and stationary), detecting firearms and identifying construction features (walls, windows, stairwells) from standoff range. Develop multi-band, multi-mode systems using UWB pulsed radar, acoustics, Doppler and biometric techniques. Sensors will be networked to enhance resolution and situational awareness

TRL at Start: 4 (Average)

TRL at Transition: 6

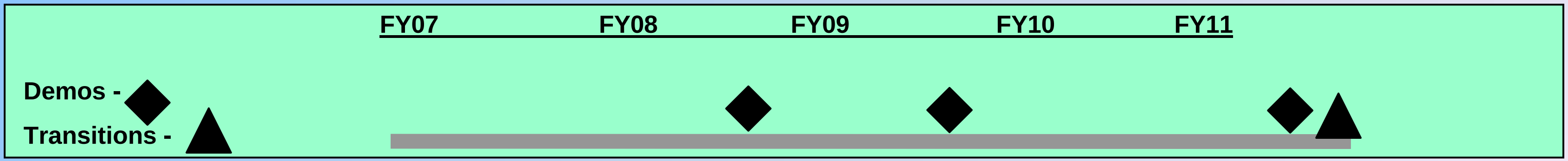


Planned Demos/Deliverables/Transitions

- Demos
  - 4QFY08 - acoustic stimulation RF and UHF/VHF resonance signatures
  - 4QFY09 - multipath mitigation and high resolution at low frequency RF
  - 2QFY11 - biometric, multiband impulse soldier-borne radar
- Transition
  - Marine Expeditionary Rifle Squad (PM MERS)

Warfighting Payoff:

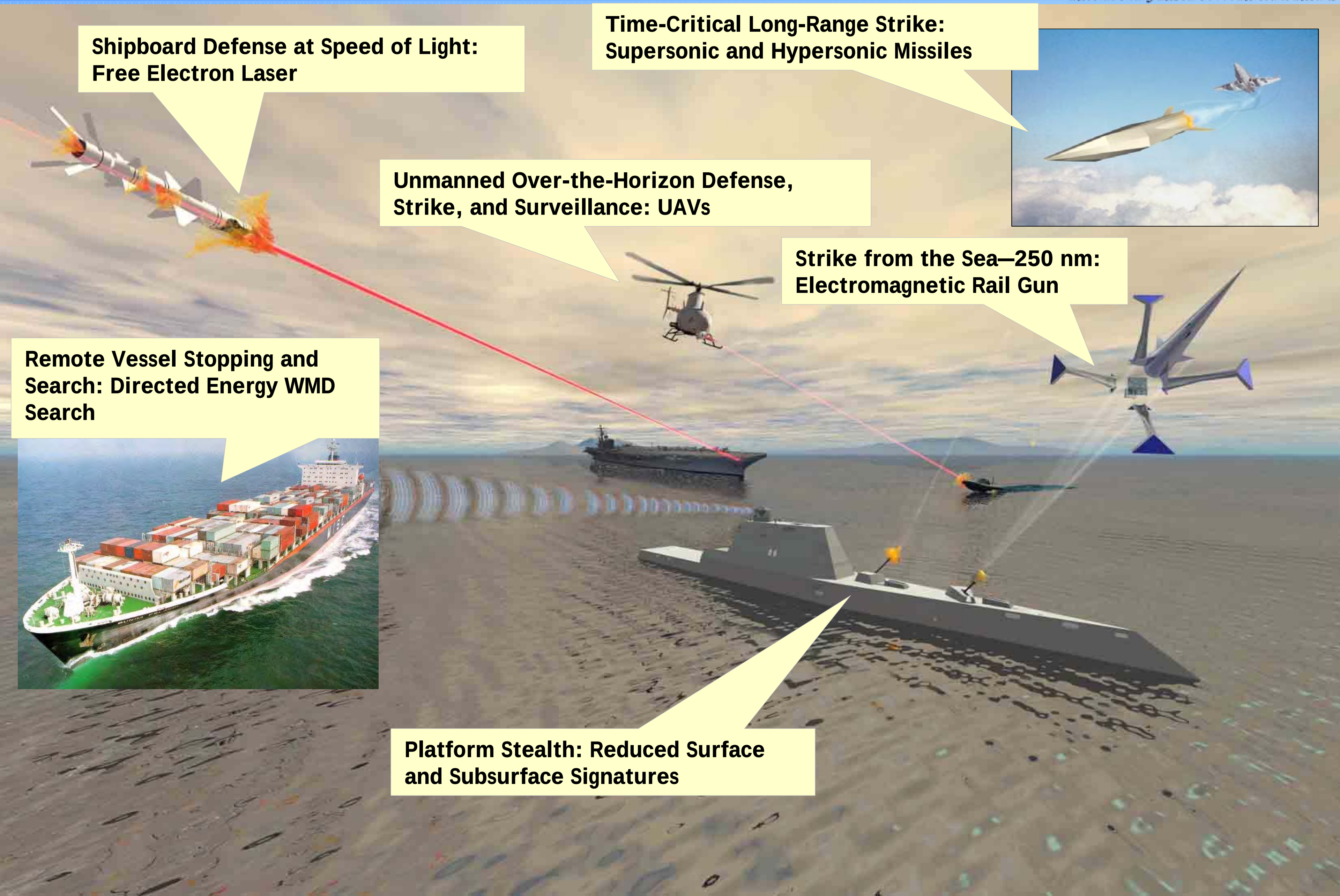
- Develop capability to detect, classify, and discriminate between friendly and enemy personnel in urban structures. Determine if buildings are occupied without entering. Detect and classify without physical confrontation. Show enemy orientation and intent before engaging. Detect and classify weapons.
- **Gap addressed:** PR09-1 Urban/Littoral Operations
- **Metrics:** SWAP suitable for individuals/UGVs; 100m standoff; Multi-wall layers; Moving & stationary personnel, weapons, explosives



Naval Expeditionary Overwatch System

Fighting at Hypervelocity & Light Speed

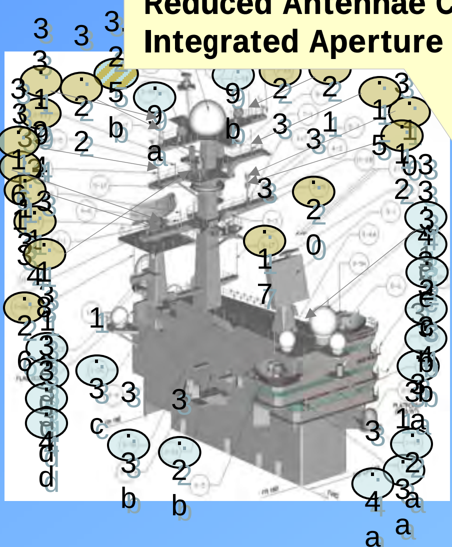
Revolutionary Research . . . Relevant Results

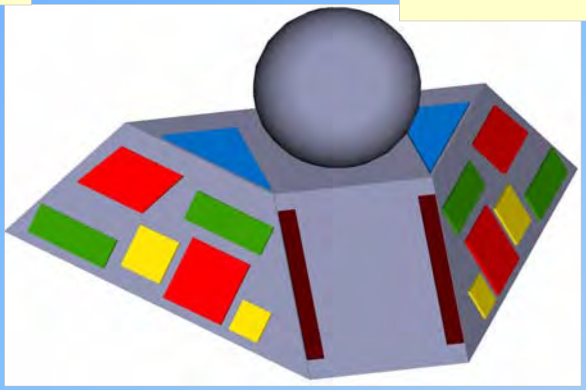


Dominating the Electromagnetic Spectrum

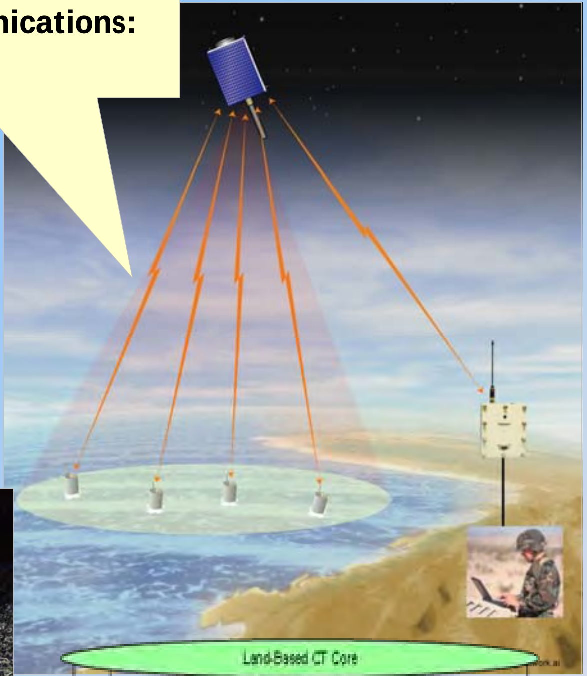
Revolutionary Research . . . Relevant Results

Reduced Antennae Clutter: Integrated Aperture Array



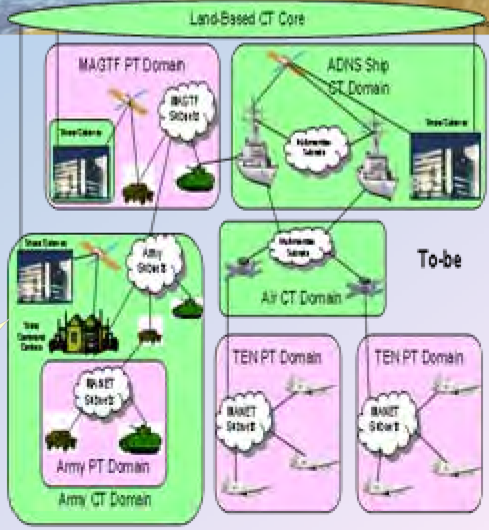


Adaptable, Quickly Deployable Communications: ODTML and TacSat



EM and Electro-Optical Camouflage

Electronic Suppression: Counter-IED Systems



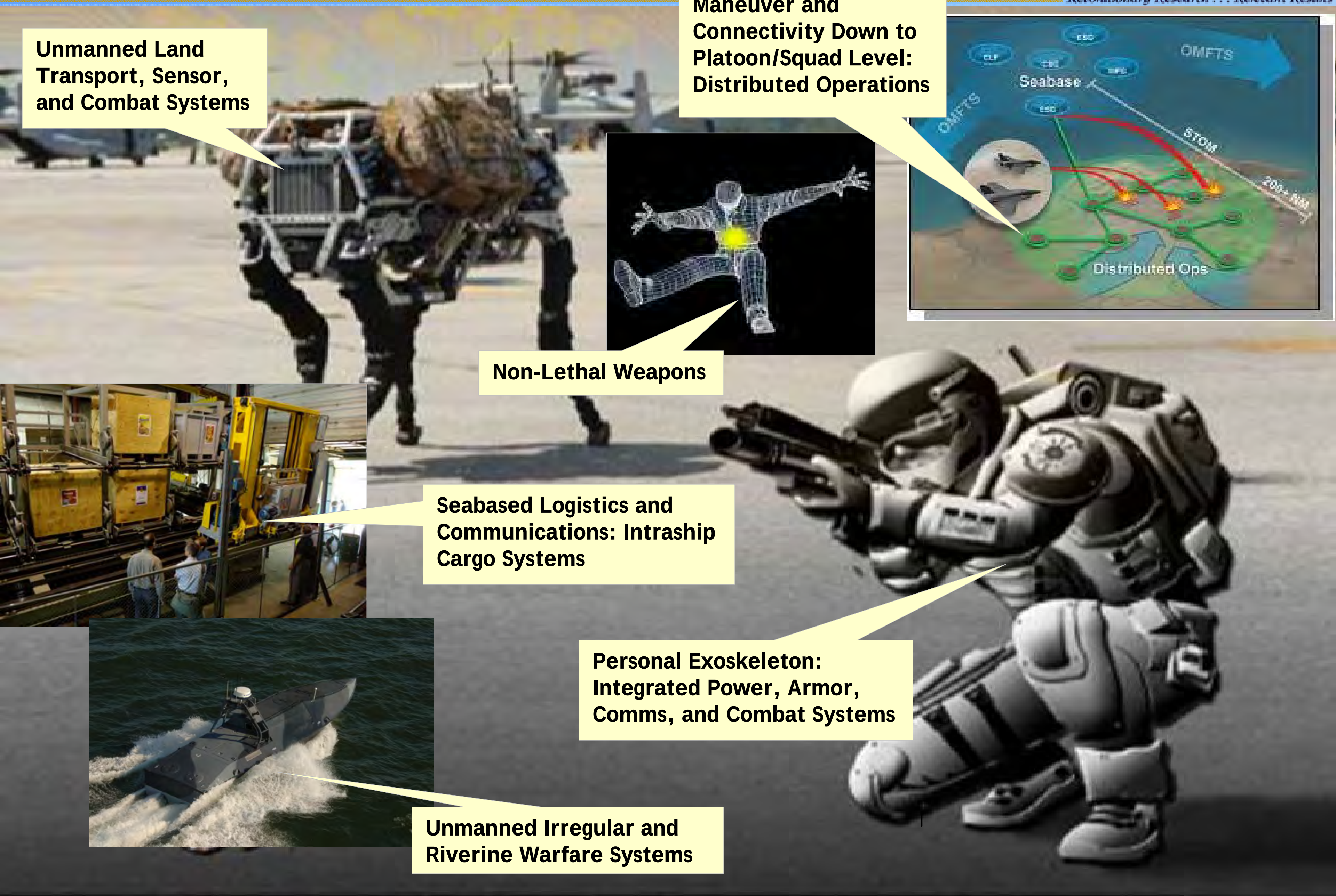
Self-Organizing, Dynamic Tactical Communications Networks

Outthinking & Out-Adapting the Enemy

Revolutionary Research . . . Relevant Results

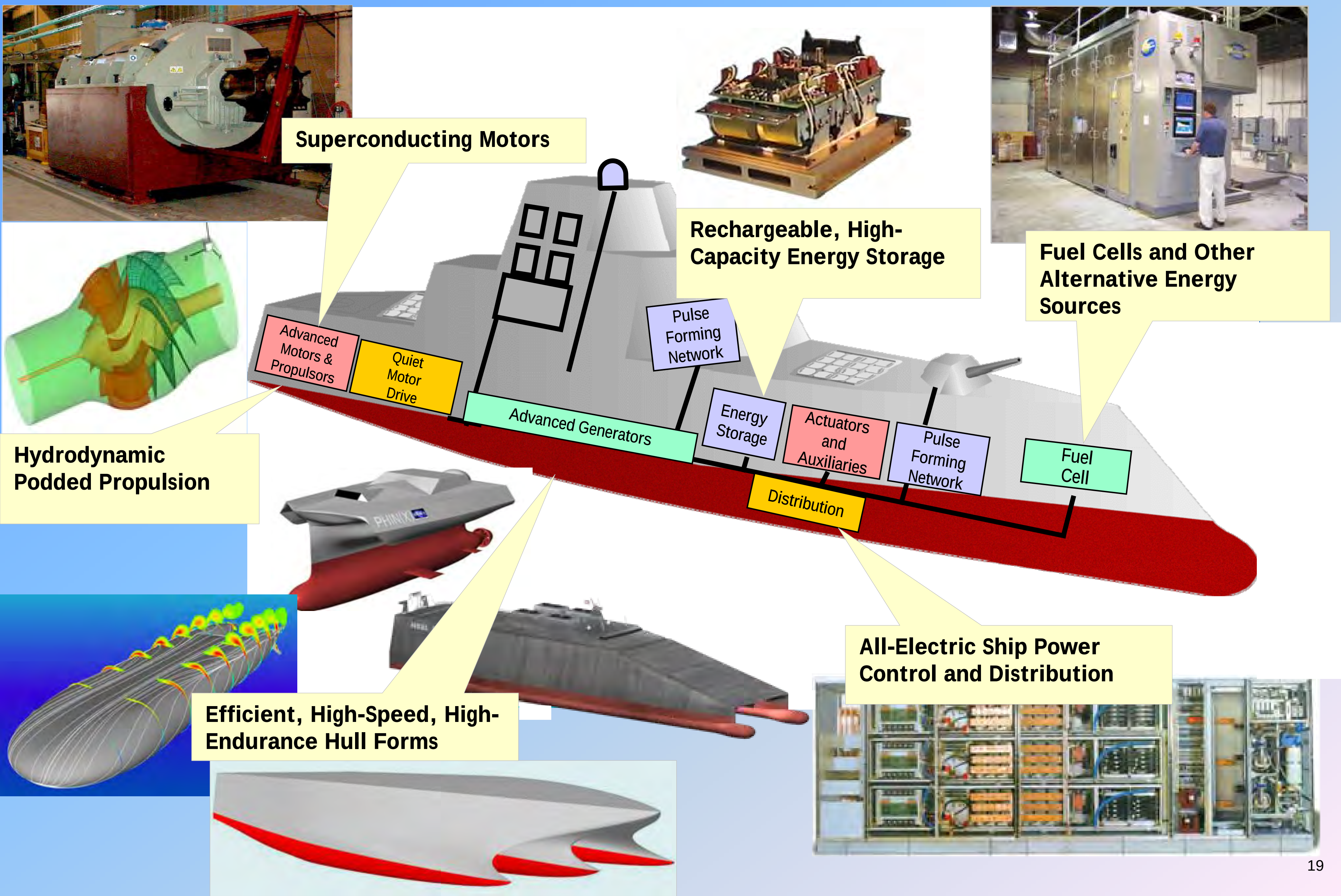
Dominating the Battle in the Littorals

Revolutionary Research . . . Relevant Results



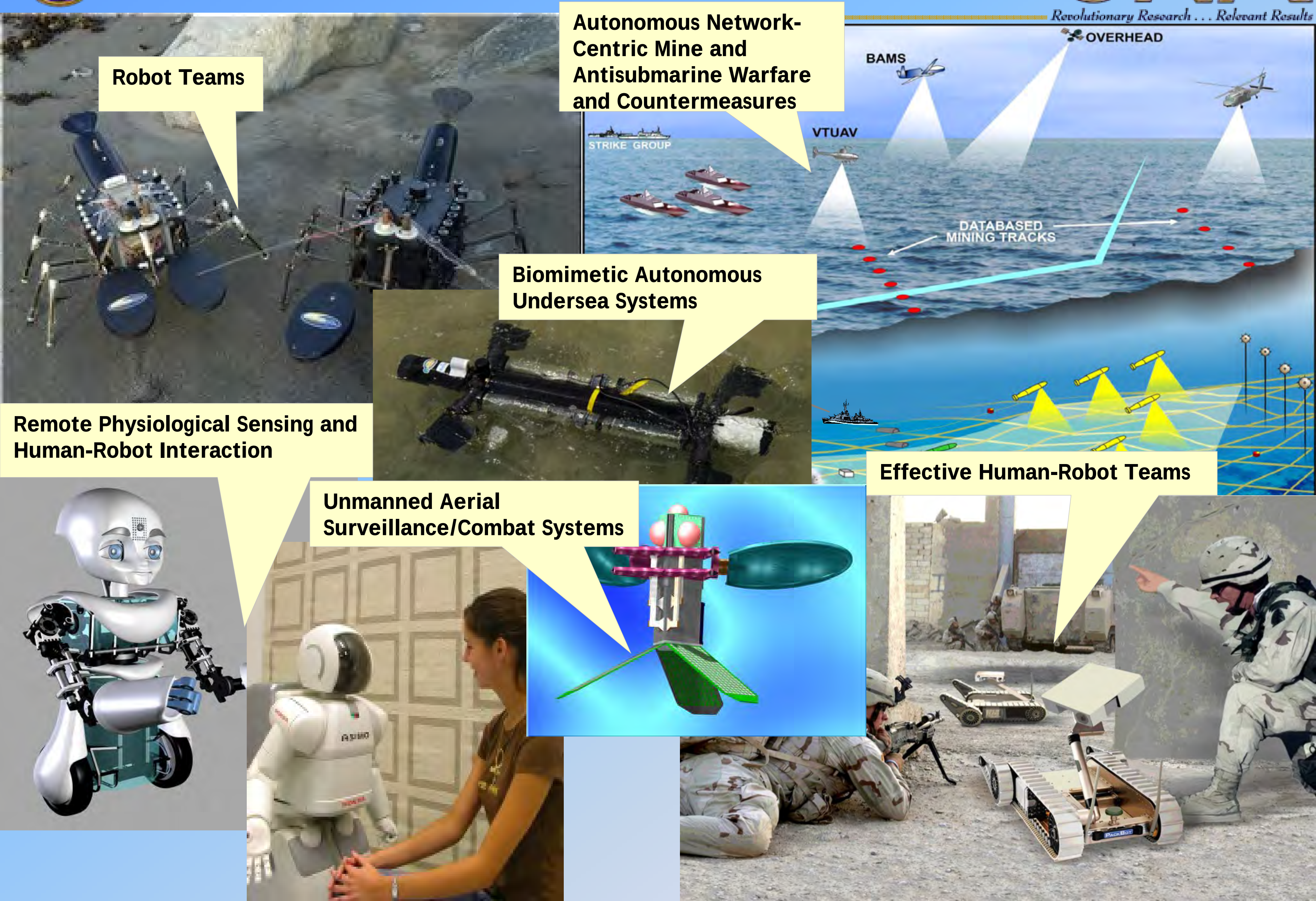
Next-Generation Power, Propulsion, and Hull Forms

Revolutionary Research . . . Relevant Results



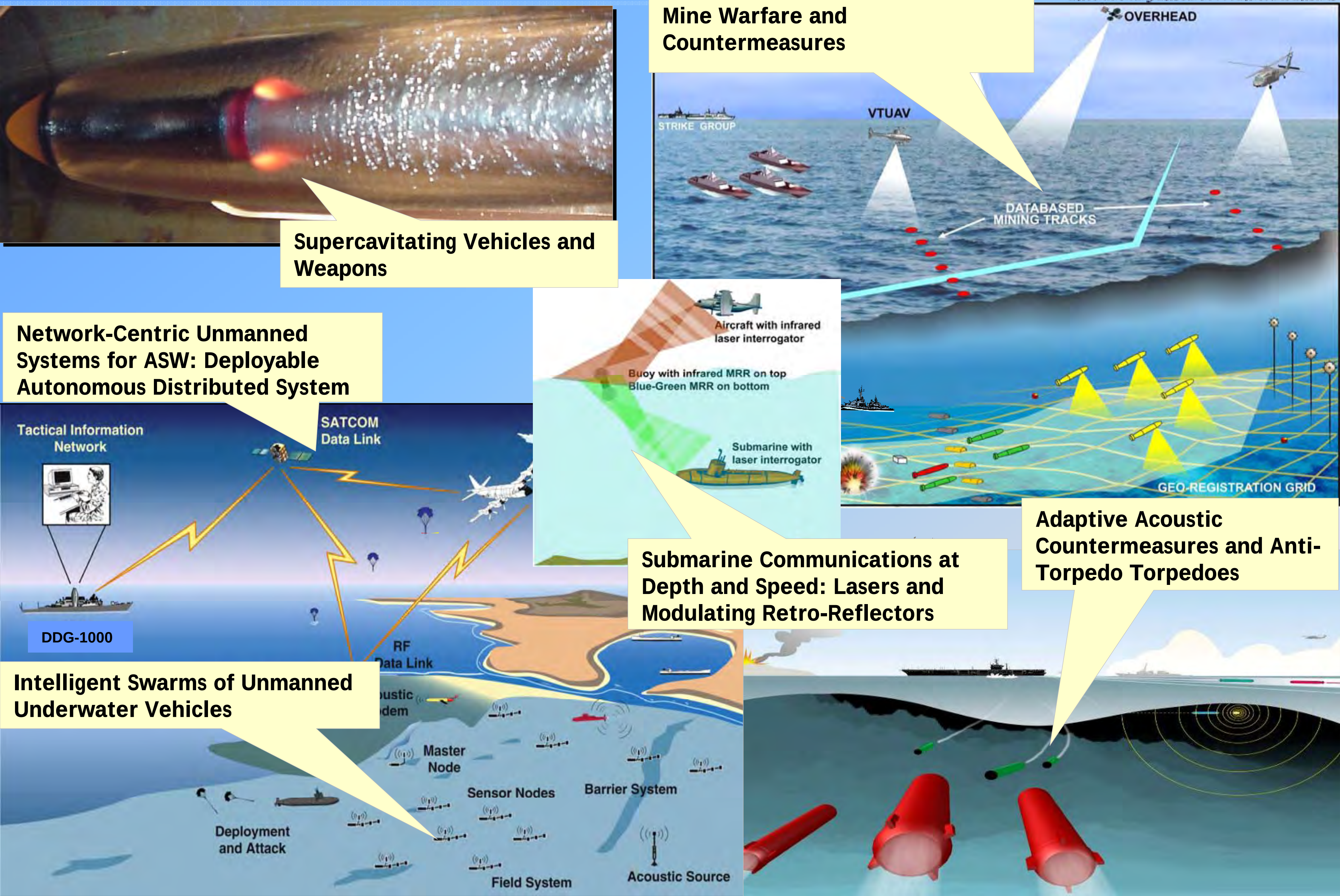
Adaptable Autonomous Systems

Revolutionary Research . . . Relevant Results



Dominating the Undersea Battlespace

Revolutionary Research . . . Relevant Results



A Swiftly Changing Planet

Revolutionary Research . . . Relevant Results

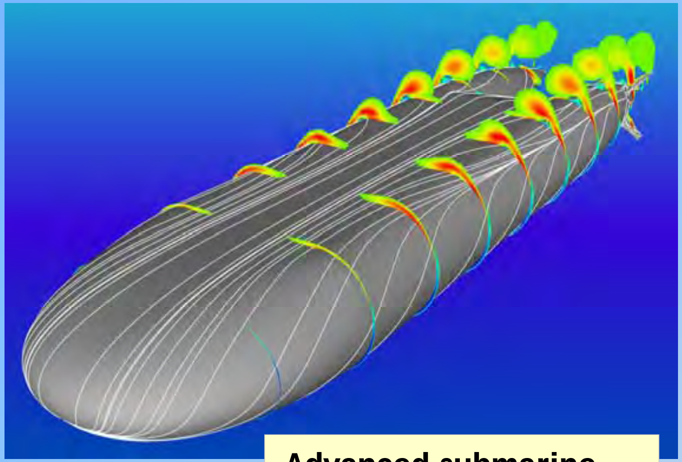
- In an era of increasing globalization, new technology is more readily available—and more quickly—than ever before
- The natures of "combatant" and "weapon" are changing, and new challenges can come from anywhere in the world

- We must accept the fact that adversaries will use our technology against us
- To stay competitive on tomorrow's battlefields, we must:
  - **Ensure** our people and research enterprises are more innovative
  - **Maintain** our technological advantage

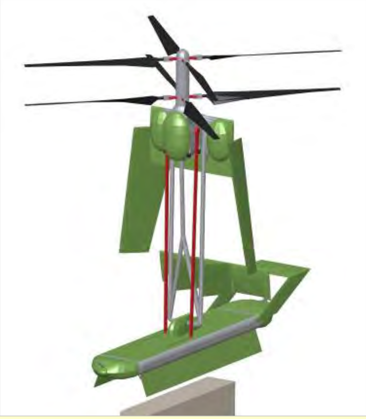
Relevant and Revolutionary

Revolutionary Research . . . Relevant Results

Supercavitating weapons and transports



Advanced submarine and ship designs



Unpiloted logistics and support aircraft

Radically augmented human performance

"I never, ever want to see a Sailor or Marine in a fair fight."

— ADM Gary Roughead, CNO

Long-range, ultra-high-endurance air platforms

The Home of Innovation

Revolutionary Research . . . Relevant Results

The Office of Naval Research is THE destination for innovative ideas and the birthplace of next-generation science and technology

Office of Naval Research

Revolutionary Research . . . Relevant Results

www.onr.navy.mil

Pacific Operational Science & Technology Conference

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Listen Up! Panel

CMSgt James Roy, USAF
MSG Luis Colon, USA
SSG (P) Randall Reed, USA
SSgt Michael R. Kaylor, USMC
Sgt Daniel T. Kreitzer, USMC
TSgt Mark L. Farmer (CES)-USAF

TSgt James E. Gardner III (SFS)-USAF
SGT Sean Martin (3IBCT)-USA
CPL Luke Solorzano (3IBCT)-USA
SO1 (SEAL) Dave Noyes-Smith
ENC Jonathan Dupree
SOC (SEAL) Mark Cardillo

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Pacific Operational Science and Technology Conference

Donald P. Loren
Deputy Assistant Secretary of Defense
for
Homeland Security Integration
July 16, 2008

POLICY

Agenda

- Function and mission of the ASD for Homeland Defense and Americas' Security Affairs
- Defending the homeland in depth requires PACOM
- Ongoing national level planning activities
- Synchronization of state activities - Task Force for Emergency Response (TFER)
- 15 national planning scenarios application to Pacific AOR
- Summarize how HD & ASA can assist PACOM

POLICY

DoD is the Lead for Homeland Defense

Homeland Defense is the protection of US sovereignty, territory, domestic population, & critical defense infrastructure against external threats and aggression or other threats as directed by the President.

- **DoD roles within the United States:**
  - Homeland Defense (HD)
    - DoD exercises its core warfighting mission – to defend U.S. territory and interests
    - Missions include: Maritime Interception Operations, Air Patrols over U.S. airspace, Land-based defense of critical infrastructure and assets, and Use of military forces, when directed by the President or Secretary of Defense, to protect the U.S. and territories from attack
  - Defense Support of Civil Authorities (DSCA)

POLICY

U.S. National Security Environment: A Diverse Set of Threats

- **Nation-state threats will continue**
  - "Traditional" ballistic and cruise missile threats
  - Rogue states employing asymmetric means
  - Potential emergence of a regional peer competitor
  - Asymmetric warfare: cyber attacks

- **Natural Hazards**
  - Earthquake
  - Flood, Tsunami
  - Wildfire
  - Disease

- **Transnational threats will be the most pressing**
  - Terrorists will seek to
    - Attack Americans and Allies at home and abroad
    - Inflict mass casualties or cause mass panic through CBRN means (e.g., CBRN weapons or conversion of civilian infrastructure or transport into WMD)

U.S. Approach to Countering the Threats: Homeland Defense

Homeland Defense is the protection of US sovereignty, territory, domestic population, & critical defense infrastructure against external threats and aggression or other threats as directed by the President.

- **DoD roles within the United States:**
  - Homeland Defense (HD): DoD exercises its core warfighting mission – to defend U.S. territory and interests
    - **PACOM, NORTHCOM, SOUTHCOM**
    - **Missions include**:
      - Maritime Interception Operations
      - Air Patrols over U.S. airspace
      - Land-based defense of critical infrastructure and assets
  - Defense Support of Civil Authorities (DSCA)
    - Typical DoD DSCA missions include support to other Federal Departments and Agencies, *in support of State and local needs*
  - Role of National Guard
    - Chain of Command – President or State Governor

The Department of Defense conducts homeland defense missions whenever the President, exercising his constitutional authority as Commander in Chief, authorizes military actions.

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U.S. Approach to Countering the Threats: Homeland Security

Homeland Security is a concerted ***National*** effort to prevent terrorist attacks within the United States, reduce America's vulnerability to terrorism, and minimize the damage and recover attacks that do occur.

National Strategy for Homeland Security (October 2007)

- **The Department of Homeland Security (DHS) is responsible for the homeland security of the United States: local, state, and national**
- **DHS also has responsibilities beyond the prevention of terrorism**
  - ***Improve Information Sharing*** ***- Immigration***
  - ***Border Security*** ***- Commerce & Trade***
  - ***Transportation Security***
  - ***Domestic Counterterrorism***
- **Other federal agencies, such as the FBI, also have critical roles in combating terrorism (e.g., FBI is responsible for terrorist crisis management in the U.S.)**

The Department of Homeland Security conducts homeland security missions through statutory authority provided by Congress.

POLICY

Spectrum of Response: Military or Civilian?

Spectrum of Threats to the Homeland

WAR

CRIME

Clearly military operations

Example: missile attack

"The Seam"

- Overlap of capabilities
- Overlap of responsibilities

Not clearly military

Not clearly law enforcement

Example: maritime security

Clearly law enforcement

Example: bank robbery

Capabilities

Military

Non-military

POLICY

Homeland Defense: The DoD Organizing Construct

❑ ***Lead:*** **Defend the United States from direct attack**

- At the direction of the President or the Secretary of Defense
- Combat Air Patrols, Maritime Intercepts, Missile Defense

❑ ***Support:*** **Provide defense support of civil authorities**

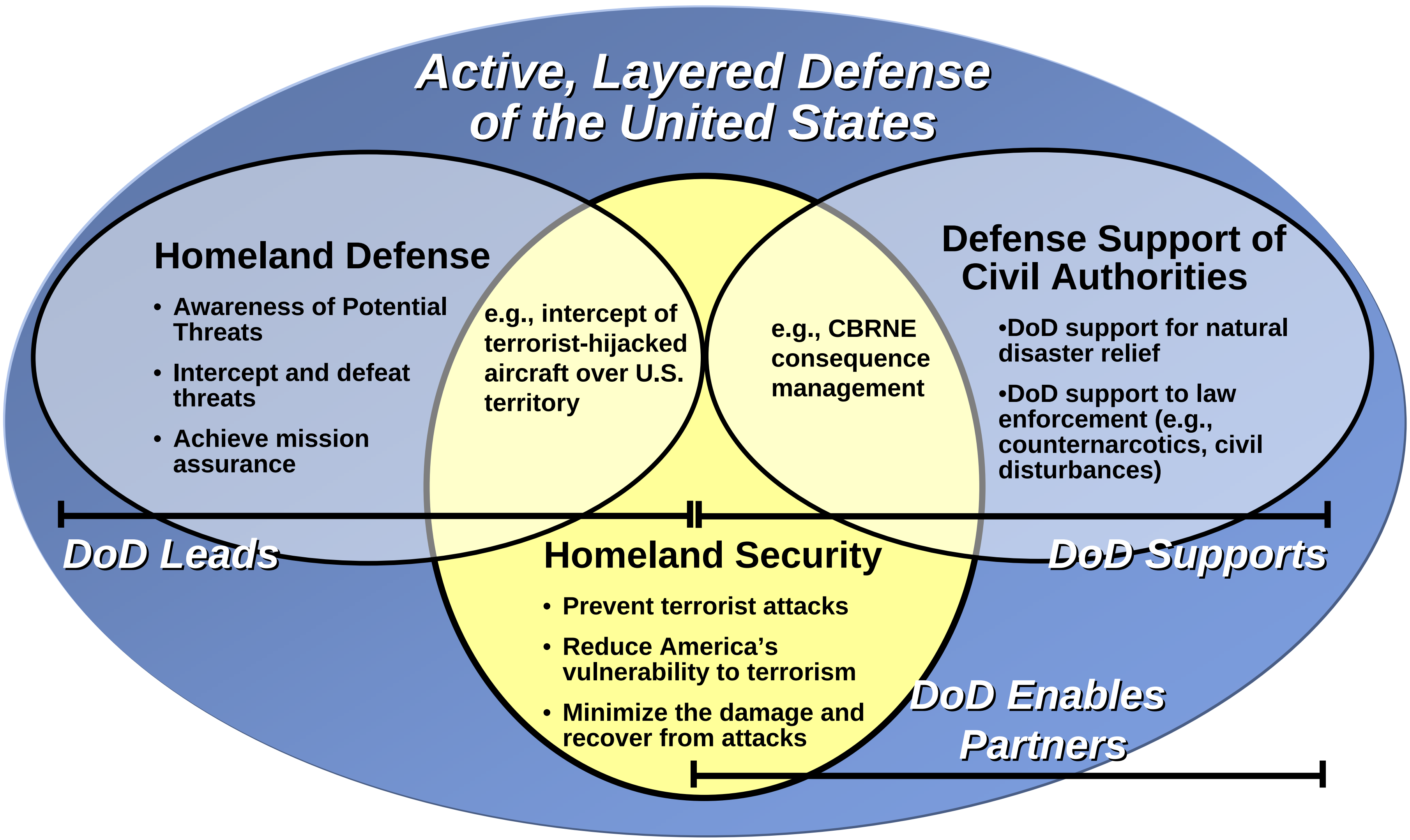
- At the direction of the President or the Secretary of Defense
- Natural Disasters and CBRNE Consequence Management

❑ ***Enable:*** **Improve partner capabilities**

- Increase capabilities of local, state and federal first responders to improve homeland security
- Improve international partnerships and defense-to-defense relationships.

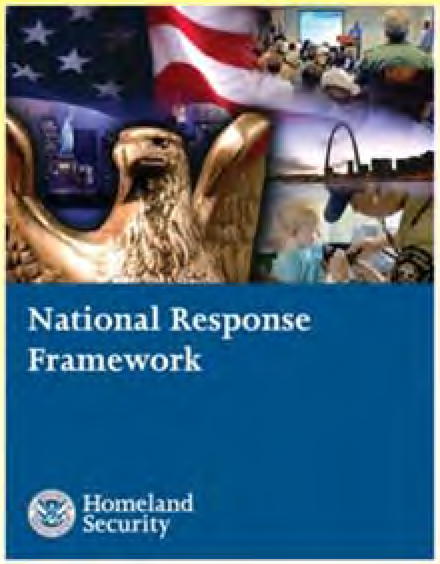
POLICY

U.S. Construct: Homeland Defense / Homeland Security



National Solution to Incident Response: The National Response Framework

POLICY



Core Document

Doctrine, organization, roles and responsibilities, response actions and planning requirements that guide national response

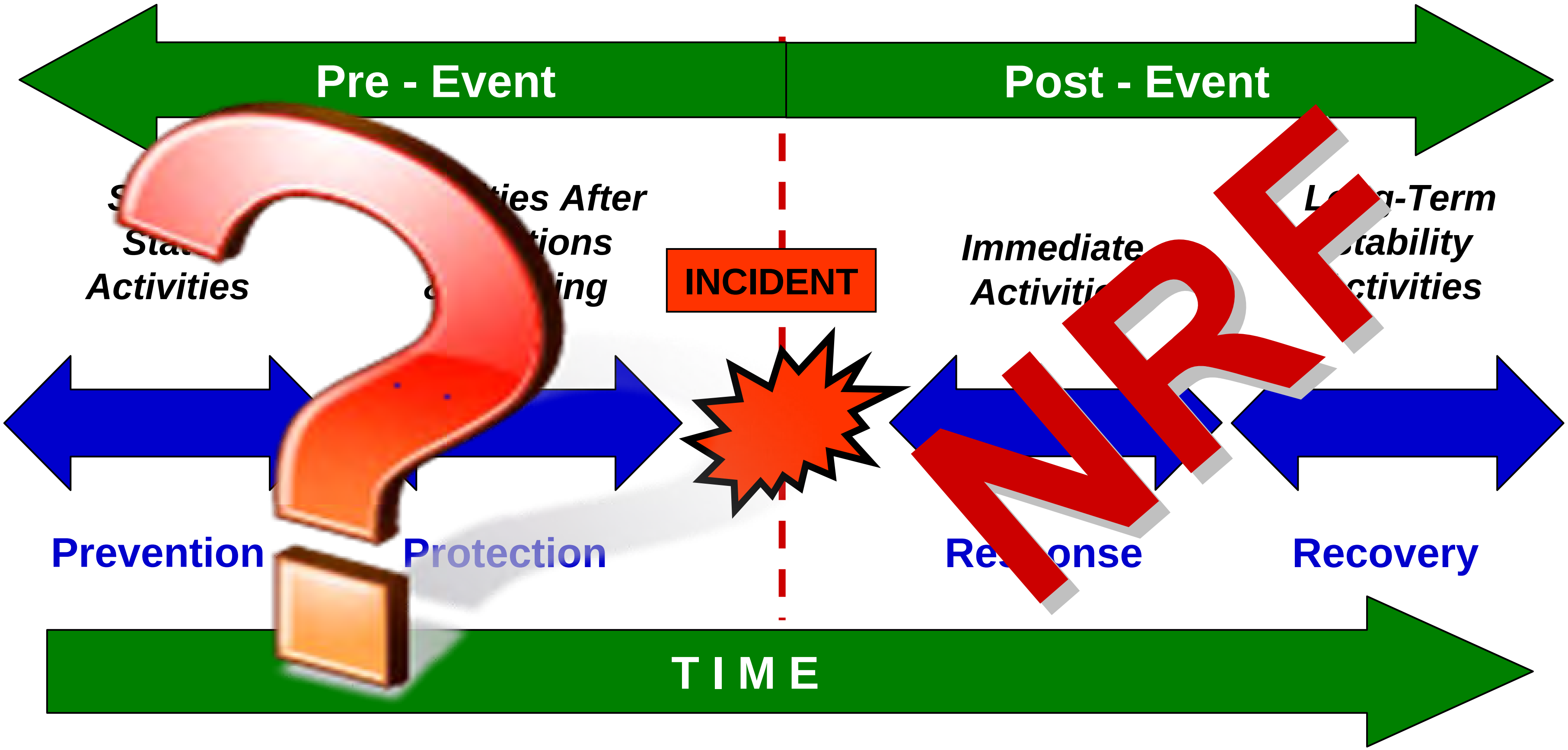
http://www.fema.gov/emergency/nrf/

NRF Resource Center

Emergency Support Function Annexes	**Mechanisms to group and provide Federal resources and capabilities to support State and local responders**
Support Annexes	**Essential supporting aspects of the Federal response common to all incidents**
Incident Annexes	**Incident-specific applications of the Framework**
Partner Guides	**Next level of detail in response actions tailored to the actionable entity**

POLICY

Preparedness Continuum: The Need for Pre-Event Planning



National Response Must Address <u>Full</u> Cycle Of The Preparedness Continuum

POLICY

Integrating State and Local Planning with Federal Planning

- **Interface → Supports State Emergency Management Agencies (EMA)**
- **Task Force for Emergency Readiness (TFER) focus is on aiding States in:**
  - ***Fixing*** shortcomings in existing plans
  - ***Building*** planning processes and planning communities
  - ***Resourcing*** plans by aiding in both assessment & analysis and increasing overall capability
- **Testing and improving plans through exercises**

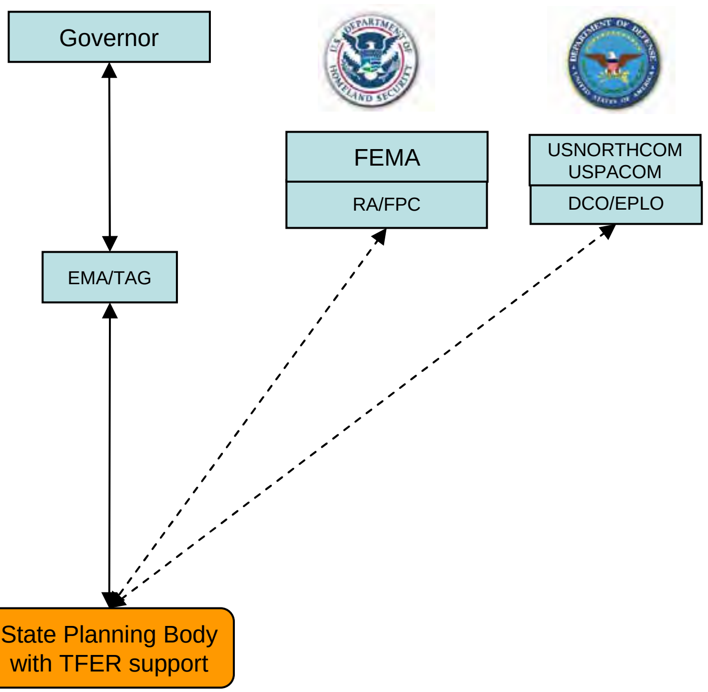
Supports Planning Through the Full Range of Preparedness Activities to include vertical and horizontal synchronization

POLICY

TFER Organization

ORGANIZATION

- State organization established by Governor
- DHS coordinates through the Federal Preparedness Coordinator (FPC) / Regional Administrator (RA)
- DoD coordinates through the Defense Coordinating Officer (DCO) / Emergency Preparedness Liaison Officer (EPLO)
- National Guard Bureau (NGB) coordinates through the Adjutant General (TAG)



TFER integrates Federal, State, local planners and as appropriate, private/public and non-governmental organizations into a State planning body, resulting in integrated national planning

CBRNE Consequence Management Response Force (CCMRF)

JTF-CS

HQ Augmentation

- Tech Aug
  - Mapping
  - Modeling
- Public Affairs

TF Response

Incident Site Support

- Coord w/Local EM Director
- Extraction of Injured
- Decontamination
- Surveying, Monitoring, and Marking of Incident Site
- Security and Protection

TF Medical

Medical Support

- Triage /Treatment
- Hospital Augmentation
- Agent Technical Support
- Veterinary Support
- Prophylaxis/Immunization
- NDMS support

TF Support

Logistics Support

- General Support Log
- JRSOI
- Displaced Populace
- Mortuary Affairs
- Transportation
- Engineering

TF Aviation

Aviation Support

- A2C2 (Rotary)
- Gen Avn Support
- Search and Rescue
- CASEVAC/MEDAVAC
- Aviation Maintenance

National Planning Scenarios (15)

- Scenario 1: Nuclear Detonation – 10-Kiloton Improvised Nuclear Device
- Scenario 2: Biological Attack – Aerosol Anthrax
- Scenario 3: Biological Disease Outbreak
- Scenario 4: Biological Attack – Plague
- Scenario 5: Chemical Attack – Blister Agent
- Scenario 6: Chemical Attack – Toxic Industrial Chemicals
- Scenario 7: Chemical Attack – Nerve Agent
- Scenario 8: Chemical Attack – Chlorine Tank Explosion
- Scenario 9: Natural Disaster – Major Earthquake
- Scenario 10: Natural Disaster – Major Hurricane
- Scenario 11: Radiological Attack – Radiological Dispersal Devices
- Scenario 12: Explosives Attack – Bombing Using IED
- Scenario 13: Biological Attack – Food Contamination
- Scenario 14: Biological Attack – Foreign Animal Disease
- Scenario 15: Cyber Attack

POLICY

Homeland Defense In the Pacific

Needed Capabilities include:

- ❑ Joint Command and Control for homeland defense and civil support missions including systems that are interoperable
- ❑ Seamless integration with NORTHCOM and SOUTHCOM
- ❑ Air and maritime domain awareness and information sharing about potential threats
- ❑ Capabilities to assist in responding to the consequences of major catastrophic events
- ❑ Broad spectrum medical countermeasures to defend against genetically-engineered pathogens and other asymmetrical attacks
- ❑ Tailored deterrence, including air and missile defenses

POLICY

How Can Homeland Defense Help PACOM Science & Technology Efforts

- Homeland Defense and Civil Support Capabilities Based Assessment (CBA)
- Comprehensive Maritime Awareness JCTD proponent
- Collaboration on Next Generation Over-The-Horizon-Radar (OTHR) Technology Risk Reduction Initiative and JCTD partnership with Australia
- Automated Biometrics Identification System (ABIS) data sharing with international partners advocacy
- HSPD – 6 international sharing of information on persons who pose a threat to national security coordination
- Wide area surveillance initiatives support

Homeland Defense and Americas' Security Affairs Can Integrate with PACOM

- **DHS Activities**
  - Shared funding
  - Teamwork to meet national goals
- **NORTHCOM and SOUTHCOM Synchronization Activities**
  - JCTDs (e.g. OTHR)
- **State Department**
  - HSPD – 6 international sharing of information on persons who pose a threat to national security
- **FEMA**
  - Synchronize planning process
- **White House Office on Science and Technology Policy**
  - HSPD-24 on Biometrics
  - National Identity Management Strategies
- **Domestic Readiness Group (DRG)**
  - White House led structure facilitating a comprehensive, integrated and coordinated approach to domestic incident management

POLICY

Cleared for PA release per WPAFB-08-4335, 11 Jul 08

AFRL

THE AIR FORCE RESEARCH LABORATORY

LEAD | DISCOVER | DEVELOP | DELIVER

PACOM + AFRL: You Gotta Have Friends!

16 July 2008

Maj Gen Curtis M. Bedke

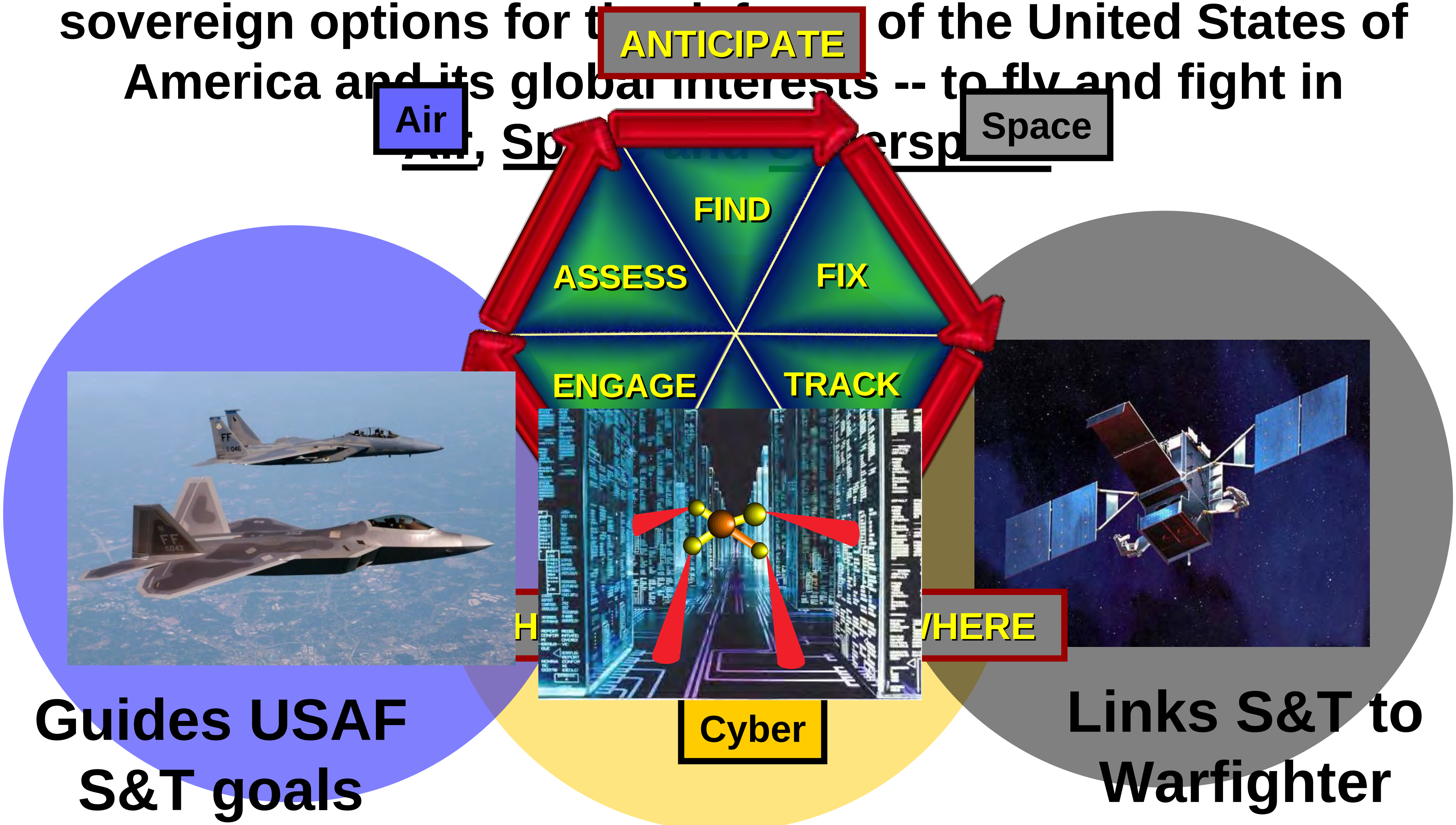
Commander

Air Force Research Laboratory

USAF Mission

USAF S&T Vision

The mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests -- to fly and fight in Air, Space and Cyberspace

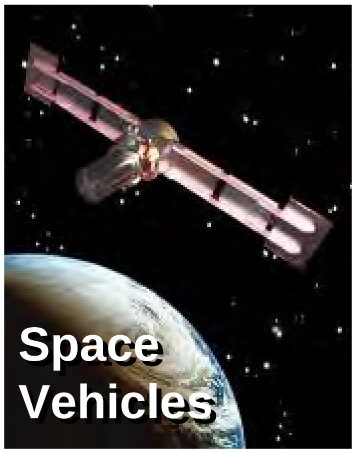


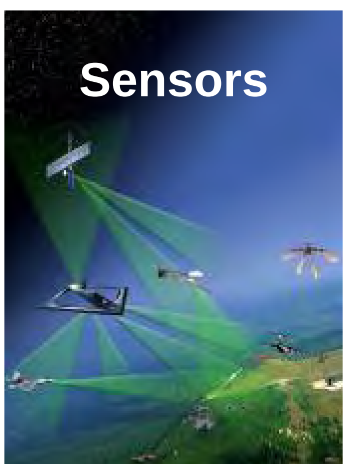
AFRL Mission

Leading the discovery, development, and integration of affordable warfighting technologies for our air, space and cyberspace force.

It's not just about the science…
…it's about *leadership* in S&T

Technical Directorates





Air Force Vision 2020

Global

Vigilance	Reach	Power

AFRL Strategic Vectors

Strategic Vectors

Universal Situational Awareness	Access and Survive in the Battlespace	Deliver Precision Effects

Julius Caesar's Vision

Julius Caesar - 47 BC

Veni	Vidi	Vici
I came	I saw	I conquered

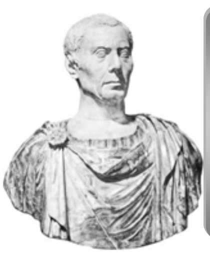
Restatement of Concepts

AFRL Strategic Vectors

Universal Situational Awareness	Access and Survive in the Battlespace	Deliver Precision Effects

Air Force Vision

Global Vigilance	Global Reach	Global Power



Julius Caesar - 47 BC

Veni (I came)	Vidi (I saw)	Vici (I conquered)

Focused Long Term Challenges

FLTC #1	Anticipatory Command, Control & Intelligence (C2I)
FLTC #2	Unprecedented Proactive Intelligence, Surveillance and Reconnaissance (ISR)
FLTC #3	Dominant Difficult Surface Target Engagement/Defeat
FLTC #4	Persistent & Responsive Precision Engagement
FLTC #5	Assured Operations in High Threat Environments
FLTC #6	Dominant Offensive Cyber Engagement
FLTC #7	On-demand Force Projection, Anywhere
FLTC #8	Affordable Mission Generation & Sustainment

AFRL S&T Strategy

AF S&T Vision

Anticipate, find, fix, track, target, engage, and assess – anything, anywhere, anytime

Universal Situational Awareness

- Multi-layer sensing architecture – with fused knowledge delivery, forensics and technical efforts
- Cyber Situational Awareness
- Space Situational Awareness
- Psycho-cultural Situational Awareness

FLTC 1 – Anticipatory Command, Control & Intelligence

FLTC 2 – Unprecedented Proactive Intelligence, Surveillance & Reconnaissance

Deliver Precision Effects

- Low-collateral-damage weapons
- Ubiquitous Swarming Sensors & Shooters
- Rapid global engagement

FLTC 3 – Dominant Difficult Surface Target Engagement/Defeat

FLTC 4 – Persistent & Responsive Precision Engagement

FLTC 6 – Dominant Offensive Cyber Engagement

Access and Survive in the Battlespace

- On demand access and mission effectiveness in space
- Cyber security, forensics, and assured battlespace networks
- Self Protection
- Sustaining Warfighter Capabilities

FLTC 5 – Assured Operations in High Threat Environments

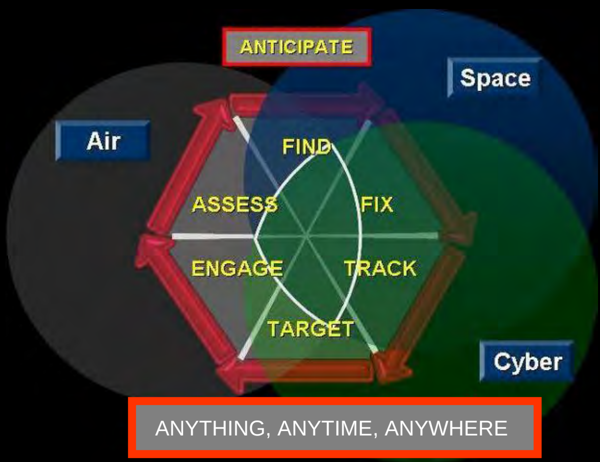
FLTC 7 – On-demand Force Projection, Anywhere

FLTC 8 – Affordable Mission Generation & Sustainment

Core Technical Competencies

AFRL's Core Processes Aligned to Customer Needs

Core Process 1



<u>Achieve AF S&T Vision</u>

Long-Term Focus

Lead / Discover

Core Process 2

<u>Deliver Needed Technology Options</u>

Mid-Term Focus

Develop / Deliver

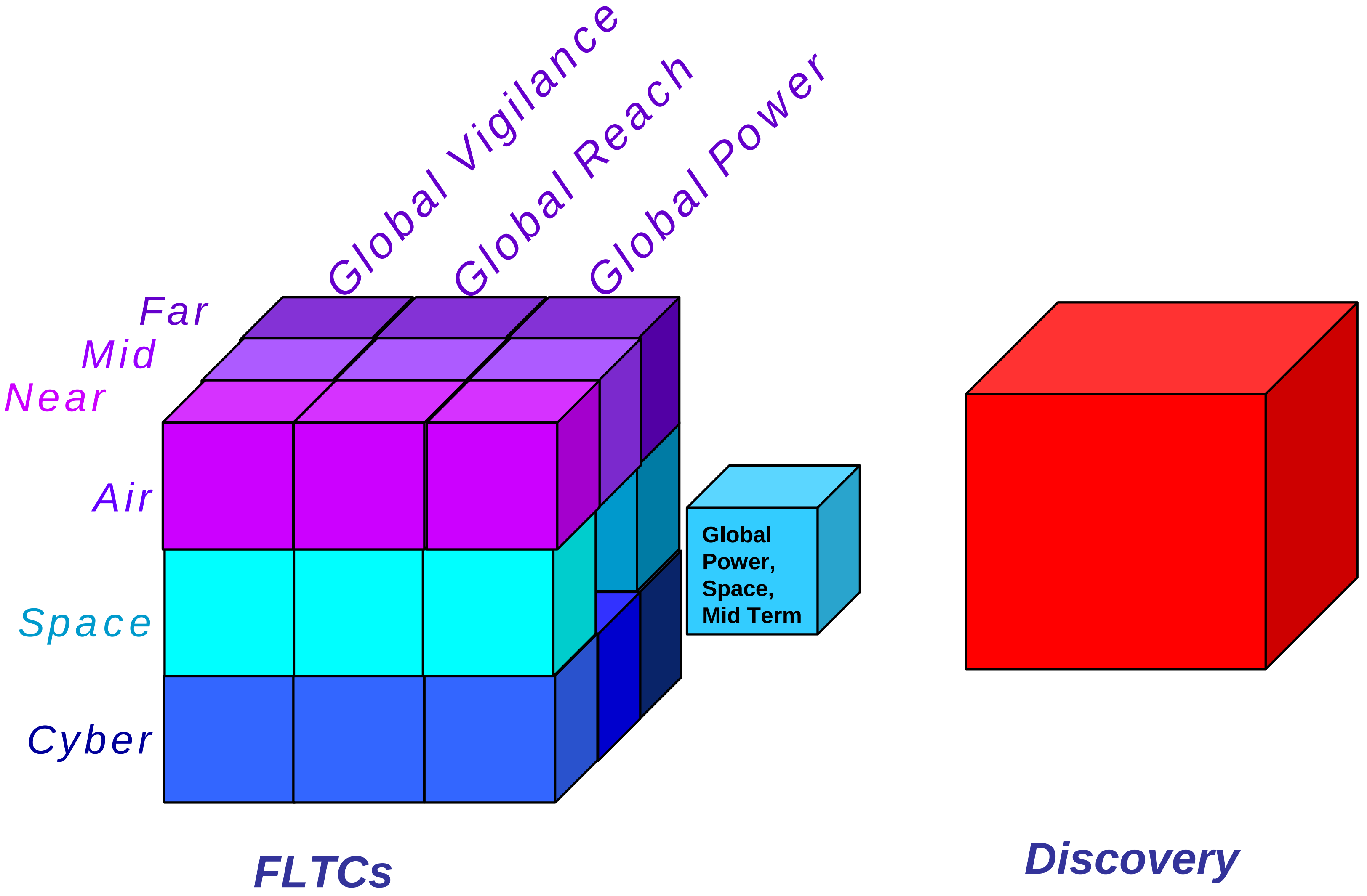
Core Process 3

<u>Deliver Rapid Response and Tech Support</u>

Near-Term Focus

Solve / Deliver

Depicting a Balanced Portfolio

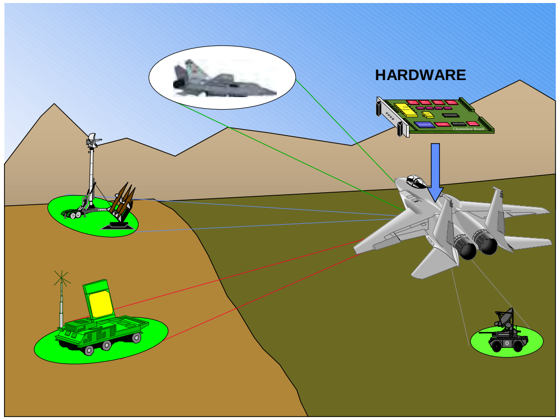


AFRL Manages Portfolio Using Multiple Frames of Reference

Air Domain: Near-term Technologies

UAS Operations Center

24/7 Operational Effectiveness



Digital Receiver Upgrade

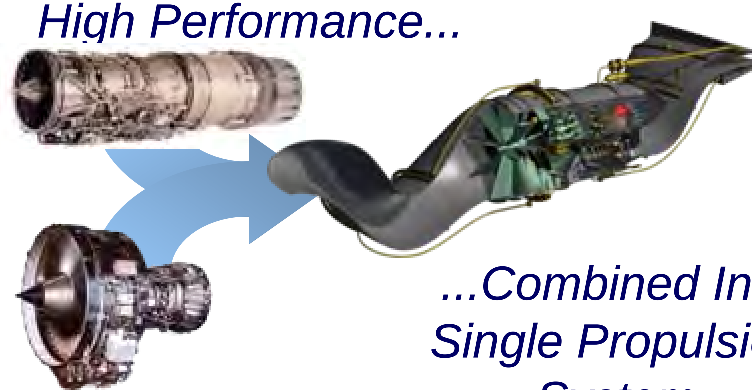
Stealth Aircraft Field Repair

Focused Lethality Munition

Air Domain: Mid-term Technologies

Target ID/cueing

Composite Cargo Aircraft

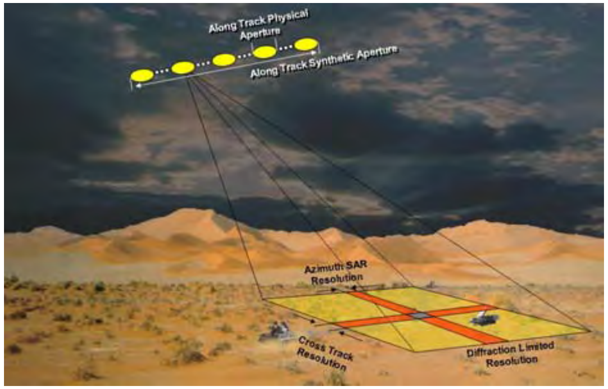


Collision Avoidance

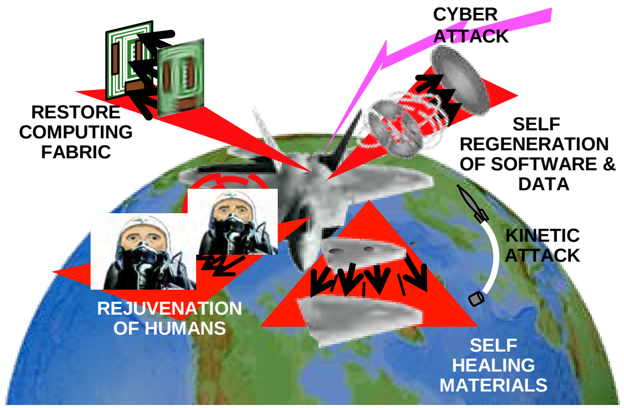
Advanced Tactical Laser

Sensor Hardening

Air Domain: Far-term Technologies



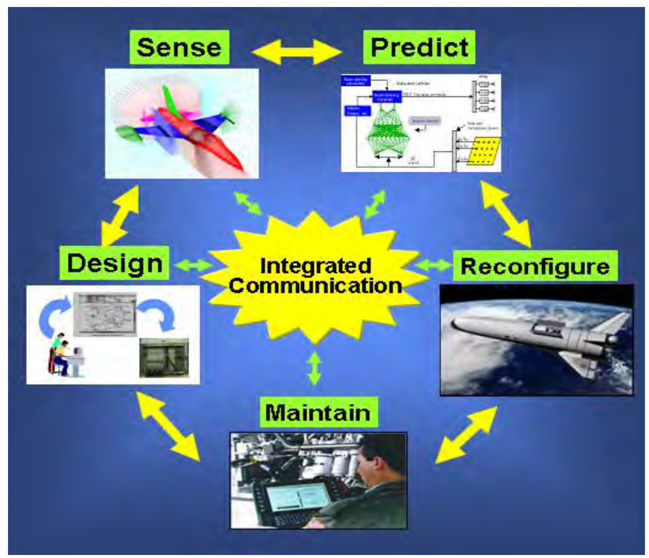
Synthetic Aperture Ladar



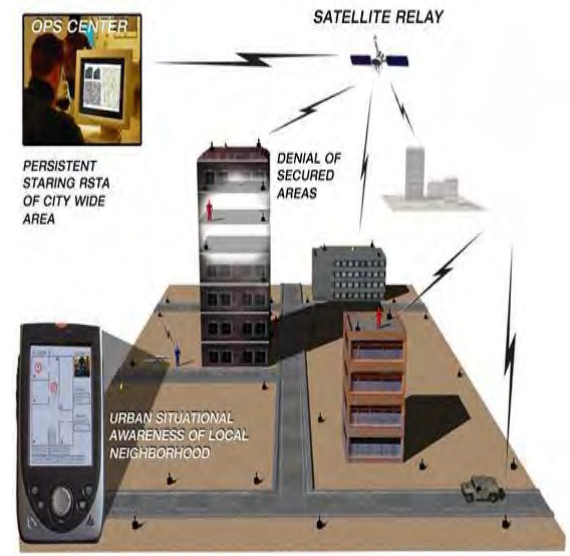
Self-healing/Recovery

Scramjet Cruise Missile

Advanced Mobility



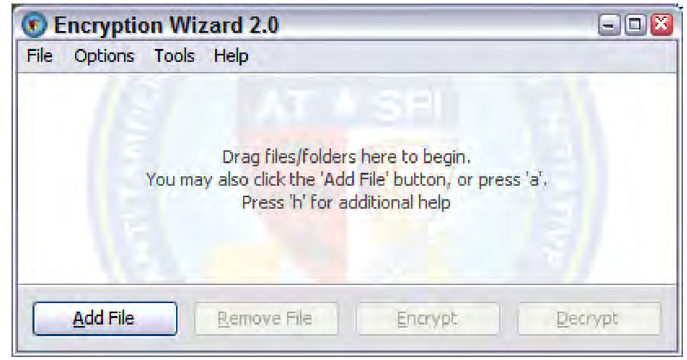
Condition-Based Maintenance



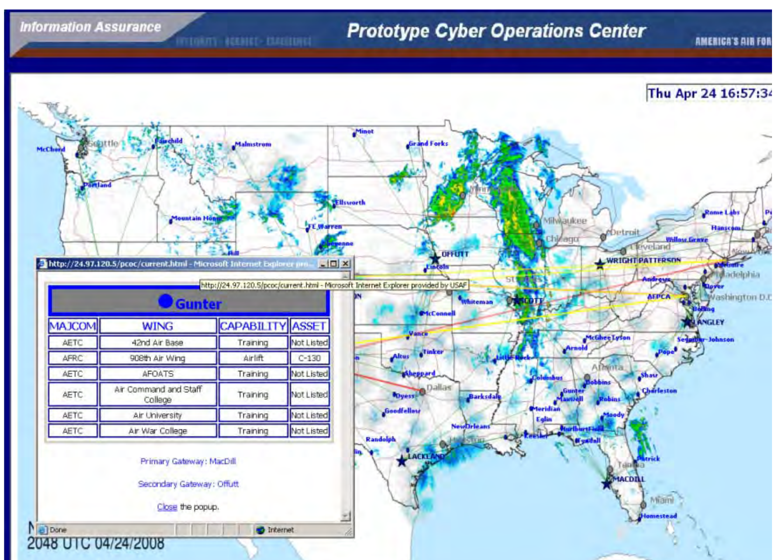
Persistent Layered ISR

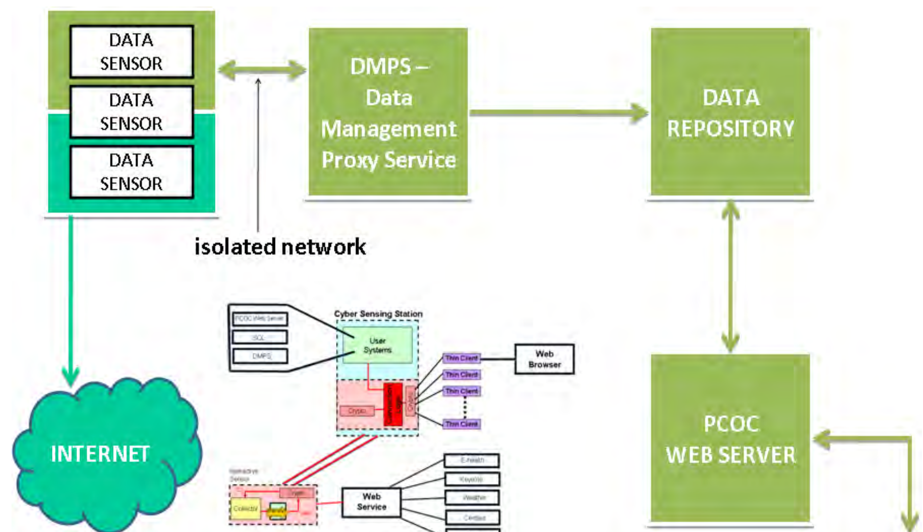
Cyber Domain: Near-term Technologies

Lightweight Portable Security



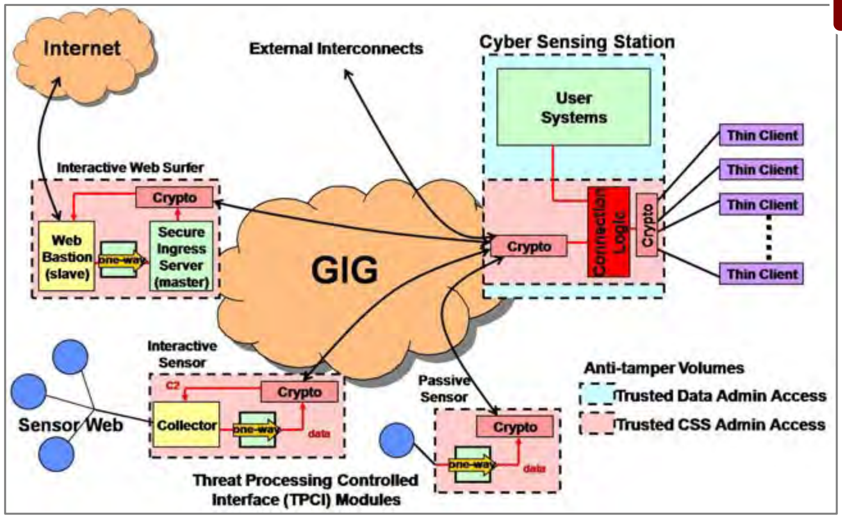
Encryption Wizard



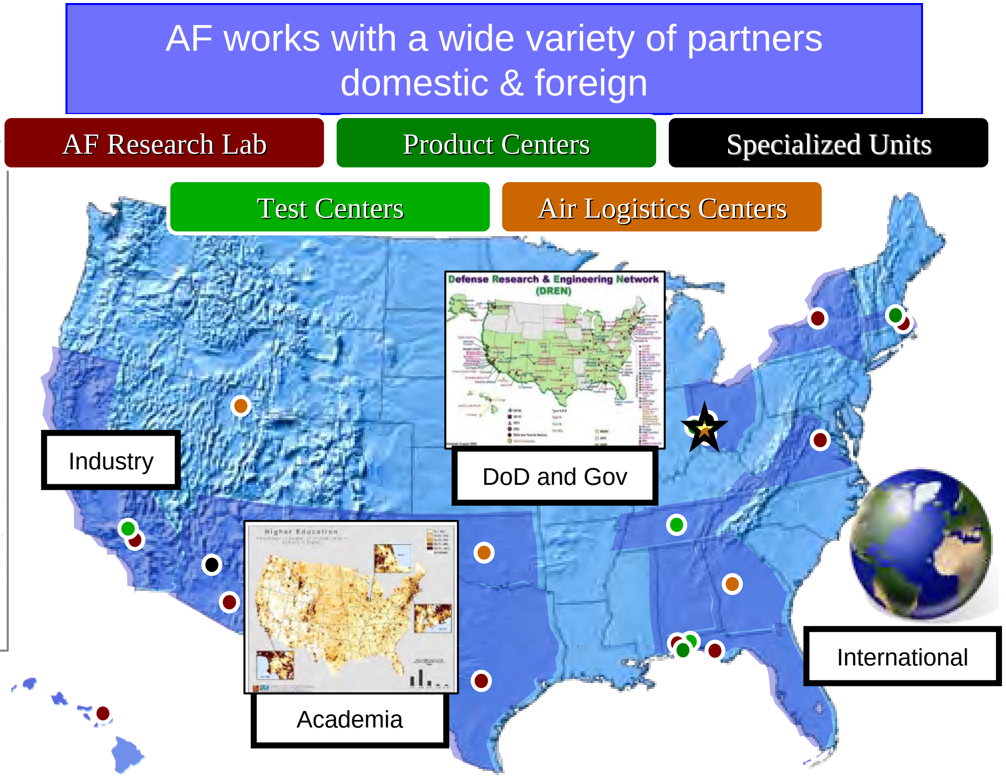


Prototype Cyber Operations Center - PCOC

Cyber Domain: Mid-term Technologies

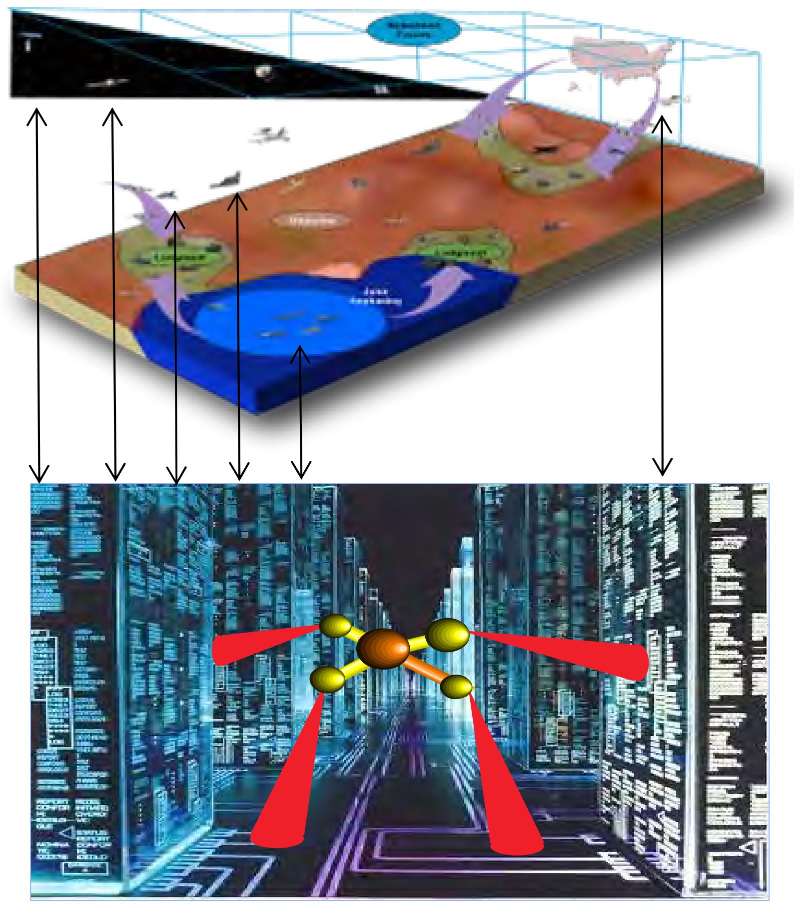


Cyber Sensing Station Network Enclave



Specialized Environments

Cyber Domain: Far-term Technologies

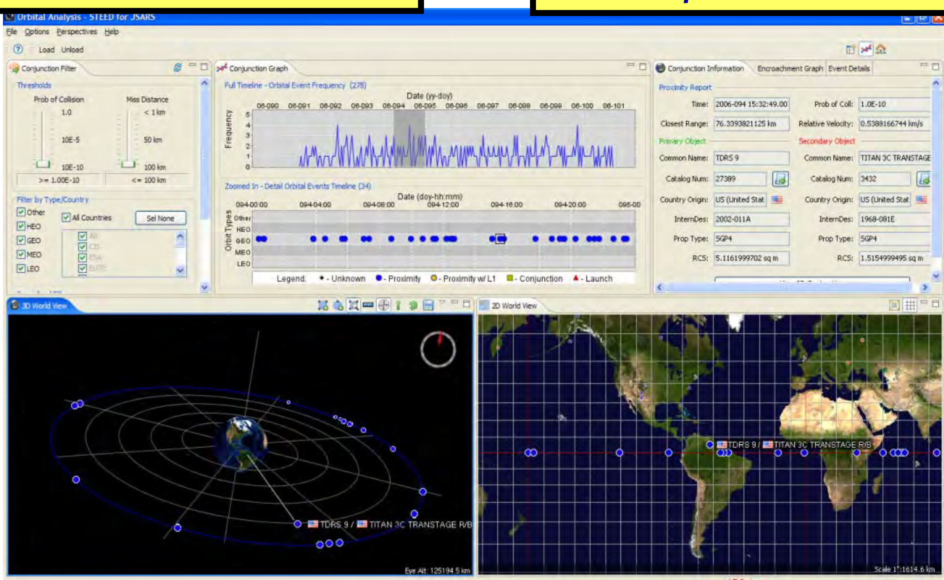


Offensive and Defensive Cyber Operations

Space: Near-term Technologies

All-on-all Conjunction Prediction and Proximity Awareness

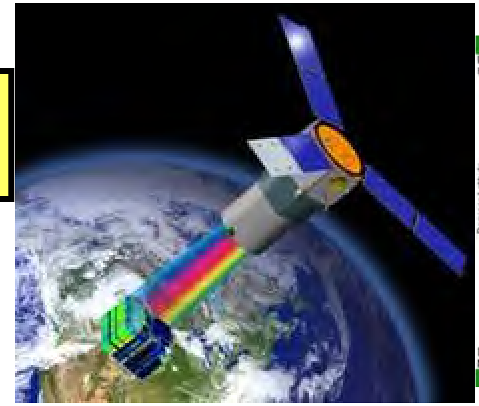
Multi-level Distributed Data Fusion of Satellite Telemetry & Space Weather



Satellite Information Database, with Net Centric Information

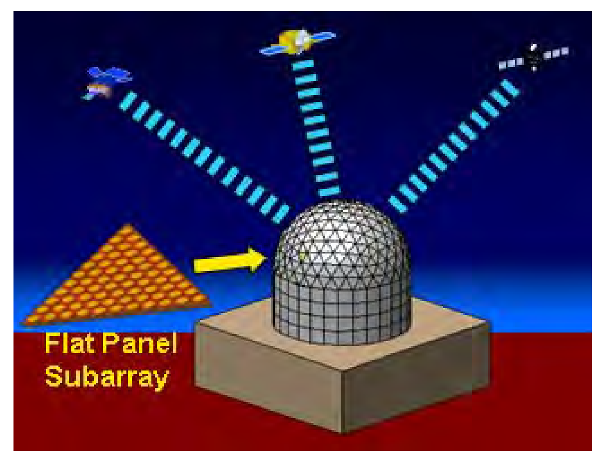
Advanced Visualization System For Intuitive Display And Interface

Joint Space Ops Center Situational Awareness Response Systems



TacSat-3

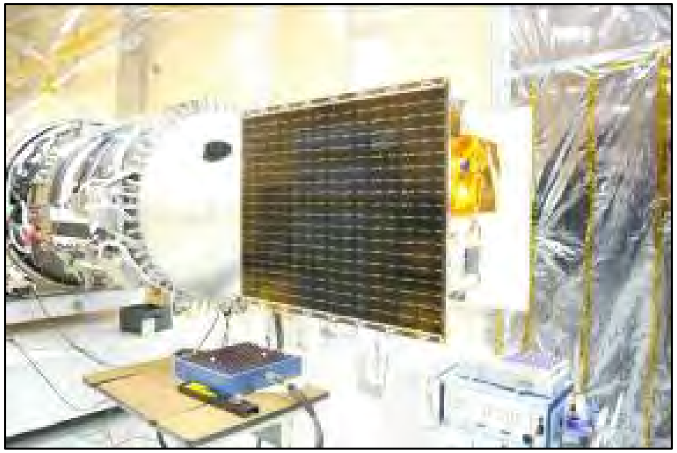
C/NOFS Forecast Map

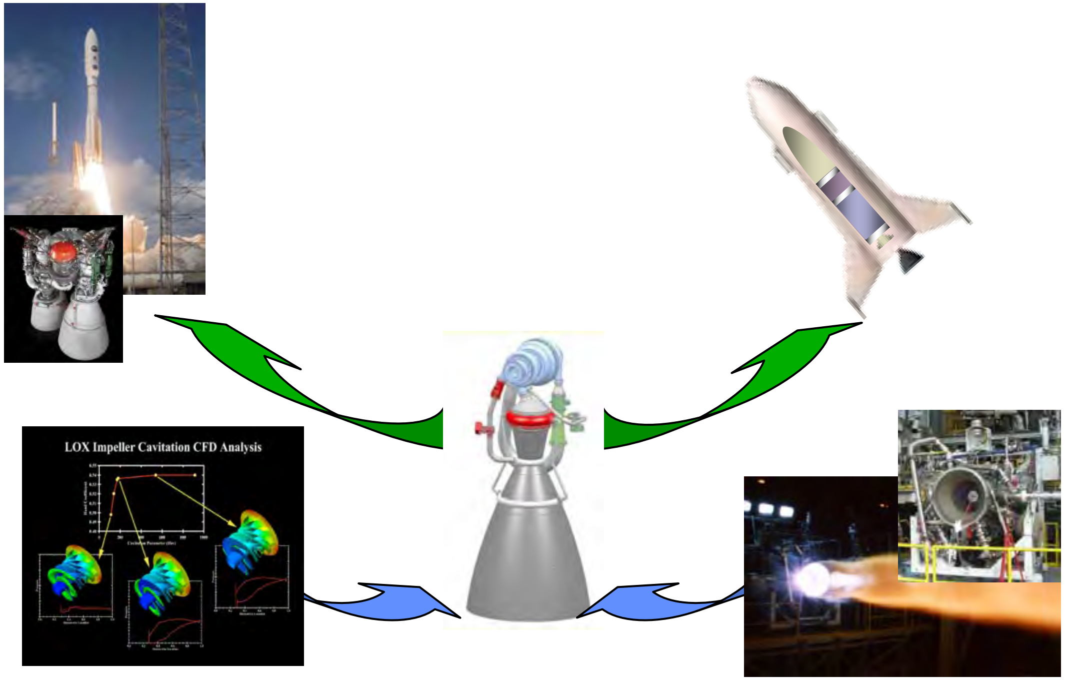


Satellite Control

Space: Mid-term Technologies

Advanced Multi-Junction Solar Cells





Hydrocarbon Boost Demo

Space: Mid-term Technologies

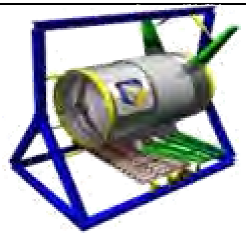
Future Responsive Access to Space Tech (FAST)

Airframe

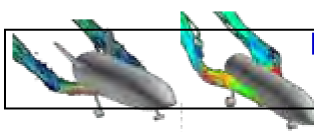
- Advanced composite airframe tank structures
- Structure health monitoring
- Thermal protection systems

Operability

- Rapid operability
- Rapid Mission Planning
- Mate/De-mate
- Propellant loading
- Ground and Mission Ops
- Engine Remove and Replace



Airframe & Structural Health Mgmt Experiment



Design & Operability Experiment

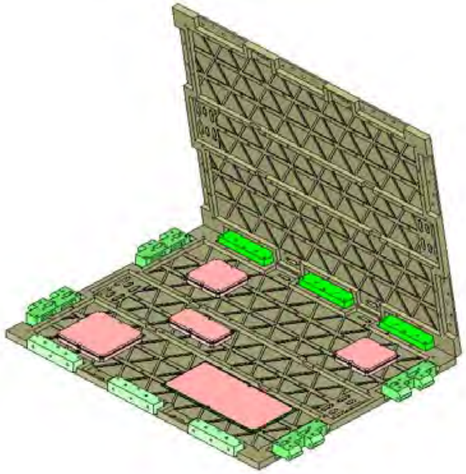
Integrated Adaptive Guidance & Control

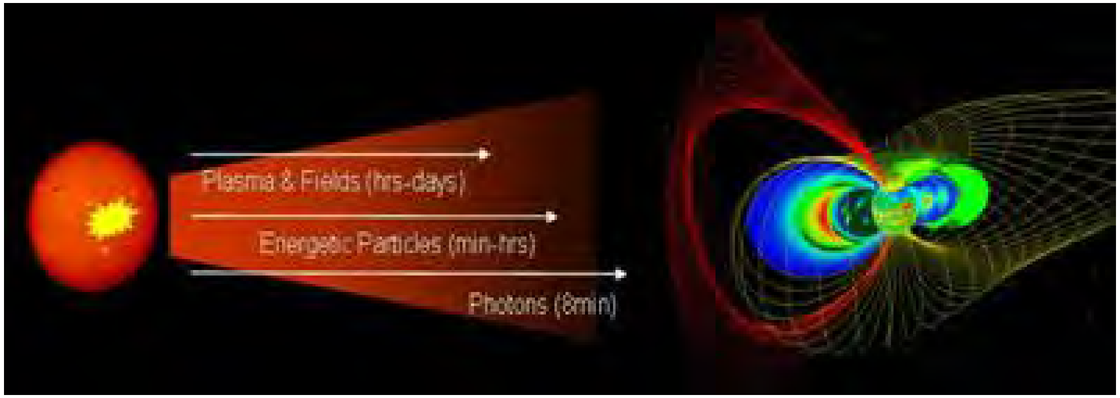
- Autonomous & Adaptive Guidance & Control
- Trajectory reshaping
- Mission re-planning in response to subsystem failures
- Integrated systems health monitoring

Adaptive Guidance and Control Experiment

Space: Far-term Technologies

Space Situational Awareness





Near-real time space environment forecasting

Take Away

- **AFRL's Vision, Strategy & Approach Directly Support PACOM's Needs**

- **Multiple Perspectives**
  - Global Vigilance, Reach, Power
  - Air, Space, Cyber
  - Defend, Engage, Attack
  - Near-, Mid-, Far-term
  - Etc...

Let's Keep the Dialogue Going!

AFRL

THE AIR FORCE RESEARCH LABORATORY

LEAD | DISCOVER | DEVELOP | DELIVER

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Australian Defence Science & Technology - making the difference

Dr Nanda Nandagopal

Deputy Chief Defence Scientist (Policy & Programs)

Pacific Operational Science and Technology Conference
Hawaii
July 2008

Discussion Topics

- What’s new in Australia?
- Defence Science making the difference
- Flagship Programs
- Capability Technology Demonstrator Program

New Govt - New initiatives

- White Paper Review
- Force Structure Review
- Companion Reviews
- Budget measures

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White Paper Review 2008

- Australian Minister for Defence, the Hon Joel Fitzgibbon MP, announced a new Defence White Paper.
- The White Paper will be underpinned by a series of Companion Reviews. These reviews will be a key input to developing Defence business and budget priorities out to 2030.

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Companion Reviews

- Defence Capability Plan Review
- Preparedness, Personnel and Operating Costs Review
- Logistics Review
- Estate Review
- Workforce Review
- Industry Capacity Review
- Workforce Review
- Industry Capacity Review
- Information and Communications Technology Review
- Science and Technology Review

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Defence Budget Measures

- **3% annual growth until 2018 (2 extra years)**
- In 2008-09, ~$22.6B
- $1.036 billion for ADF operations

Defence Budget Measures

- Defence needs to find savings of $10B over next decade
- $1B per year needs to be found to pay for Defence Capability Plan and Operations
- 5% cuts to the operational budget !
- Overseas travel cuts
- Reduction of Civilian staffing numbers

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Science Making the difference

- “Shapes Vector” Network security
- Nulka - Anti-ship Missile Defence – Off Board decoy
- Aircraft repairs/ fatigue testing
- High strength steel
- Barra sonobuoy
- Laser Airborne Depth Sounder
- Jindalee Operational Radar Network – Over the Horizon Radar

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Flagship Technology Initiatives

- Automation of the Battlespace
- Fibre Laser Sensor Technology
- Smart Materials and Structures
- Hypersonic flights

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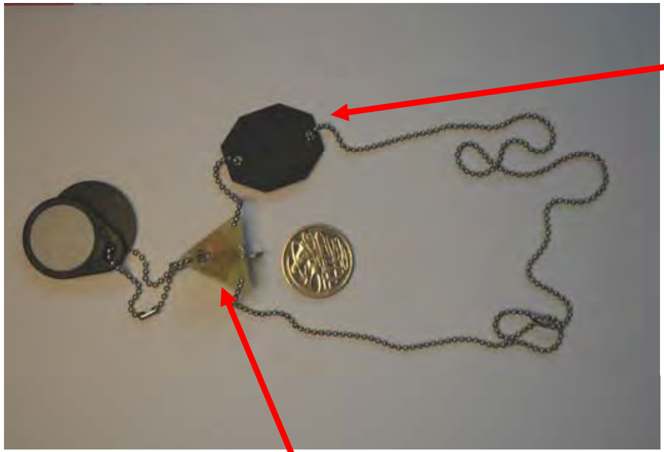
Capability & Technology Demonstrators

- Allows Australian Defence Industry to demonstrate how advanced technology can enhance Defence capability
- $210 M invested since 1998
- Average CTD $2m; 3 years



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Recent Capability & Technology Demonstrators

- Ka Band Satellite On-The-Move Communications System
- Field Portable Supersonic Particle Deposition unit
- Special Sonar for Submarines
- Elongate Solar Cells for Energy Generation
- Adaptive Tuned Mass Damper for Submarine Engines
- Miniaturised GPS Anti-Jam Module
- Low Band Direction Finding Sub-System
- Tactical Electronic Warfare Open Architecture RF Subsystem
- Rifle Fired High-Velocity Grenade Launcher
- Low Cost On-Store Telemetry
- Battlefield Integrated Tactical Exploitation of Sensors
- Take-Off and Landing Aid for Helicopter Maritime Operations

DSTO at a Glance

- Budget (08-09) – $400m (approx)
- 12 Research divisions
- 2400 staff
- 8 sites across Australia

Questions?

Dr Nanda Nandagopal – Deputy Chief Defence Scientist
Defence Science & Technology Organisation
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nanda.nandagopal@dsto.defence.gov.au
+61 (0) 2 6128 6304

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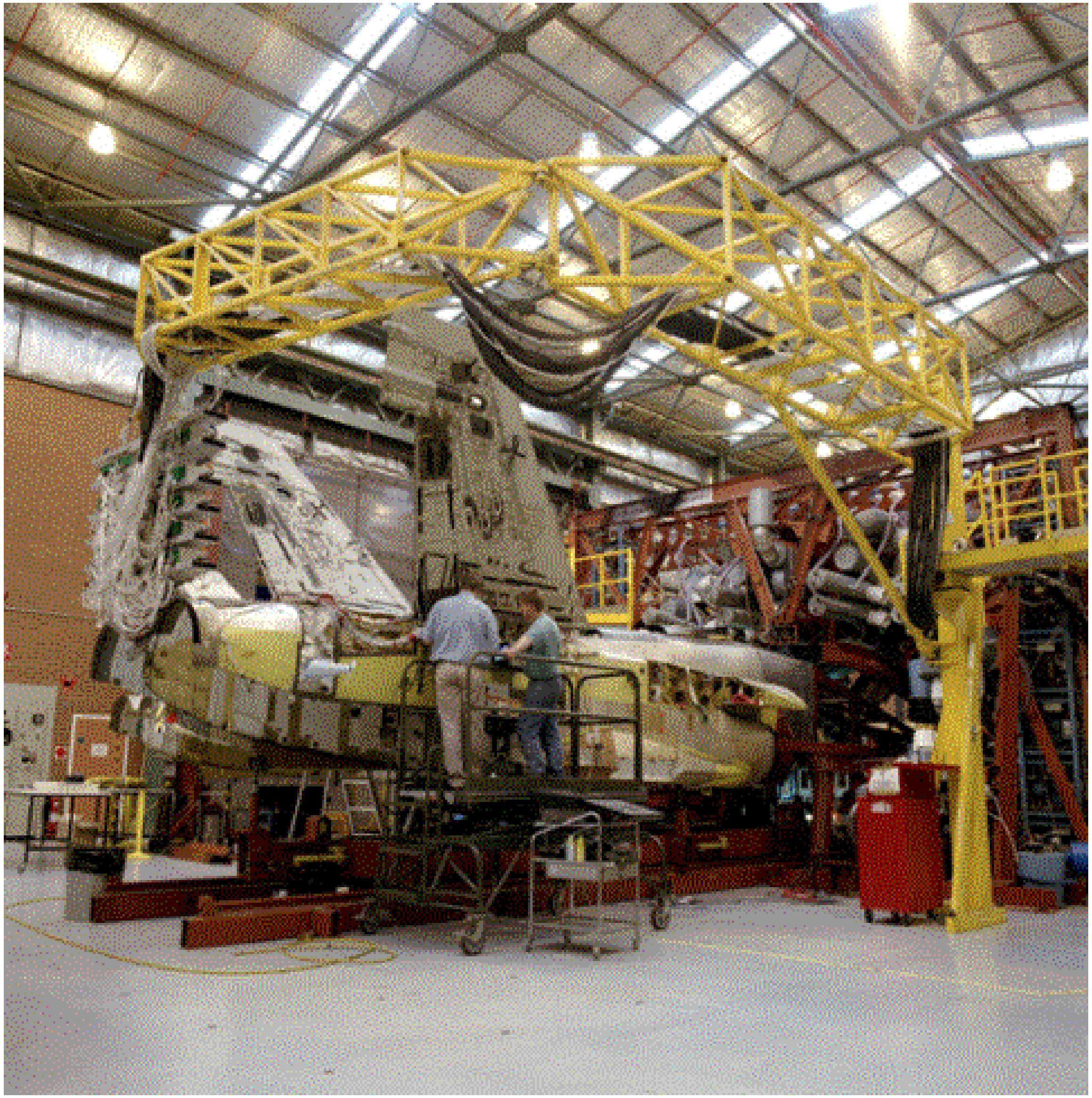
F/A-18 Fatigue Test



NULKA

- Hovering rocket to seduce anti-ship missiles
- DSTO invention
- Australia – US joint development
- Deployment to Australia, US, Canada

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Scale of the Problem

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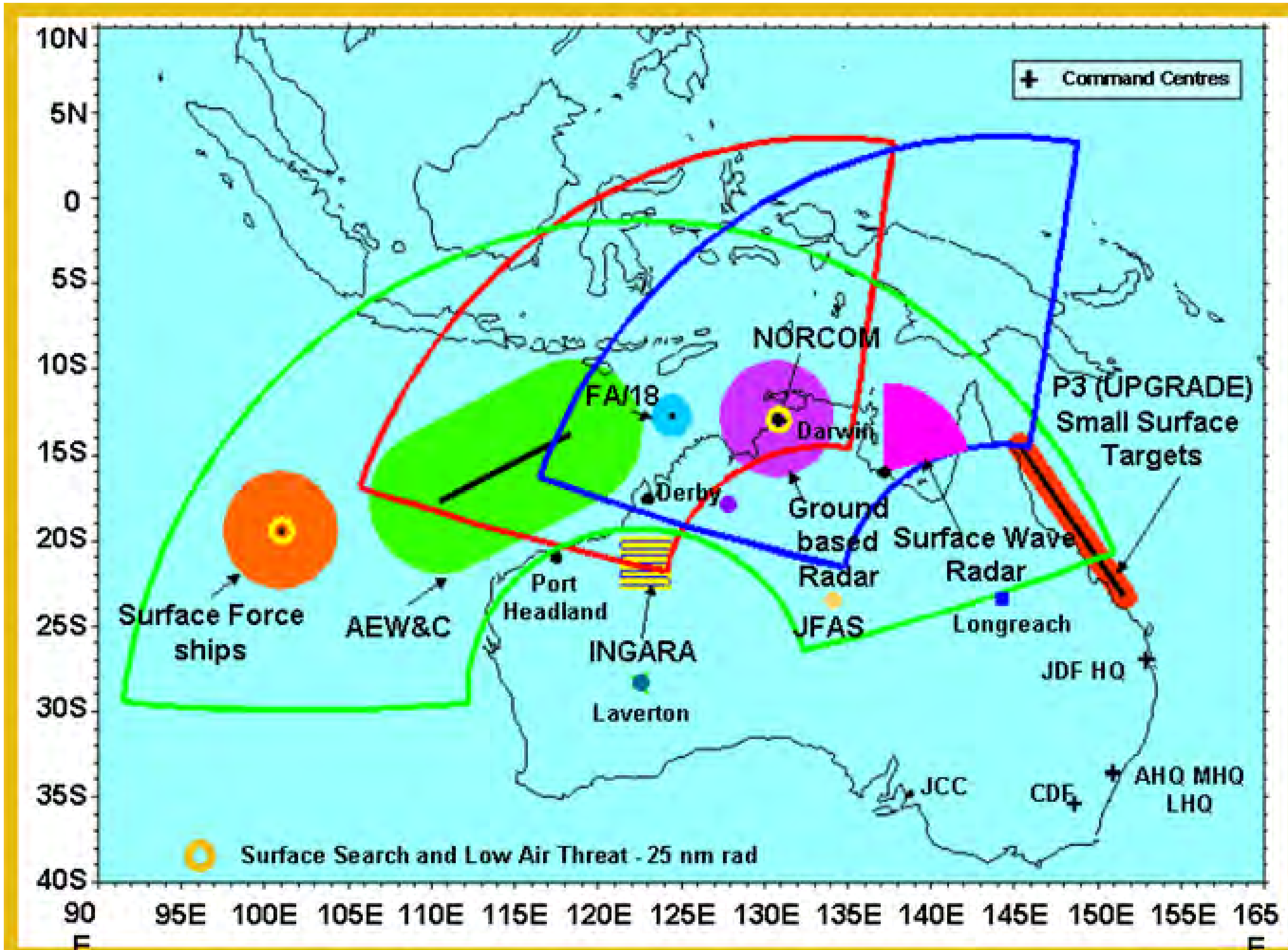
Sphere of Surveillance



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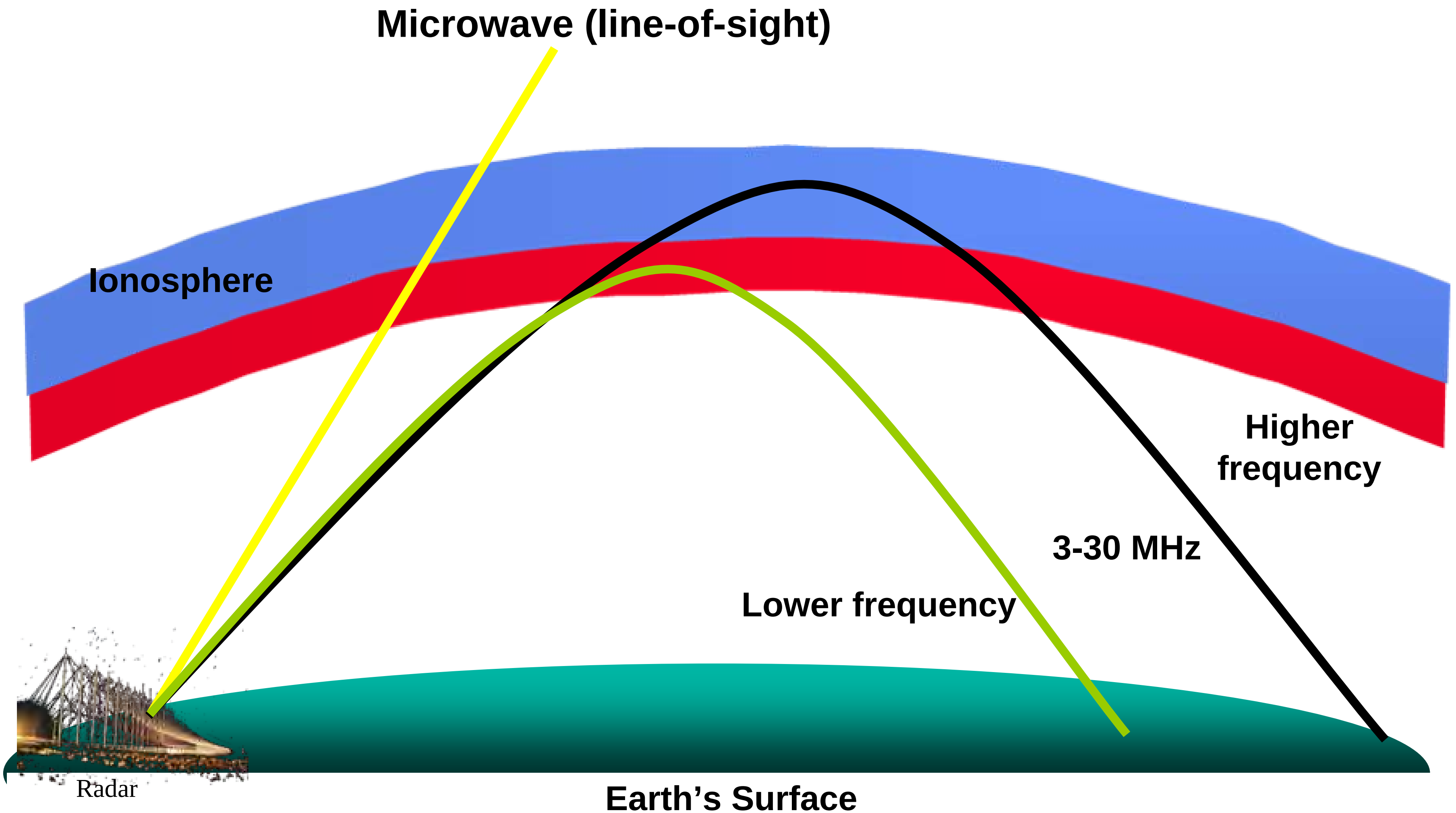
Over-the-Horizon Radar



Range 1000km – 3000km

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OTHR Current Capability

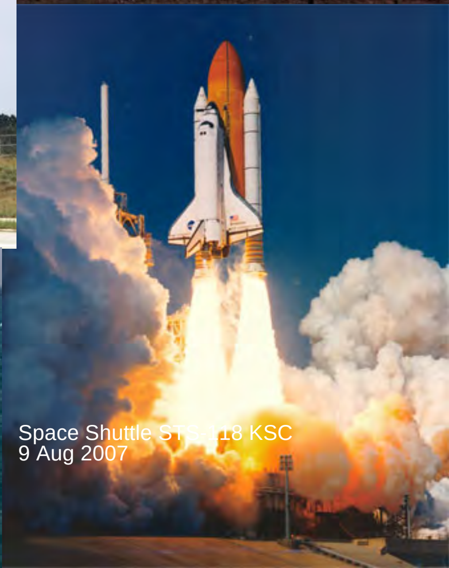
… the ADF's wide area surveillance system will provide the potential for continuous real-time coverage of our northern air and sea approaches … Defence 2000 White Paper

- Wide area surveillance
- Spot surveillance

OTHR Future Capability

Aims

- Maritime domain awareness
- Small aircraft targets
- Missile defence
    - Early launch detection
- Track Accuracy



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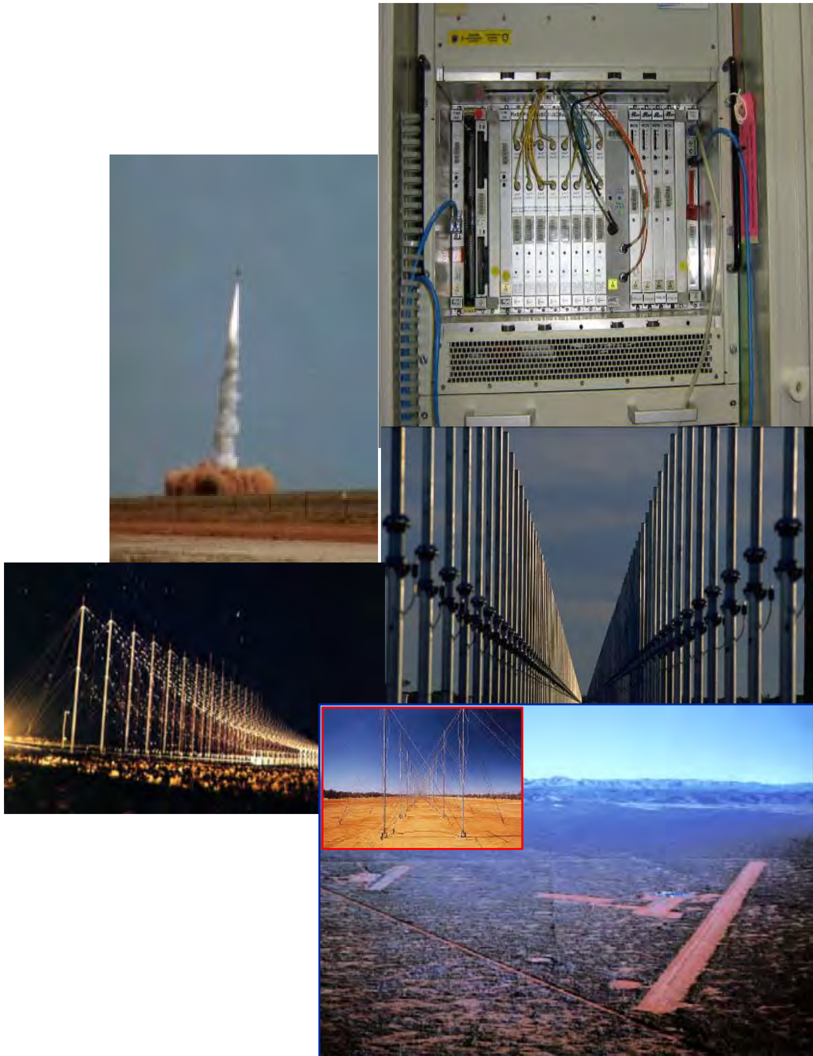
JORN Phase 5 Enhancement Program

DSTO hardware and signal processing innovations provide performance enhancements, together with cost and timeline reductions

JP2025 Phase 5: 2006-12

- Improved Track Accuracy
- Improved Coverage
    - 8 fold increase
- Enhanced Detection
- Electronic Protection
- Radar Management
- Reduced cost of operation/training



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What is Shapes Vector?

- A fully-integrated system for monitoring and surveillance of ultra-large computer networks, critical infrastructure, physical security

- Modular Architecture
  - Allows easy integration and wrappeing of third party systems and components
  - Novel method for semantic integration of in house developed and third party components

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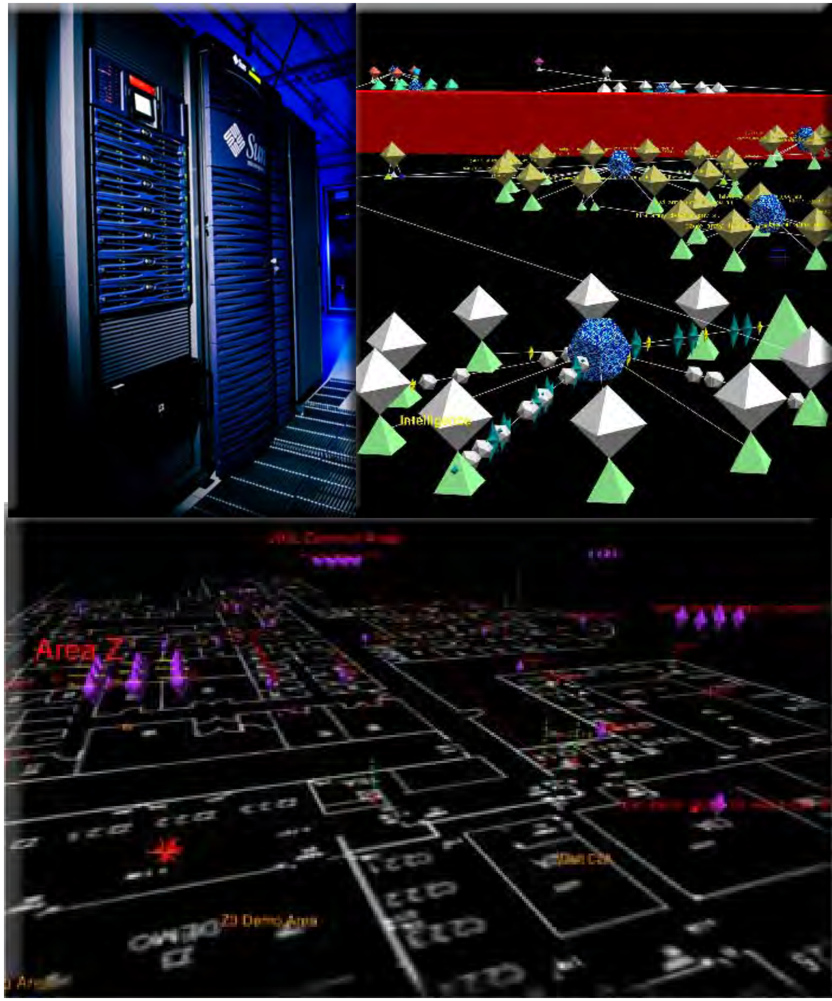
SV as a Unified Security System

- SV system offers ability to:
  - automatically deduce many forms of knowledge about a network, and
  - comprehensively integrate that knowledge into a single consistent environment
- SV Processes knowledge as semantically-meaningful units
- Can correlate with other monitoring systems, e.g., Physical Base Security/Acces, visual surveillance



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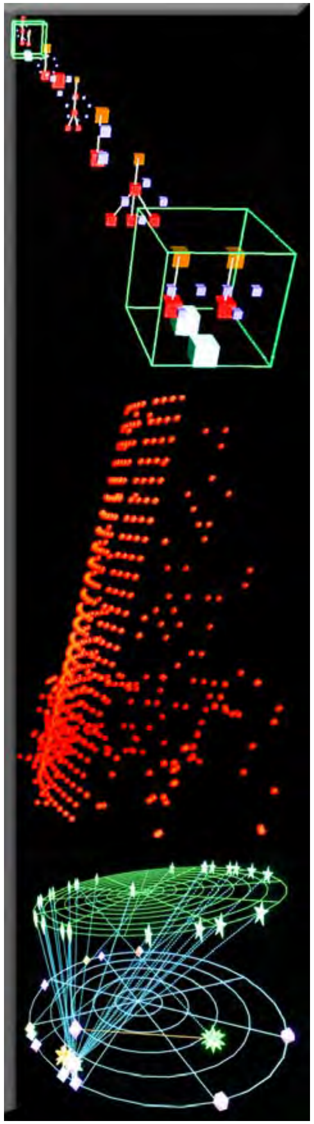
Beyond COTS Capabilities

- “State of the Art” COTS Security tools can detect types of threat at network perimeter (usually those which are context-free)
- Some have limited detection of site-defined policy breaches
- Beyond this, all other phases of the investigative process remain intensively manual
- Consequently, still need lots of people to ‘police’ even a moderate-sized network



- SV can provide more comprehensive protocol analysis, leading to greater coverage of network perimeter threat
- SV has a detailed language for defining and monitoring local site policy which can include physical infrastructure as well as cyberspace
- SV is easily customisable

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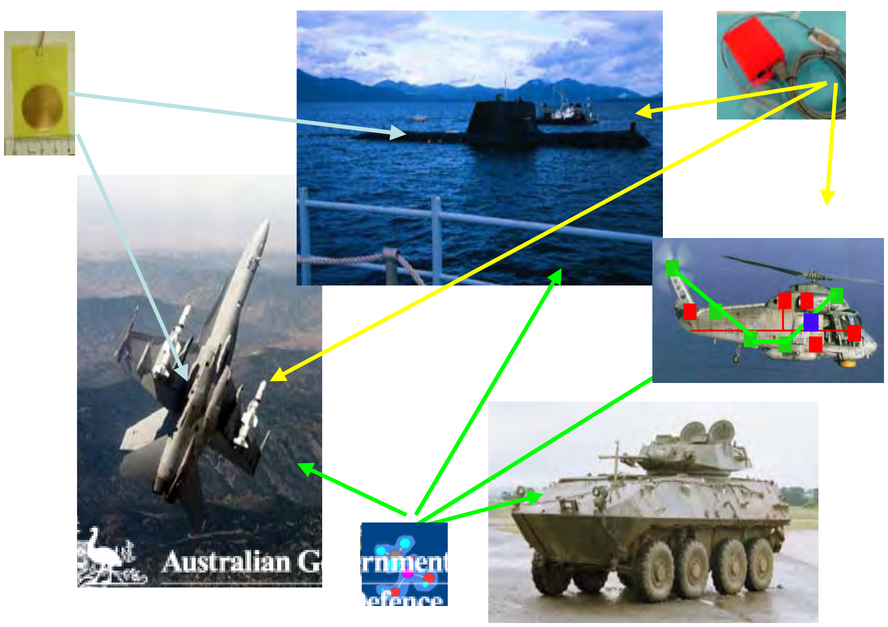
Smart Materials & Structures

Nano-materials can display novel properties not available with current (macro-) materials -

SMS focuses on exploring opportunities



Through SMS - DSTO is:

- Developing smart platform sensing/management systems for reduced cost of ownership and increased platform safety
- Developing smart materials using transformational nano-scale concepts to enhance platform capability
- Focusing on emerging technology in smart sensors, systems using micro / nanotechnology, MEMs, OE, automation

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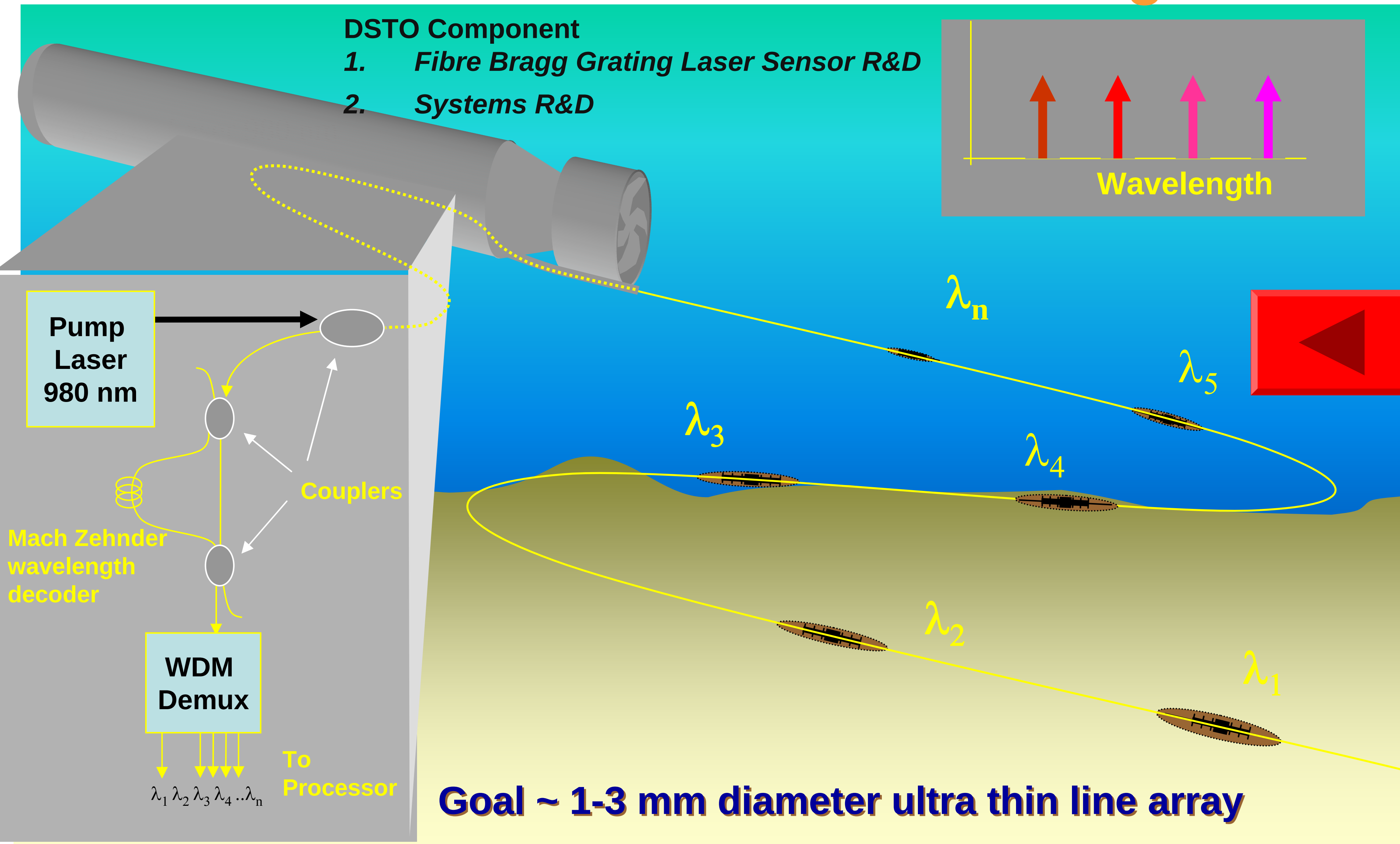
Fibre Bragg Gratings in Acoustic Sensing

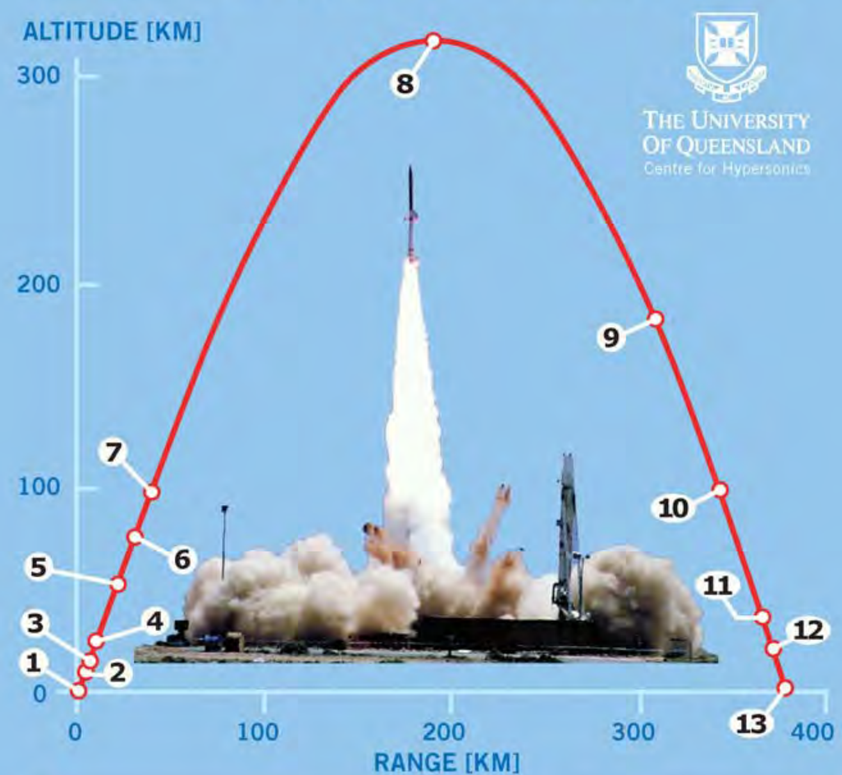
DSTO Component

1. *Fibre Bragg Grating Laser Sensor R&D*
2. *Systems R&D*



Goal ~ 1-3 mm diameter ultra thin line array

Nominal HyShot Mission Profile

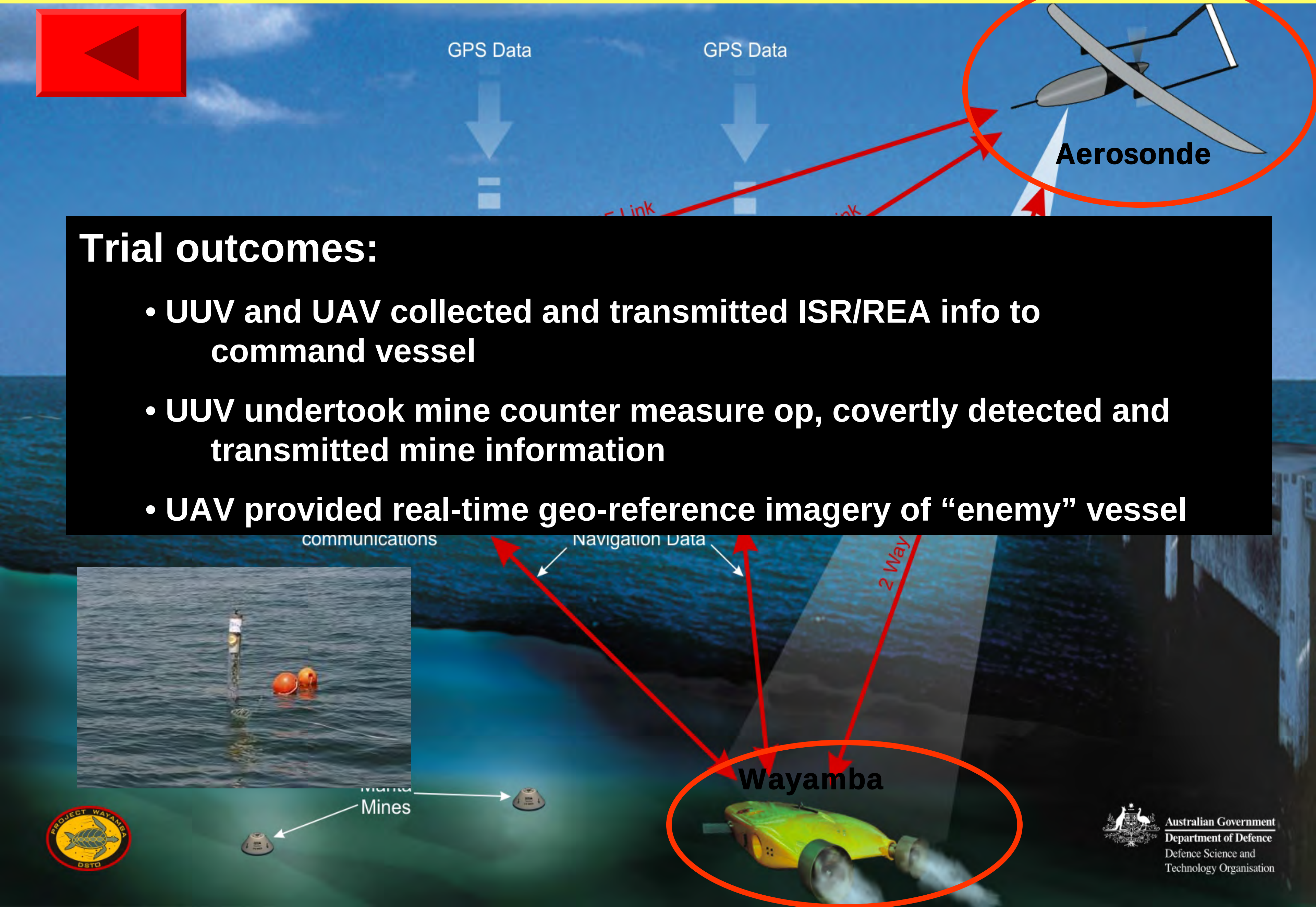


		Time	Altitude	Speed – Mach
1	Terrier Ignition	– 0 SEC,	0 KM,	M0
2	Terrier Burnout	– 6.03 SEC,	3.44 KM,	M 3.6
3	Stage Separation	– 6.04 SEC,	3.5 KM,	M 3.6
4	Orion Ignition	– 16 SEC,	12.8 KM,	M 3.3
5	Orion Burnout	– 42.4 SEC,	56.4 KM,	M 7.1
6	Nosecone Eject	– 63 SEC,	100 KM,	–
7	Start Attitude Control Manoeuvre	– 73 SEC,	115 KM,	–
8	Apogee	– 281 SEC,	315 KM,	–
9	Re-enter Atmosphere	– 510 SEC,	80 KM,	M 8.0
10	‡ Start Experiment	– 529 SEC,	35 KM,	M 7.6
11	‡ Stop experiment	– 535 SEC,	23 KM,	M 7.6
12	Impact	– 565 SEC,	0 KM,	M 0.67

Automation of Battlespace Initiative

Trial outcomes:

- UUV and UAV collected and transmitted ISR/REA info to command vessel
- UUV undertook mine counter measure op, covertly detected and transmitted mine information
- UAV provided real-time geo-reference imagery of “enemy” vessel



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DTRA Research & Development Enterprise Overview

Dr. G. Peter Nanos, Jr.
Associate Director, Research & Development

Pacific Operational Science & Technology Conference
July 16, 2008

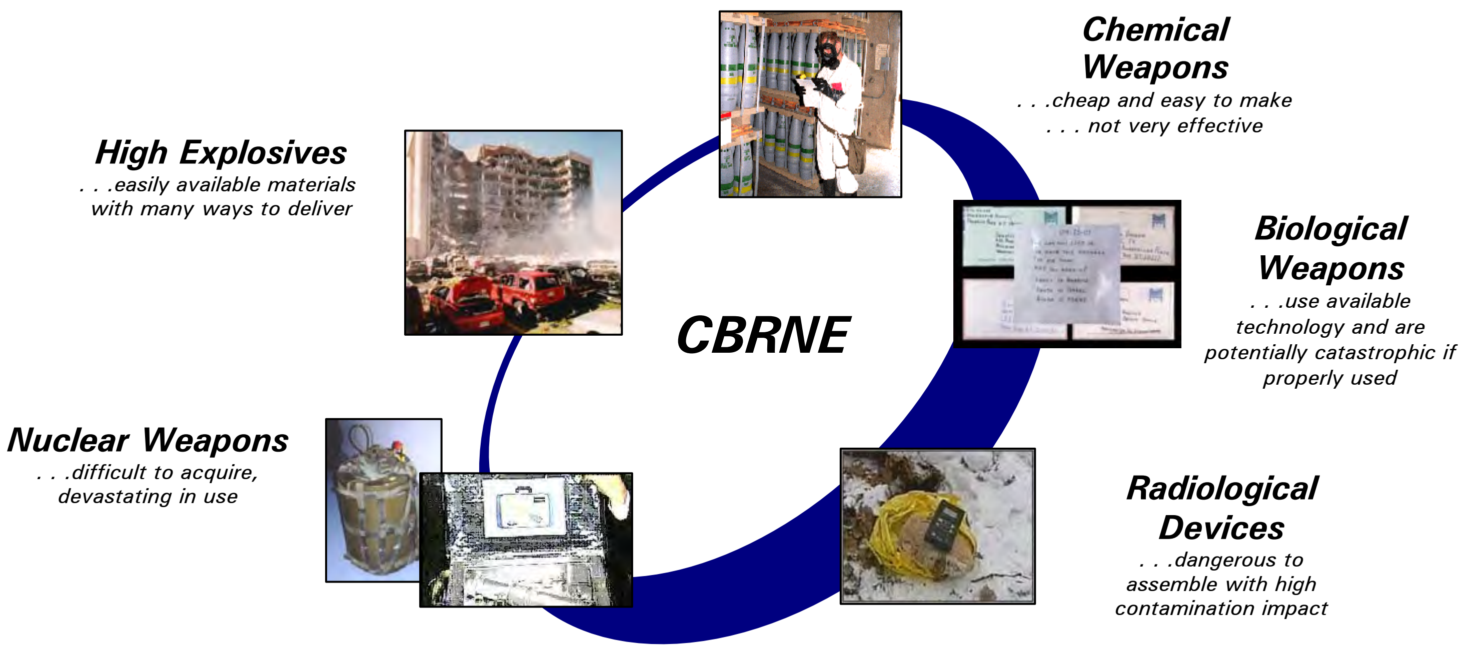
UNCLASSIFIED

Overview

- Mission and Organization
- Investment Strategy
- Top Challenges and Major Programs
- Technologies Transitioned to the Warfighter
- Future R&D

RD Enterprise Mission

- Identify, conduct, and deliver innovative science and technology, through systematic, risk-balanced processes, that enable America to combat Weapons of Mass Destruction. Our system engineering activities provide for research, development, and acquisition to support the needs of Combatant Commanders, Services and DTRA



RD Enterprise Portfolios

Nuclear Technologies
RD-NT

- Mission: Research, develop and demonstrate technologies and capabilities to mitigate the threat and/or effects of nuclear and radiological events; and to enhance the safety, security, survivability, and performance of U.S. nuclear assets and facilities

Nuclear Forensics
Ground Sample Collection ATD

Counter WMD Technologies
RD-CX

- Mission: Research, develop and demonstrate innovative technologies and capabilities to actively counter the full spectrum of CBRNE threats

Combating Terrorism Prevention of Structural Collapse

Chem/Bio Technologies
RD-CB

- Mission: Manage and integrate the development, demonstration, and transition of timely and effective chemical and biological defense solutions for the Department of Defense, while serving as the focal point for science and technology expertise

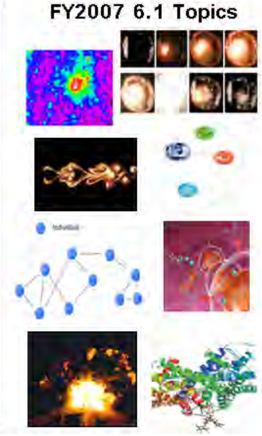
Automated extraction

Rapid Diagnostics

Basic and Applied Sciences
RD-BA

- Mission: To foster and enable farsighted, high payoff research to reduce, eliminate, counter and mitigate the effects of weapons of mass destruction (WMD) by:
  1. Advancing fundamental knowledge and understanding in the sciences
  2. Utilizing best practices in systems engineering

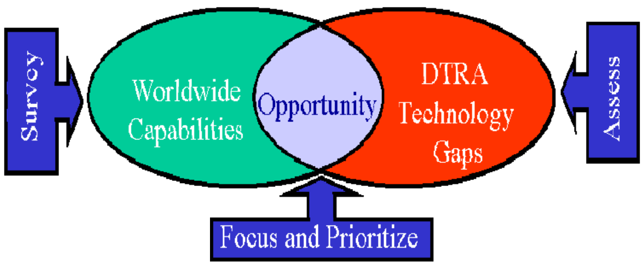
FY2007 6.1 Topics



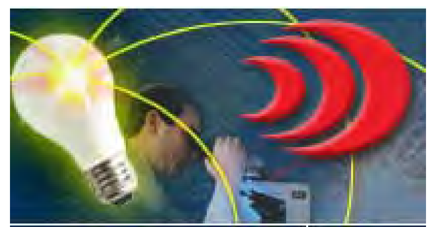
Technology Innovation

RD Innovation Office - Advance a work environment that creates new ideas, concepts and capabilities to solve hard problems for the Combating WMD mission

International Collaboration



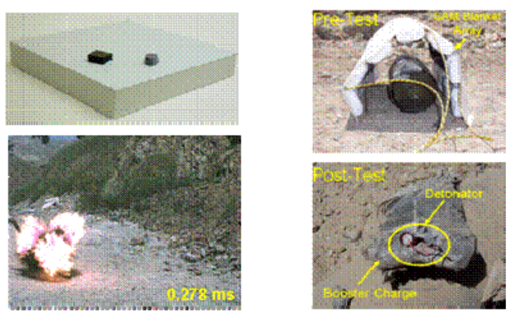
Small Business Innovation Program



Broad Agency Announcement

InnoCentive

Discovery of Innovative Technologies and Capabilities

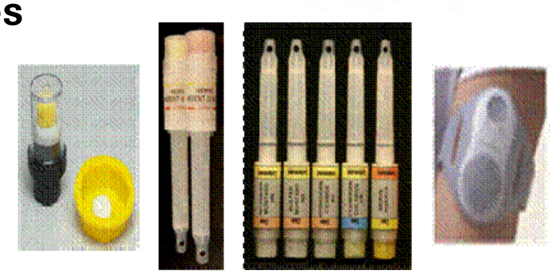


Novel Counter IED Tools

State-of-the-art Technology

Pixel Interrogation

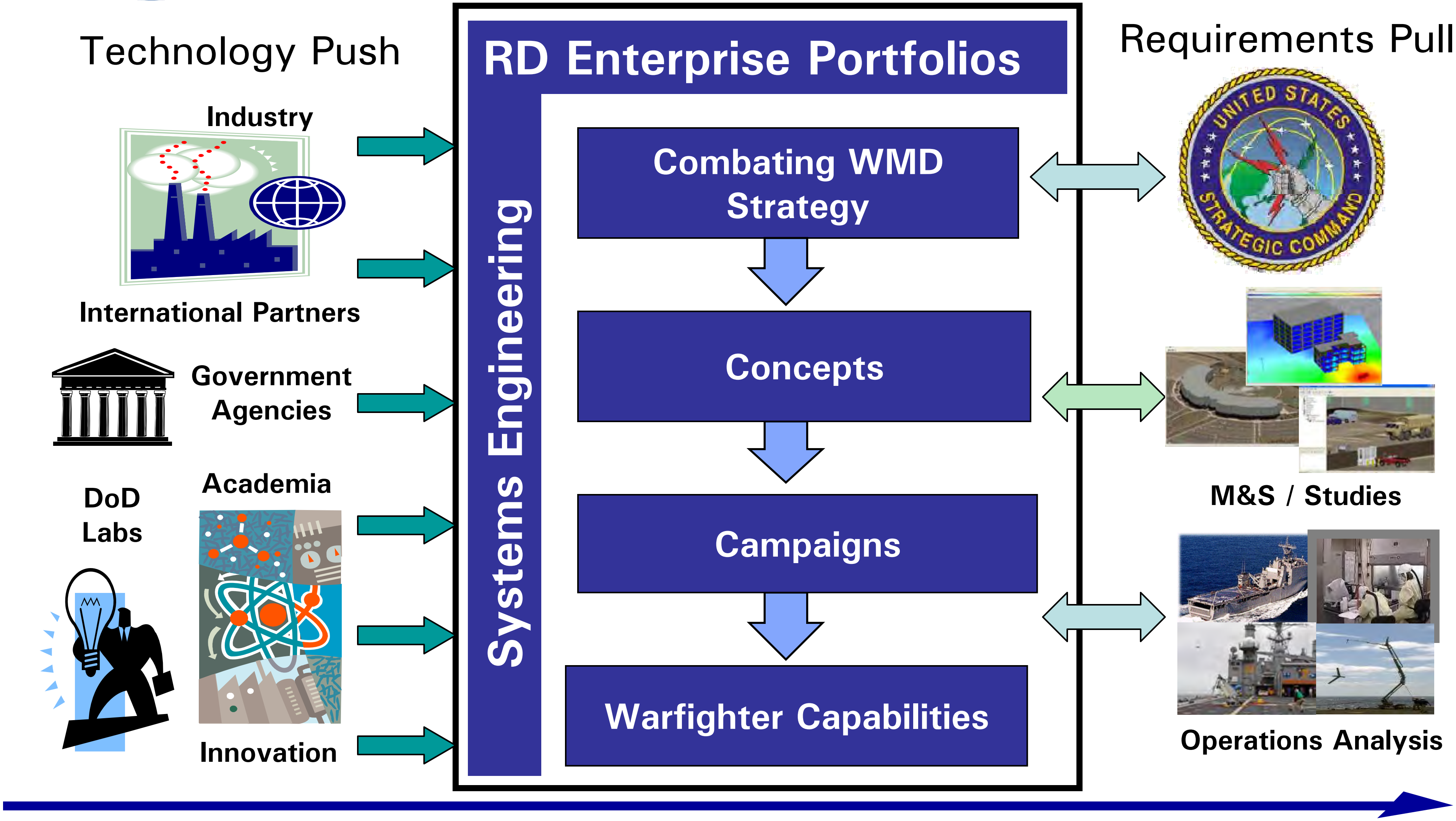
Hunter / Gatherer of Ideas



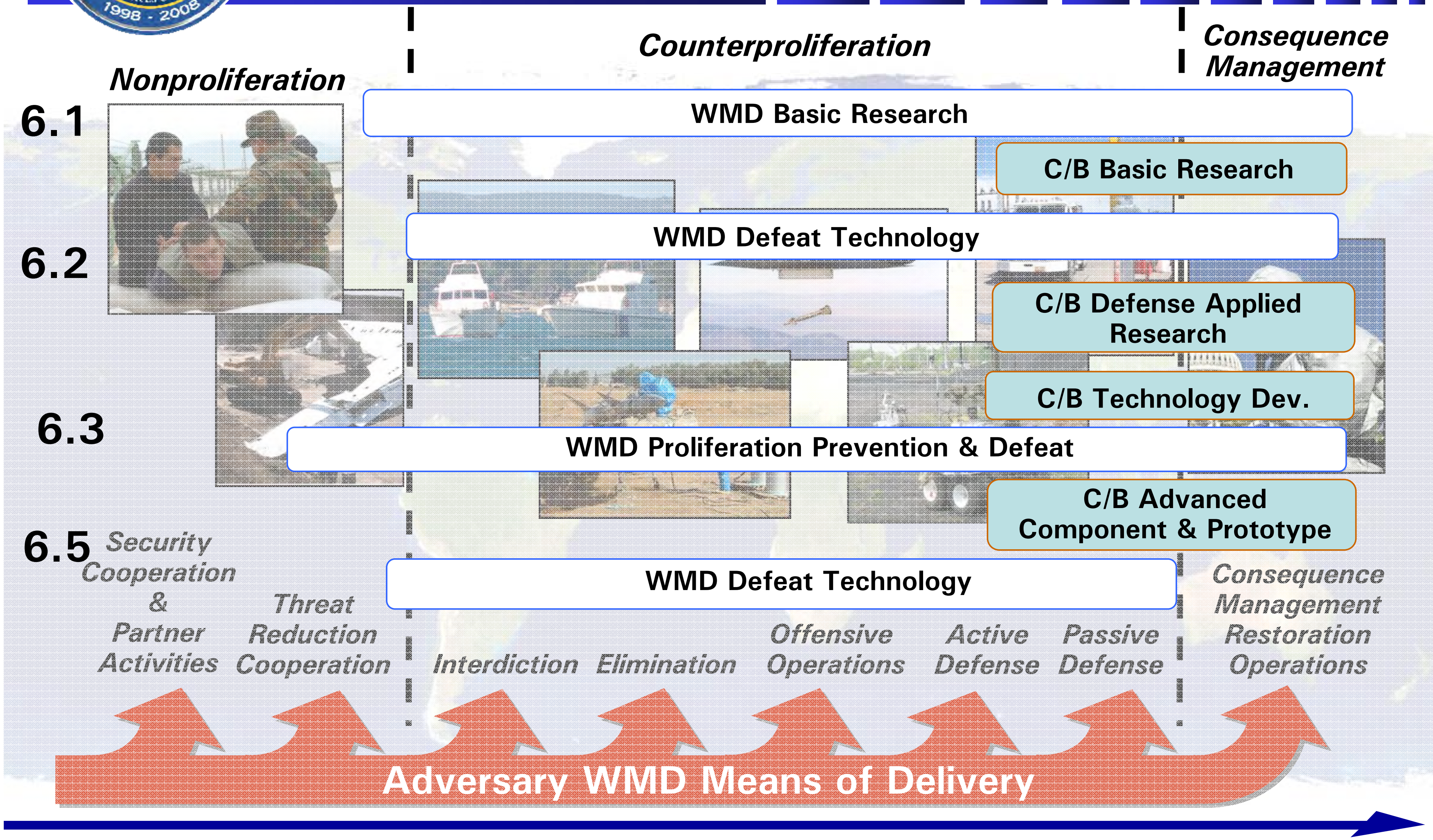
Chemical Detection Badge

Market Research

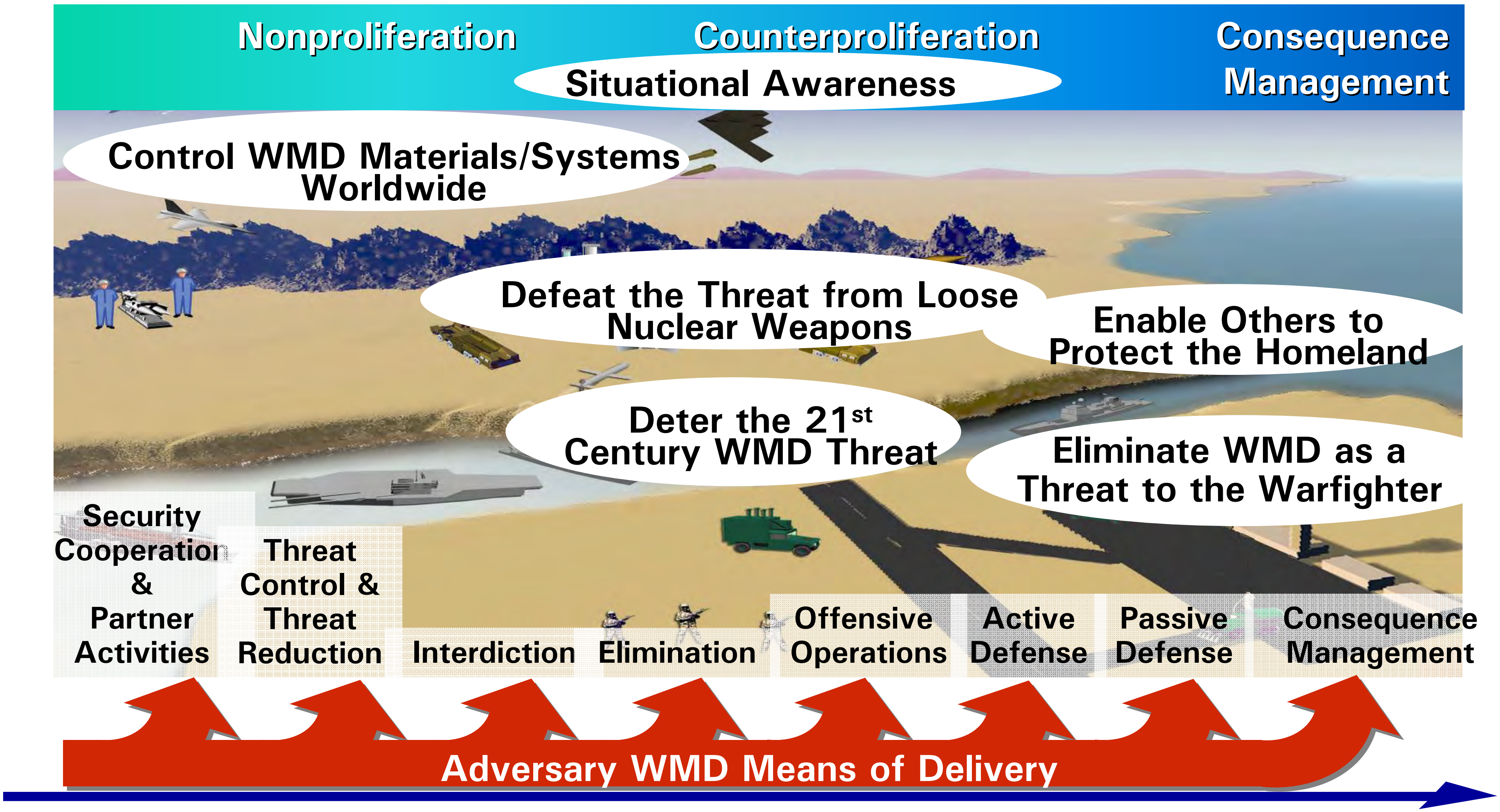
R&D Coordination and Integration



R&D Integration Into Combating WMD Mission



Campaigns Provide an Integrated Approach to Combating WMD

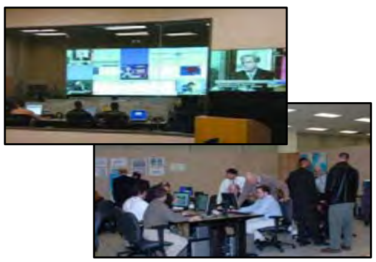


R&D Investments by Campaign

1. Situational Awareness

End State

Improve knowledge and information to permit execution of successful courses of actions



R&D Investments

- *Common operating picture for interagency connectivity and an integrated architecture*
- *Decision support/ predictive CBRNE decision support tools*
- *Strategic assessment*
- *CBRNE and Protection & Mitigation Assessment tools*

2. Control WMD Materials and Systems Worldwide

End State

Provide effective tools to prevent proliferation of WMD and WMD related capabilities

R&D Investments

- *Nonproliferation training tools for arms control/confidence and security building measures*
- *Regional training tools (customs, culture, language)*
- *Doctrinal and planning support tools*
- *Sensors and detectors*
- *Train-the-trainer systems*

3. Eliminate the Threat of WMD to the Warfighter

End State

Provide an integrated capability to eliminate the WMD threat to the Warfighter

R&D Investments

- *Personnel Protection Equipment*
- *System survivability in environments where WMD use has occurred*
- *Response, mitigation and restoration in contaminated areas*
- *Technology and subject matter expertise to identify vulnerabilities*

R&D Investments by Campaign

4. Protect the Homeland from WMD

End State

Improve defense support of civil authorities through shared training, planning, tools, and technologies

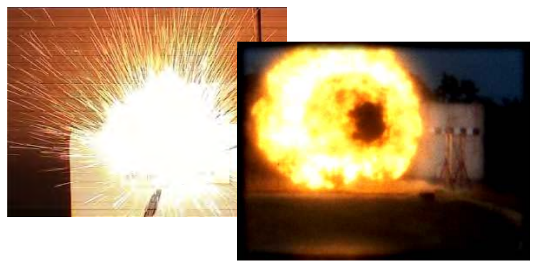
R&D Investments

- *CBRNE decision support tools*
- *Bio-surveillance*
- *Radiation hardening technologies*
- *Blast mitigation technologies*
- *Bio-medical prophylaxes*
- *CBRN treatment technologies*
- *CM and restoration technologies*

5. Transform the Deterrent

End State

Establish DTRA role in supporting USSTRATCOM as it transforms the nuclear deterrent.



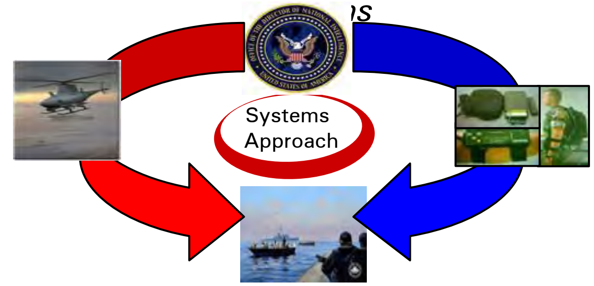
R&D Investments

- *CBRNE decision support tools*
- *Sensors and detectors*
- *Experimentation facilities*
- *Test/experimental instrumentation*
- *M&S of weapons effects*
- *Specialized weapon designs for combating WMD*
- *Advanced energetics*

X. Defeat the Threat of Loose Nuclear Weapons

End State

Provide an integrated capability to eliminate the threat from loose (lost or stolen) nuclear

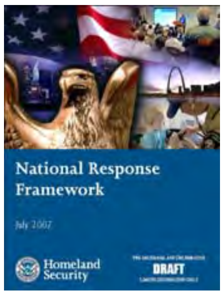


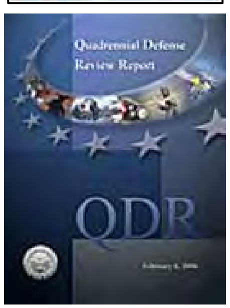
R&D Investments

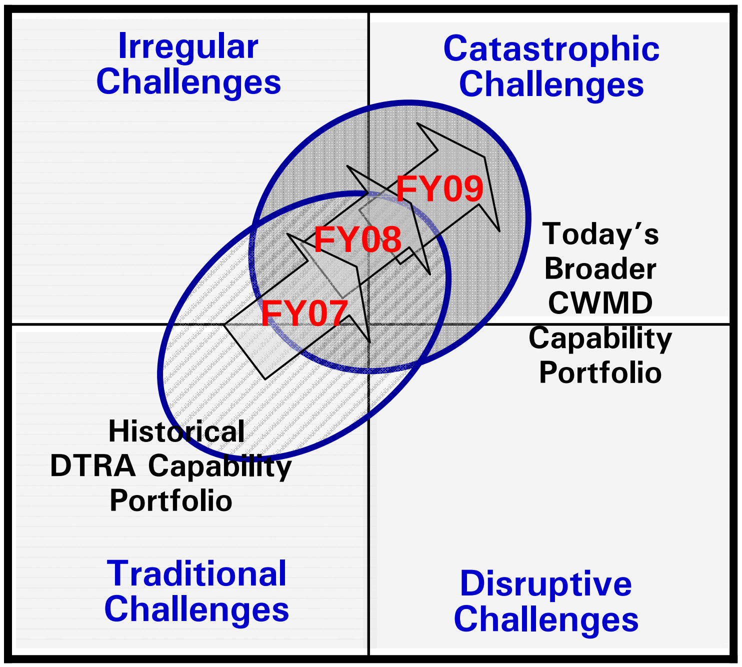
- *Common operating picture*
- *Sensors and detectors, fixed sites and portable applications*
- *Specialized weapons design*
- *Doctrinal support*
- *Strategic assessments*
- *CBRN neutralization and destruction technologies*

Top Challenges and Program Areas

The complexity and evolution of the threat demands that we change our investment to meet the most pressing challenges







<u>Evolution of R&D Efforts</u>

Transformational Goal - Reduce the time to close capability gaps

Top Program Areas

- Technology Innovation
- Deployable Technical Intelligence Laboratory
- Nuclear Forensics
- Nuclear Survivability
- Hard & Deeply Buried Targets
- Hardened Target Research & Analysis Center (HTRAC)
- Advanced Energetics for Weapons
- Counter WMD Analysis Cell (CWAC)
- WMD Threat Research and Analysis Collaboration (WTRAC)
- Chem/Bio Applied Technology Dev
- Transformational Medical Technologies Initiative
- Basic Research Engagement

Concept

Deployable Technical Intelligence Laboratory

- **Modular**
  - Adaptable to meet requirements
- **Mobile**
  - Rapid deployment
  - At-the-ready set up
- **Self Contained**
  - Generator power
  - Climate control
  - Outfitted with ruggedized state of the art equipment
- **Multifunctional**
  - Administration
  - Electronics
  - Analysis
  - Satellite communications

State and Local Forensic Challenges

- **National Emergency Response (9/11)**
- **Catastrophic events, WMD or natural disasters (Katrina)**
  - **Resources burdened beyond capabilities**
  - **Supplementing functional laboratories to reduce backlog**

DOD-DOJ Partnership

NIJ Mobile Forensic Laboratory

- Developing a readily deployable forensic laboratory
- Examining, identifying, comparing and storing evidence
- Linking suspect, victim, and crime scene through analysis of physical evidence
- Supporting existing forensic operations in the aftermath of a catastrophic event

Communications

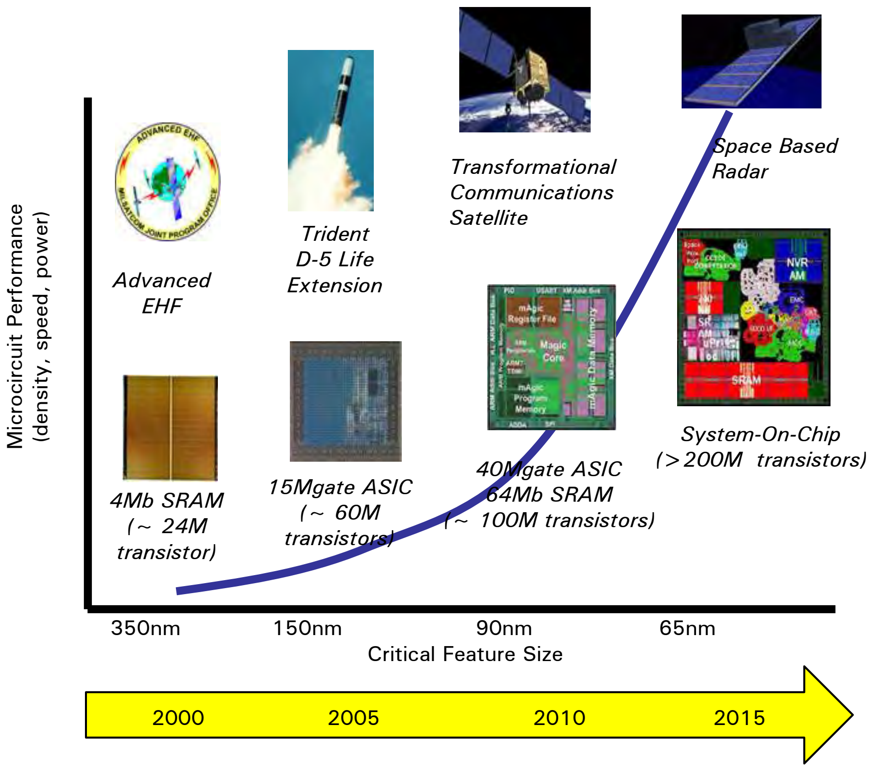
Interoperable secure communications capability with a national support infrastructure, including national databases, virtual experts and others within the criminal justice community

Nuclear Forensics

- **Develop a robust (accurate, rapid, and reliable) capability to characterize post detonation materials and prompt data for a nuclear or radiological event**
  - **Prompt Data Collection**
    - Ground-based gamma collection and alternative signatures for yield determination
    - Improved personal protection equipment for manual collections
  - **Sample Debris Collection**
    - Automated collection systems
    - Ground sample Advanced Technology Demo
  - **Sample Debris Analysis**
    - Deployable analytical and screening capabilities
    - Rapid analytical technologies
  - **Data Evaluation & Knowledge Management**
    - Database development
    - Prompt phenomenology data evaluation

Nuclear Survivability

Research that provides leading-edge radiation immune microelectronics for nuclear hardening and survivability of critical defense and missile/space systems



Technical Approach

- Develop ≤90nm silicon-based technology using industry fabrication processes
- Electronic/computer-aided design methods for very high density integrated circuits
- Enabling technologies for enhanced performance and functionality
  - Non-volatile storage applications
  - Photonics
  - Micro-electro-mechanical systems
  - Non-silicon based technology solutions

Hard and Deeply Buried Targets

Enhance non-nuclear capabilities to put Hard Targets at risk

- **Focus areas - achieve an effective level of lethality in WMD Counterforce Weapons while minimizing Collateral Effects**
  - Conventional (weapons, fills, fuzing)
  - Non-conventional (non-energetic, functional defeat)

- **DTRA activities - define extremes of conventional weapon capabilities**
  - ☑<u>Size</u> - Massive Ordinance Penetrator
  - <u>Speed</u> - Precision Global Strike concepts and survivable/smart fuzing
  - <u>Weapon Payload</u> - Advanced energetics (enhanced blast) and agent defeat effects

Advanced Energetics for Weapons

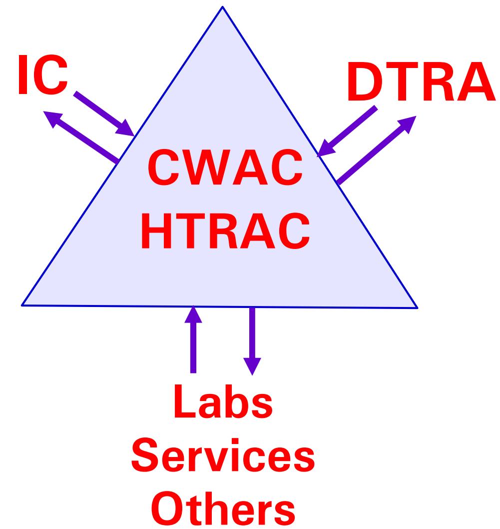
Significantly improve weapon effectiveness to attack Hard and Deeply Buried Targets and WMD facilities

- **Near-Term – Advanced Energetics Payoffs**
  - Enhanced blast/thermobarics explosives
  - Reactive materials
  - Shock-dispersed fuels
- **Mid-Term – Additional Payoff from Both Advanced and Disruptive Energetics**
  - All nitrogen and high nitrogen species
  - Advanced multi-functional energetics
  - Shock-dissociated fuels
- **Far-Term – Disruptive Exotic Energetics**
  - Metastable molecular clusters
  - Nuclear spin, shape isomers
  - Small-scale fusion

Counter-WMD Analysis Cell (CWAC) Hardened Target Research & Analysis Center (HTRAC)

Develop new techniques to characterize complex proliferation threats

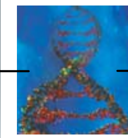
- **Information Sharing - Collaborative capability that combines intelligence collection and all-source analysis expertise with science and engineering R&D capabilities**
  - Integrate DTRA, Intelligence Community and other expertise in a multi-disciplined effort to address adversary WMD & HDBT developments
  - Develop innovative collection and analysis strategies and technical capabilities to understand adversary WMD & HDBT



- **Strategic/Policy Guidance – HTRAC and CWAC provide opportunities in organizing and integrating counter-WMD analysis**

Chem/Bio Applied Technology Development

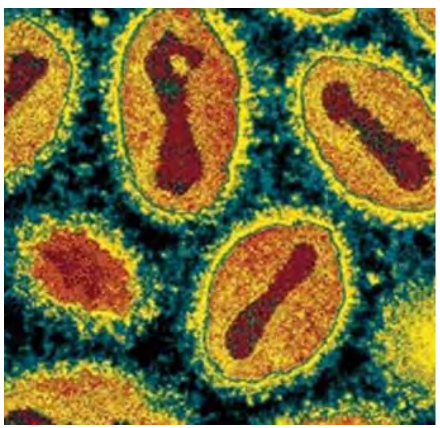
Automated extraction



Rapid Diagnostics

Applied Technologies

- Transition mature technologies to advanced developers
- Manage ACTDs, ATDs and JWEs
- Provide technologies in support of installation protection and homeland defense programs



Antiviral for smallpox

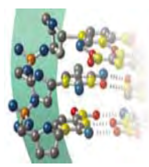
Chemical Biological Radiological Nuclear (CBRN) Unmanned Ground Reconnaissance (CUGR) ACTD

Transformational Medical Technologies Initiative

Revolutionary Technologies to Counter Emerging Biological Threats

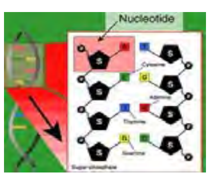
Scientific Thrust Areas

Genomic Identification



Small Molecule Discovery

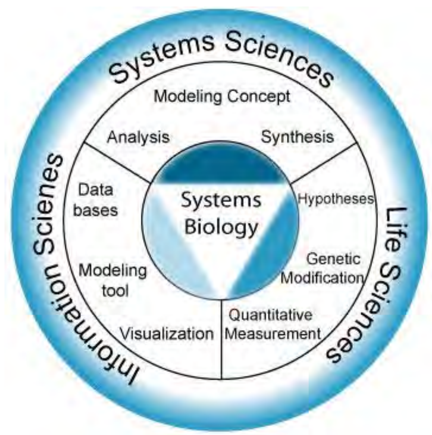
Protein Based Therapeutics



Nucleotide Therapeutics

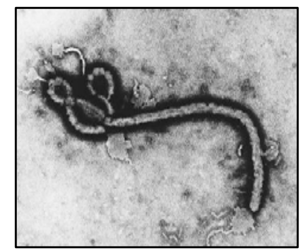
Human Immune Enhancement

Integrated Cross-Cutting Technologies

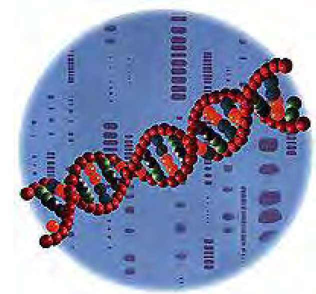


Microarray Technology
Bioinformatics
Proteomics
Genomics
siRNA

Deliverables



Broad Spectrum Treatments
Hemorrhagic fever viruses
Intracellular bacterial

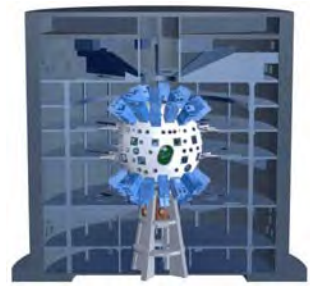


Genetic ID & Analysis

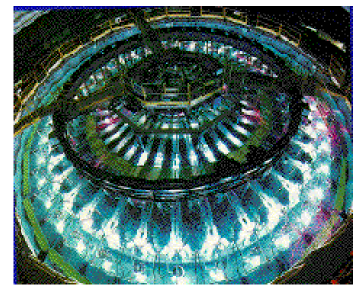
Basic Research Engagement

Through science-based programs attract world-class talent into the WMD S&T research field

- **Basic Research (6.1) Program**
  - Farsighted, high payoff research to reduce, eliminate, counter and mitigate the effects of WMD
  - Invest in combating WMD science with high payoff
  - Balance investment of evolutionary and potential revolutionary advances
- **University Strategic Partnerships**
  - Forge long-term alliances and science partnerships
  - Revitalize the skill base and train the next generation
  - Develop science programs that create flow of new ideas

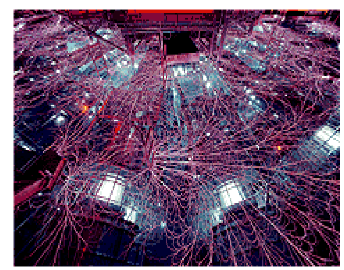


National Ignition Facility (NIF) – Cold/Warm X-Rays (Future?)



Saturn – Hot/Cold X-Rays

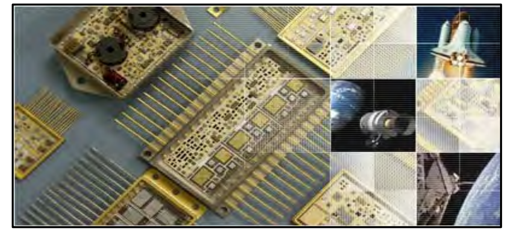
Modular Bremsstrahlung Source (MBS) – Warm X-Rays

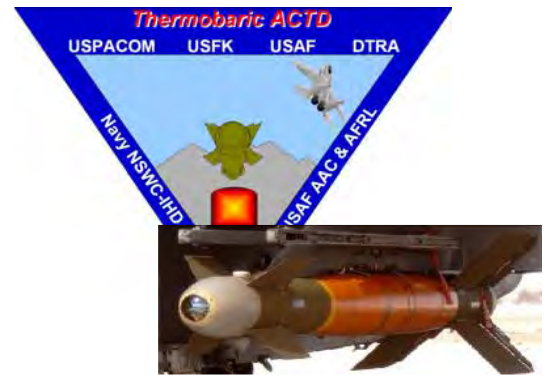


Sandia Z Facility – Cold X-Rays

RD Enterprise Transitions (1 of 3)

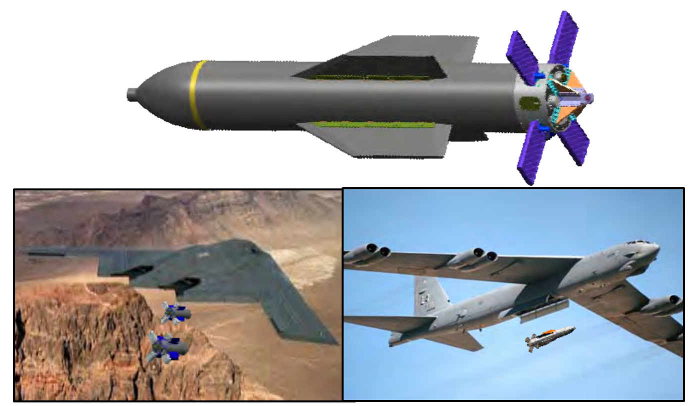
- **Electromagnetic Pulse (EMP) Radiation Hardened Chip Transition to Industry**
  - RH 150nm devices from BAE Systems and Honeywell foundries transitioned to Services
  - Radiation Hardened By Design (RHBD) 90nm technology transition to DoD programs to include TSAT and onboard signal processing development efforts.
- **Thermobaric Weapons (BLU-121 A/B) Transition to AF procurement**
  - USFK - Assets delivered to meet weapon requirement needs
  - USCENTCOM – Additional asset requirements being purchased
- **Integrated WMD Toolset (IWMDT) Transition of Research Tools for Ops Support**
  - Comprehensive capability to incorporate all DTRA modeling and decision support efforts
  - DTRA Operations Enterprise/USSTRATCOM
  - Transition integrated DTRA codes into a net-centric architecture





RD Enterprise Transitions (2 of 3)

- **Smart Threads Integrated Radiation Sensor (STIRS) JCTD**
  - MPDS - Man-portable detection system (individually worn)
  - VMDS - Vehicle Mounted Detection System (manned/unmanned)
  - ARDIMS - Airborne Radiological Detection, Identification, and Measurement System
  - NORTHCOM is Operational Manager
- **Massive Ordnance Penetrator (MOP) Transition to USAF**
  - Provides critical global strike capability to fight the war on terrorism
  - Transition to Air Force Quick Reaction Capability (QRC)
  - QRC integrates weapon with the B-2



RD Enterprise Transitions (3 of 3)

- **Angel Fire & Constant Hawk Wide-Area Persistent Surveillance Programs**
  - Technologies to transition include:
    - Analysis algorithms
    - Multi-sensor fused visualization
    - Improved SME product generation
    - Next-generation on-board processing/data compression

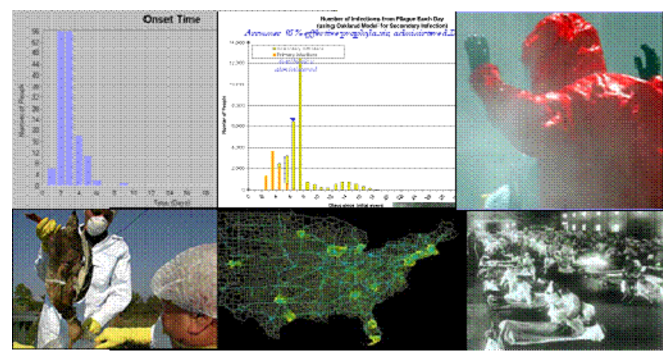
- **CBRN Unmanned Ground Reconnaissance (CUGR) ACTD**
  - New Joint Contaminated Surface Detection (JCSD) components
  - Updated CBRN Unmanned Ground Vehicle short-range reconnaissance robot
  - Transitioning to the Joint Program Manager for Contamination Avoidance

- **Biological Combat Assessment System (BCAS) ATD**
  - Testing completed in Nov 2007
  - Spiral 2 will include a Chemical/Radiological sensor

What's Next on the Horizon?

WMD Battle Management Challenge: Provide the warfighter with an enhanced, near real-time, and persistent adversary WMD threat analysis and assessment capability

- **Integration of the three combating WMD pillars (CP, NP, CM)**
  - Integrate the intelligence, sensors, reconnaissance, and consequence management activities
  - Produce common operational picture with net-centric interfaces
  - Implement integration of sensors and taggants
  - Monitor numerous adversary tracks, sensors, and movements to predict hostile intent
- **High Performance Computing for Science-Based Applications**
  - Develop integrated modeling and simulation solutions to CWMD threats
  - Create decision support alternatives for CWMD operations
  - Provide predictive analysis and consequence management



Closing Thoughts…

- RD Enterprise is a major driver of Combating WMD Science and Technology
- Although our focus is on the warfighter, we fully support cooperative work across all agencies
- Major initiatives include: Nuclear detection, Forensics, medical technology transformation, large scale computing for weapons effects, energetics and penetrators
- What's Next? Information integration and fusion, Tracking 100,000 targets, application of large scale modeling and simulation to real-time battle management

…providing COCOMs the tools to defeat the WMD threat!

Contact Information

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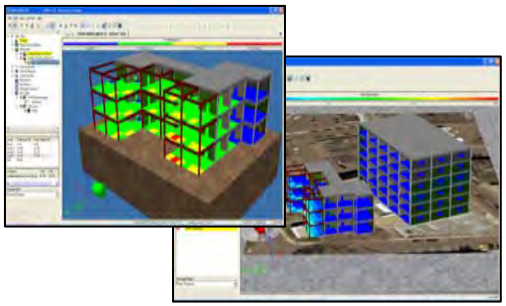
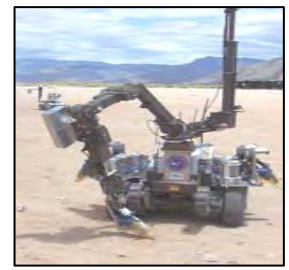
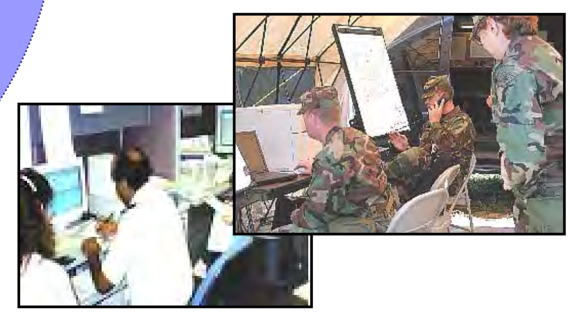
Fort Belvoir, VA 22060-6201

Dr. G. Peter Nanos, Jr.
Associate Director,
Research & Development Enterprise
(703) 767-1302 / DSN 427-1302

Summary / Questions

Harvesting technical solutions...



...for the Combating WMD mission

NDIA Brief

Company Profile

- **Torrey Pines Logic, Inc.** ("TPL") provides research, design, development and custom solutions the areas:

  Visible, NV and IR sensors
  Image Processing
  Optical Communications
  UAV Payloads and Processing
  Optical Design and Lasers

Torrey Pines Logic

- **Partial List of Clients:**

SPAWAR Systems Center San Diego
NAVAIR
NAE Naval Aviation Enterprise
REF Rapid Equipping Force
Asymmetric Warfare Group
NAVSEA Naval Sea Systems Command
AeroVironment
USC
GENERAL DYNAMICS Armament and Technical Products
SAIC An Employee-Owned Company
SPAWAR Space and Naval Warfare Systems Center Charleston
DARPA
TITAN
POLICE
TSWG
ONR Department of the Navy Science & Technology
MOUT I & TDWG

TPL Projects

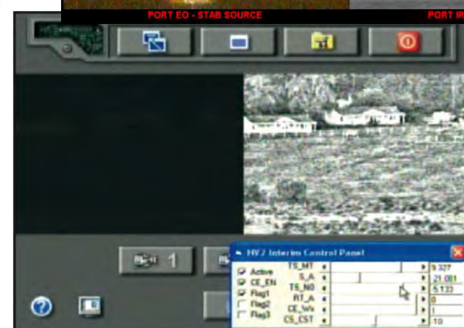
- Gigapixel Mosaic System
- Sensor Fusion and Target Tracking
- Sniper Detection
- Optical Communications

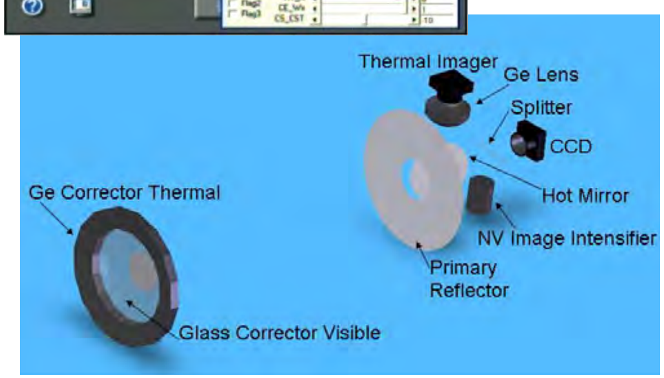
Gigapixel Mosaics

Completely automated open system software capable of building geo-registered Gigapixel mosaics in real-time from video or high resolution imagery. And perform change detection!

Torrey Pines Logic

Sensor Fusion and Target Tracking





Multi-spectral instruments with image enhancement, sensor fusion and target tracking in maritime environment

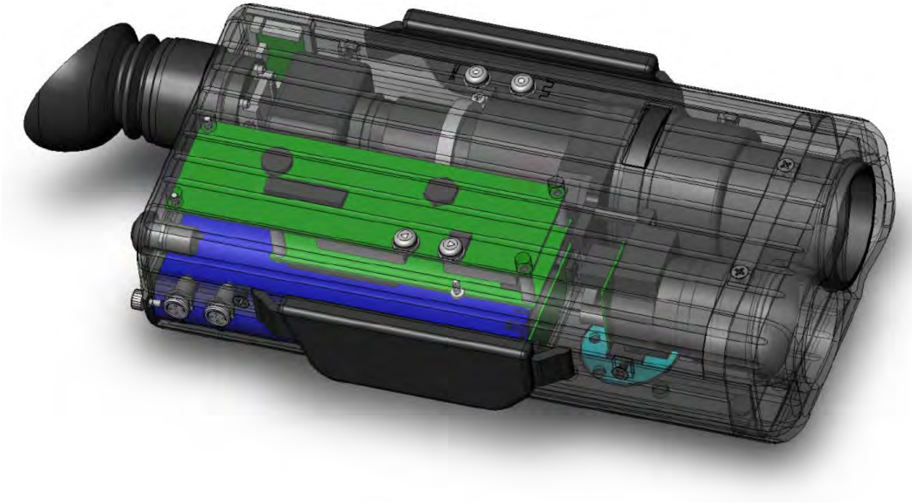
Sniper Detection

Mirage-1200:

- Sniper detection
- Camera and Camcorder detection
- Border protection

Next Mirage:

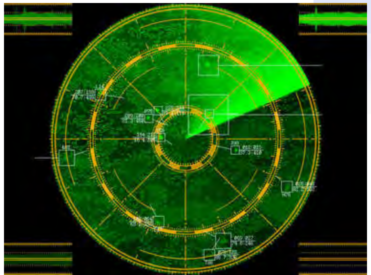
- Water-proof, hardened
- Fast Scanning ability
- Full remote control
- Automatic alerts
- Synchronized triggers



Sniper Detection - Advanced Development

Beam

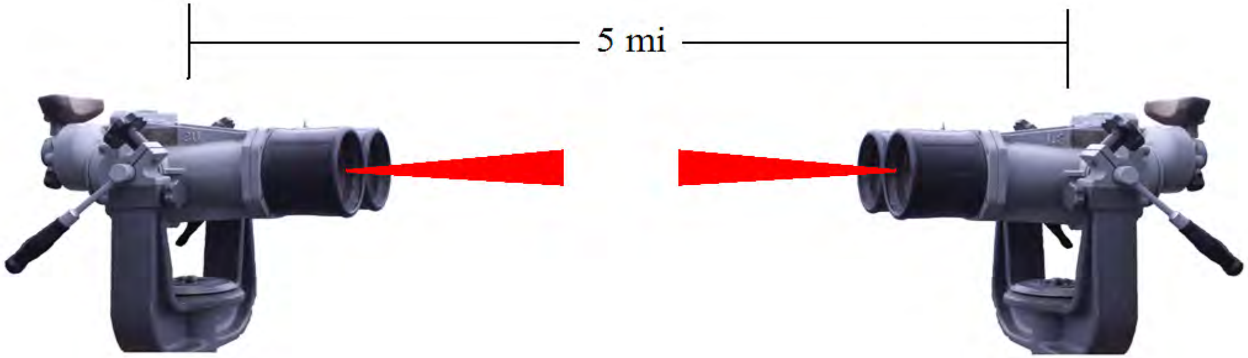
- OEM Module
- 360° Fast Scanning ability
- Detection up to 1km, precision 5m
- Automatic alerts
- Synchronized triggers
- Size – 3.5” x 3.5” x 2”
- Weight <1lb – module only
- Weight <10lb – complete system



Sniper Detection - Video Demo

Optical Communications - Overview

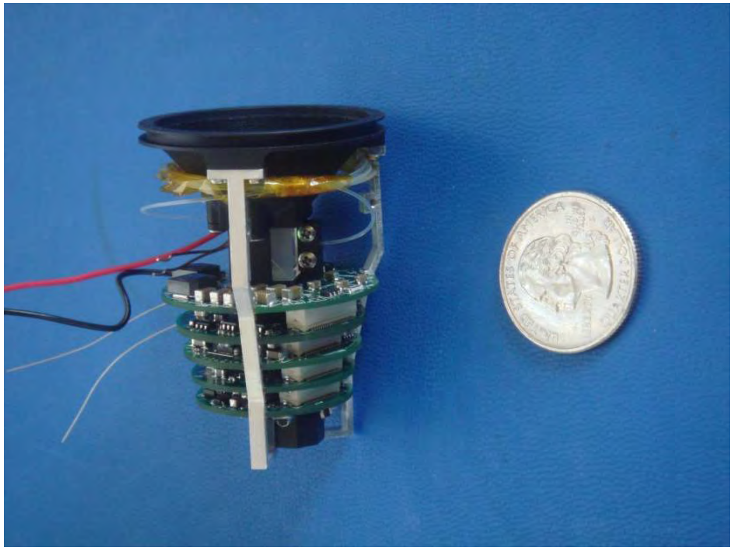
Secure voice and data communication between ships & individuals using US Navy Big Eyes or other binoculars



- *Attachment* *easily connects to any optical device – binoculars, scopes*
- *System* *supports voice and data eye-safe transmission simultaneously*
- *Ethernet* *data connection between binoculars with cable modem speed*
- *Video* *output (color or b/w) from the binoculars is available for recording*
- *Distance* *between binoculars can be up to 12 miles*
- *Technology* *will be adapted to small hand-held binoculars*

Optical Communications - Operational Use

LightSpeed system can be built into small packages like this SUREFIRE light for operational use up to 2 km

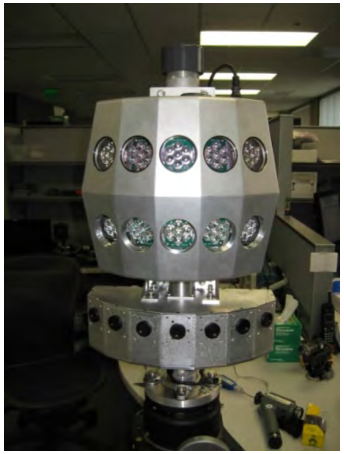


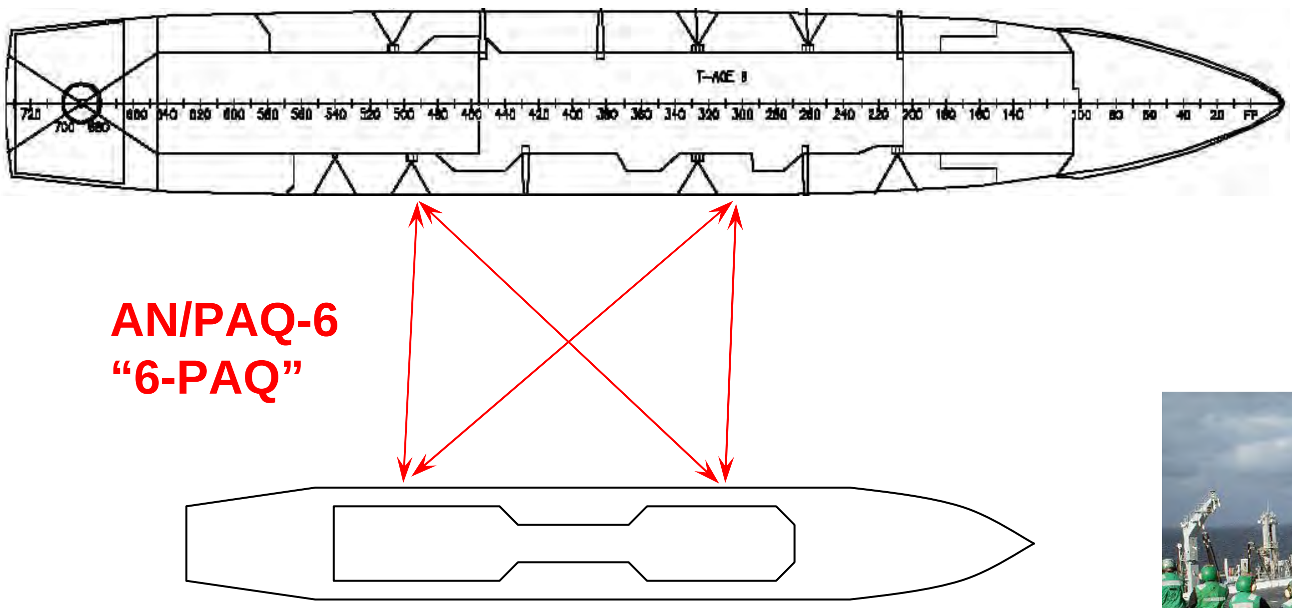
Complete LightSpeed transceiver

Operational LightSpeed SUREFIRE voice communication system

Underway Replenishment (*Light**Speed*** UNREP)

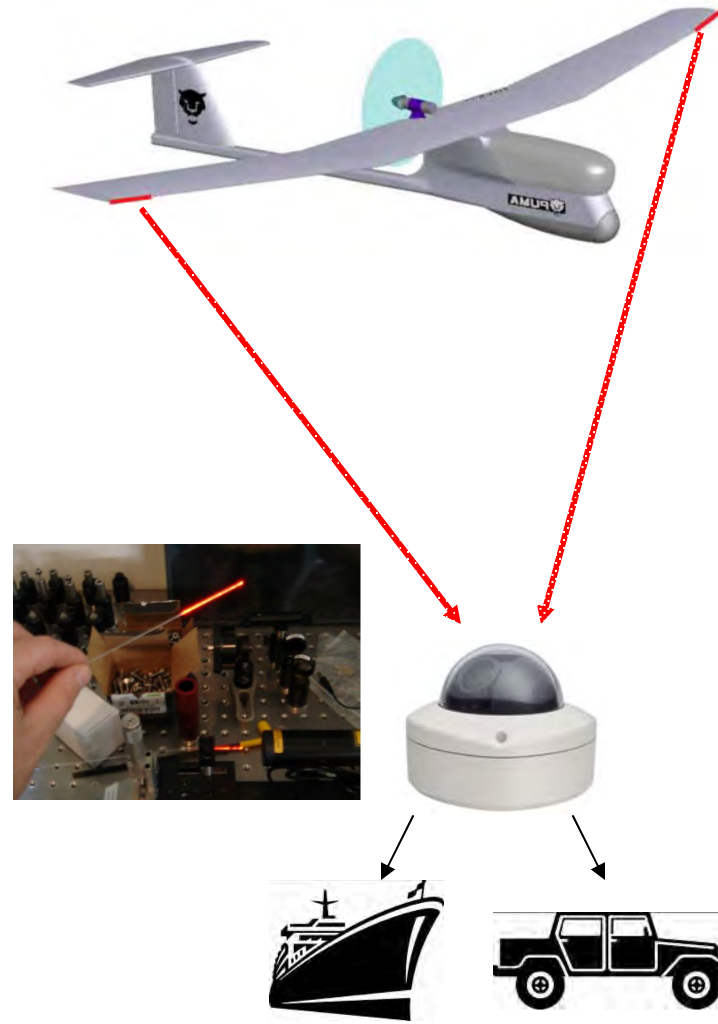
System provides multiple voice, data lines and real-time distance measurement via optical comms





Advanced *Light**Speed*** Development

Not limited to binocular implementation. Special purpose LightSpeed systems can be built into UAVs, gun scopes, Blue Force Tracking devices, etc.



*Light**Speed*** - Fifth Generation

- Binocular & Attachment
  - Evolutionary Enhancement
  - Not detectable by NVG
  - Longer Range
  - Smaller, lighter, less power
- *Rapid**Fire***
  - New Data interface
  - Small size – 5” long, 2.5” diameter
  - Long range – 3km +

*Light**Speed*** on tactical vehicles?

- Connected convoy
- Uses existing IR NV illuminator on MRAP
- Allows all connected cars to talk / send data

- Collect vehicle logistics
- **Secure, Non-RF Comms**

For more information contact:

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(858) 382-7200

LBV@tplogic.com

Agency for Defense Development

A Call for Strengthening Defense S&T Collaborations

C. K. Park, President

Agency for Defense Development

Operational S&T Conference
PACOM, Hawaii
July 2008

Overview of Talk

- ADD Overview
- ROK-US S&T Cooperations

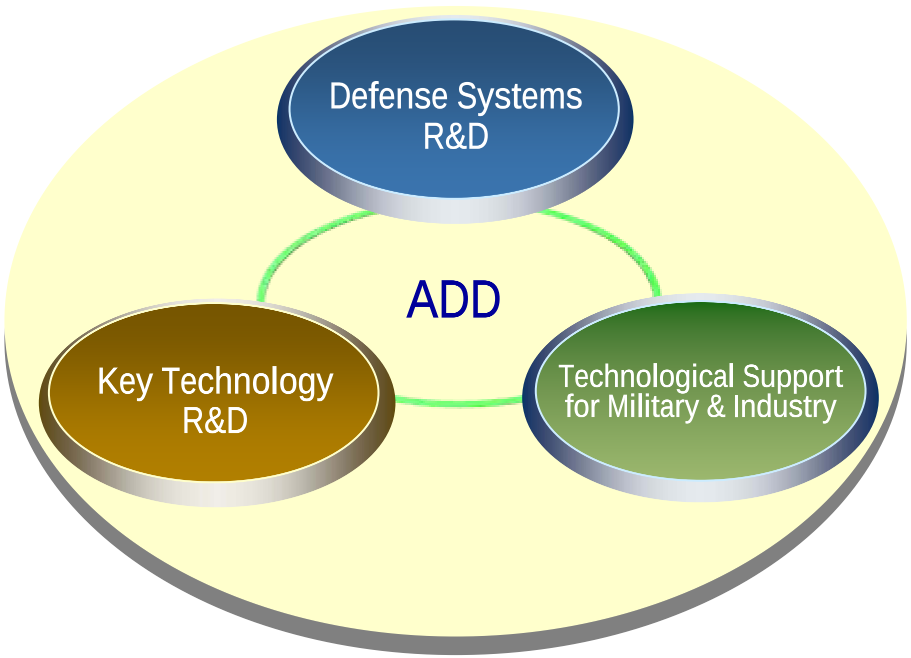
  : Past & Present
- Suggestions for Future
- Conclusions

We have green tea.

We have traditions.

We have mountains.

And we have… ADD

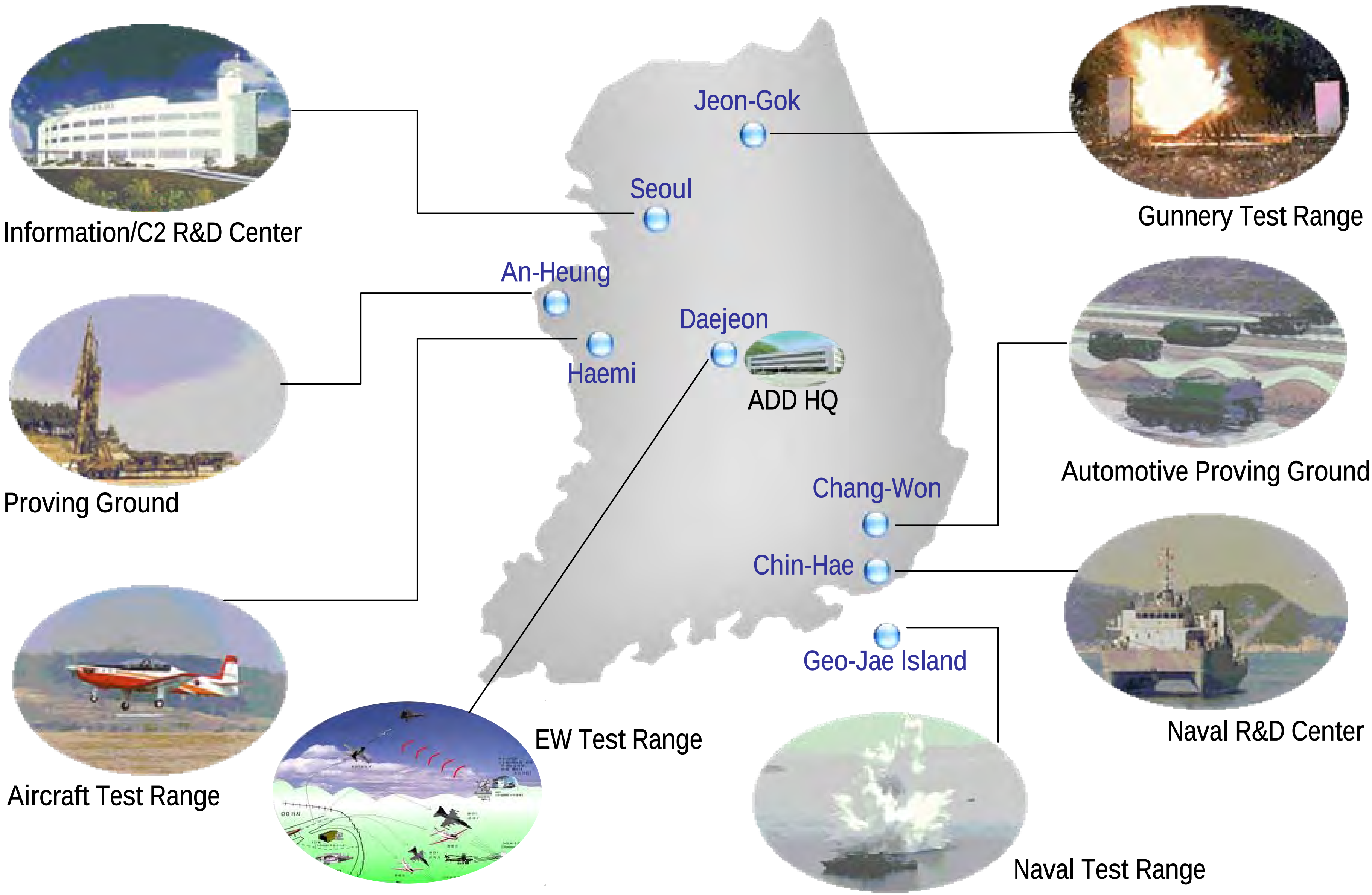


Mission :

Research, Development, Test and Evaluation of weapon systems, equipments and related technologies to reinforce defense capability for self-reliant national defense.

Location

Land : 1,094 Km^2
Building : 559




Spring
Summer
Autumn
Winter

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- Training & Edu.
- Dual-Use Tech.

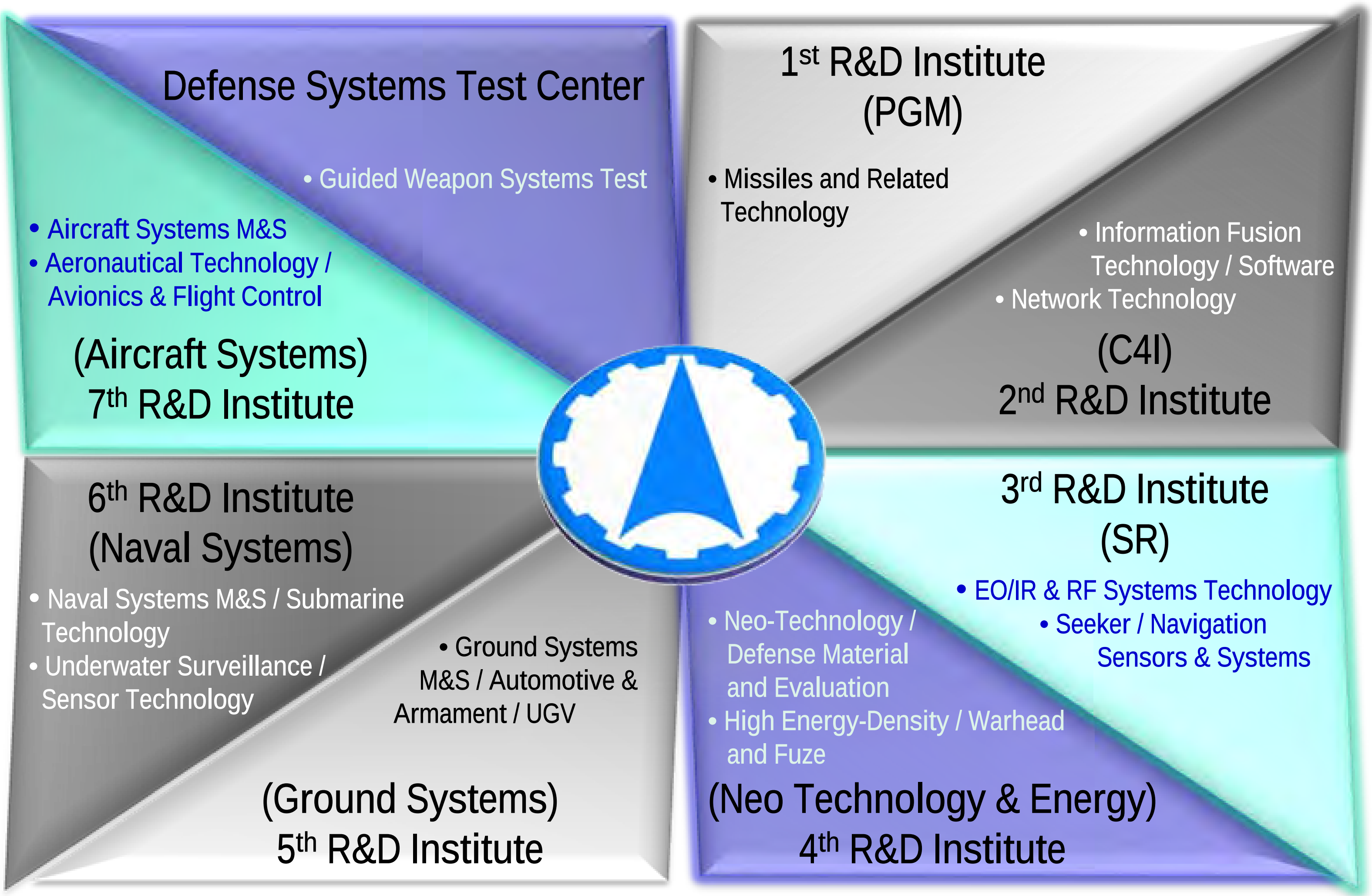
Admin Support & Security

R&D Institutes

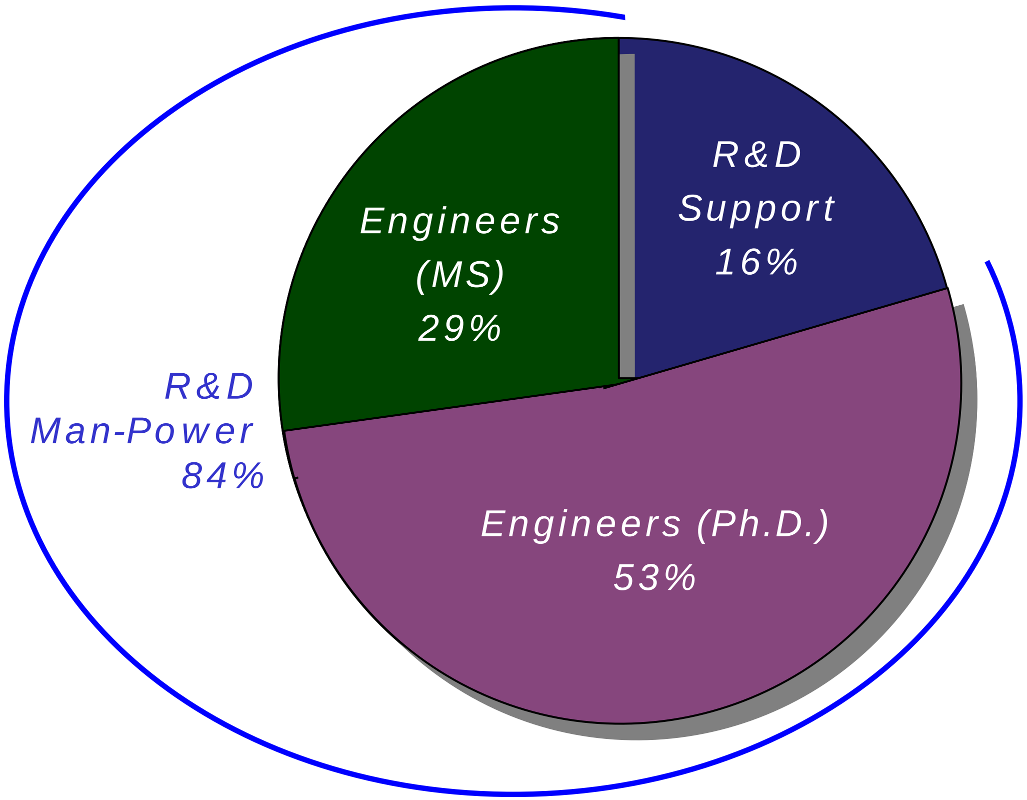
Systems Dev. PEOs

T&E Center

R&D Institutes



Man Power



➢ Employees: 2,522

- Daejeon: 74%
- Chinhae: 10%
- Anheung: 7%
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- Changwon: 2%
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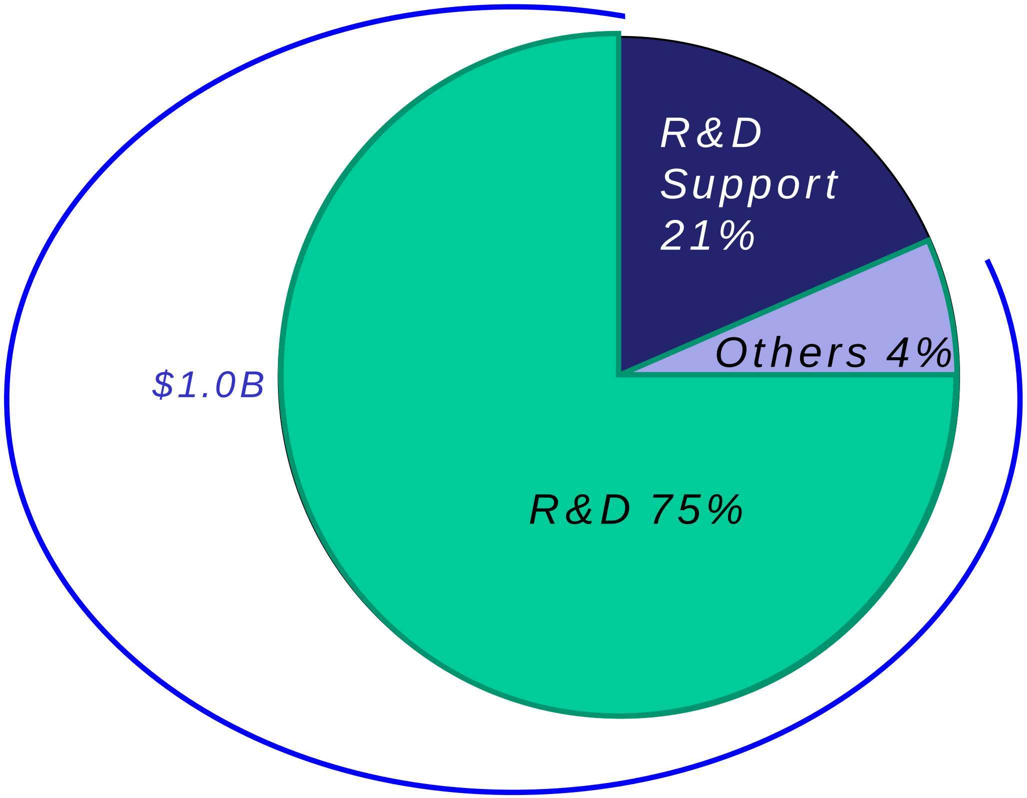
- Haemi: 0.5%

Budget



- Budget : ~$1.0B
  - R&D : $700M
  - R&D Support : $200M
  - Others : $100M

R&D History





Basic Systems Design and Build
Mortars, Howitzers, Recoilless Rifle, etc.

1970~

Expanding R&D Areas
Missile, Torpedoes, FM/AM Radios, Machine Guns, etc.

1980~

Complex Systems Development
K-9 (Self-Howitzer), KT-1(Basic Trainer Aircraft), Shipboard EW, etc.

1990~

Advanced R&D / Future Technology Build-up
Guided Missile, etc.

2000~


Laboratories

Area	Major Laboratories	56
Gun/Munitions	Warhead, Munitions Test	15
Maritime/Underwater	Underwater Acoustic Test	10
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Electronics/Optic	EMI/EMC Test	4
Aviation	Structure, Wind Tunnel Test	6


Structure fatigue test


Wind Tunnel test


EMI/EMC test


Guidance control test


Underwater acoustic

Test Facilities

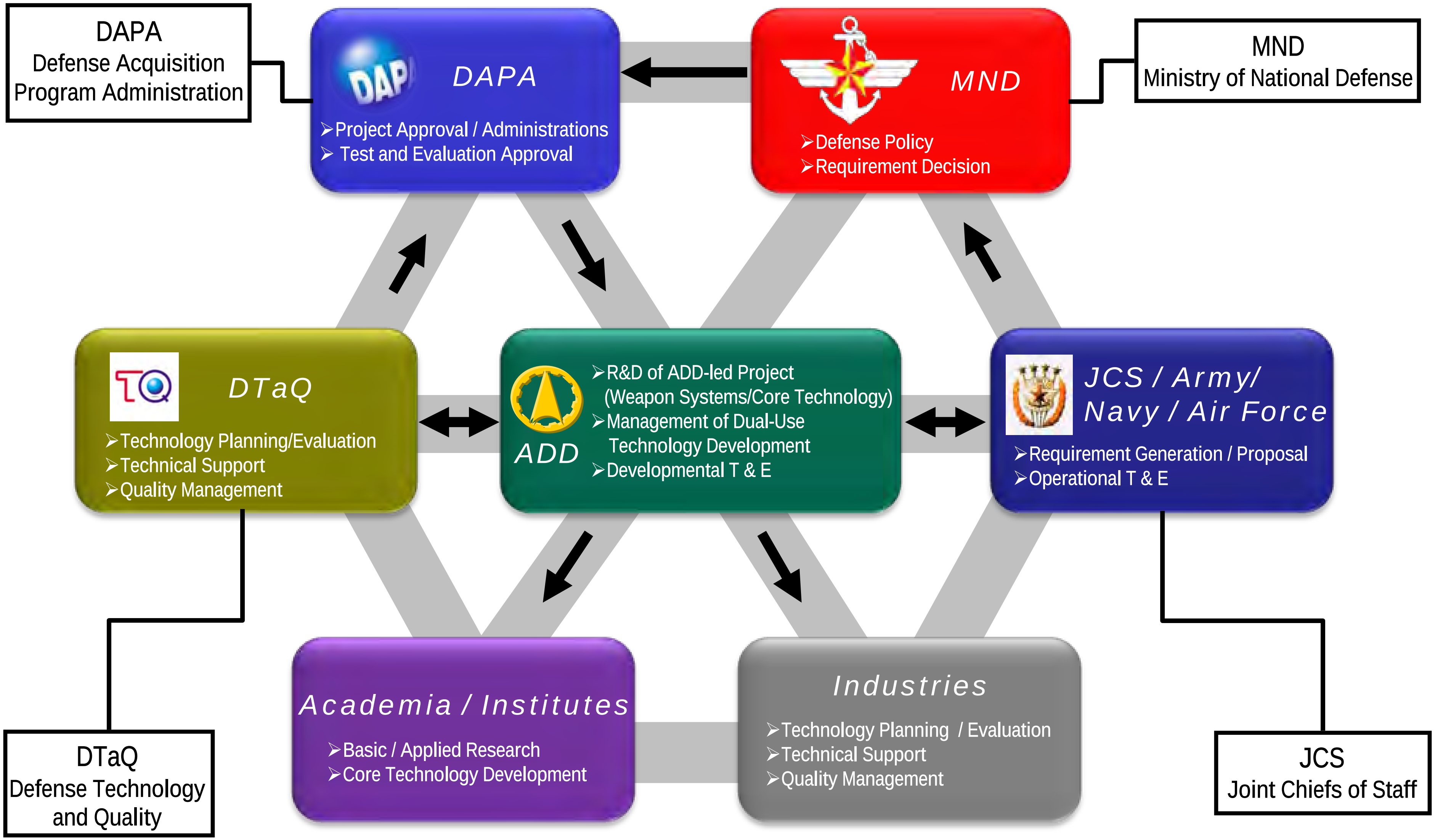
▲Changwon Proving Ground : Test Track

▲An-Heung Low-Temperature Chamber

▲Sled Test

▲Environmental Test (Under Construction)

R&D Process(1)


DAPA
Defense Acquisition
Program Administration
DAPA
➢Project Approval / Administrations
➢ Test and Evaluation Approval
MND
➢Defense Policy
➢Requirement Decision
MND
Ministry of National Defense
DTaQ
➢Technology Planning/Evaluation
➢Technical Support
➢Quality Management
ADD
➢R&D of ADD-led Project
(Weapon Systems/Core Technology)
➢Management of Dual-Use
Technology Development
➢Developmental T & E
JCS / Army/
Navy / Air Force
➢Requirement Generation / Proposal
➢Operational T & E
Academia / Institutes
➢Basic / Applied Research
➢Core Technology Development
Industries
➢Technology Planning / Evaluation
➢Technical Support
➢Quality Management
DTaQ
Defense Technology
and Quality
JCS
Joint Chiefs of Staff

R&D Process(2)

Weapon Systems

Exploratory Development
- ✓ Preliminary Design
- ✓ Experimental Prototype

Preliminary Study
- ✓ Analysis of Alternatives
- ✓ Conceptual Study

System Development
- ✓ Critical Design
- ✓ System Prototype
- ✓ Test & Evaluation

Core Technology

Applied Research
- ✓ Development Research
- ✓ Experimental Prototype

Basic Research
- ✓ Theoretical Study

Experimental Development
- ✓ Prototype
- ✓ Standardization

Acquisition Re-Alignment

- **Role of MND**

  : Mid-term and Long-term Planning

  : Budgeting

  : T&E

- **Role of DAPA**

  : Programming

  : Being Re-Examined

- **Role of ADD**

  : Defense Systems R&D

  : Budget Proposals

  : Proposals for Mid- and Long-term Planning, Programming

ROK-US Defense Chiefs Reach Hands

The Coldest Winter : America and the Korean War

written by David Halberstam

6. HEIGHT OF NORTH KOREAN ADVANCE, LATE AUGUST 1950

Three-year Korean War Casualty (June 1950 – July 1953)		
	Killed	Wounded
US Soldiers	*33,000*	*105,000*
RoK Soldiers	*415,000*	*429,000*
China & N.K. Soldiers	*1.5 millions*	*?*

US Labs – ROK(ADD) Joint Programs

1980~1990

- Short-Range SAM Guidance Technology (1988): with MICOM

1991~2000

- Harbor Protection (1990): with NRL
- New Underground Ammunition Storage Technologies (1992): with WES
- Tungsten Heavy Alloy (1992): with MTL
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- Insensitive Munitions (1998): with ARDEC

2001~2007

- Supersonic Jet Interaction (2003): with AFA
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- **High Alpha** Flow Control (2010): with AFRL/AFA
- High Energy Density Materials (2008): with ARDEC

US Labs-ADD Cooperative Programs

Collaborative R&D Projects Agreement (PA)

- 2 PA s are active
  - Low Cost Guided Imaging Rocket (LOGIR)
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- 7 PAs are under discussion
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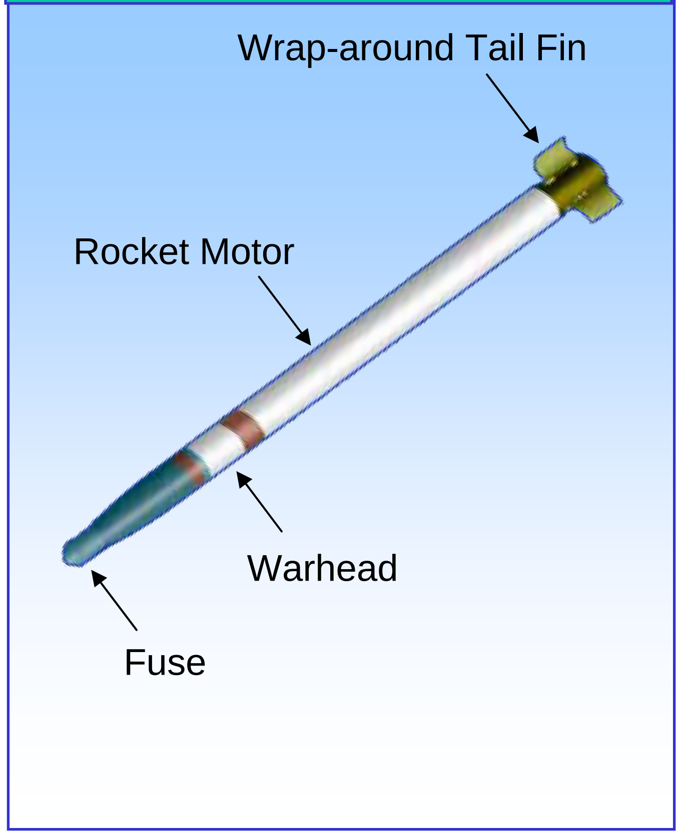
  - Naval Battle Experimentation
  - Radar Target Signature (RTS)
  - Aerodynamics
  - Live Virtual-Constructive (LVC) Integration Technology of Ground Weapon Systems

Engineers and Scientists Exchange Program (ESEP)

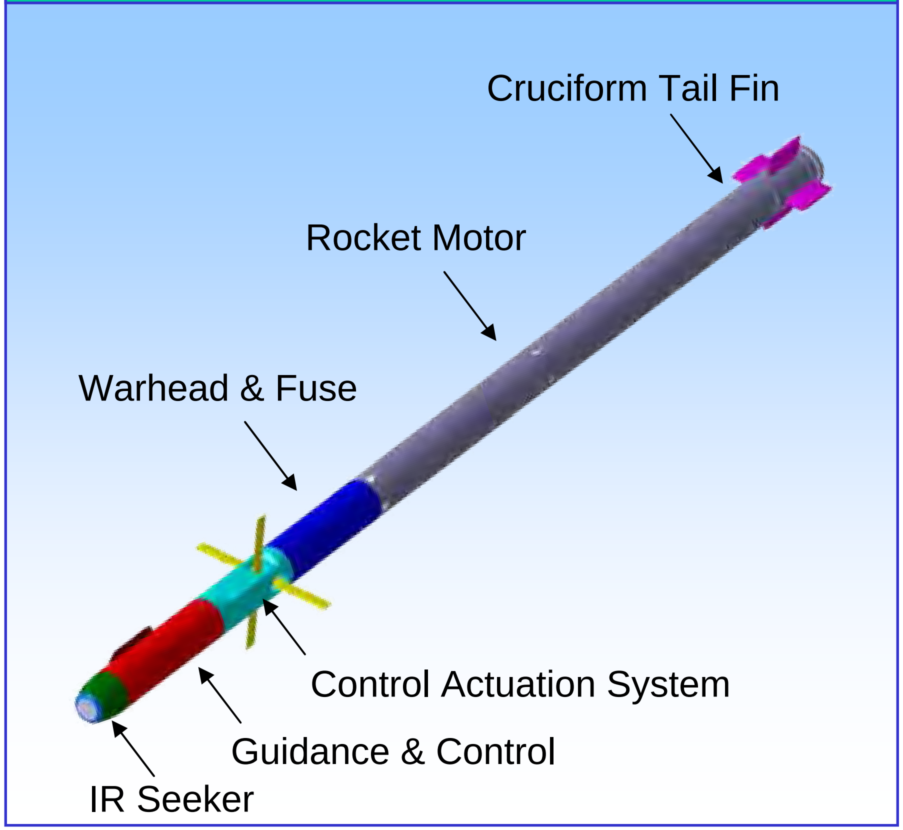
- 393 Engineers have been exchanged since 1974
  (269 ADD Engineers and 13 US Engineers are included)

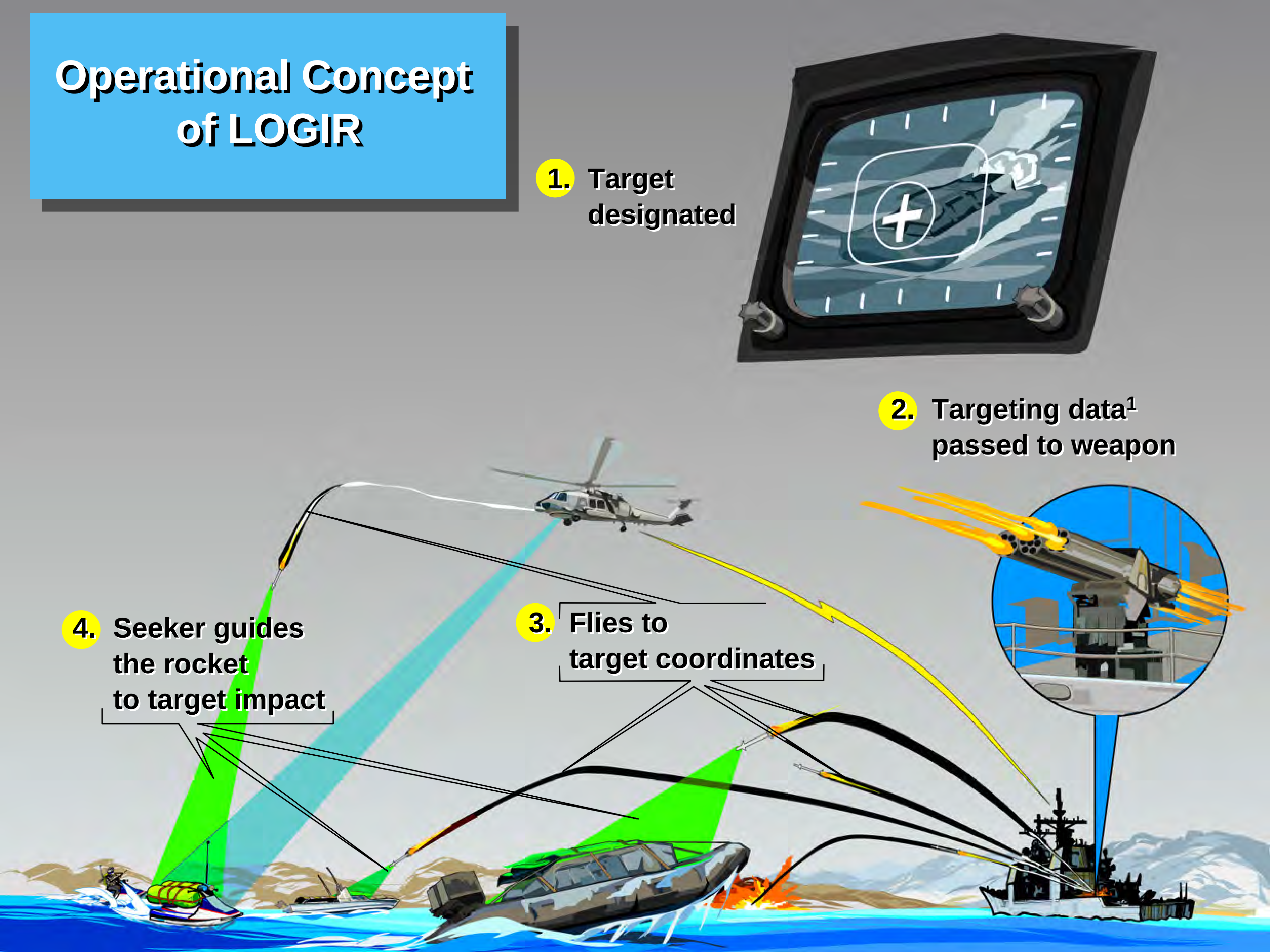
LOGIR S&T MOU

Hydra 70 (2.75-inch Rocket)



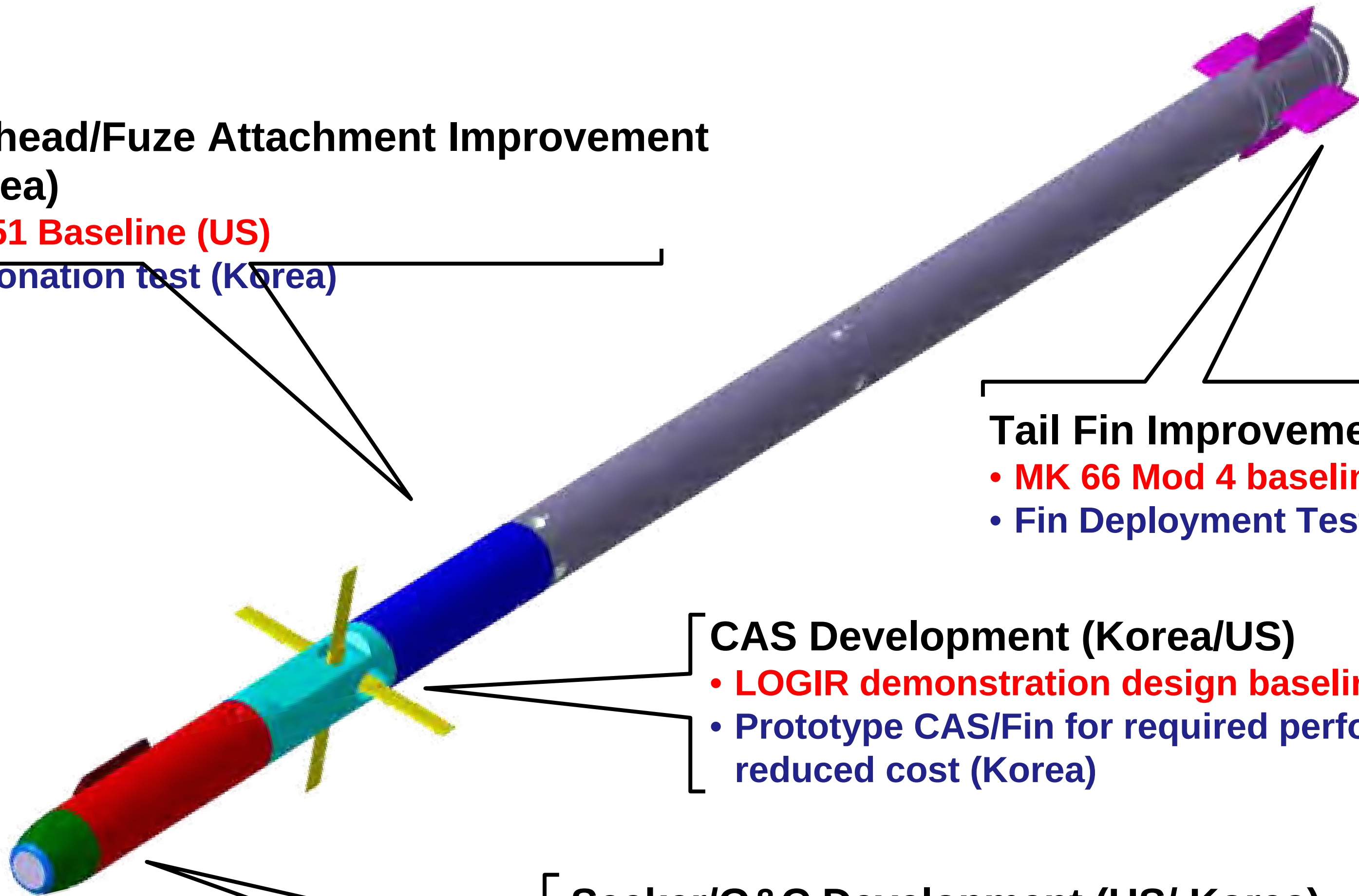
LOGIR (2.75-inch Guided Rocket)




Operational Concept of LOGIR
1. Target designated
2. Targeting data[1] passed to weapon
3. Flies to target coordinates
4. Seeker guides the rocket to target impact

Technology Complement

Warhead/Fuze Attachment Improvement (Korea)
- M151 Baseline (US)
- Detonation test (Korea)

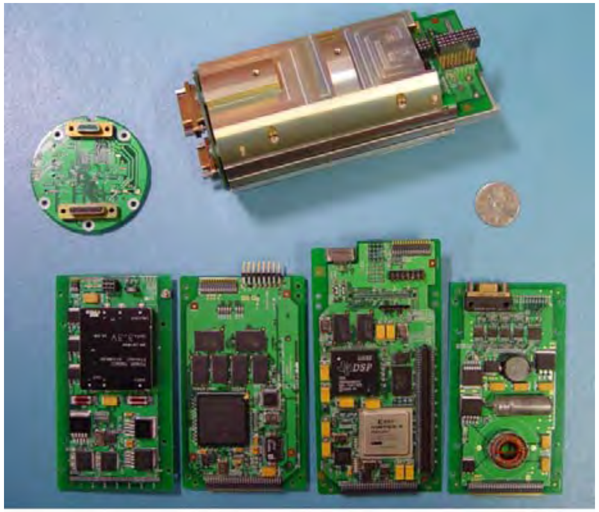


Tail Fin Improvement (Korea)
- MK 66 Mod 4 baseline (US)
- Fin Deployment Test (Korea)

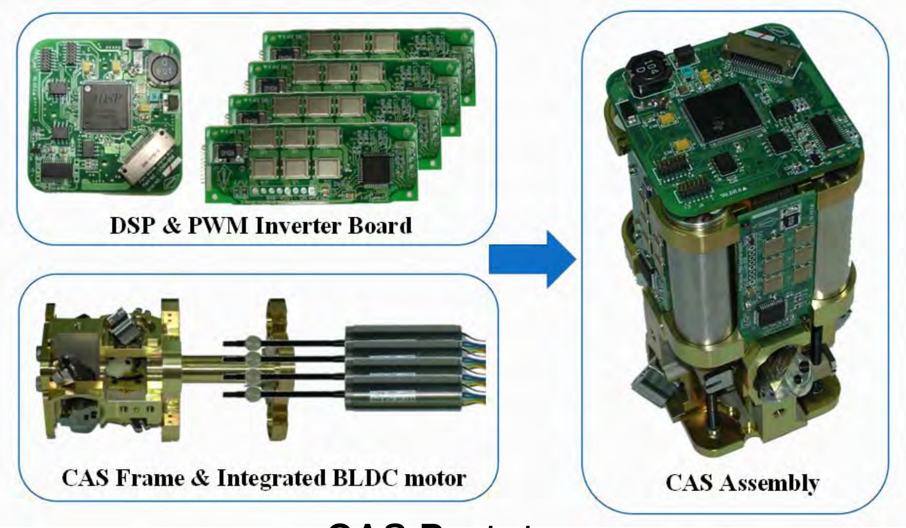
CAS Development (Korea/US)
- LOGIR demonstration design baseline (US)
- Prototype CAS/Fin for required performance at a reduced cost (Korea)

Seeker/G&C Development (US/ Korea)
- LOGIR demonstration design baseline (US)
- Improvements in electronic assembly design and hardware to reduce overall cost (Korea)

ROK Contribution for LOGIR

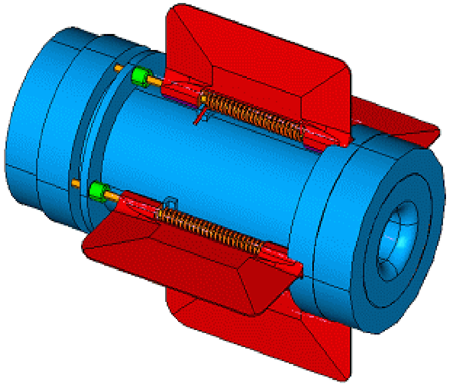


G&C Prototype

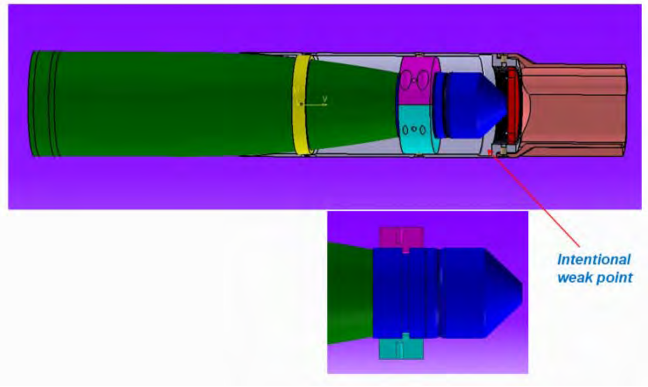


CAS Prototype

Structure and Fins Prototype



Cruciform Tail Fins and Nozzle Assembly



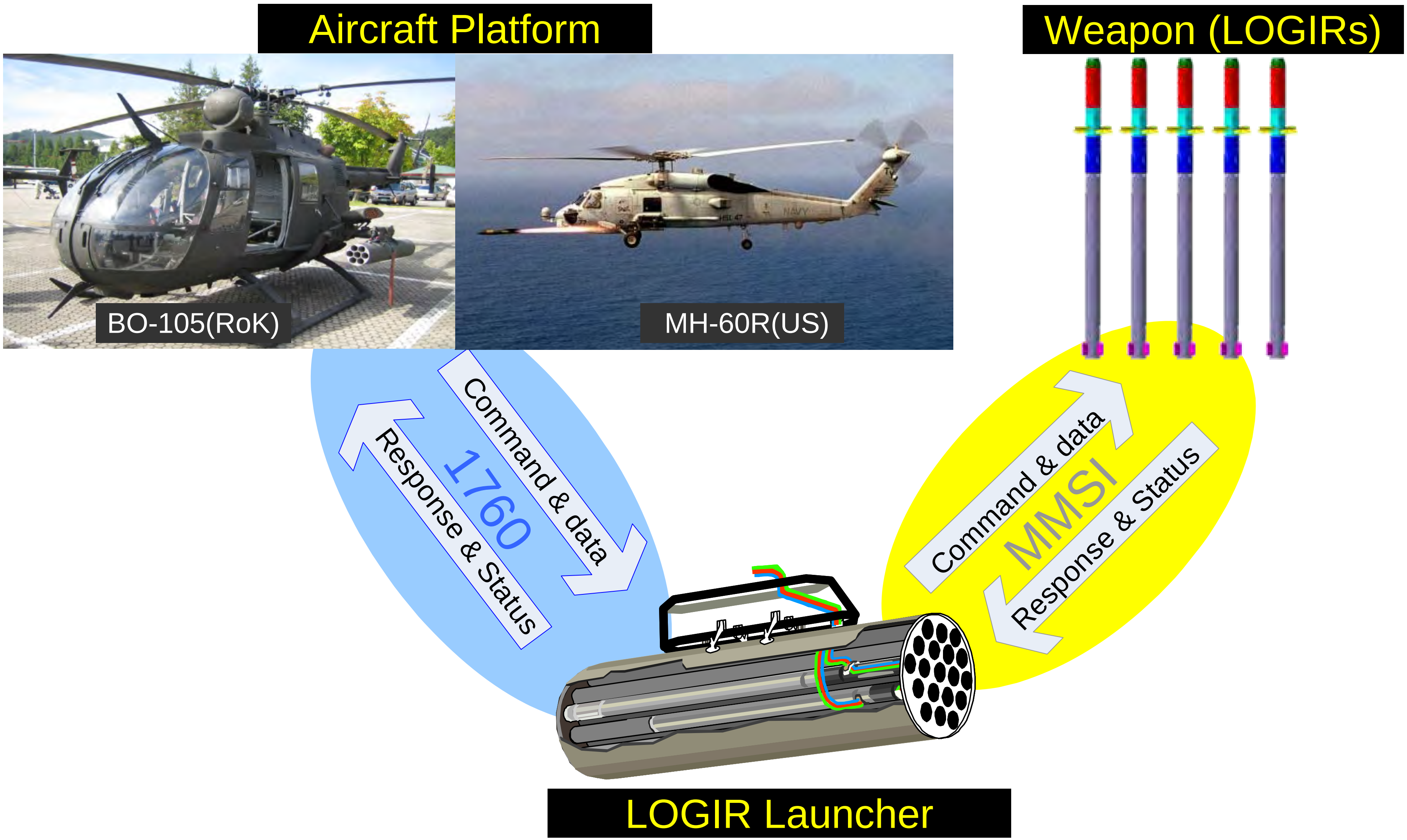
Warhead/Fuze Attachment Improvement

ADD's Capabilities on Testing

- Wind tunnel testing: complete 6DOF
- Structural testing: static, dynamic and bending mode frequency
- Environmental testing for G&C and CAS: temperature, vibration, humidity,…
- Sled testing for impact detonation for fuze/warhead
- Structural testing for warhead assembly
- Thrust misalignment measurement

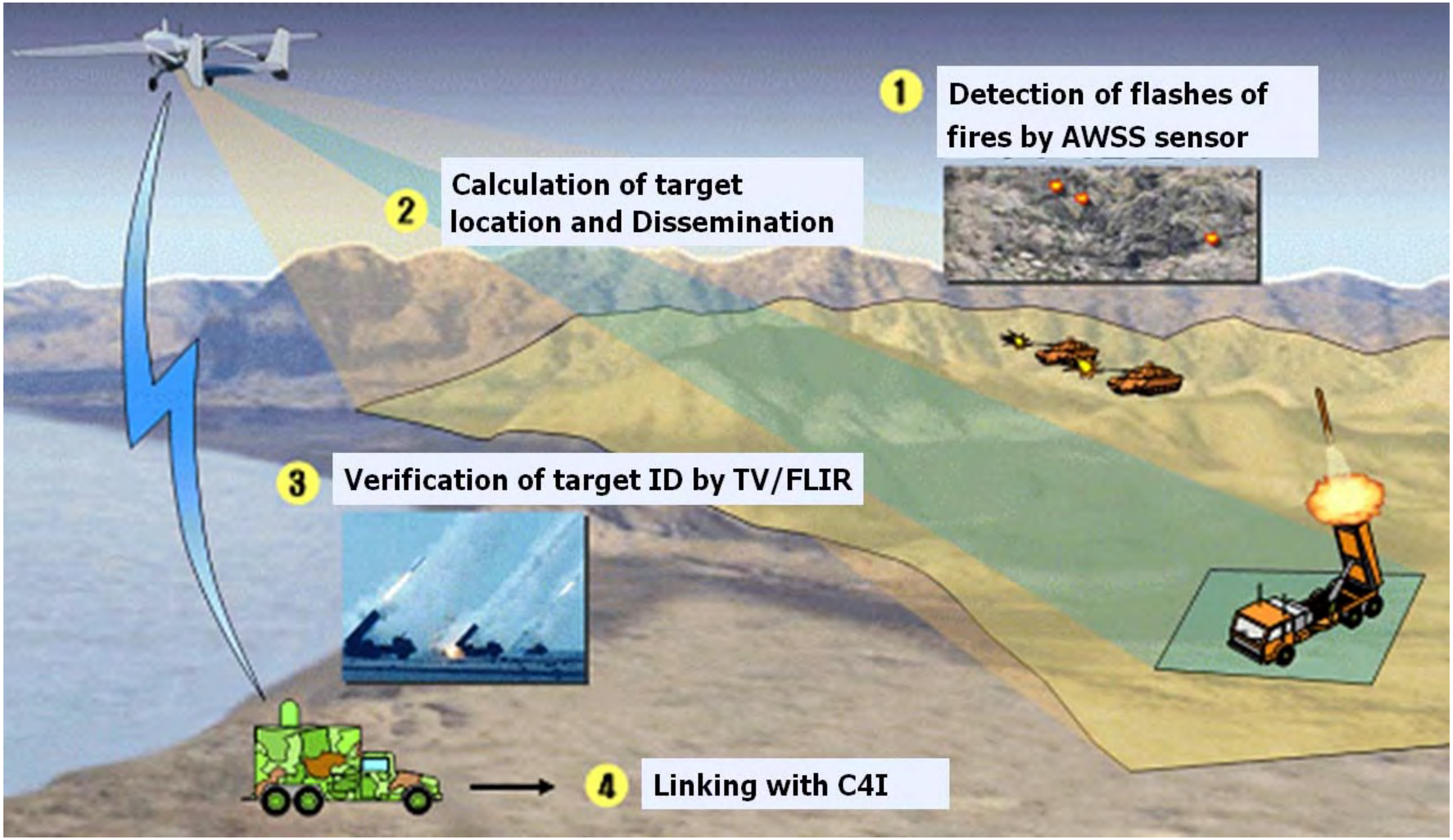

Items for Cooperation
Signal Processing Computer
Power Supply
Time Schedule of Activities
Analyze the Transferred data
G&C Section Optimization
- Design
- Manufacture
- Test Evaluation
Flight test and Data Collection

Medusa JCTD


Aircraft Platform
BO-105(RoK)
MH-60R(US)
Weapon (LOGIRs)
Command & data
1760
Response & Status
Command & data
MMSI
Response & Status
LOGIR Launcher

AWSS JCTD:
Airborne Weapon Surveillance Systems

- To develop capability to detect, identify and locating/targeting weapon firings and reporting over tactical C4I system using airborne IR sensor system



Rapid Aerodynamic Design and Analysis

Collaboration

RADA

AFOSR
- Dr. John Schmisseur
- Implement the PA
- Oversee the progress

ADD
- Dr. Seung K. Hong
- Develop RADASE
- Shape Design

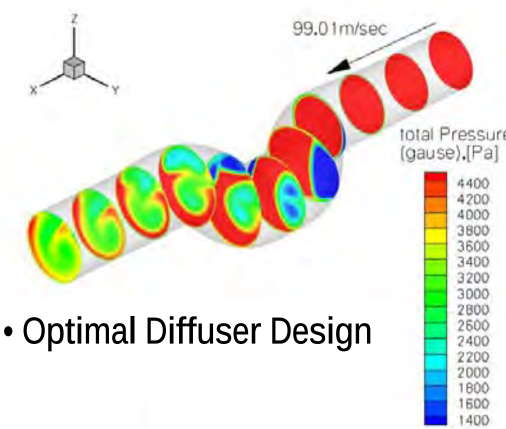
USAFA
- Dr. Russ Cummings
- Wind-Tunnel Test & Validation

RUTGERS School of Engineering
- Prof. Doyle D. Knight
- Develop RADASE
- Training

Multi-disciplinary Design Optimization (MDO)

❖ Minimize the Pressure Loss & the Flow Distortion. (2006~ 2008)

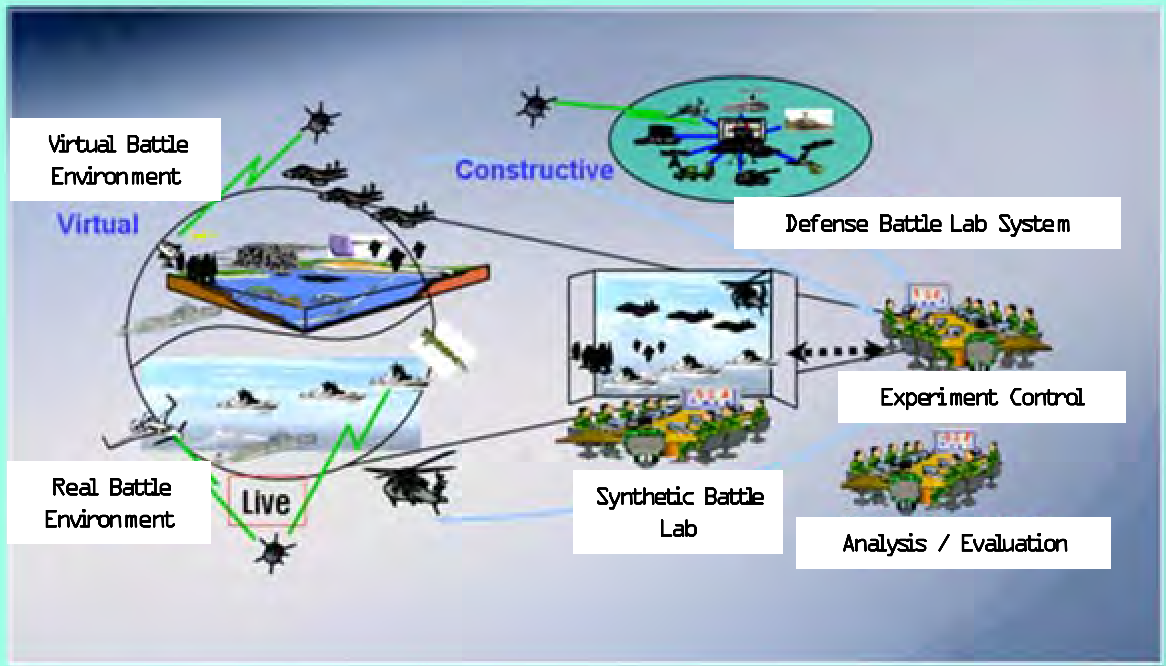
• Subsonic Diffuser



• Optimal Diffuser Design

Battle Experimentation

Systematic/Scientific Verification Process for Military Transformation



Real Battle Environment
+
Virtual Battle Environment
➡ Synthetic Battle Space

Need for International Collaboration

- **Economic strength depends on technology:**

  - Top five categories of US exports were high-tech items.

- **The pace of research/technology has grown exponentially.**
- **The obvious direction for maintaining strength and continuing growth is through international collaboration.**
- **Need to stimulate new collaborations from basic research to system level.**

Common Situation

- **It is hard to match programs once they are already started:**

  - Programs, though similar, have different goals and are progressing down separate paths

- **Budgets are already set and not easy to allocate new funding to support cooperation**

- **Long lead time before signing agreements:**

  - Some measures are already taken

Remedy for Better Solution

- We need to factor in cooperation plan early enough when we can still influence the planning and budget processes
- It will take openness on both sides:

  - Need to share our technology roadmaps

- It will take a new level of cooperation and interaction between the service labs:

  - e.g. LOGIR

Two-Level Approach

(1) Personal level:

- Need to find the common interest
- Want to work together
- Build a personal relationship

(2) High level/Management level:

- Agree the area of research is mutually beneficial
- Willing to commit resources

Questions and Challenges

(1) Where do we focus our technology thrust for 2015 or beyond?

- Resources are always limited

(2) How, as an S&T community, do we gain trust from the political leaders as well as military community?

- Is PACOM OS&T Conference enough?

- How do we follow it up?

(3) How do we cut down the procedures to accelerate our partnership for mutual gain?

- Can we “tear down the wall”?

ADD Initiatives

- Increase in funding for international cooperation
- Strengthening “International Co-op Office” to find matches
- Early planning for mid-term budgets
- Carry-out a big project of strategic importance
- Collaborate on tactical-level system development
- Exchange people and enhance visits:

  - let scientists see what each other is doing

Reward:
Merits of International Joint Work

- **Shares resources and keeps risk low:**

  - Manpower, Fund, Lab Facilities, Ideas

- **Complement technologies each other**
- **Reduces development cycle:**

  - Joint DT and OT

- **Opportunities for industrial collaboration**

Conclusions

- **Current Cooperation Status was briefly reviewed and Some suggestions were made.**
- **ADD plans to Strengthen International Cooperation**

  - Expand Defense Cooperation in

    - Co–R&D

    - Co–Development / LOGIR
- **S&T Cooperation will also be a <u>Cornerstone</u> for Defense Alliance between ROK and US**

Thank You

- For PACOM Conference Organizers
- For Opportunity to Participate

C4ISR Breakfast

August 6, 2008

Pentagon City, VA

Missile Defense Agency Small Business Innovation Research (SBIR) Industry Day

August 6 - 7, 2008

National Harbor, MD

2008 Naval Science & Technology Partnership Conference

"Sustaining the Edge - Serving the Next Generation Warfighter... Now"

August 12 – 14, 2008
Washington, DC

Homeland Security Executive Breakfast

Featured Speaker
The Honorable Richard Mangogna,
Chief Information Officer, DHS

August 14, 2008

Arlington, VA

An NDIA Affiliate Event

Advanced Distributed Learning Co-Lab Implementation Fest (ADL CoLab)

August 25 - 26, 2008

Orlando, FL

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Land & Maritime Supply Chains Business Conference & Exhibition (DSCC)

"Yesterday, Today, Tomorrow..."

August 25 - 27, 2008
Columbus, OH

Stability, Security, Transition and Reconstruction Operations (SSTRO) Conference

"Stability Operations, From Planning to Execution, A Comprehensive Approach"

September 3 - 4, 2008

Pentagon City, VA

Disruptive Technologies Conference

"Dynamic Capability Differences"

September 4 - 5, 2008
Washington, DC

Joint Undersea Warfare Technology Fall Conference (Secret US Only)

"Undersea Warfare: Solutions for a Complex Environment"

September 8-11, 2008

Groton, CT

Defense Systems Acquisition Management Course (DSAM)

September 8 - 12, 2008

Annapolis, MD

Homeland Security Symposium and Exhibition

"New Directions in Homeland Security "

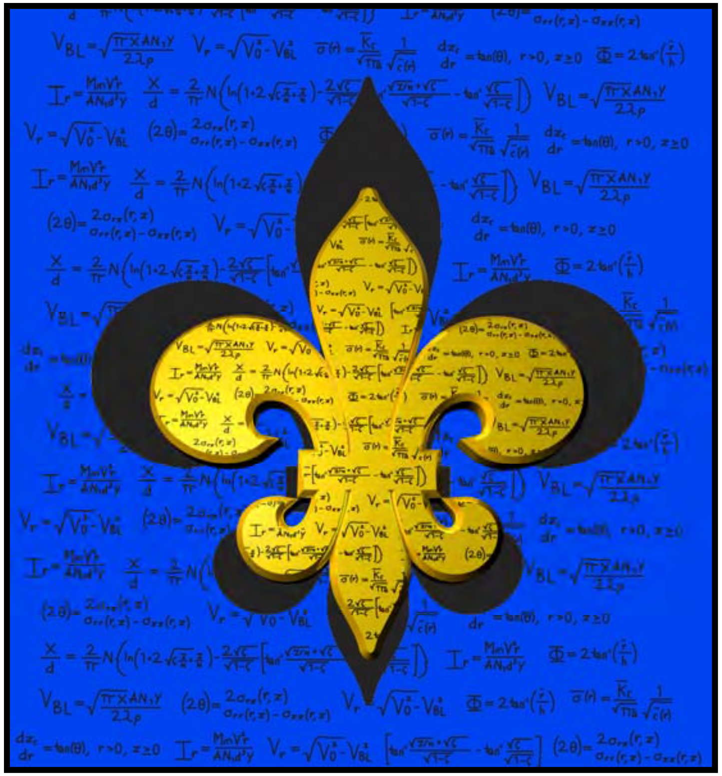
September 9 - 10, 2008
Arlington, VA

Chemical-Biological Ensemble Component Forum

September 9 – 10, 2008

Baltimore, MD

International Symposium on Ballistics



September 22 - 26, 2008

New Orleans, LA

C4ISR Breakfast

October 2, 2008
Pentagon City, VA

46th Annual
Targets, UAVs & Range Operations Symposium & Exhibition

"Supporting the Warfighter in Times of Change: Test Like You Train... Train Like You Fight"

October 8 - 10, 2008

San Antonio, TX

2008 Women In Defense National Fall Conference

"Defense Professionals in Transition: People, Markets, and Tools"

October 15, 2008

Arlington, VA

13th Annual Expeditionary Warfare Conference

"21st Century Expeditionary Warfare Challenges, Opportunities and the new Maritime Strategy"

October 20 - 23, 2008
Panama City, FL

Technical Information Division Conference

"Enterprise Configuration and Data Management"

October 20 - 21, 2008

Huntsville, AL

11th Annual Systems Engineering Conference

October 20 - 23, 2008

San Diego, CA

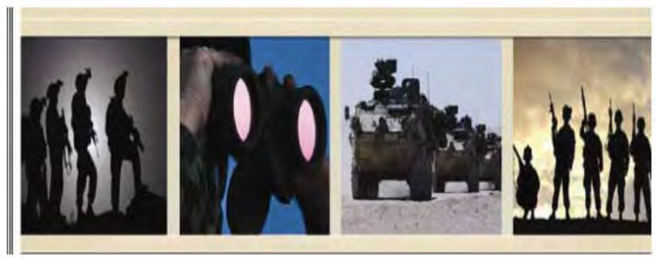
Combat Vehicles Conference

"Today's Legends: How our Current Systems Will Contribute to the Future"

October 20 - 22, 2008

Dearborn, MI

Tank-Automotive Command Life Cycle Management Command APBI



October 22 - 24, 2008

Dearborn, MI

An NDIA Affiliate Event

Precision Strike Technology Symposium

PRECISION STRIKE ASSOCIATION

October 28 - 30, 2008

Laurel, MD

Aircraft Survivability Symposium
(Secret US Only)

"Low Altitude Today,
Preparing for Tomorrow"

November 4 - 7, 2008
Monterey, CA

Intelligence Community Forum

November 5, 2008

Bolling AFB, Washington, DC

12th Annual Small Business Conference

November 12 - 13, 2008

McLean, VA

Homeland Security Executive Breakfast

November 13, 2008

Arlington, VA

8th Annual CMMI Technology Conference

November 17 - 20, 2008

Denver, CO

USCG Innovation EXPO

November 18 - 20, 2008

Virginia Beach, VA

Interservice/Industry Training, Simulation and Education Conference (I/ITSEC)

"Learn.Train.Win!"

December 1 - 5, 2008

Orlando, FL

C4ISR Breakfast

December 3, 2008
Pentagon City, VA

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December 8 - 12, 2008

New Orleans, LA

Agency for Defense Development

A Call for Strengthening Defense S&T Collaborations

C. K. Park, President

Agency for Defense Development

Operational S&T Conference
PACOM, Hawaii
July 2008

Overview of Talk

- ADD Overview
- ROK-US S&T Cooperations

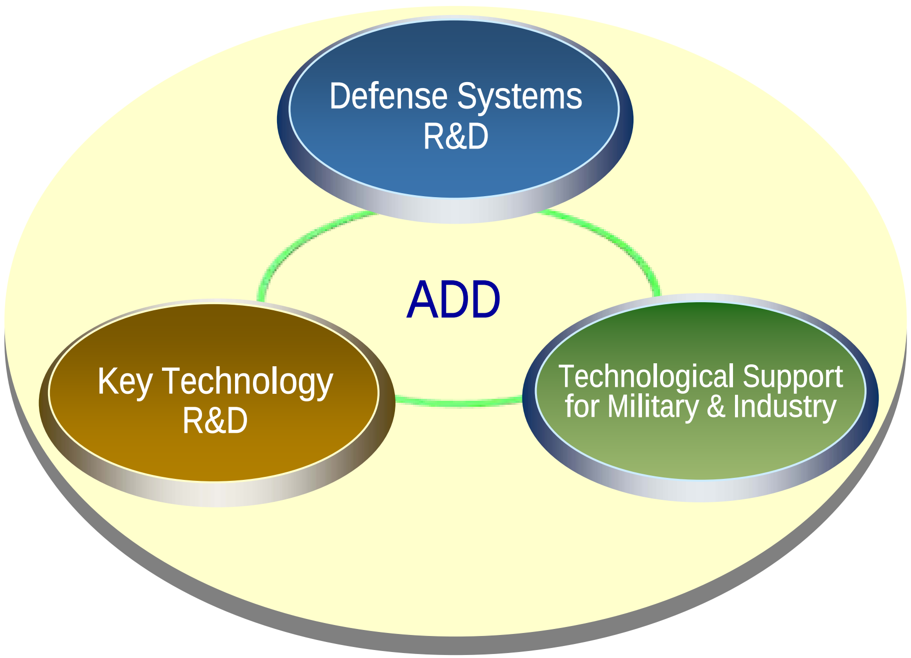
  : Past & Present
- Suggestions for Future
- Conclusions

We have green tea.

We have traditions.

We have mountains.

And we have… ADD

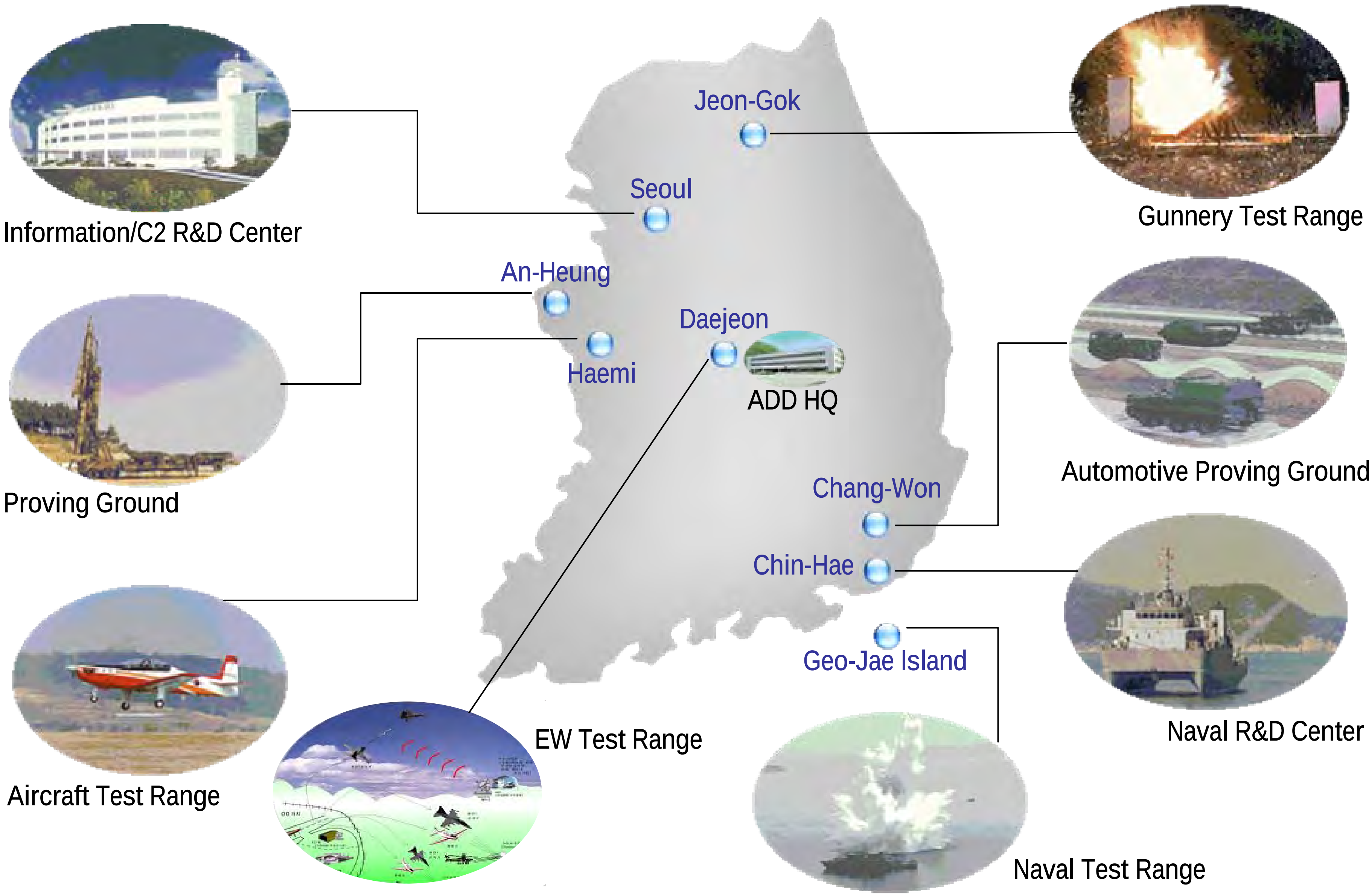


Mission :

Research, Development, Test and Evaluation of weapon systems, equipments and related technologies to reinforce defense capability for self-reliant national defense.

Location

Land : 1,094 Km²
Building : 559



Organization

Board of Trustees

MND & DAPA

President

Auditor

Executive V.P.

Directorates

- Policy Planning
- Plans & Programming
- Tech. Cooperation
- Analysis & Evaluation

Centers

- Joint M&S
- E-Information
- Training & Edu.
- Dual-Use Tech.

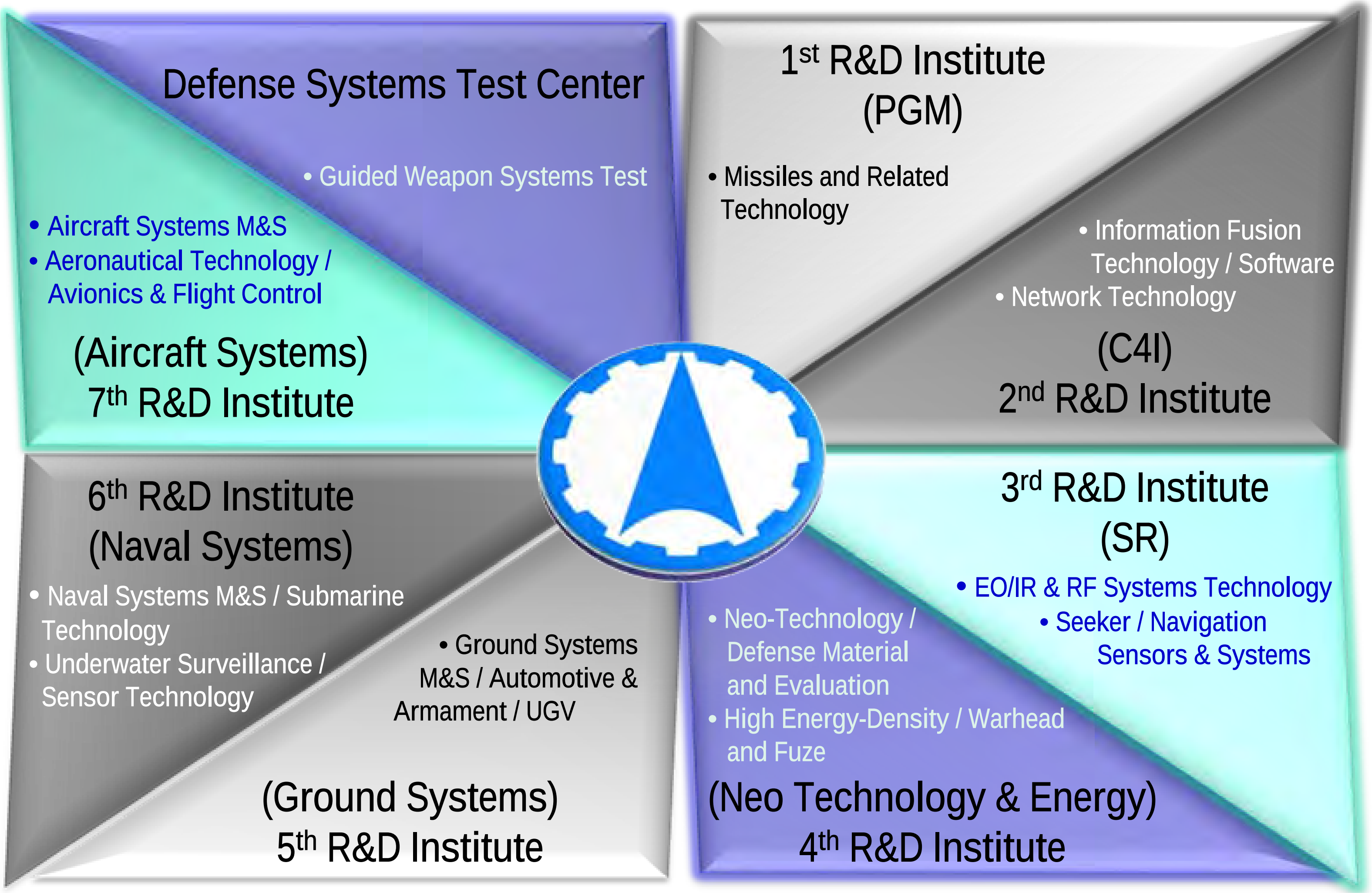
Admin Support & Security

R&D Institutes

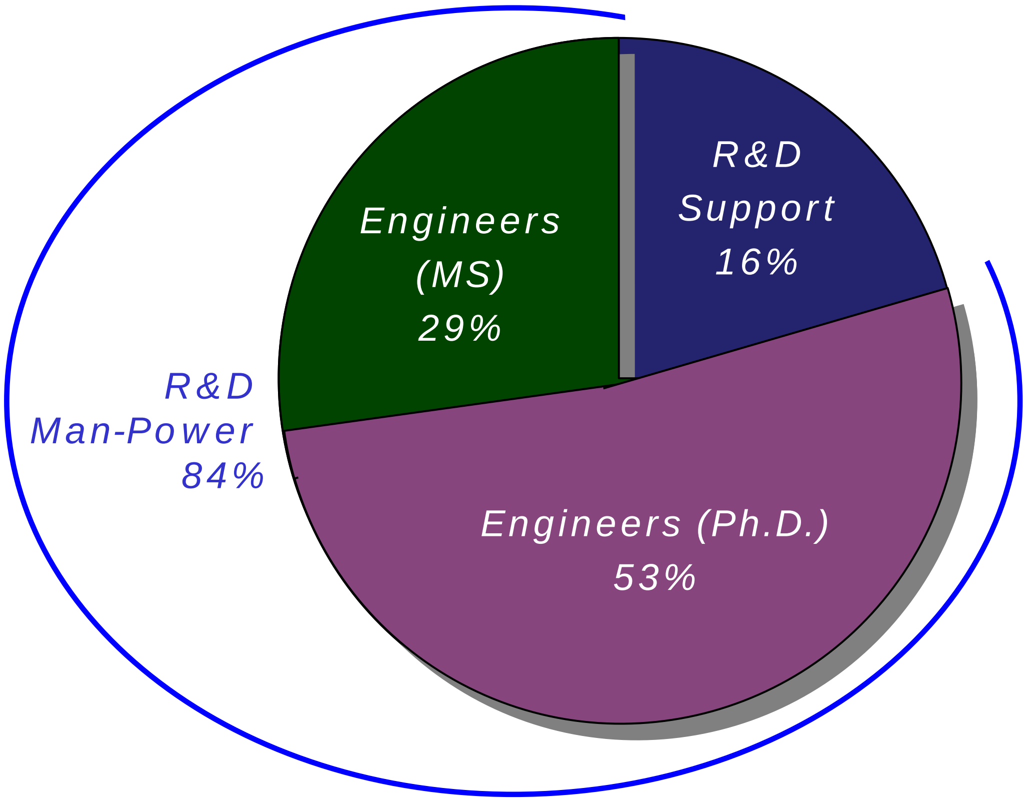
Systems Dev. PEOs

T&E Center

R&D Institutes



Man Power



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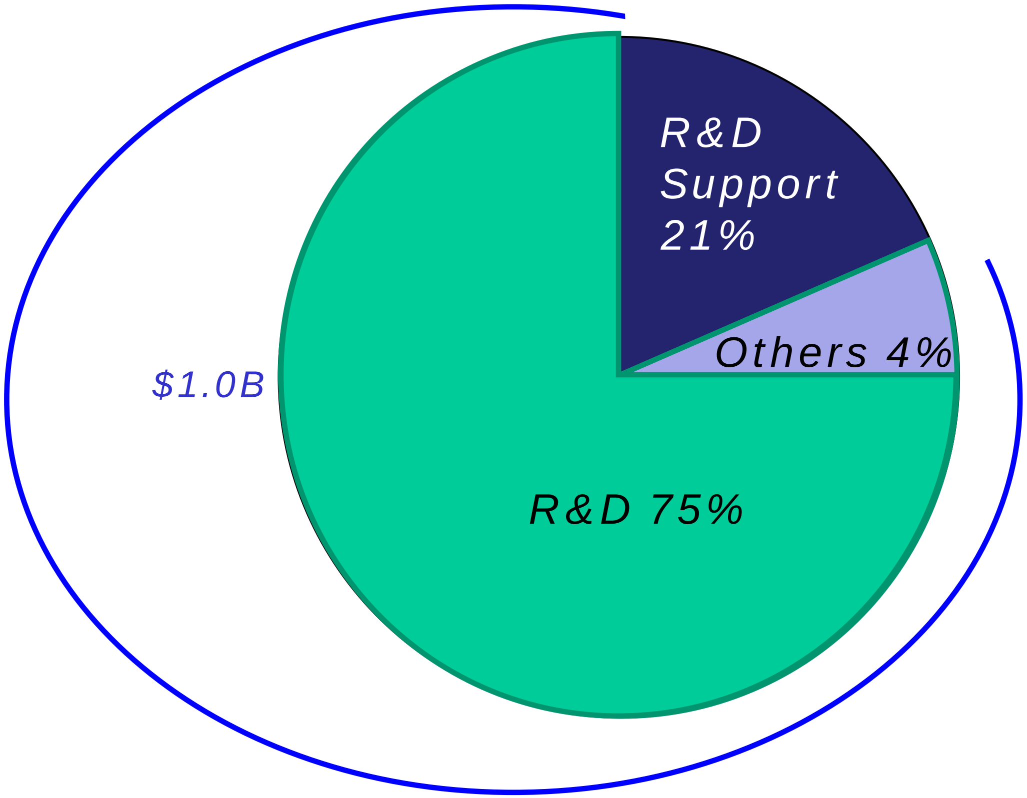

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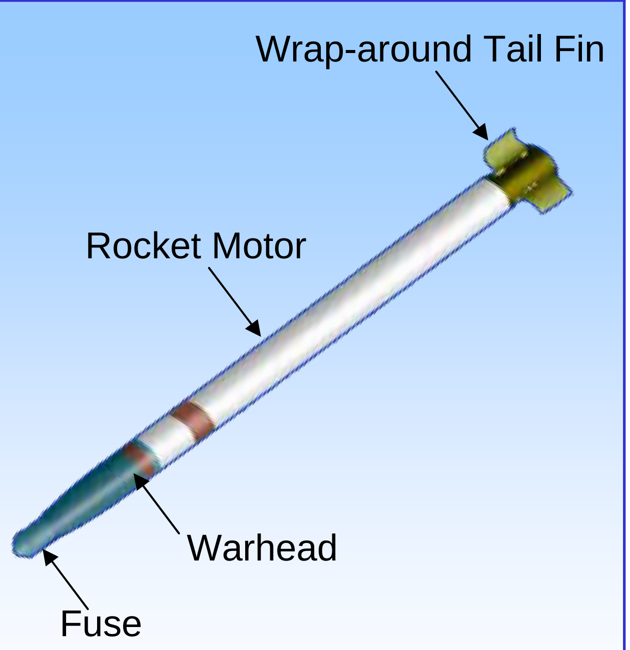
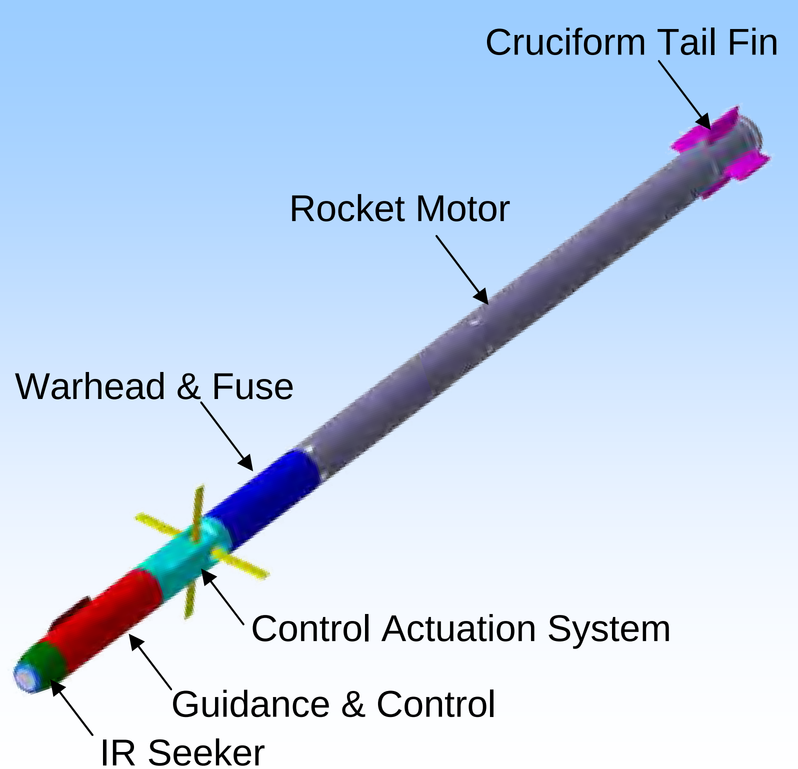
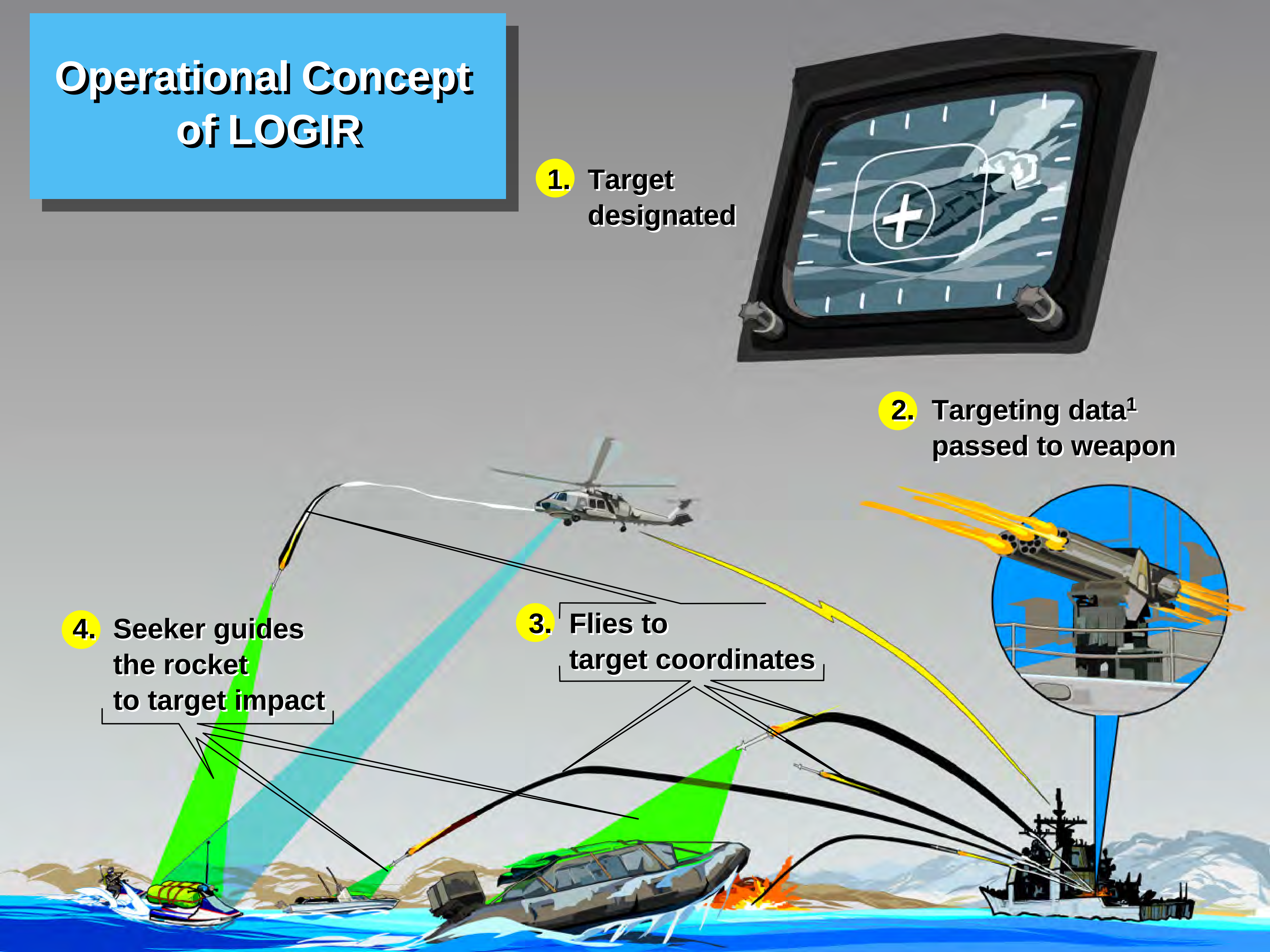
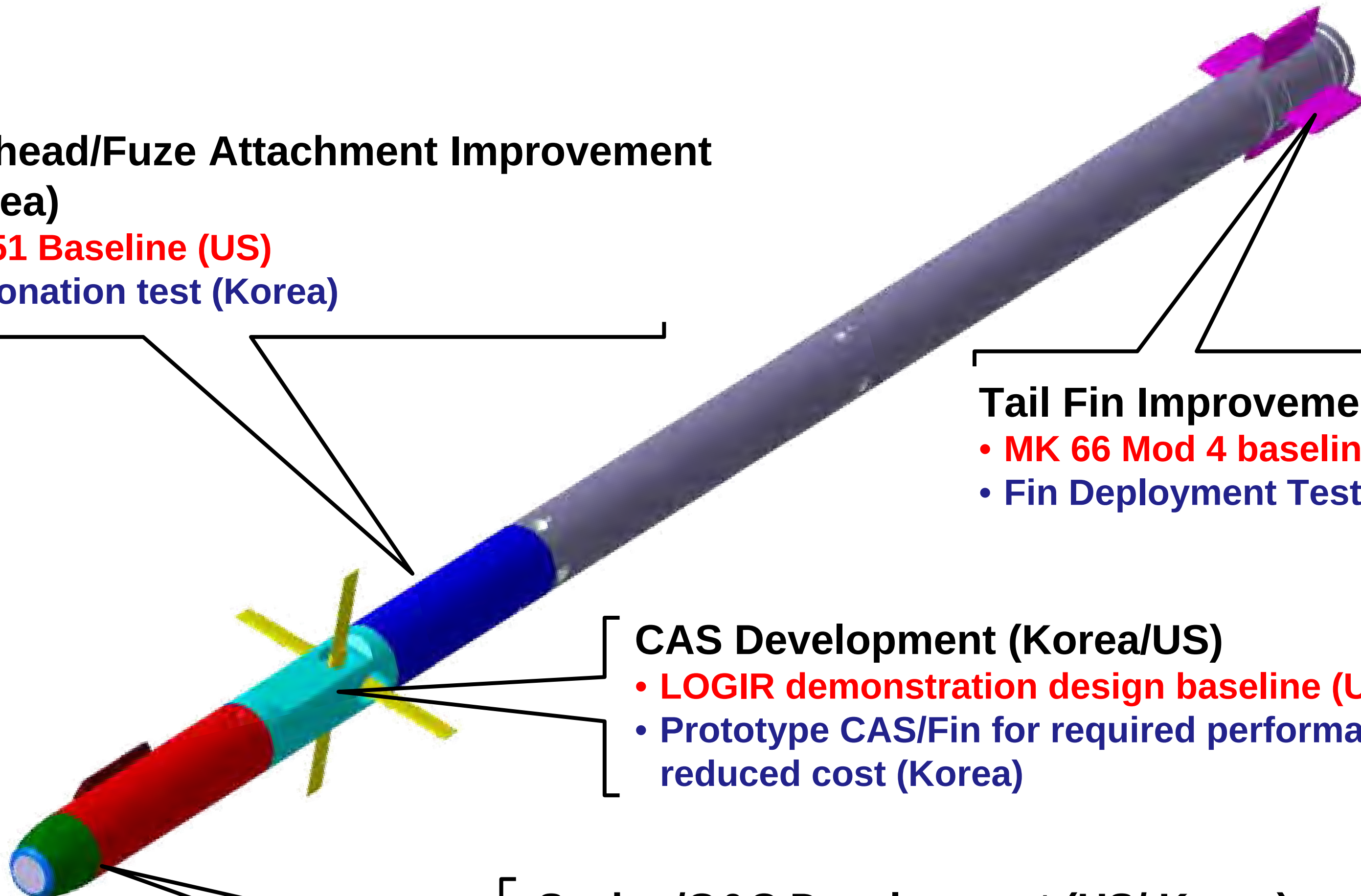


LOGIR (2.75-inch Guided Rocket)




Operational Concept of LOGIR
1. Target designated
2. Targeting data[1] passed to weapon
3. Flies to target coordinates
4. Seeker guides the rocket to target impact

Technology Complement



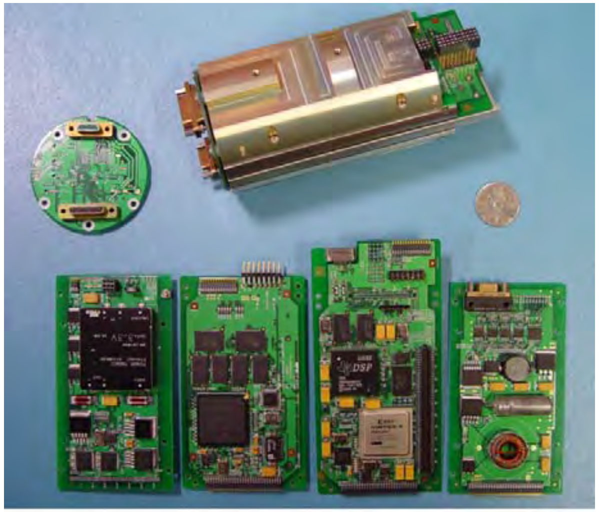
Warhead/Fuze Attachment Improvement (Korea)
- M151 Baseline (US)
- Detonation test (Korea)

Tail Fin Improvement (Korea)
- MK 66 Mod 4 baseline (US)
- Fin Deployment Test (Korea)

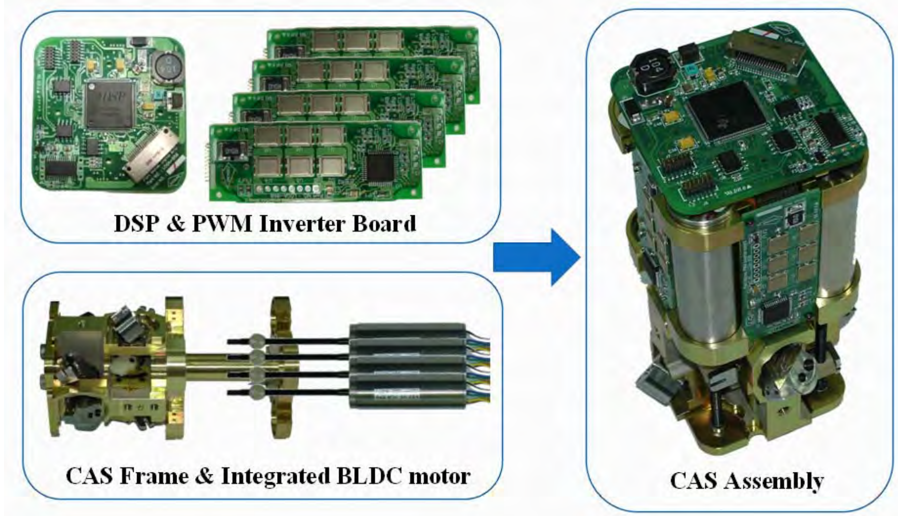
CAS Development (Korea/US)
- LOGIR demonstration design baseline (US)
- Prototype CAS/Fin for required performance at a reduced cost (Korea)

Seeker/G&C Development (US/ Korea)
- LOGIR demonstration design baseline (US)
- Improvements in electronic assembly design and hardware to reduce overall cost (Korea)

ROK Contribution for LOGIR

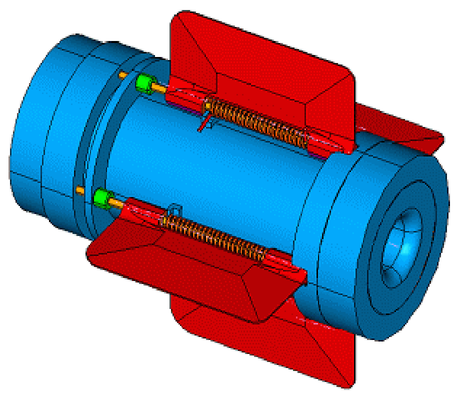


G&C Prototype

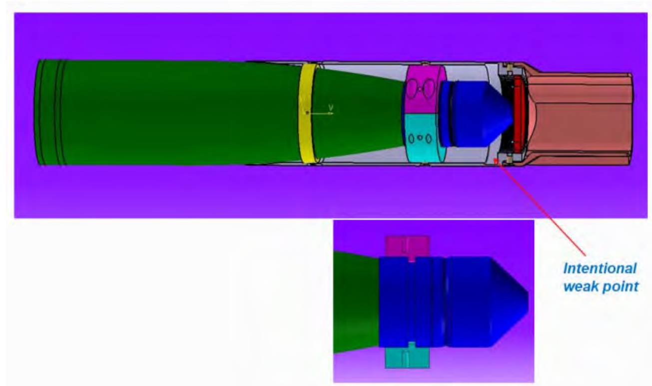


CAS Prototype

Structure and Fins Prototype



Cruciform Tail Fins and Nozzle Assembly

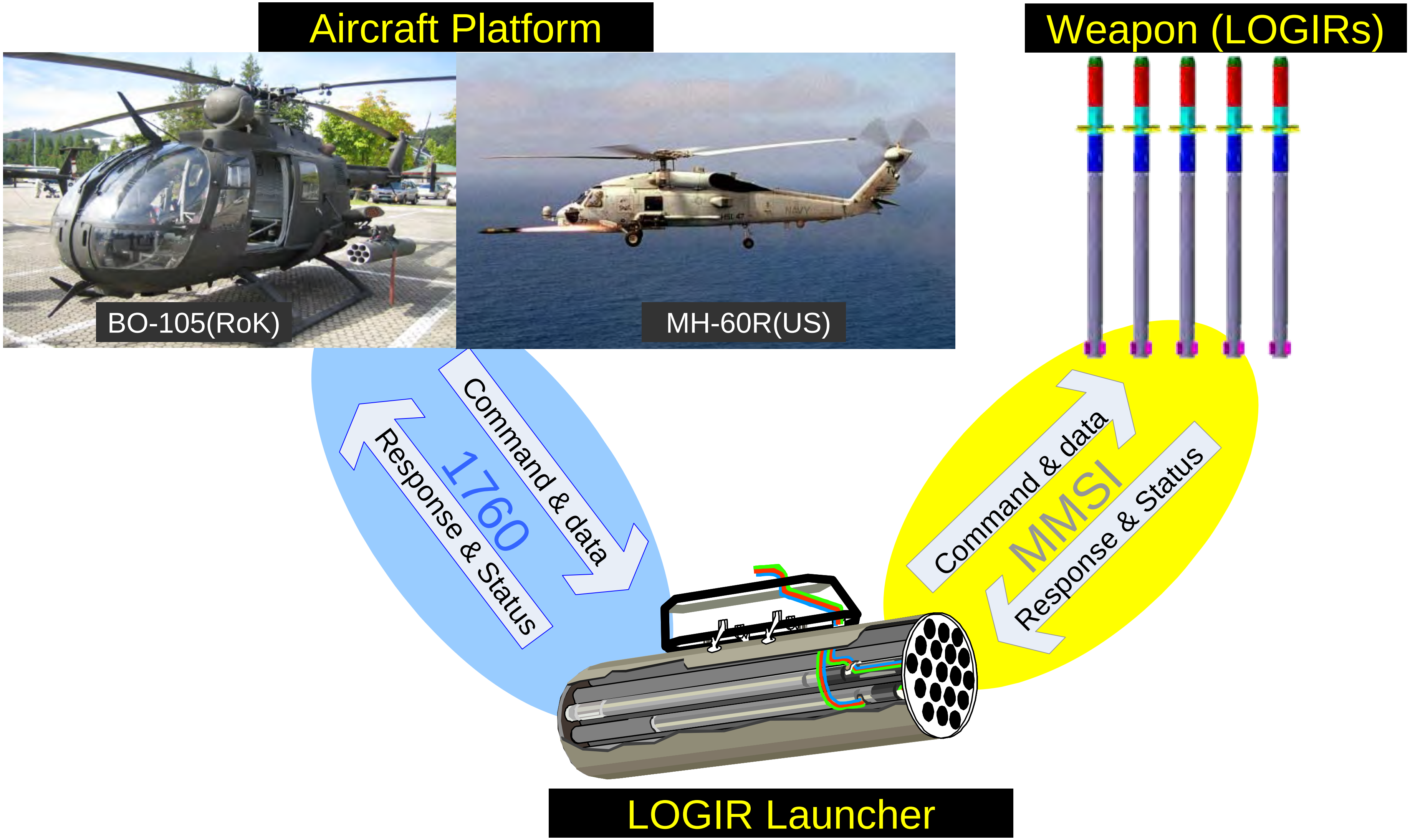


Warhead/Fuze Attachment Improvement

1st LOGIR S&T Meeting
May 2007

After 5th LOGIR S&T Meeting
March 2008, Jeju Island

Medusa JCTD



Aircraft Platform
Weapon (LOGIRs)
BO-105(RoK)
MH-60R(US)
Command & data
1760
Response & Status
Command & data
MMSI
Response & Status
LOGIR Launcher

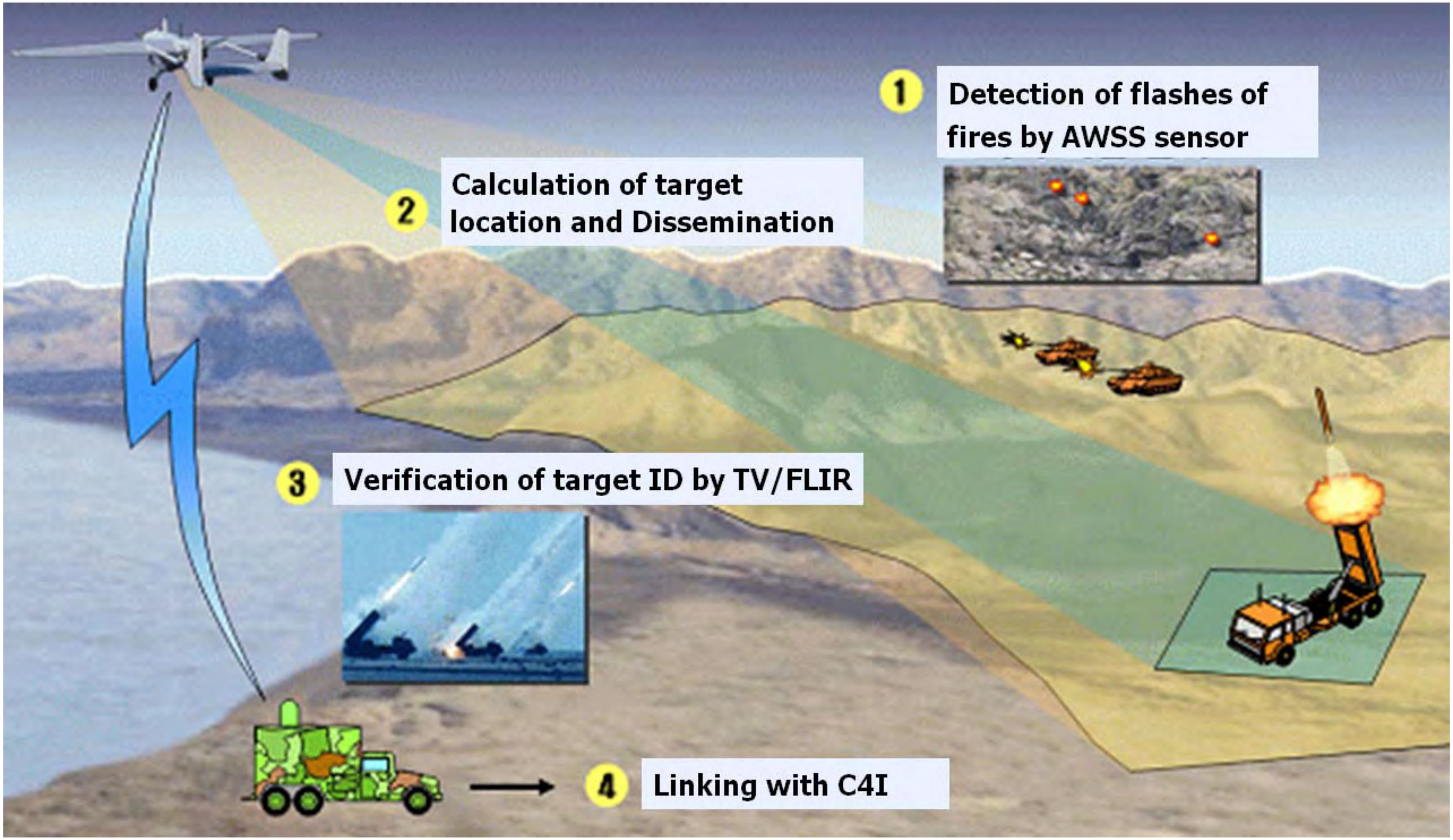
ADD's Capabilities for Medusa

- Wind tunnel testing: complete 6DOF
- Structural testing: static, dynamic and bending mode frequency
- Environmental testing for G&C and CAS: temperature, vibration, humidity,…
- Sled testing for impact detonation for fuze/warhead
- Structural testing for warhead assembly
- Thrust misalignment measurement


Medusa
JCTD Meeting
October 2007
국방과학관

AWSS JCTD:
Airborne Weapon Surveillance Systems

- To develop capability to detect, identify and locating/targeting weapon firings and reporting over tactical C4I system using airborne IR sensor system



Rapid Aerodynamic Design and Analysis

Collaboration

RADA

AFOSR
- Dr. John Schmisseur
- Implement the PA
- Oversee the progress

ADD
- Dr. Seung K. Hong
- Develop RADASE
- Shape Design

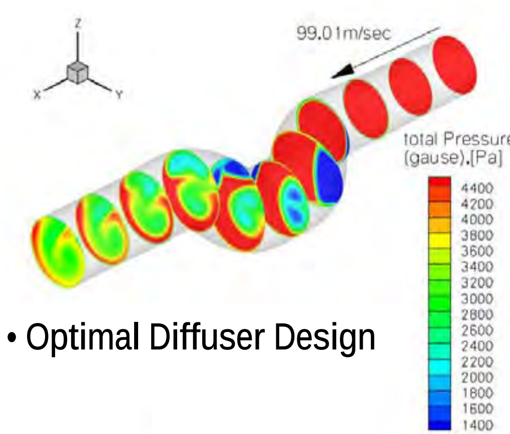
USAFA
- Dr. Russ Cummings
- Wind-Tunnel Test & Validation

RUTGERS School of Engineering
- Prof. Doyle D. Knight
- Develop RADASE
- Training

Multi-disciplinary Design Optimization (MDO)

❖ Minimize the Pressure Loss & the Flow Distortion. (2006~ 2008)

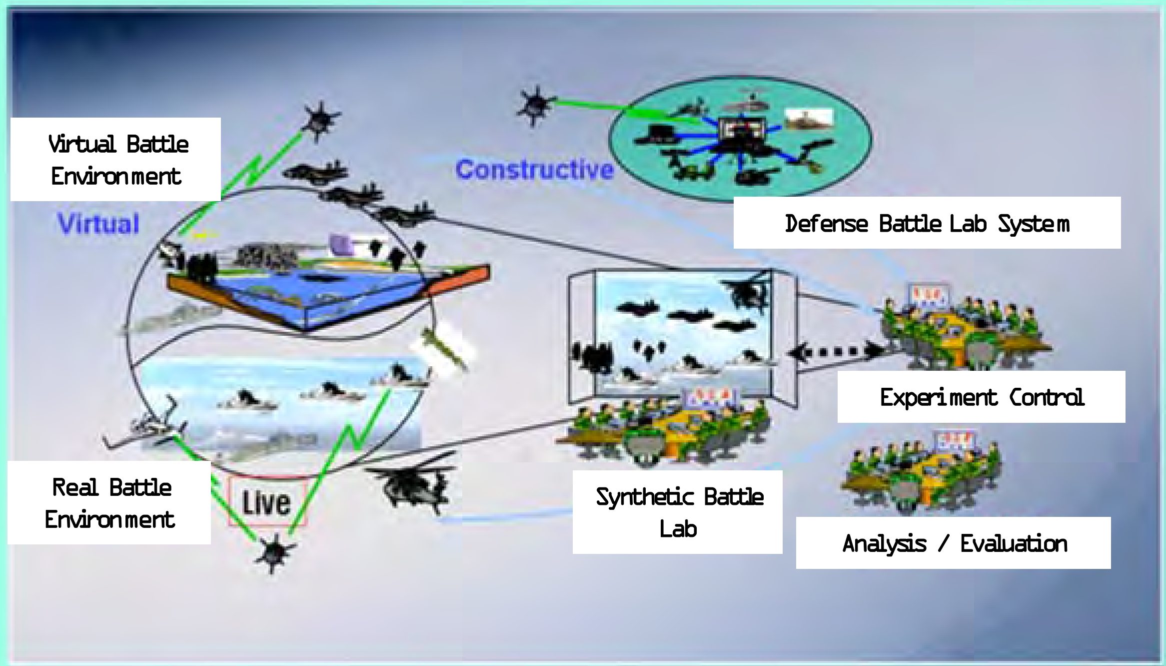
• Subsonic Diffuser



• Optimal Diffuser Design

Battle Experimentation

Systematic/Scientific Verification Process for Military Transformation



Real Battle Environment
+
Virtual Battle Environment

➡ Synthetic Battle Space

Need for International Collaboration

- **Economic strength depends on technology:**

  - Top five categories of US exports are high-tech items.

- **The pace of research/technology has grown exponentially.**

- **The obvious direction for maintaining strength and continuing growth is through international collaboration.**

- **Need to stimulate new collaborations from basic research to system level.**

Common Situation

- It is hard to match programs once they are already started.
- Budgets are already set and not easy to allocate new funding to support cooperation.
- Long lead time before signing agreements:

  - Some measures are already taken

Remedy for Better Solution

- We need to factor in cooperation plan early enough when we have still influence on the planning and budget processes.
- It will take openness on both sides:

  - Need to share our technology roadmaps

- It will take a new level of cooperation and interaction between the service labs:

  - e.g. LOGIR

Two-Level Approach

(1) Personal level:

- Need to find the common interest
- Want to work together
- Build a personal relationship

(2) High level/Management level:

- Agree the area of research is mutually beneficial
- Willing to commit resources

ADD Initiatives

- **Increase in funding for international cooperation**
- **Strengthen “International Co-op Office” to find matches**
- **Set up a “formal process” for early planning:**

  - Early dialogue and develop joint proposal

Reward:
Merits of International Joint Work

- **Shares resources and keeps risk low:**
  - Manpower, Fund, Lab Facilities, Ideas
  - Complement technologies and more
- **Reduces development cycle:**
  - Joint DT and OT
- **Opportunities for industrial collaboration**

Conclusions

- ADD plans to Strengthen International Cooperation:
  - Expand Defense Cooperation in Co-R&D and Co-Development
- Propose a Formal Process for Early Planning
- S&T Cooperation will then Help Boost Defense Alliance between ROK and US

Thank You

- For PACOM Conference Organizers
- For Opportunity to Participate

Deputy Under Secretary of Defense

Advanced Systems & Concepts

~

US Pacific Command S & T Conference

~

The Advanced Systems and Concepts Portfolio of Opportunities

~

OSD/AT&L/DDR&E/AS&C

Chuck Perkins

PADUSD(AS&C)

16 July 2008

OSD/AT&L/DDR&E/AS&C Mission

OSD / Advanced Systems & Concepts

- **Find, Integrate, Demonstrate, and Transition** operational concepts and technologies for **Joint** & **Coalition Warfare Needs** to include **coalition shared capacity building** opportunities
- Leverage RDT&E Defense-wide resources through partnerships with Services and Agencies to meet the **Most Critical Needs** of the joint warfighter as defined by **Combatant Commanders (COCOMs)**
- **Induct Innovative Technologies** inside the traditional Planning, Programming, Budgeting, and Execution (PPBE) process that result in an enduring **Capabilities-based Portfolio** to defeat asymmetric threats

Thrusts: Agile, Adaptive, Affordable, Relevant, Urgent, Enduring, Transition

How Advanced Systems & Concepts Functions

- **Joint Needs-Driven**
  - Monthly meetings with COCOMs - Progress on Deliverables
  - Frequent meetings with Intel Community
  - Participation in JCIDS and in JS/StratCom/DDR&E-sponsored studies
- **Technological Awareness**
  - Formal searches, pursuits and harvests of specified critical technologies
  - Briefings from industry (Domestic and International)
  - Intimate with technology development and assessment organizations
    - Services, Agencies, Intel Community, DHS, DOE, etc.
- **Program Oversight**
  - Organize, vet, select, and defend programs and projects
  - Validated Service and CoCom Priorities; IPLs and Most Pressing Needs
  - Wholly or partially funding projects – a core function
  - Closely monitor program and project execution
- **Transitioning Capabilities and Transferring Technologies**
  - Identify transfer and transition partners, pathways, PORs and POMs
  - Oversee transition process and progress; stimulate as necessary
  - Fund select game-changing technology enablers and transformation

Advanced Systems & Concepts Portfolio

OSD / Advanced Systems & Concepts

6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.7 | Proc | O&M

Science & Technology — Research & Engineering

TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9

Concept & Technology Development — A — B — System Development & Demonstration — C — Production & Deployment — O&M

Initial Product/ Process Capability — *Product/Process Development* — *Product/Process Insertion* — *Product/Process Improvement & Sustainment*

MRL	1	2	3	MRL 4 Lab or Modeling Environment	MRL 5 Prototypical Environment	MRL 6 Pre-production Representative Environment	MRL 7 Transition into LRIP	MRL 8 Low Rate Initial Production	MRL 9 Full Rate Production	MRL 10 Lean Production

COCOM /Joint/Coalition focused — *Joint Capability Technology Demonstrations* — ***Demo 1-3 yrs***

AC/JCTDs Transition Enabler – "joint peculiar" capabilities — *JCTD Transition & DAE Pilot Program*

Industry "On" Ramp – Test to Procure Tech Refresh — *Defense Acquisition Challenge*

Service, SOCOM Nominated - Test to Procure — *Foreign Comparative Testing*

DOD S&T Push — *Tech Transition Initiative*

DoD Technology Transfer — *Formerly TechLink* — ***to Private Sector***

Domestic Technologies Critical to National Security — *Defense Production Act (Title III)*

ManTech Joint Investments — *Defense Manufacturing Technology – Next-Gen Multi-Service Enablers*

Joint Capability Technology Demonstrations (JCTDs)

OSD / Advanced Systems & Concepts

JCTD Program Mission (Primary Customer: US Combatant Commands)

- **Provide capability solutions through rapid prototyping to *solve joint, coalition, and inter-agency urgent shortfalls and gaps with technologies and innovational concepts***
- **Transition enduring capabilities through strong Service & Agency partnerships**

Objectives

- **To rapidly demonstrate innovational concepts & technologies to address Combatant Commanders, and Most Pressing Military Needs**
- **Delivering a sustainable capability to the warfighter**

Metrics

- **JCTD validation via Joint Staff process & independent Military Utility Assessment (MUA)**
- **Transition to Enduring Capabilities (provide Business Case Analysis)**
  - **Residual Capability for the Warfighters**

- Global Observer –
Liquid Hydrogen Powered UAV

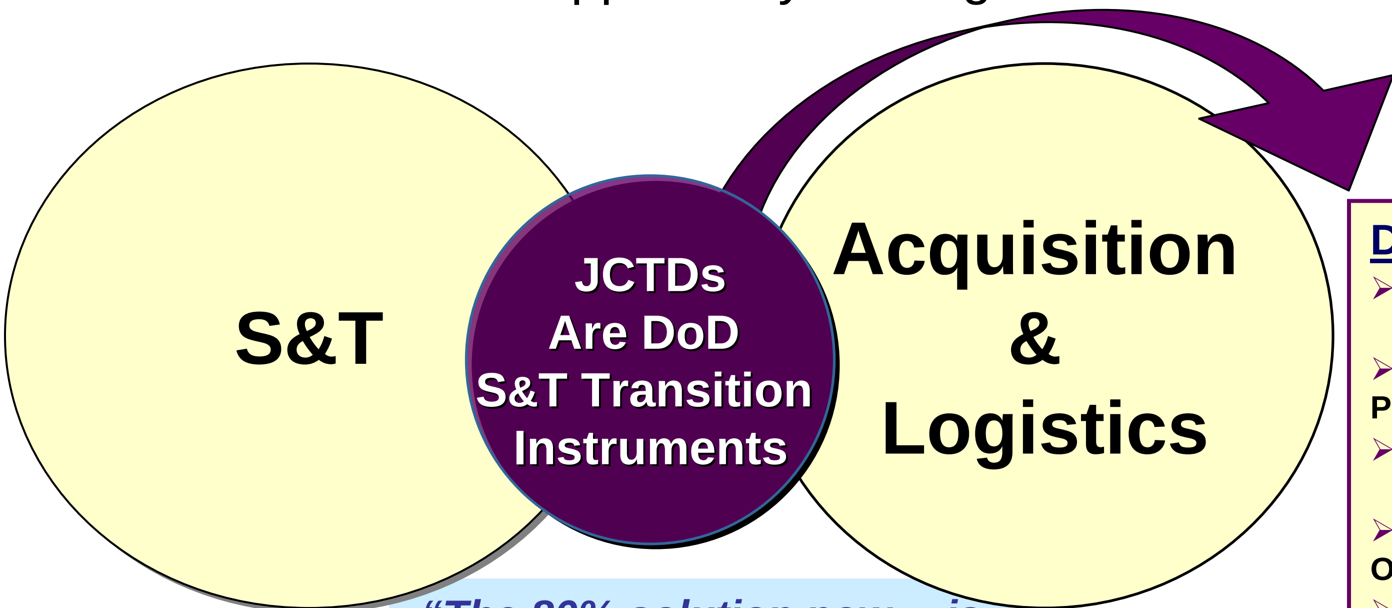
- Focused Lethality Munition -
Low Collateral Damage Weapon

- Weapon Data Link Network –
Netted Weapons

JCTDs Bridge S&T and Acquisition

OSD / Advanced Systems & Concepts

- Fill gaps between S&T and Acquisition for Combatant Commands
- Demonstrate Joint & Coalition Operational Capabilities
- Provides Transition Opportunity serving DoD's S&T/Warfighting Community



Deliverables:

- Concept of Operations (CONOPs)
- Tactics, Techniques & Procedures (TTPs)
- Military Utility Assessment (MUA)
- Residual / Interim Operational Capability
- Business Case Analysis

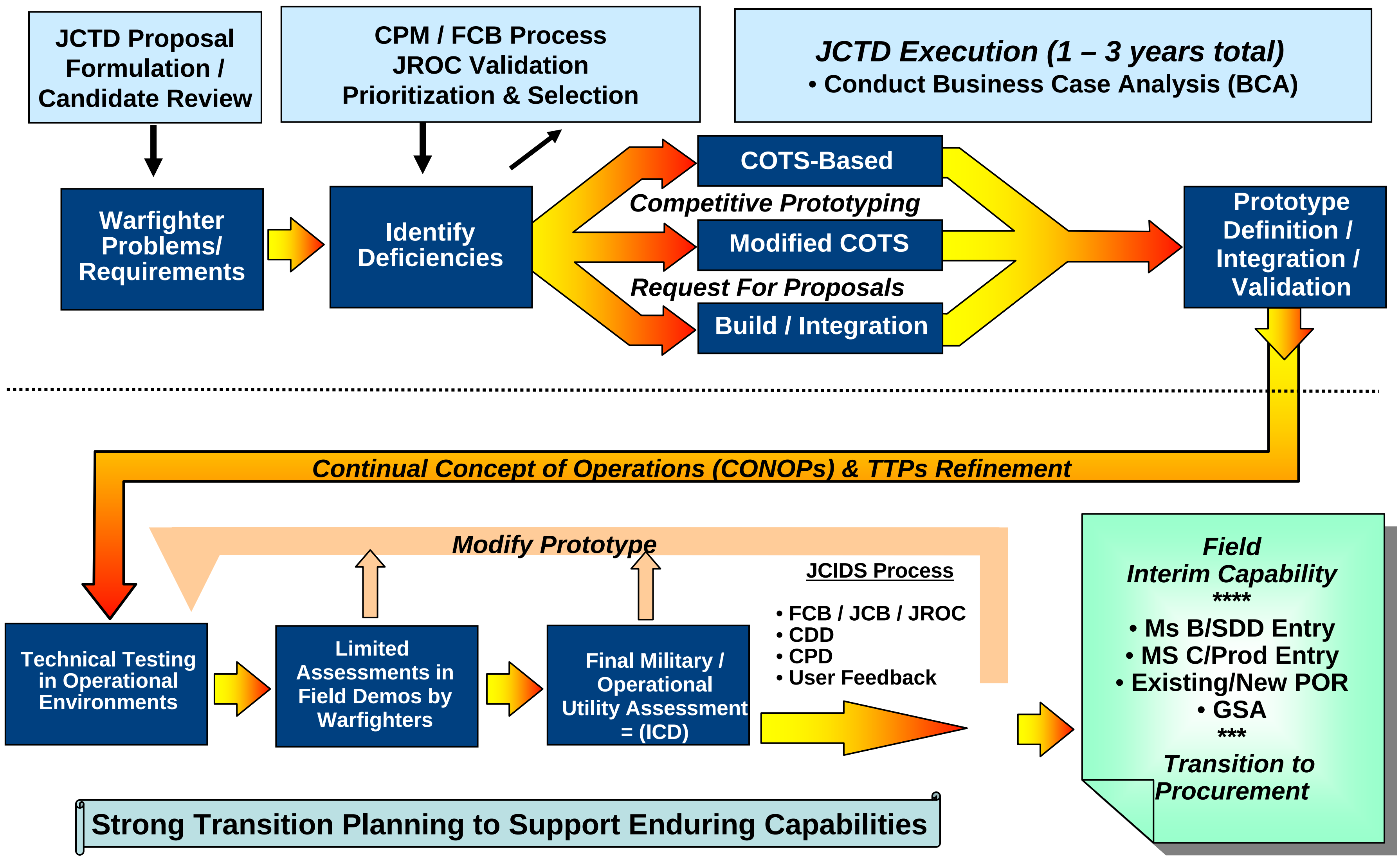
"The 80% solution now… is better than a 100% solution 5 years from now!"

JCTDs are <u>not</u> science projects but <u>are</u> agile solutions programs…

JCTDs transition capabilities to Warfighters

JCTDs … Model for Rapid Prototyping

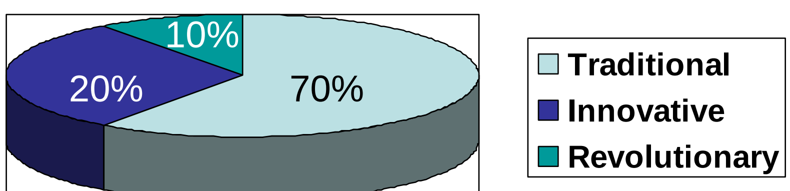
OSD / Advanced Systems & Concepts



JCTD Metrics

OSD / Advanced Systems & Concepts

JCTD Model	Tech Readiness Level	Transition Commitment Level	Comments
Traditional *e.g. Comprehensive Maritime Awareness (CMA)*	5-6	Level A Improve the Joint Force	JROC Approval, Service/Agency and Transition Commitment 1-3 Years
Innovative *e.g. Weapon Data Link Network*	5-6	Level B Leap Ahead Capability	JROC Approval, Transition Commitment 1-2 Years
Revolutionary *e.g. Global Observer UAS*	4-6	Level C Game Changer	Warfighting Need Identified; Early Transition Planning 1-3 years



The Range of Coalition JCTD Participation

35% of JCTDs are Coalition / Partner Nations

Level I
Observe *"Low"*

- Send limited number of observers to demonstrations

Level II
Development *"Med"*

- *Above plus*:
- Participant in Concept of Operations
- Contribute to Tactics, Techniques & Procedures
- Periodic review/comment on draft documents

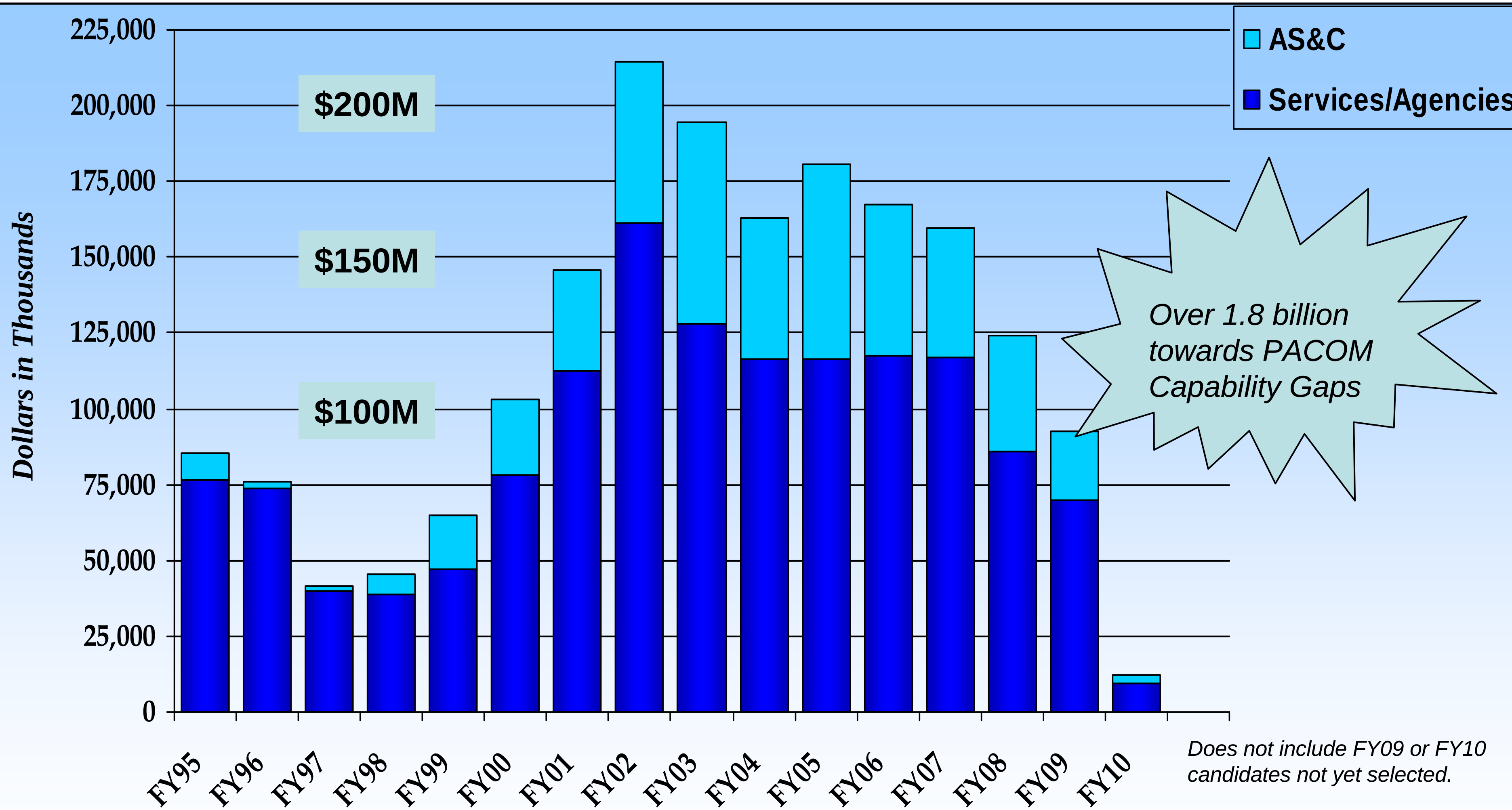
Level III
Technical and / or Operational Participation *"High"*

- *Above plus*:
- Participation in demonstrations and assessment events
- Participate in M&S effort

Best when Industry Partners across borders

PACOM ACTD/JCTD PROGRAM
HISTORICAL PROJECT FUNDING

OSD / Advanced Systems & Concepts



Total AS&C ACTD/JCTD funding to PACOM projects since inception: $466 million which has leveraged over $1.4 billion in partner funding

Defense Acquisition Challenge (DAC)…
…DoD's On-Ramp to Industry

OSD / Advanced Systems & Concepts

- ***Scope:***
  - **Allows anyone to propose innovations that could quickly improve -**
    - ✓ **Affordability, manufacturability, performance, or capabilities at a system, subsystem or component level**
  - **Competitive: Annual BAA in Federal Business opportunities and unsolicited proposals**
  - **Proposals "challenge" existing technology**
    - ✓ **Evaluated for merit & feasibility**
    - ✓ **If testing successful, innovations inserted into a program of record**
    - ✓ **Provides industry entry into DoD acquisition**
- ***Metrics & Measures***
  - **Over 1200 proposals submitted**
  - **68 projects awarded & ongoing**
  - **70 companies from 26 states**
  - **70% are small / medium enterprise technology providers**
  - **ROI (14 completed projects) is > 9:1**

Spray Cool Technology: Electronics Sprayed with Non-Corrosive Coolant in a Hermetically Sealed Housing

Before SprayCool: **482 Pounds & 17 Cubic feet**

Employed in Counter Targeting System - Part of OVERWATCH ACTD

4 units deployed to Iraq

After SprayCool: **100 Pounds & 2.6 Cubic feet**

Mini Combat Trauma Patient Simulation System: Training medics at Camp Pendleton

Casualty simulator improves skills of medical personnel in mass casualty & triage - over 3500 medics trained & deployed to Iraq; attrition rate of trainees reduced from over 20% to 6%

Enhanced Performance Location Report System Tactical Data Network: Replaces manual network planning with automated system

Reduces complexity and need for manpower redundancy, deployed to 900 users (MEF II) in Iraq, enabling rapid and accurate information flow and data priority on the joint/coalition battlefield

Foreign Comparative Testing (FCT)…

…the search for world-class technologies

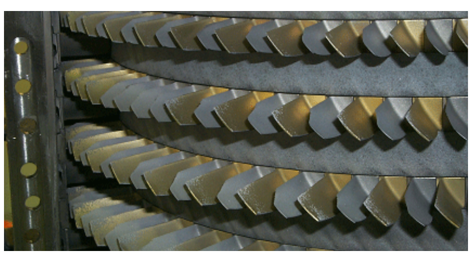
OSD / Advanced Systems & Concepts

- ***Scope:***
  - ➢ Seeks international technologies for US warfighting needs
  - ➢ Leverages mature technologies for economic/speedy buys
  - ➢ Provides US Forces with new capabilities
  - ➢ Technologies assessed for use, bought from foreign source or manufactured under license in US

UK system can refuel two aircraft at once, avoiding $40 million in R&D

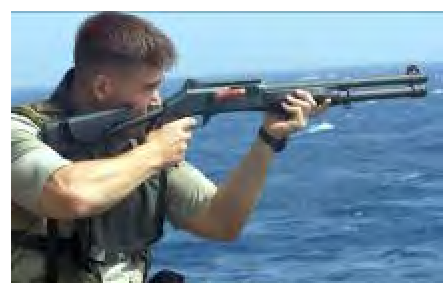
- ***Program Measures & Metrics (1980-2007)***
  - ➢ OSD investment of $1.1B has avoided $7B in costs
  - ➢ 567 projects started, 488 completed, 266 met test req's
  - ➢ 184 projects resulted in procurements worth about $8B
  - ➢ Accelerated fielding averaging 5–7 years
  - ➢ Participation from 27 allied and coalition partners
  - ➢ Vendor partnerships in 33 U.S. states
  - ➢ Past 5 years: Transition rate from test-to-procure > 80%

South-African developed Buffalo mine clearing vehicle probing & clearing mines & IEDs in Iraq

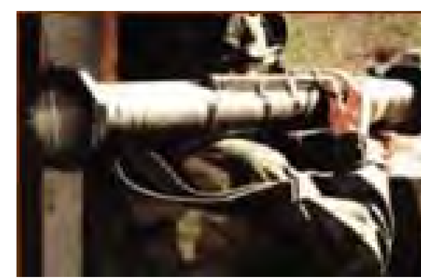


Russian erosion-resistant coating triples life of compressor blades in MH-53 helicopter, avoiding $1.6 million annually

Korean fiber optic mesh detects breaks and enhances perimeter security



Italian venture, the Joint Service Combat Shotgun, used in Iraq as a “door-buster”



Swedish bunker buster system fired from confined spaces, used in Afghanistan and Iraq

The Technology Transition Initiative (TTI)

OSD / Advanced Systems & Concepts

Objectives

- Accelerate transition of new technologies from DoD S&T programs into acquisition for production and deployment to US Armed Forces
- Demonstrate new technologies in relevant environments

Partners and Processes

- Technology Transition Council
- Technology Transition Working Group

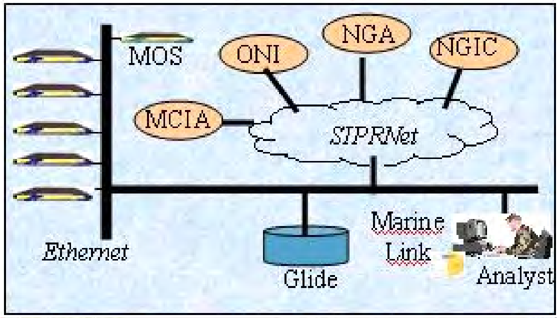
Countermeasures Protection System

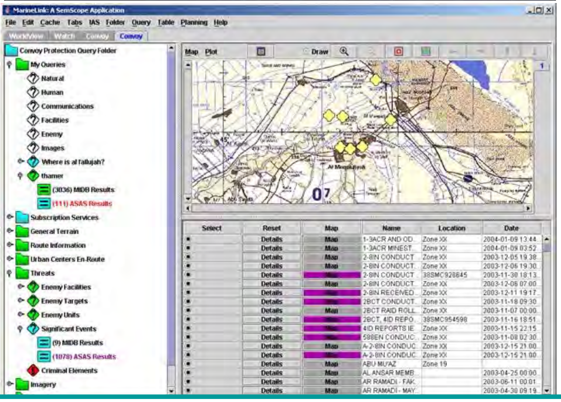
- Improves force protection against radio-controlled IEDs
- Deployed in GWOT

Water Purification Pen

- Eliminates risk of exposure to diseases and bio-chemical pollutants
- Deployed in IRAQ with each of the Services
- Sent as part of Tsunami relief effort in S.E. Asia

Semantic Web Network





- Incorporated into Marine Link
- Deployed w/1st and 2d MEF in Iraq
- Saves Analyst 4-5 hours per manual query

Technology Transfer Programs

OSD / Advanced Systems & Concepts

- Objectives
  - Ensure full use of the Nation's investment in R&D (15 USC 3710)
  - Rapidly enhance warfighter capabilities via technology exploitation
- Benefits
  - Clear path from DoD S&T to application of technology
  - Commercial source for DoD items using DoD-developed technologies
  - Speed to deployment and cost-saving advantages
- Partners
  - US Industry (as opposed to contractual relationship)
  - Funds to support joint R&D efforts (funds from CRADAs)
  - Royalties on licensed inventions to reward inventors and perform R&D



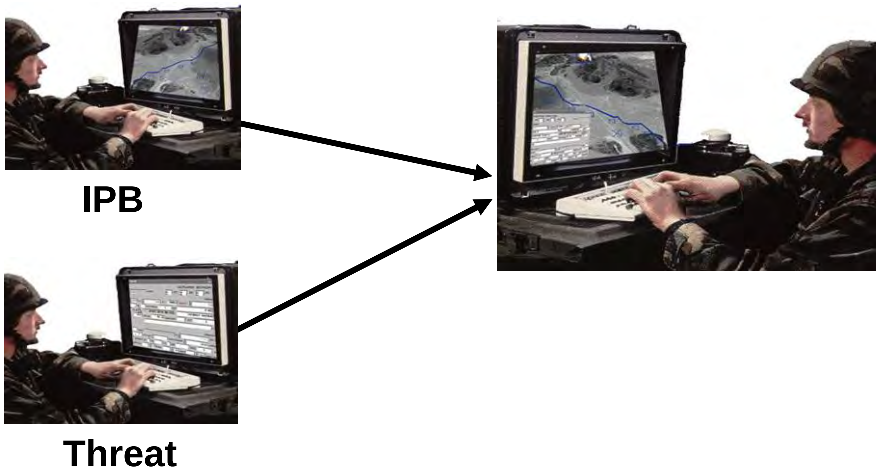


References and Discussion

Advanced Systems & Concepts (AS&C)	www.acq.osd.mil/asc	703-695-5036
Joint Capability Tech Demo (JCTD)	www.acq.osd.mil/actd	703-697-5558
Comparative Test Office (FCTs)	www.acq.osd.mil/cto	703-602-3740
Office of Technology Transition	www.acq.osd.mil/ott/tti	703-607-5316

Theater Effects Based Operations (TEBO)

FY 2004



Problem: 21st Century campaigns depend on creating desired effects to alter undesired behavior.

Solution:

- Concepts, tools and procedures for Joint Effects Based Operations.
- Effects based analysis, planning, visualization, collaborative environments, decision making, execution, assessment

Participants

- Lead Service: Army
- Sponsor: PACOM
- User: CFC/USFK
- Op Mgr: JFCOM
- Transition Manager: DISA

Schedule:

- Demos FY04-09
- Residual: FY05 and beyond

Status: Transitioning into Net Enabled Command & Control by US JFCOM and DISA

Agile Rapid Global Combat Support (ARGCS)

FY 2004

Problem This Solves: No Combat Support System (CSS) Interoperability; Delay In Supporting New Weapon Systems; No Functional Test Capability; No Integrated Diagnostics; Escalating Support and Logistics Costs.

Solution: Smaller Common / Interoperable CSS using SW defined instrumentation and integrated diagnostics. Enabling Migration of Tests from Factory to Field; Obsolescence Immunity; reduction in Proliferation of Peculiar Test Systems; reduction in Total Ownership Costs

Participants:

- Operational Manager – PACOM
- Technical Manager – NAVAIR
- Transition Manager- USMCTMDE

Schedule:

Complete Design	July 04-Jan 05
Integration & Design Testing	Feb 05-Jan 06
Demonstration Systems Delivery	Feb 06-April 06
System Testing	March 06-Aug 06
JMUA	Sept 06-March 07
JMUA User Input Modification	May 07-Oct 07
EUE	Nov 07-Oct 08

Status

- ID & MP in for final approval.
- Source selection for Prime Contractor expected complete June 30
- Coalition Partner Funding solidification/transfer in process.

Coalition Theater Logistics (CTL)

FY 2001

• **Plan, execute, monitor strategic deployment / redeployment**

• **Plan, execute, monitor movement of supply/ sustainment items**

• **Provide infrastructure visibility**

Problem This Solves:
The inability to share accurate logistics information with coalition partners for the full spectrum of military operations.

Solution:

• CTL ACTD will improve effectiveness and the efficiency of coalition logistics and all phases of coalition operations through an improvement in information quality.

• It will coordinate multi-national logistics information and decision support tools for accurate force requirements definition, effective deployment planning, responsive sustainment and rapid logistics re-planning.

Participants:

OM: PACOM J-411
XM/PM: DISA
Sponsors: PACOM, Australian Defence Force

Schedule:

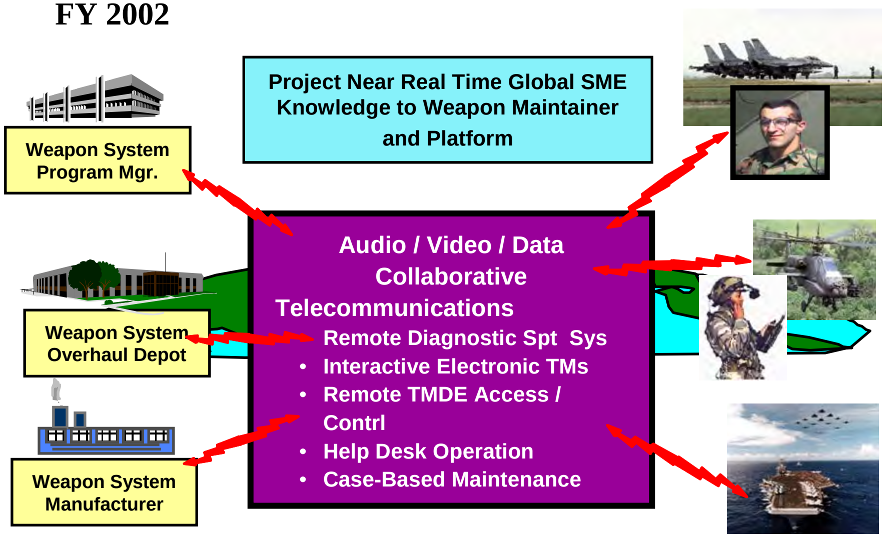
- Complete Software Development 1Q FY05
- Commence Transition to CENTRIXS Network FY05
- Complete Transition FY06
- IOC FY05

Status:

- Successfully demonstrated logistics decision support tools in three venues (JWID ’02, Cobra Gold ’03, and MultiNational Experiment 3)
- Final Military Utility Assessment (MUA) Report August 2004
- Transitioned numerous products including CENTRIXs for CENTCOM

Joint Distance and Support (JDSR)

FY 2002



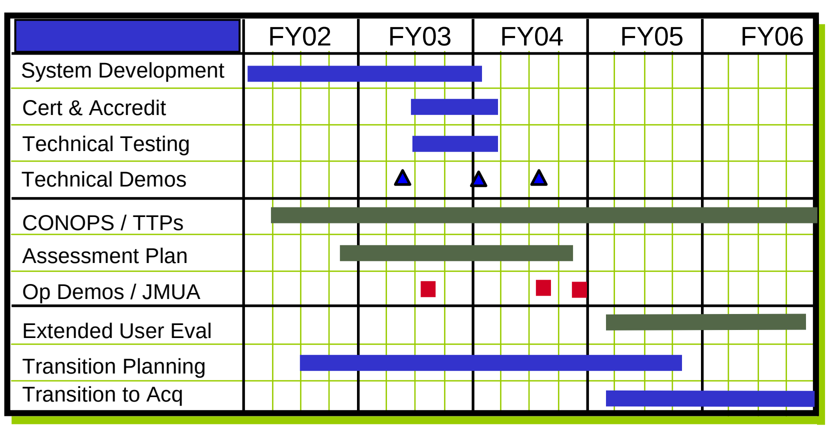
Problem This Solves:

- Shortage of experienced maint. personnel, especially for low density / hi-demand items
- Lack of near real-time maintenance on demand, info for repair and training
- Limited battlefield access to experts & collection of corporate knowledge

Solution: A Joint, common and interoperable tele-maintenance / training environment providing end to end low bandwidth reachback connectivity, customer relationship mgt, interoperable mobile computing devices, and case base reasoning tool

Participants: User Sponsor / OM: JFCOM; **Supporting Services/Agencies:** All Services; **TM:** **NAVSEA; XM: NAVSEA; Coalition:**

Schedule:



Status:

- Operational Demonstrations #1 and #2 successfully completed May 04 on ATCALS, CH-47 and H-60 helicopters, DDG, LAV, and F-16 weapon platforms.
- JDSR ACTD capability transitioned to demonstration maintenance units for ATCALS, CH-47 and H-60 helicopters, DDG, LAV, and F-16 weapon platforms as used in demonstrations
- JDSR ACTD capability operationally deployed to OIF with Army Fire Finder radar system

FY 2003

Theater Support Vessel (TSV)

TSV Technical Approach

Problem This Solves: Need for a joint expeditionary capability to deliver combat ready units configured for immediate employment in JOA.

- High Speed Rapid Littoral Maneuver and Force Closure
- Rapid Unassisted Ingress and Egress Enables Austere Port Operations
- Reduction of Reception and Staging Times in Theater of Operations
- Mitigate Anti-Access and Area Denial Efforts

Solution:

- High Speed Vessel Capable of:
  - Worldwide Movement of Combat Ready Units
  - Ship-to-Ship and Ship-to-Shore Operations
  - Supporting Operations in the Littorals

Participants:

OM: CENTCOM, CASCOM (Deputy)
TM/XM: PEO CS&CSS, PM Force Projection,
PM Army Watercraft Systems
Independent Assessor: AEC
Sponsor(s): US Army

Schedule:

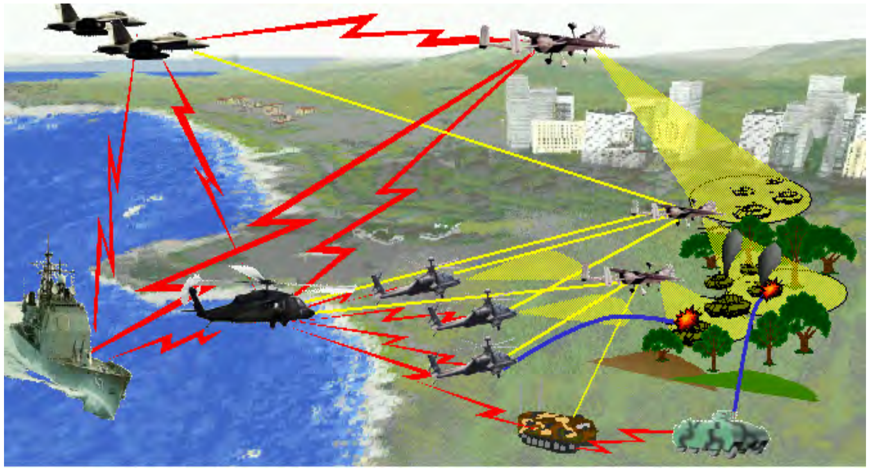
Independent Assessments/LUAs – 2QFY04 - 3QFY05
MUA – 4QFY05
MS B – 2QFY05
MS C – 3QFY08

Status:

- OEF/OIF/Joint Military Exercises Support
- Cargo Handling System Modifications
- Ride Control (Retractable T-Foil)
- C4ISR Upgrades – Joint/Service C2, FLIRs
- Battle Command Center/EMPRs
- Full Spectrum Civil Maritime/Mil Comms – Voice/Data
- Movement Tracking System/Blue Force Tracker
- Scalable Self Protection System (Planned)

Hunter Standoff Killer Team (HSKT)

FY 2001



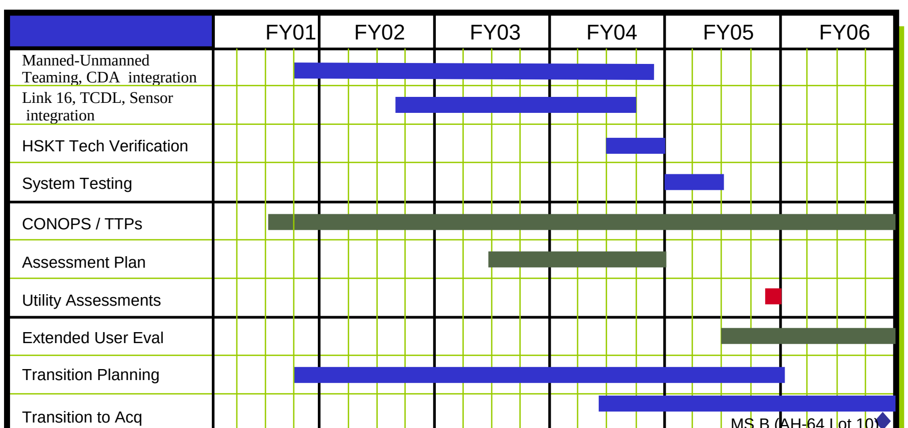
Problem This Solves:

- No airborne sensor to shooter link, manned / unmanned platforms teaming, re-plan on-the-move capability to reduce execution timelines
- Unacceptable stand-off range for manned shooter platforms

Solution: Joint Maneuver Commander Strike teaming of UAVs with AH-64Ds Longbow Apaches, A2C2S Blackhawk and F/A 18s Hornet, integrated with cognitive decision aiding, and precision targeting sensor package

Participants: User Sponsor / OM: USFK, PACOM; **Supporting Services/Agencies:** Navy, Army; **TM:** AMCOM; **XM: PEO Aviation, Army**

Schedule:

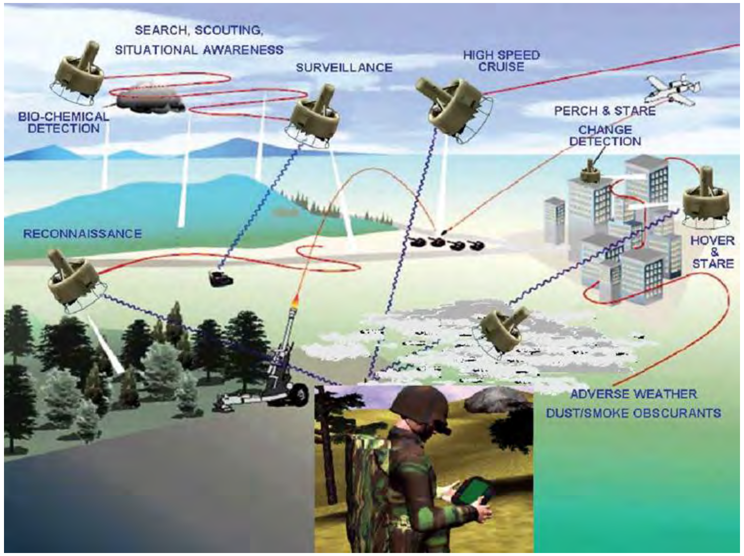


Status:

- Operational Demonstrations and Joint Military Utility Assessment planned for FY05
- HSKT ACTD Hunter UAV 3 Sensor MSOP package being considered for transition to Hunter UAV system, Dec 04 in support OIF

Micro Air Vehicle (MAV)

FY 2002



Problem This Solves: The need for close-in, real-time surveillance capability for small units conducting; urban, security, force protection, chemical, biological, and special operations.

Solution: Demonstrate affordable, expendable, easy-to-use, lightweight, man-portable, micro air vehicle with hover and stare capability.

Participants

- DARPA (executing agency)
- PACOM (lead CINC)
- Army (lead Service), USARPAC

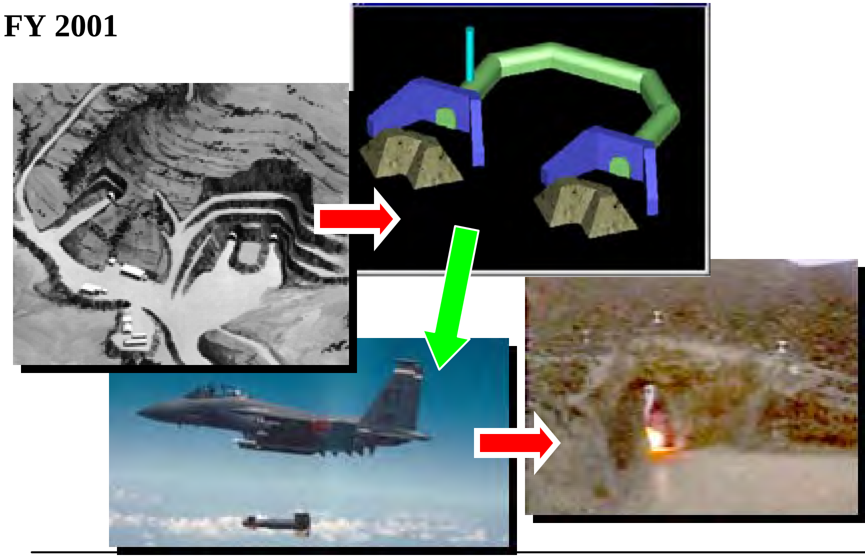
Schedule

- Demo: FY02-FY04
- Transition Residuals: FY05-FY06

Status: Vehicle, heavy fuel engine and ground station in development. Critical design review Summer 2004.

Thermobaric Weapon

FY 2001



Problem This Solves: Convention explosives lack the ability to neutralize extended tunnel targets where high value targets exist... Typical targets requires numerous conventional explosive weapons to be effective

Solution: Leverage emerging explosive, guidance, and warhead concepts to design, weaponize, demonstrate, and deliver... An enhanced weapon that will significantly improve the warfighter's capability to defeat military activities protected in tunnels.

Participants:

- PACOM – user sponsor (USFK)
- USFK - operational manager
- DTRA - lead agency / technical manager
- DUSD(AS&C) - OSD sponsor
- USAF – service sponsor

Schedule:

- FY02 - FY04: Payload development, Guidance software optimization, Warhead design, Weapon qualification
- 2QFY05 - Operational Demos

Status:

- AF waiting for performance data prior to transition recommendation
- 20 Thermobaric Weapons – on track
- Delivery Tactics / Planning Tools – on track

Joint Explosive Ordnance Disposal (JEOD)

OSD / Advanced Systems & Concepts

FY 2002

Problem This Solves: Make subscribers aware of EOD operational information:
- Increase situational awareness
- Define relevance to eliminate information overload
- Provide a reach-back capability to SME
- Provide an experience capture capability for LL

Solution: Build a GIG compliant transport mechanism (JEODnet) to enable net-centric EOD capabilities with a supporting enterprise KM Decision Support System (DSS)

Participants:

- Sponsor - PACOM
- Program Board - CENTCOM, ONR, DoD EOD
- TM - NAVEODTECHDIV
- XM - PMS-EOD
- Assessment Team - Det 1 AFOTEC

Schedule:

- Build 2 Limited MUA	Aug 2004
- Preliminary Op Capability	Sep 2004
- Final MUA	May 2005
- IOC	June 2005
- Residual Support	2006 - 07

Status: On budget and schedule for completion of demonstration. Identified requirement for Tactical Mission Critical System designation.

Global Observer
- Hydrogen Powered UAV -

OSD / Advanced Systems & Concepts

- **Global Observer UAV**
  - Liquid hydrogen fuel enables 7-day endurance
  - Provides the persistent presence required for an "unblinking eye"
  - Enables forensic intelligence operations and other critical missions for all COCOMS and Services

- **Advantages**
  - Long endurance minimizes ops tempo/cost
    - Fewer flights
    - Fewer aircraft
    - Reduced logistic tail

- **Global Persistence in the Stratosphere up to 65,000 ft**
- **Worldwide station keeping (3+ Sigma Winds)**
- **Up to 500 lb payload with 7+ days endurance**
- **Liquid hydrogen (LH2) powered**
- **Key technologies successfully developed and demonstrated**

Global Observer UAS Prototype (in flight)

Zephyr
- Solar Powered UAV-

OSD / Advanced Systems & Concepts

Objectives

- Low cost solar-electric HALE UAV
- Extended duration flight of 2 weeks
- High altitude missions >60,000ft
- Sensor capability: EO + comms

Technologies

- Low signature / low mass <66lbs / low projected production cost
- Passive surveillance payload: high resolution, EO, IR, and UHF voice/data relay plus other options as required
- 50ft wingspan with option to scale to 80ft for greater payloads
- Low cost of operational support and minimal personnel need
- Ground launch by hand and recover from unprepared sites / ship
- Technology transfer in the US through partnership with UK

Focused Lethality Munition (FLM) - Small Diameter Bomb – Eglin AFB

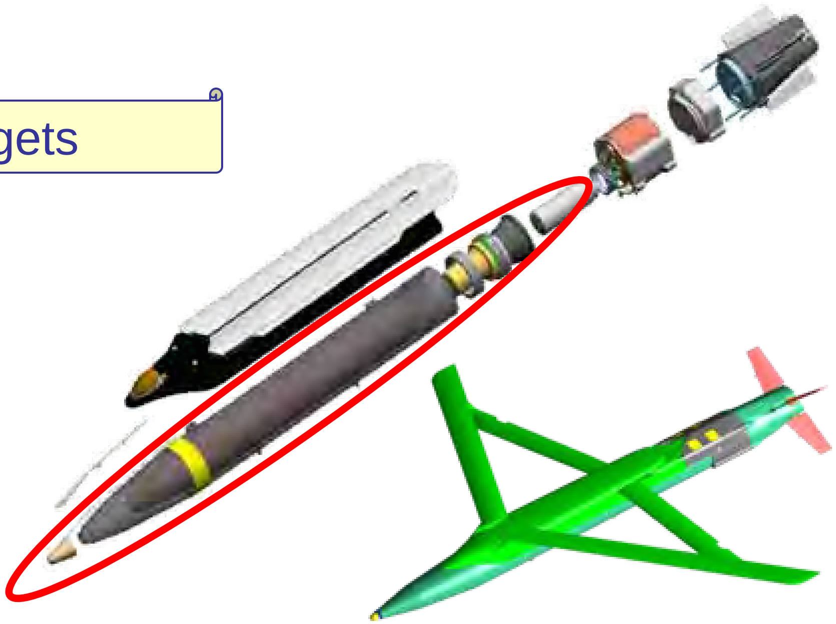
OSD / Advanced Systems & Concepts

- **Problem Statement:** Collateral Damage from Current Weapons Result in Target Restrictions Limiting COCOMs Ability to Prosecute Targets Requiring Minimized Collateral Damage
- **Objective:** Develop Composite Cased Warhead w/ Specialized Fill to Reduce Fragmentation Effects While Increasing Blast Effects → Focused Lethality Munition (FLM)

Prosecute Previously Off-Limits Targets

Solution

- Integrate Dense Inert Metal Explosive (DIME) w/ Composite Warhead Case into the Small Diameter Bomb (SDB) I Airframe




S&T Challenges in Transformation

PACOM Operational S&T Conference 2008

14 July 2008

Soh Kong Pheng

Chief Executive

Defence Science and Technology Agency

DSTA
Defence Science & Technology Agency

Agenda

- Strategic Challenges
- 3rd Generation SAF
- Research and Technology (R&T)
- Our Collaboration

Strategic Challenges

Area ~ 704 sq. km

Population ~ 4.8 million

- No hinterland

- No natural resources

- Vulnerable to changes in regional security environment

Straits of Malacca: An Attractive Terrorist Target

Strategic Significance

- A third of world trade
- Half of all oil shipments by sea
- Two-thirds of all LNG shipments
- 50,000 ships
- 90% of China's trade

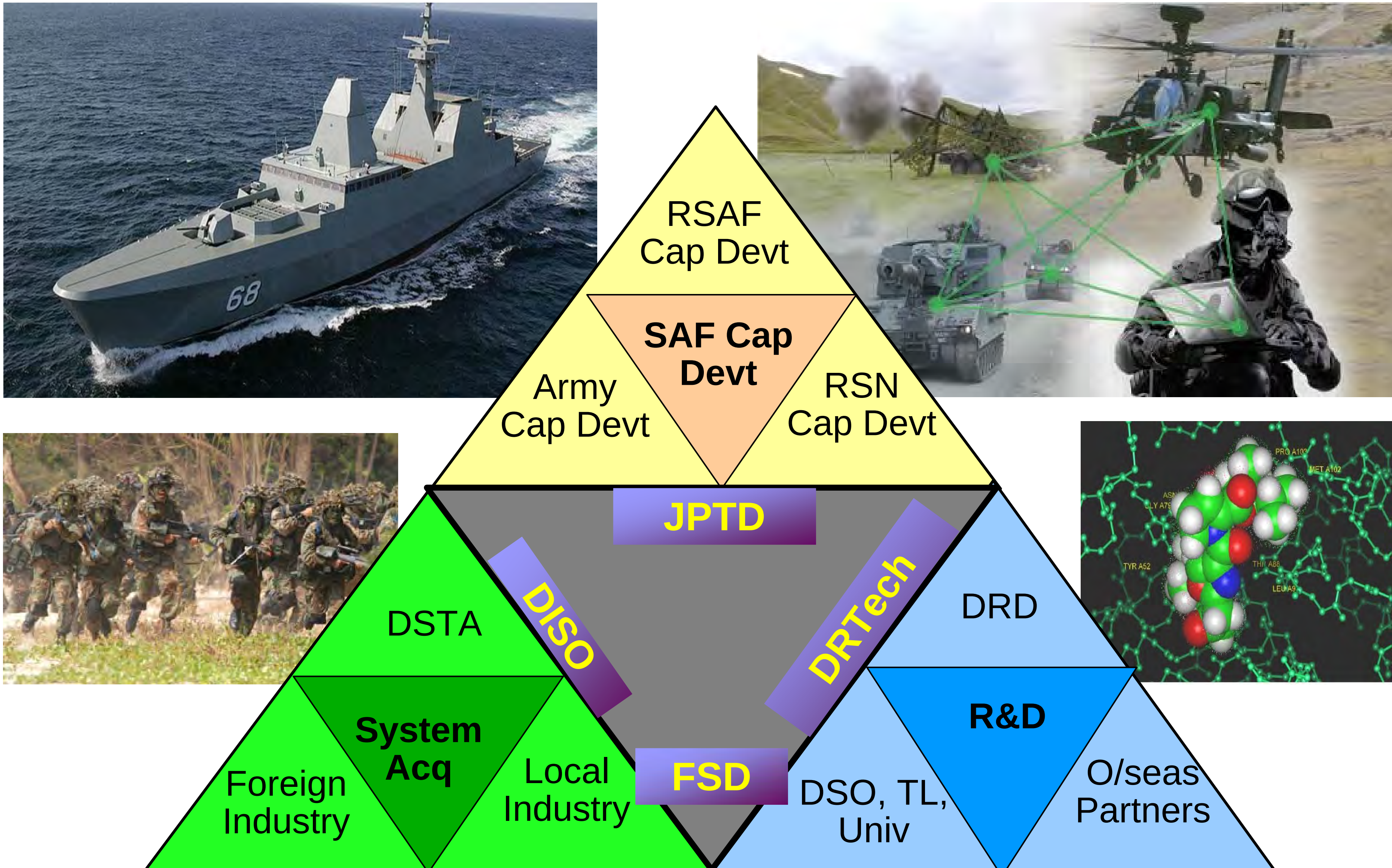
To a small country like Singapore, the application of science and technology was even more critical. The country suffered from *__a small space and tiny population__*. Only the *__technology edge__* could overcome these natural constraints

Source : “Creating the Technology Edge 1110”, DSO National Laboratories, Singapore (1972-2002)


3rd GEN
SAF

Defence Technology Ecosystem

Integrated Planning



Defence Science & Technology Agency

Equipping and Technology support for defence and national security

- Integrative role
  - Enterprise System
  - Joint SAF Ammunition Command
  - Central Procurement System

DSTA
Defence Science & Technology Agency

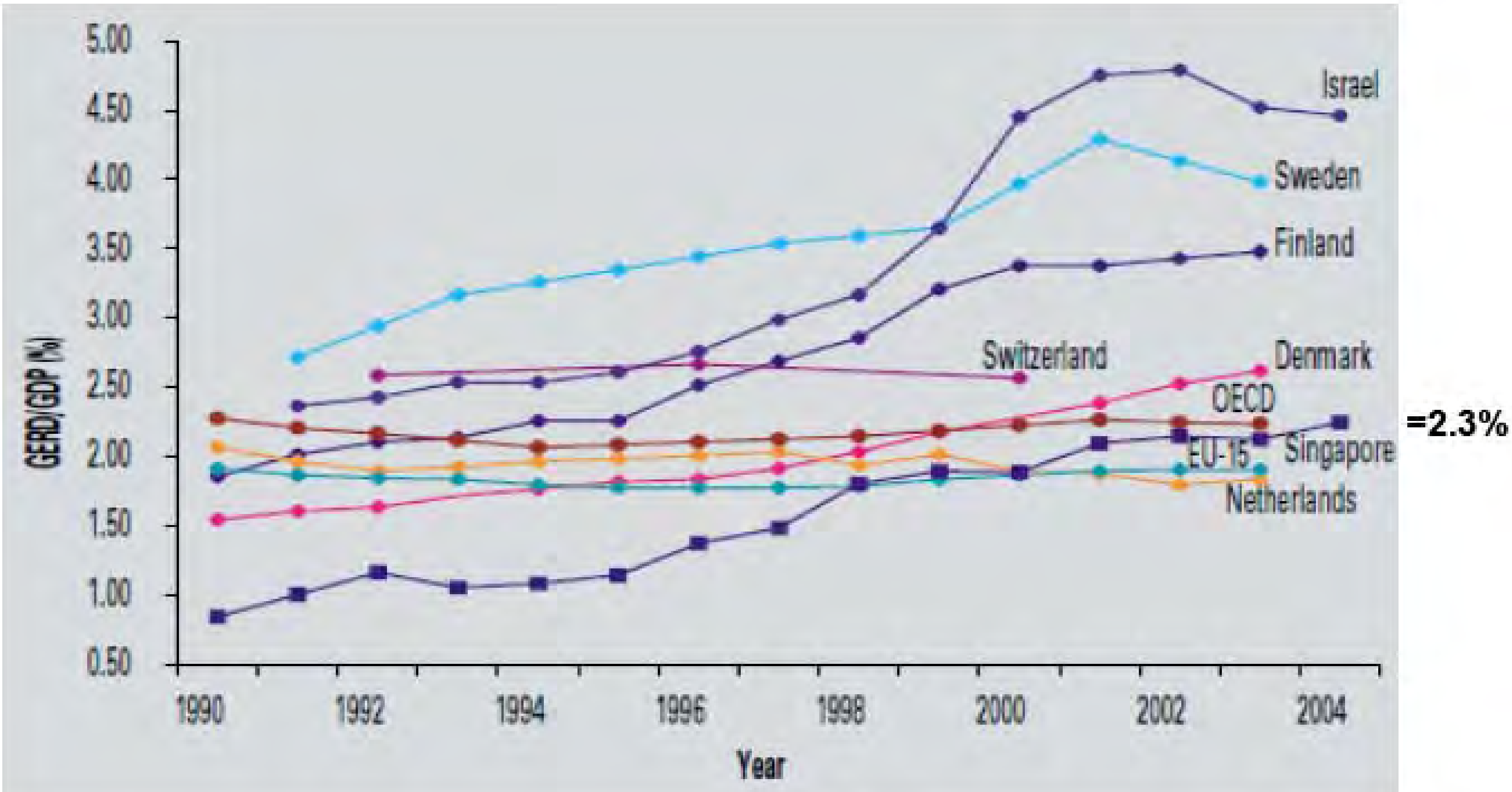
The Straits Times page 2 - Saturday 8 March 2008

ST PHOTO: MUGILAN RAJASEGERAN

COMPLEX WARREN: Two-lane wide roads, as seen here, at the SAF underground facility, link caverns where ammunition will be stored.

Singapore's ammo stored safely – underground

International Comparison of GERD (Gross Expenditure on R&D)



Source: OECD Main Science and Technology Indicators (2005)

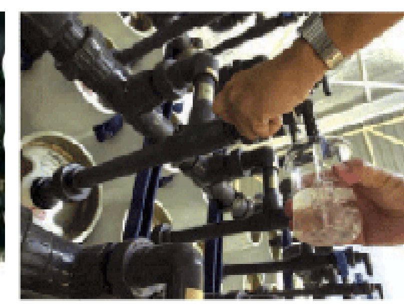
NATIONAL R&D PROGRAMS

BIOMEDICAL SCIENCE (BMS)

INTERACTIVE DIGITAL MEDIA (IDM)

Prof. Seeram using a simple filtration set up to test the efficiency of nanofibre membranes at the nano-bioengineering Laboratory.

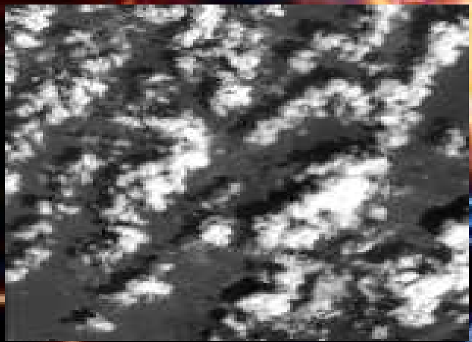
Technological advancements made possible the successful development of NEWater. Today, Singapore has three NEWater Factories at Bedok (above), Kranji and Seletar, and the fourth and largest plant at Ulu Pandan will be completed in early 2007.



ENVIRONMENTAL & WATER TECHNOLOGIES (EWT)

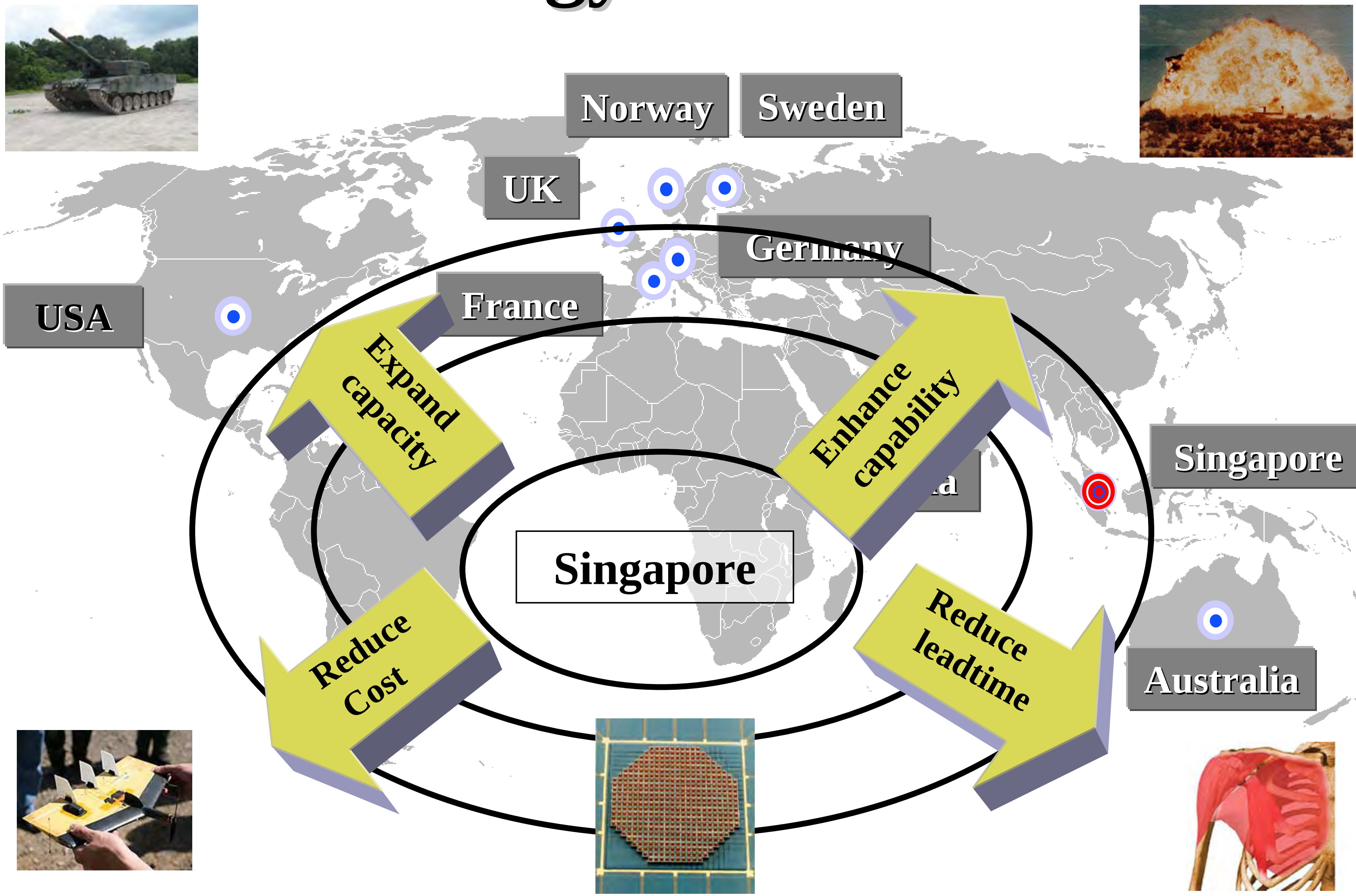
R&T

- Decisive Edge
- Unique Requirements
- Capability Sustenance




DRTech
Defence Research & Technology
Ops - Tech Synergy

Technology Collaboration



Conclusion

- S&T critical for Singapore.

- Integration and networked systems for greater synergy.

- Collaboration to overcome resource constraints and expand capacity of ideas and innovation.


Thank you.
• Knowledge
• Trust
• Connectivity

CARBOGEN

A prophylactic and therapeutic approach against noise induced hearing loss

Conceptualised by
Defence Institute of Physiology & Allied Sciences, Delhi

System designed by
Industrial Design Centre of Indian Institute of Technology, Powai, Mumbai

Emerging Robotics Technologies:

Implications for the Future Warfighter

16 July 2008

Mrs. Ellen M. Purdy
Enterprise Director, Joint Ground Robotics
OUSD(ATL)/PSA/LW&M
ellen.purdy@osd.mil

Today’s Context

“Just about every threat to our security in the years ahead will require working with or through other nations. Success in the war on terror will depend less on the fighting we do ourselves and more on how well we support our allies and partners… “

“It is DoD policy that stability operations are a core U.S. military mission that the Department of Defense shall be prepared to conduct and support. They shall be given priority comparable to combat operations and be explicitly addressed and integrated across all DoD activities” …

DoD Directive 3000.05, Nov 28, 2005

What is the Relevance to Robotics?

U.S. Army Spc. Jacob Miller uses a hooligan tool to hit a wall suspected to hold a weapons cache during a house search in Amariyah, Iraqi, on April 30, 2008. Miller is assigned to the 4th Infantry Division's 10th Cavalry, 4th Squadron. U.S. Air Force photo by Staff Sgt. Manuel J. Martinez

UGV TRAINEE - Defense Secretary Robert M. Gates learns how to operate an unmanned ground vehicle, or UGV, during a tour of the future combat systems facility on Fort Bliss in El Paso, Texas, May 1, 2008. *Defense Dept. photo by Cherie Cullen*

In Theaters Near You

MDARS

- planned for 6 sites
- 1 system per site (4 MDARS, Control Console, and ASIOE)

SWORDS

- 3 deployed to theater
- 8 to be procured by SOCOM

FIDO/PackBot

- 6 currently in operation
- Planned procurement; approximately 100

In Army Labs Today

Robotic Convoy/Leader-Follower

- Perception and planning for safe maneuver among people and other vehicles
- Integration of unmanned systems within the network
- Safe remote weapons operation
- Behaviors (intelligence) required to successfully operate with troops to accomplish assigned missions
- Affordability: cost of future systems using projected technology
- System robustness

What's on the Horizon?

Robotic Snakes

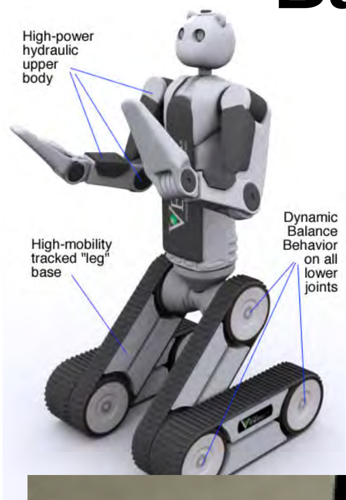
- Provides the ability to navigate over rough, steep terrain where a wheeled robotic
vehicle would likely get stuck or topple over

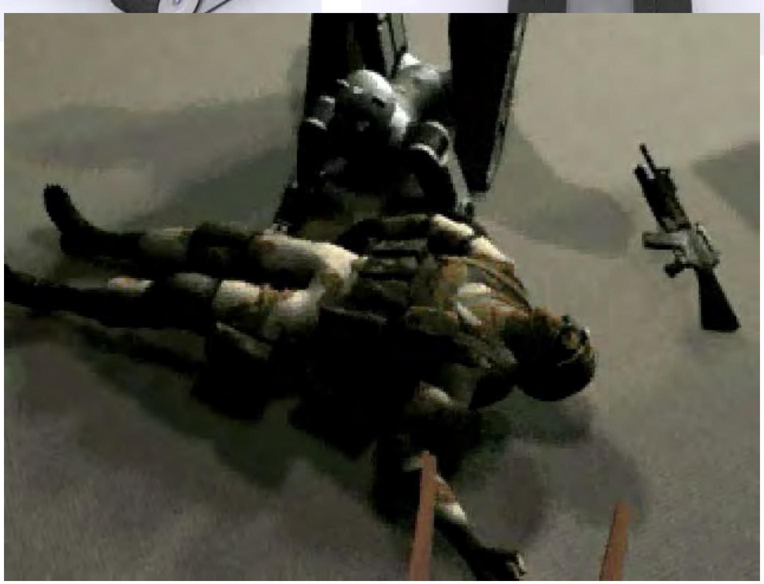
- Recon in severely restricted terrain

- Future software will allow the Snakes to learn on its own by experience

What's on the Horizon?

Battlefield Extraction-Assist Robot (BEAR)





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- Designed to find, pick up and rescue people without risking additional human life
- Upper body controlled by hydraulics
- A mobility platform that features two independent sets of tracked "legs"
- Features dynamic balancing behavior (DBB) while on its "ankles", "knees" or "hips"

What's on the Horizon?

Little Dog

- Developed under the Defense Advanced Research Projects Agency's (DARPA) Learning Locomotion program

- Goal is to learn how to traverse large, irregular obstacles with a high degree of freedom robot

- Expected Locomotion Strategy:
  - Develop a library of moves to traverse terrain elements
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Big Dog

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- **Made of high-strength aluminum and titanium to withstand below-hull strikes from boulders and tree stumps, and a nose designed to absorb the impact of major collisions.**

Crusher

Cobra Gold 09 Warfighter Experiment

US PACOM Mission: … promotes security and peaceful development in the Asia-Pacific region by deterring aggression, advancing regional security cooperation, responding to crises, and fighting to win.

Challenge: Individuals must carry a range of equipment including armor, ammunition, electronics and batteries to sustain a battle and maintain personnel safety into complex terrain, in harsh weather. Many systems require a team of personnel to pack equipment. An unmanned systems to transport gear may address this capability need.

This Experiment will include a Limited Utility Evaluation (LUE) of potential platforms supporting this mission area via the Coalition Partner Exercise, Cobra Gold 2009. The user assessment will result in refining requirements and focusing the development of complex terrain traversability of unmanned systems.

Wrap-Up

- Nearly $2B is being invested in ground robotics by the Department of Defense
- Statutory mandate that the Department of Defense pursue use of unmanned systems
- Warfighter Experiments enable concurrent operational concept, requirements, and technology maturation

Joint Ground Robotics Enterprise is committed to ensuring those investments are responsive to Warfighter needs.

Emerging Robotics Technologies:

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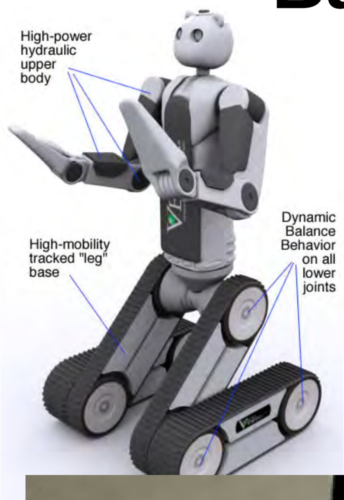

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Joint Ground Robotics Enterprise

Ground Robotics Update

Presented at the Congressional Robotics Caucus Kick-Off Lunch

26 February 2008

Mrs. Ellen M. Purdy
Enterprise Director, Joint Ground Robotics
OUSD(ATL)/PSA,LW&M
ellen.purdy@osd.mil

A New Context

"We must focus our energies beyond the guns and steel of the military, beyond just our brave soldiers, sailors, Marines, and airmen. … I hear all the time from the senior leadership of our armed forces about how important these civilian capabilities are."

Secretary of Defense Robert Gates

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Recent Metrics

• In 2002, the military's share of US official development assistance totaled 5.6 percent; by 2005, it had quadrupled to 21.7 percent, or $5.5B. More than $4B of that money was allocated for projects in Iraq

• Other Defense expenditures in 2005 included:
  – $447M for counter-drug activities mainly in South America
  – $844M for civilian reconstruction projects in Afghanistan and Iraq
  – $117M in tsunami relief
  – $12M in HIV and AIDS initiatives with African militaries

Center for Global Development

USSOUTHCOM Mission

Vision

A joint and interagency organization seeking to support security, stability and prosperity in the Americas.

Goals

- Ensure Security
  - Secure the U.S. from threats
  - Enhance hemispheric security
- Enhance Stability
  - Ensure cooperative U.S. partner nation relationships
  - Enhance consequence management and disaster response capabilities of our partner nations
- Enable Prosperity
  - Ensure favorable security conditions by enabling effective sovereignty
  - Help ensure political and economic freedom with respect for human dignity

Something to Think About

Casualty figures will rise sharply as villagers begin the harvest, picking olives from trees whose leaves and branches hide bombs that explode at the smallest movement. Farmers are caught in a deadly dilemma: to risk the harvest, or to leave the produce on which they depend to rot in the fields.

In poor communities it is common for civilians to salvage military debris for saleable scrap metal

Scrap metal collection at a Central Demolition Site, Afghanistan © Zak Johnson

What's on the Horizon?

Snakebot

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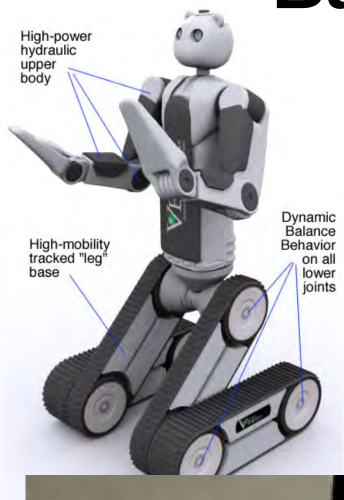

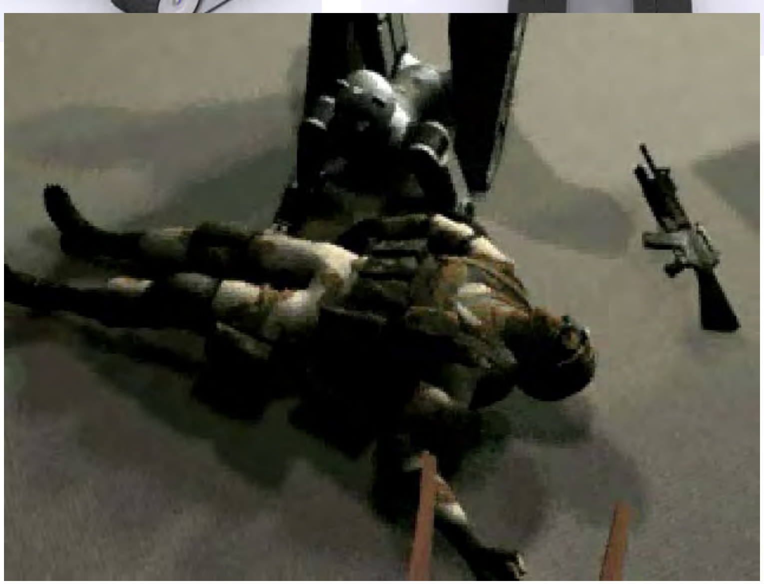

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Crusher

Convoy Active Safety Technologies (CAST)

- Perception and planning for safe maneuver among people and other vehicles; active safety systems for collision detection and avoidance
- Integration of unmanned systems within the network
- Enhanced tele-operation
- Way point navigation
- Affordability: cost of future systems using projected technology
- System robustness

Combat Autonomous Mobility System (CAMS)

Problem:

- Special Operations Forces personnel are operating for extended periods in wider ranging, increasingly austere, non-permissive areas against larger forces; all with resource constrained manpower.

- They lack robust organic capability to conduct timely tactical insertion, ground-based Intelligence Surveillance and Reconnaissance, and tactical re-supply in these environments, and the technology to effectively force-multiply available manpower.

Solution:
Develop an integrated, autonomous, tactical ground-based system to leverage current Special Operations Forces manpower.

Ground Robotics Technology Consortium

Ground Robotics Enterprise

Joint Ground Robotics Enterprise

Section 845
Other Transaction

Ground Robotics Consortium

?

- •OUSD(AT&L) PSA/LW&M
- •Department of the Army
- •Department of the Navy
- •Department of the Air Force
- •Defense Treat Reduction Agency
- •J8
- •Other Agencies and Departments

- •Defense Contractors
- •Small Businesses
- •Academic Institutions
- •Non-Profit Organizations
- •Not-for-Profits Organizations

DoD and GRC … Partnering to Leverage Capabilities and Investment

Purpose of the Consortium

- **Provide opportunity for non-government organizations to participate in DoD research planning, resulting in a plan based on industry expert knowledge of evolving technologies**

- **Allow for better leveraging of IR&D funding through insights gained as a result of this mutual planning process**

- **Lower the entry barriers for small companies to enter into the government acquisition process**

Scope

- **The OTA will encompass**
  - Technology Development and Maturation
  - Performance Improvement
  - Autonomous Tactical Behavior Development
  - Standard Maturation and Evolution
  - Mission Equipment Package Integration
  - Technology Transition Preparation

- **The OTA will not encompass**
  - Policy Development
  - Operational Concept Development
  - TTP Development

- **Only US firms as members of the Consortium**

Roles and Responsibilities

- **Joint Ground Robotics Enterprise (JGRE)**
  - Provides Oversight and Guidance
  - Conducts Planning and Budgeting
  - Manages Acquisition Process
  - Liaison with Other Organizations
  - Ensures Development of Annual Research Plan, Requirements and Source Selection Plan
  - Conducts Source Selection
- **Ground Robotics Consortium (GRC)**
  - Liaison among Industry and with JGRE
  - Participates in Development of Annual Research Plan
  - Conducts Technology Development and Maturation, Performance Improvement, Autonomous Tactical Behavior Development, Standards Maturation and Evolution, and Mission Equipment Package Integration

Keeping it in Perspective

Now is a crucial time for ground robotics:

- **Ground robots have proven their military worth in combat environments**

- **Despite the flaws in the existing systems today, Warfighters are adamant they will not give them up**

- **We need to do better … we will invest where it does the most good and work with the user to solve the hard problems.**

One Last Thought: Let's not fall into the trap of thinking robotics have to be better than or replace humans to have military worth… they give us better than the status quo when they reduce exposure to loss of life and limb.

Wrap Up

- A greater awareness of ground robotics is forming across the DoD:
  - PACOM interested in legged robots for transport in complex terrain
  - SOCOM – CAMs JCTD
  - NORTHCOM looking to robotic tunnel exploration for border security
- Interest in ground robotics is world wide, no longer at the periphery of future planning
  - UK – Grand Challenge
  - Germany ELROB – European Land Robotic Competition
- Technology is beginning to outpace concept development – experimentation is key
  - CAST War fighter Experiment
  - Exoskeleton Experiment
  - ARC 2 Countermine War fighter Experiment
- Power continues to be a constraint, tech base investments still needed
- Sensors are starting to exhibit the needed capabilities to enable the next step towards full autonomy

There is much to be done, and DoD is organized and committed to do it

Joint Ground Robotics Enterprise

The Role of Robots in National Security

Mrs. Ellen M. Purdy
Enterprise Director, Joint Ground Robotics
OUSD(ATL)/PSA/LW&M
ellen.purdy@osd.mil

A New Context

"Army will require leaders of uncommon agility, resourcefulness and imagination; leaders willing and able to think and act creatively and decisively in a different kind of world, in a different kind of conflict than we have prepared for for the last six decades".

Secretary Robert Gates

"We must focus our energies beyond the guns and steel of the military, beyond just our brave soldiers, sailors, Marines, and airmen. … I hear all the time from the senior leadership of our armed forces about how important these civilian capabilities are."

"It is DoD policy that stability operations are a core U.S. military mission that the Department of Defense shall be prepared to conduct and support. They shall be given priority comparable to combat operations and be explicitly addressed and integrated across all DoD activities" …

DoD Directive 3000.05, Nov 28, 2005

Metrics

• In 2002, the military's share of US official development assistance totaled 5.6 percent; by 2005, it had quadrupled to 21.7 percent, or $5.5B. More than $4B of that money was allocated for projects in Iraq

• Other Defense expenditures in 2005 included:
  – $447M for counter-drug activities mainly in South America
  – $844M for civilian reconstruction projects in Afghanistan and Iraq
  – $117M in tsunami relief
  – $12M in HIV and AIDS initiatives with African militaries

Center for Global Development

Partner Nations

"Just about every threat to our security in the years ahead will require working with or through other nations. Success in the war on terror will depend less on the fighting we do ourselves and more on how well we support our allies and partners…

But what do you do when, as is the case today with NATO in Afghanistan, some of your allies don't want to fight; or they impose caveats on where, when and how their forces may be used; or their defense budgets are too small as a share of national wealth to provide a substantial contribution?"

"Eisenhower was a commander who believed that building and maintaining an international coalition of democracies was not a political nicety…but a matter of national survival."

Focusing Beyond Guns and Steel of the Military

U.S. Army Maj. Nathan Haas greets a local tribal leader at the Mada'in Agriculture and Technology Expo in al-Wahida, Iraq, April 26, 2008. Haas is assigned to the 3rd Infantry Division's 3rd Brigade Combat Team, which developed the expo to revitalize farming in the community. U.S. Army photo by Pfc. David J. Marshall

U.S. Army Capt. Christopher Flores examines a 45-day old carp from a fish farm in al-Buaytha, Iraq, April 26, 2008. Flores is fish farm advisor assigned to the Embedded Provincial Reconstruction Team, which provided a micro grant that enabled local fish farmers to buy fish from a Baghdad hatchery to improve his farming capacity. U.*S. Army photo*

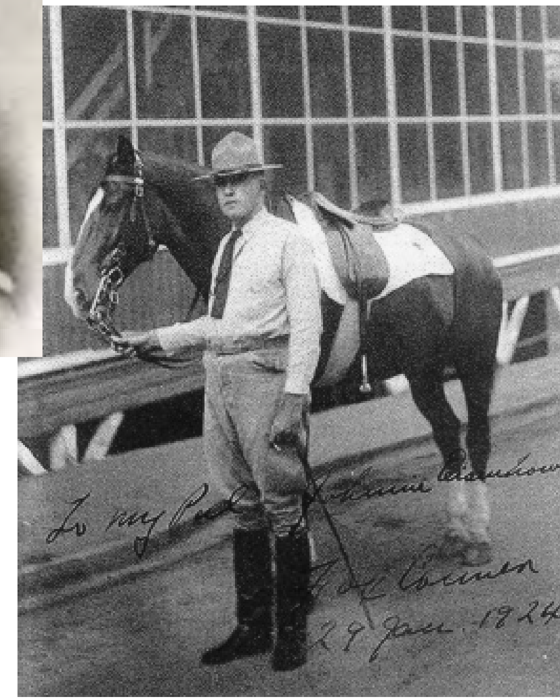
Something to Think About

Casualty figures will rise sharply as villagers begin the harvest, picking olives from trees whose leaves and branches hide bombs that explode at the smallest movement. Farmers are caught in a deadly dilemma: to risk the harvest, or to leave the produce on which they depend to rot in the fields.

In poor communities it is common for civilians to salvage military debris for saleable scrap metal

Scrap metal collection at a Central Demolition Site, Afghanistan © Zak Johnson

From Eisenhower's Inspiration



Never fight unless you have to;
Never fight alone;
And never fight for long.

- MG Fox Conner

What is the Relevance to Robotics?

U.S. Army Spc. Jacob Miller uses a hooligan tool to hit a wall suspected to hold a weapons cache during a house search in Amariyah, Iraqi, on April 30, 2008. Miller is assigned to the 4th Infantry Division's 10th Cavalry, 4th Squadron. U.S. Air Force photo by Staff Sgt. Manuel J. Martinez

UGV TRAINEE - Defense Secretary Robert M. Gates learns how to operate an unmanned ground vehicle, or UGV, during a tour of the future combat systems facility on Fort Bliss in El Paso, Texas, May 1, 2008. ***Defense Dept. photo by Cherie Cullen***

Robotics can serve as tools for today's warfighter's but you have to ask for it … then advocate for it!

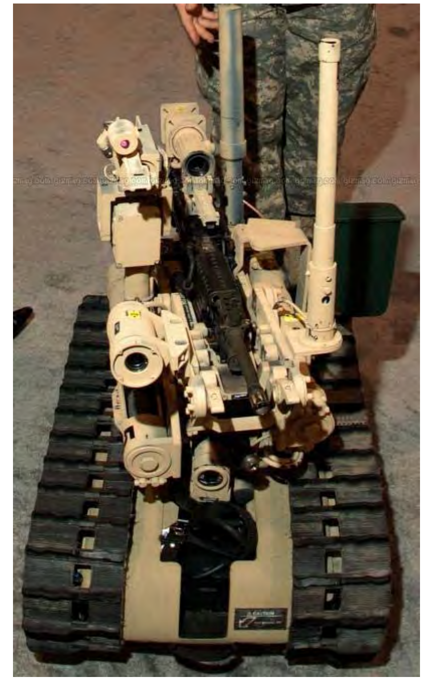
In Theaters Near You

MDARS

- planned for 6 sites
- 1 system per site (4 MDARS, Control Console, and ASIOE)

FIDO/PackBot

- 6 currently in operation
- Planned procurement; approximately 100



SWORDS

- 3 deployed to theater
- 8 to be procured by SOCOM

In Army Labs Today

Robotic Convoy/Leader-Follower

• Perception and planning for safe maneuver among people and other vehicles

• Integration of unmanned systems within the network

• Safe remote weapons operation

• Behaviors (intelligence) required to successfully operate with troops to accomplish assigned missions

• Affordability: cost of future systems using projected technology

• System robustness

What's on the Horizon?

Snakebot

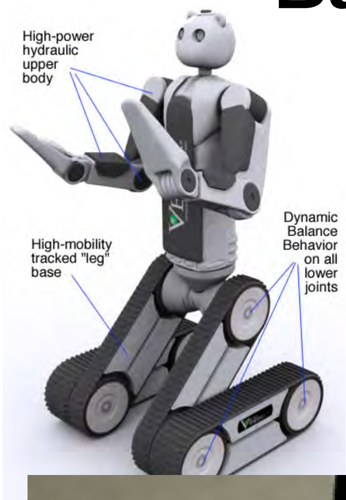
- Provides the ability to navigate over rough, steep terrain where a wheeled robotic
vehicle would likely get stuck or topple over

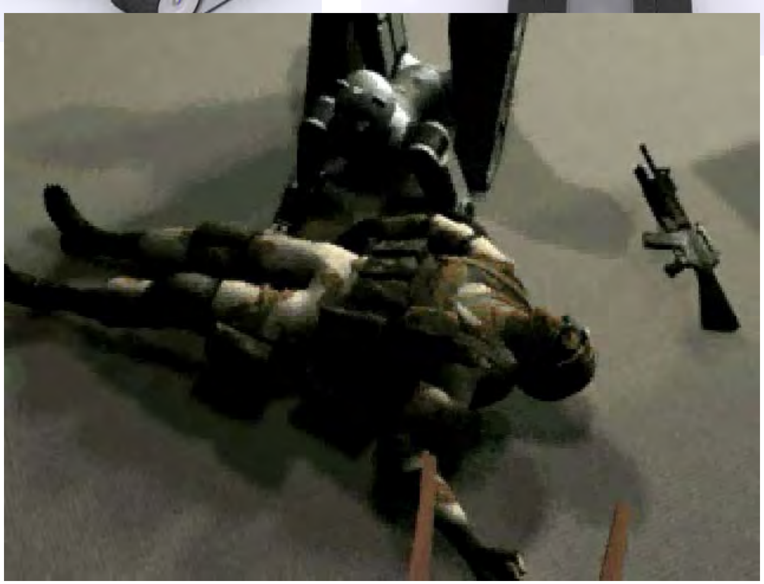
- Recon in severely restricted terrain

- Future software will allow the Snakebot to learn on its own by experience

What's on the Horizon?

Battlefield Extraction-Assist Robot (BEAR)





- Currently in the proof-of-concept development phase for US Army's Telemedicine and Advanced technology Research Center
- Designed to find, pick up and rescue people without risking additional human life
- Upper body controlled by hydraulics
- A mobility platform that features two independent sets of tracked "legs"
- Features dynamic balancing behavior (DBB) while on its "ankles", "knees" or "hips"

What's on the Horizon?

Little Dog

- Developed under the Defense Advanced Research Projects Agency's (DARPA) Learning Locomotion program

- Goal is to learn how to traverse large, irregular obstacles with a high degree of freedom robot

- Expected Locomotion Strategy:
  - Develop a library of moves to traverse terrain elements
  - Recognize similar, already learned elements and modify as required in real time
  - Best results will be ported to Big Dog

Big Dog

What's on the Horizon?

• **Developed by Carnegie Mellon University to assess the capabilities of large, unmanned ground vehicles operating autonomously in a wide-range of complex, off-road terrains**

• **Made of high-strength aluminum and titanium to withstand below-hull strikes from boulders and tree stumps, and a nose designed to absorb the impact of major collisions.**

Crusher

With a Nod Toward George Santayana…

The history of warfare suggests that every new technological leap - the longbow, the tank, the atomic bomb - outraces the strategy and doctrine to control it.

Those who do not remember the past are doomed to repeat it.

– George Santayana

Will We Repeat History on the Ground?

"I will give up a tank battalion for a UAV company,"

- MG Paul J. Kern, CDR, 4th ID, 1997

"Because people were stuck in old ways of doing business, it's been like pulling teeth."

- Secretary Robert Gates

Gates said in a speech at Maxwell Air Force Base, Alabama, that getting the military services, largely the Air Force, to send more unmanned surveillance and reconnaissance aircraft to Iraq and Afghanistan has been "like pulling teeth."

What Does it Take to Lead Technology Adoption?

- **Leadership cannot be confined to one larger-than-life individual who charms thousands into being obedient followers.**

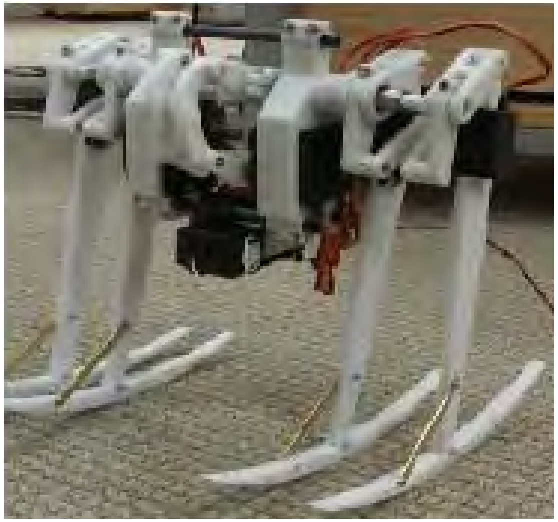
- **Modern organizations are far too complex to be transformed by a single giant. (This goes double for DoD!)**

- **The leadership effort must have support from many people who assist the leadership agenda within their sphere of activity.**

\- P. Kotter, professor of leadership at Harvard Business School

A Discussion With Danny Hillis*

"Leap Ahead Technologies are tough to pursue because surrounding technologies haven't leaped. All components in the system must be leap ahead for real transformational change."



* Danny Hillis developed parallel processing and is co-founder of Applied Minds which is currently working with Northrop Grumman to develop a robotic "MULE" for dismounted soldiers.

For example…

We tend to think of Countermine, Explosive Ordnance Disposal, and Range Clearance Systems in terms of Combat Service Support…

What about as tools for National Security:

- unmanned to enable the few troops deployed in partner nations to do more

- unmanned to reduce the risk to our own and partner nation troops

Shouldn't we have the technology to robotically conduct countermine, IED defeat, and range clearance in all COCOM Areas of Responsibility?

What Are *You* Going to Do?

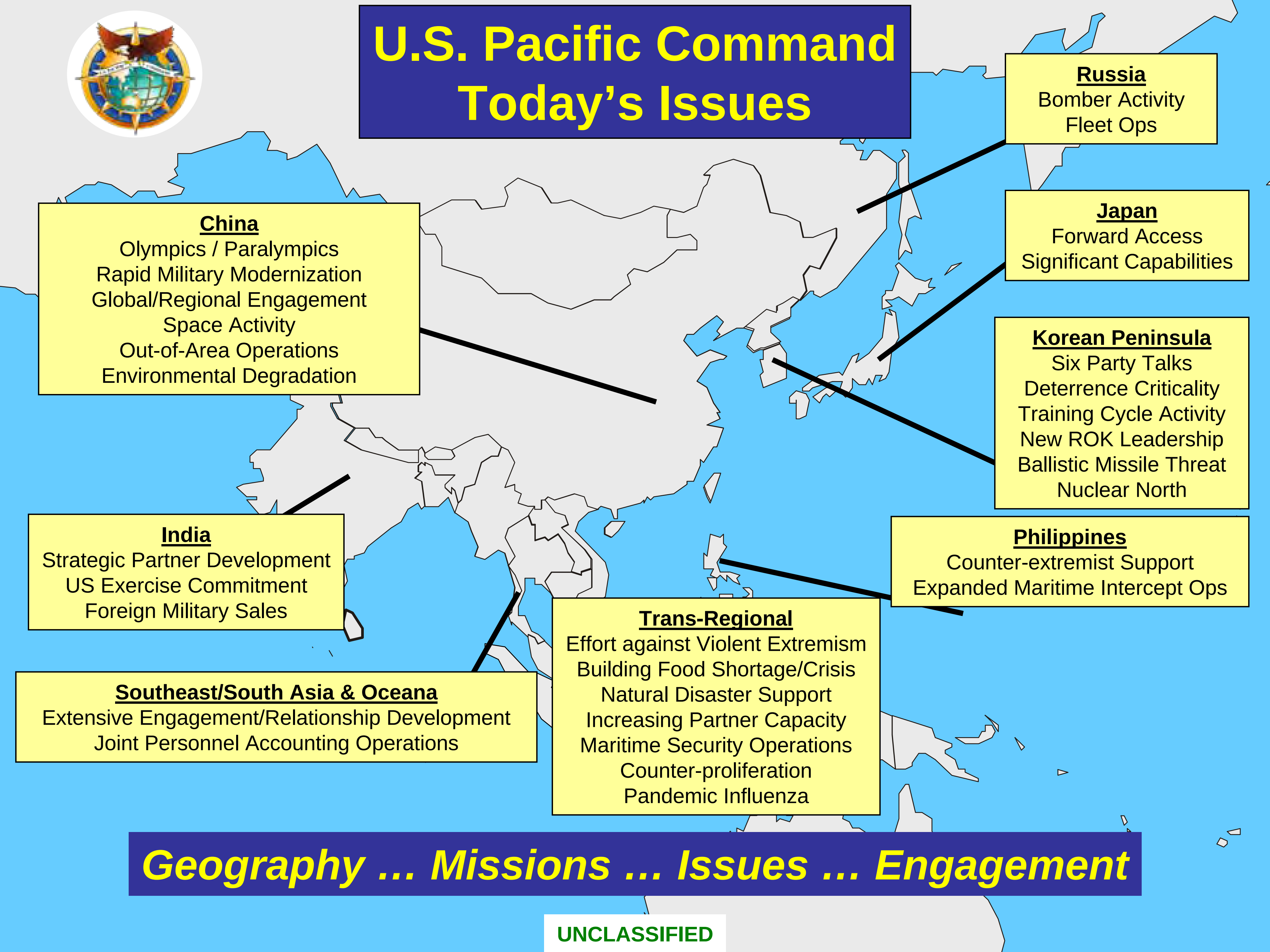
Robotic Technology is only a promise…for it to provide military worth, it must be deliberately managed in a larger context.

Leaders intent on introducing robots to war fighters must:

- **Manage expectations – leap ahead is easy to say but hard to deliver**
- **Account for context – robots are perceived as eliminating jobs or enabling one community to do another community's job**
- **Ensure robotic development is underpinned by sound operational concept (quality, integrity) – it's a brave new world…we do not have a history of military robotics…that is what you will invent!**

"We may not be interested in the long war, but the long war is interested in us."

U.S. Pacific Command
Today's Issues



Russia
Bomber Activity
Fleet Ops

China
Olympics / Paralympics
Rapid Military Modernization
Global/Regional Engagement
Space Activity
Out-of-Area Operations
Environmental Degradation

Japan
Forward Access
Significant Capabilities

Korean Peninsula
Six Party Talks
Deterrence Criticality
Training Cycle Activity
New ROK Leadership
Ballistic Missile Threat
Nuclear North

India
Strategic Partner Development
US Exercise Commitment
Foreign Military Sales

Philippines
Counter-extremist Support
Expanded Maritime Intercept Ops

Trans-Regional
Effort against Violent Extremism
Building Food Shortage/Crisis
Natural Disaster Support
Increasing Partner Capacity
Maritime Security Operations
Counter-proliferation
Pandemic Influenza

Southeast/South Asia & Oceana
Extensive Engagement/Relationship Development
Joint Personnel Accounting Operations

Geography … Missions … Issues … Engagement

UNCLASSIFIED

U.S. Army Research, Development and Engineering Command

RDECOM

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

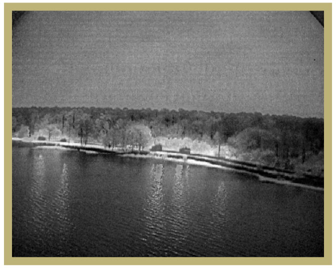
PACOM Operational S&T Conference
14-17 July 2008

MG Fred D Robinson, CG
RDECOM

What We Do

Strike
(Exploit FCS Netted Fires)

Human Performance &
Embedded Training



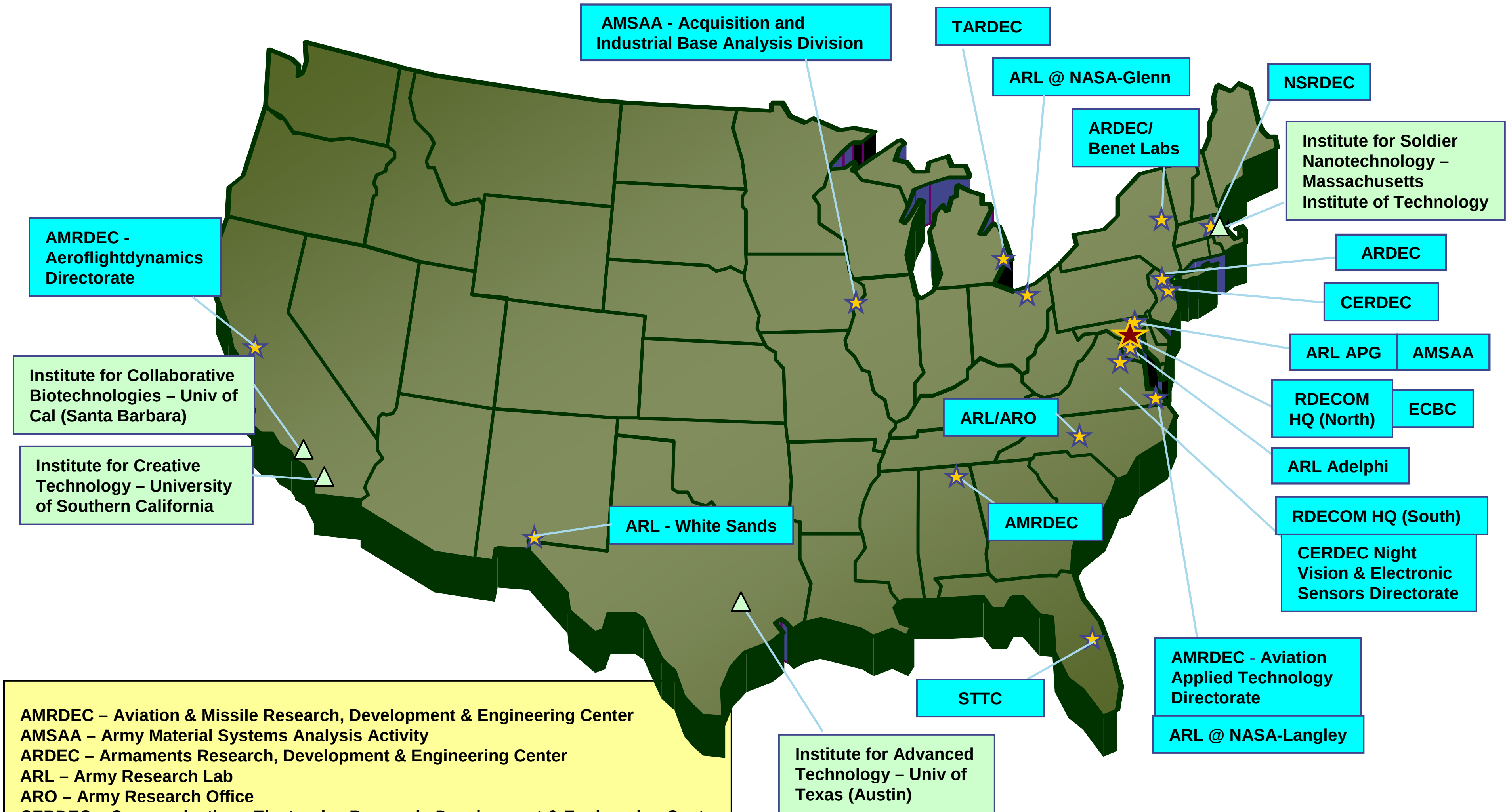
Sensory Enhancement

MISSION:

Get the right technology to the right place, at the right time, for the Warfighter (Current and Future)

- ★ Technology Out of the Laboratories and into the Hands of Warfighters in the Shortest Time
- ★ Develop Materials and Technologies for Future Combat System (FCS) and Future Force
- ★ Manage Speed and Complexity of Technological Change to Operational Needs
- ★ Systems Engineering, Assessment, and Analysis
- ★ Engineering Support to Development and Sustainment
- ★ Identify Foreign Technologies for US Army Use

Major Locations



AMRDEC – Aviation & Missile Research, Development & Engineering Center
AMSAA – Army Material Systems Analysis Activity
ARDEC – Armaments Research, Development & Engineering Center
ARL – Army Research Lab
ARO – Army Research Office
CERDEC – Communication - Electronics Research, Development & Engineering Center
ECBC – Edgewood Chemical Biological Center
NSRDEC – Natick Soldier Research, Development & Engineering Center
STTC – Simulation and Training Technology Center
TARDEC – Tank and Automotive Research, Development & Engineering Center

RDECOM

Partnerships

Co-op Agreements, OTAs, TSAs, Contracts, Grants, CRADAs

297
Academic Partners
In 50 States + DC

1229
Single Investigator Grants

63 MURI

422
Active CRADAs

Over 300
International Agreements

Centers Of Excellence

High Performance Computing
- *Stanford University*
- *New Mexico State University*
- *Morgan State University*
- *University of Texas, El Paso*
- *High Performance Tech, Inc*
- *NASA - Ames*

Flexible Displays
- *Arizona State University*

Materials
- *University of Delaware*
- *Johns Hopkins University*
- *Rutgers University*
- *Drexel University*
- *Virginia Tech*

University Affiliated Research Centers

Biotechnology

Biologically-derived:
- Sensors
- Electronics
- Information Processing

Soldier Survivability

- Protection
- Performance Enhancement
- Injury Intervention and Cure

IAT Institute for Advanced Technologies

Electromechanics & Hypervelocity Physics

- EM Launch
- Pulsed-power
- Electric Armaments

ict USC institute for creative technologies

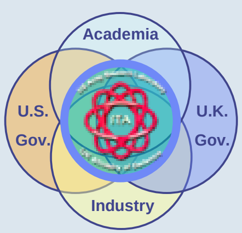
Immersive Environments

- Full Sensory Immersion
- 3-D Mobility
- Compelling Interactive Stories

Battlefield Capability Enhancement Centers

Human Centric C2 & Decision Making	Intelligent Sensor Fusion	Environmentally Stable Flexible Displays	Flexible Extremities Protection:	Digital Battlefield Communication:
North Carolina A&T State University explore. discover. become.	Tennessee State University Two Campuses. One University.	North Carolina A&T State University explore. discover. become.	Tuskegee University	Prairie View A&M University

International Technology Alliance



Collaborative Technology Alliances

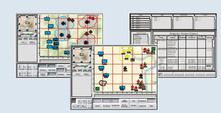
Advanced Sensors

Robotics

Power & Energy

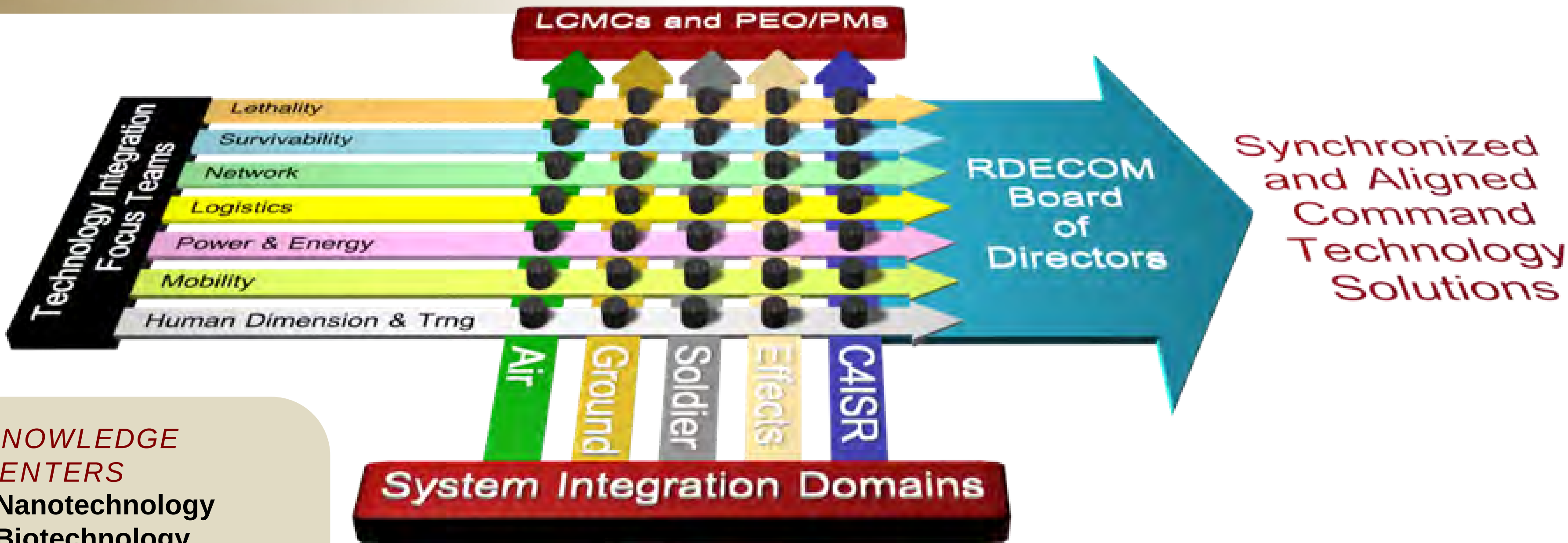
Comms & Networks

Advanced Decision Architectures



Micro Autonomous Systems & Technology

Technology Integration
The Concept



KNOWLEDGE CENTERS

- Nanotechnology
- Biotechnology
- Cognitive & Neuroergonomics
- Electronics
- Advanced Computing
- Enterprise Integration

SYSTEM OF SYSTEMS OVERLAY

- Systems Engineering Across Domains
- RDECOM HQ
- AMSAA

- **System Integration Domains ensure integrated capabilities for common systems.**
- **Technology Focus Teams ensure 6.1-6.3 S&T portfolio is optimized across all domains.**
- **Knowledge Centers provide coordination and serve as technology advocate to Focus Area leads on emerging technologies.**
- **Board of Directors provide RDECOM S&T strategic guidance, establish command priorities and adjudicate inter-RDEC/Lab issues.**

Future Technologies / Capabilities

- **Survivability**
  - **Vehicles**
  - **Soldier**

- C4ISR
  - Fusion of Asymmetric Sensor Data / Intel
  - Information Assurance
  - Spectrum Usage / Management

- Power and Energy
  - Hybrid Electric Technologies
  - Improvements in Soldier Power
  - Alternative Energy Sources (Fuel Cells, Battery Chemistries, Solar)

- Robotics
  - Autonomous Systems
  - Manned / Unmanned Teaming

MRAP Family of Vehicles




Category I
Urban Combat Operations

<u>Concept of Operation:</u>

Small unit combat operations in urban or confined areas - Mounted patrols, reconnaissance, communications, command and control, and direct interaction with civilian population.





Category II
Multi-mission Operations

<u>Concept of Operation:</u>

Ground logistics support operations - Reconfigurable vehicle capable of convoy security, combat engineering, ambulance, troop & cargo transportation.

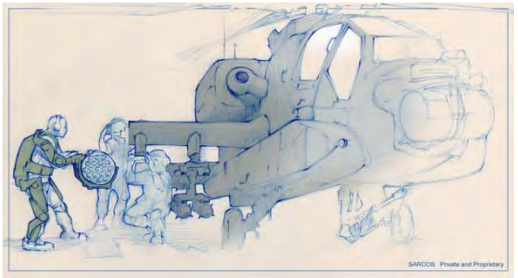
Category III
Mine/IED Missions

Navy and Marine Corps Only

<u>Concept of Operation:</u>

Explosive Ordnance Disposal - Route Clearing; detect and disarm or detonate IEDs, mines and other explosive devices.

Exoskeleton Logistic Variant



Purpose:

Develop a fully-powered wearable exoskeleton that increases the Logistic Support Soldiers' repetitive manual lifting/handling (holding, moving, lifting, pushing, pulling) capacity and maximal load carrying capacity

Products:

- *2 Prototypes that operate in austere environments while making the load feel lighter thru strength augmentation*
- *1 System will have a power tether*
- *1 System will have on board power*
- *Draft Operation & Maintenance plan*

Payoff:

- *Enhanced load bearing & manual lifting capability*
- *Reduced fatigue and injury potential*
- *Enhances Soldier effectiveness in combat support and combat service support*

Future Technologies / Capabilities

- Survivability
  - Vehicles
  - Soldier
- **C4ISR**
  - **Fusion of Asymmetric Sensor Data / Intel**
  - **Information Assurance**
  - **Spectrum Usage / Management**
- Power and Energy
  - Hybrid Electric Technologies
  - Improvements in Soldier Power
  - Alternative Energy Sources (Fuel Cells, Battery Chemistries, Solar)
- Robotics
  - Autonomous Systems
  - Manned / Unmanned Teaming

Asymmetric Data Fusion

Provides timely analysis, identification and tracing capability in contemporary & future operating environments, by fusing data from all sources.

Future Technologies / Capabilities

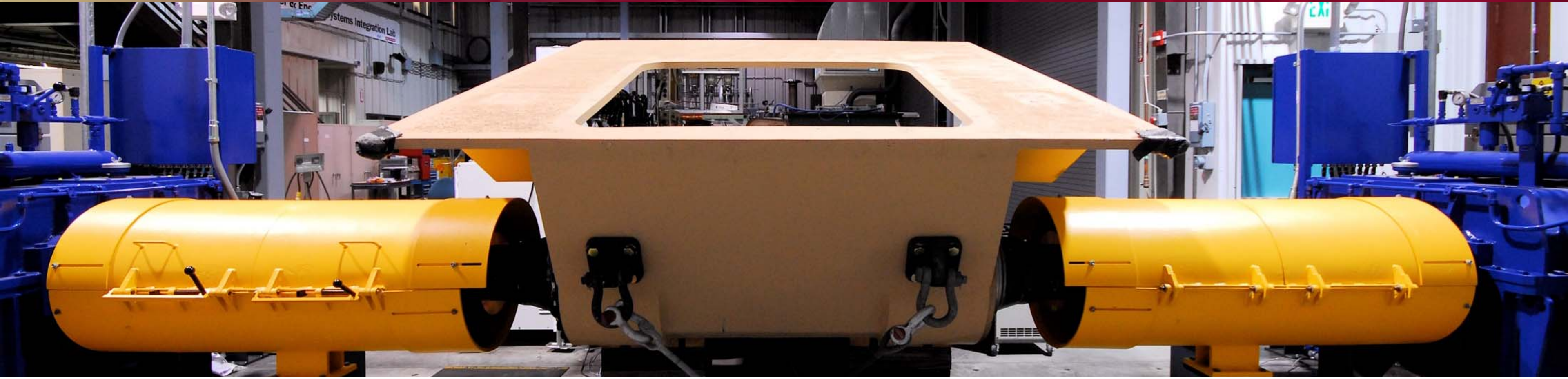
- Survivability
  - Vehicles
  - Soldier

- C4ISR
  - Fusion of Asymmetric Sensor Data / Intel
  - Information Assurance
  - Spectrum Usage / Management

- **Power and Energy**
  - **Hybrid Electric Technologies**
  - **Improvements in Soldier Power**
  - **Alternative Energy Sources (Fuel Cells, Battery Chemistries, Solar)**

- Robotics
  - Autonomous Systems
  - Manned / Unmanned Teaming

Why Hybrid Electric Technology?



Design Attributes

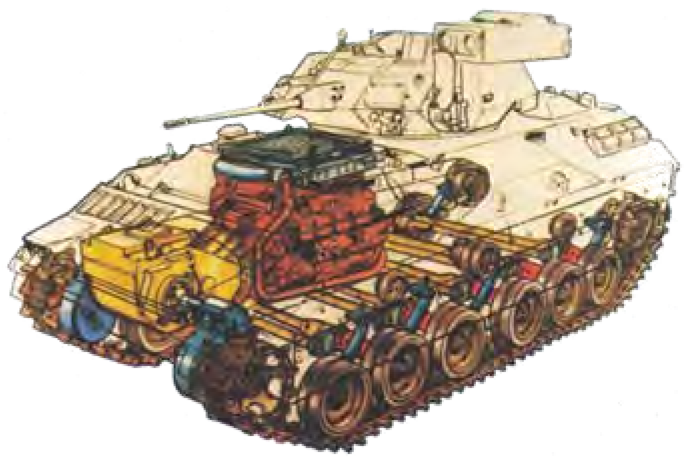
- More effective & responsive than current platforms at lesser weight
- Computer processing power equivalent to higher performance computers
- Capability to produce electrical power equivalent to 90 portable 5kW generators
- On-board storage capability of more than 500 full-length movie videos
- Increased diagnostic capability than a typical automobile repair shop

Design Solutions

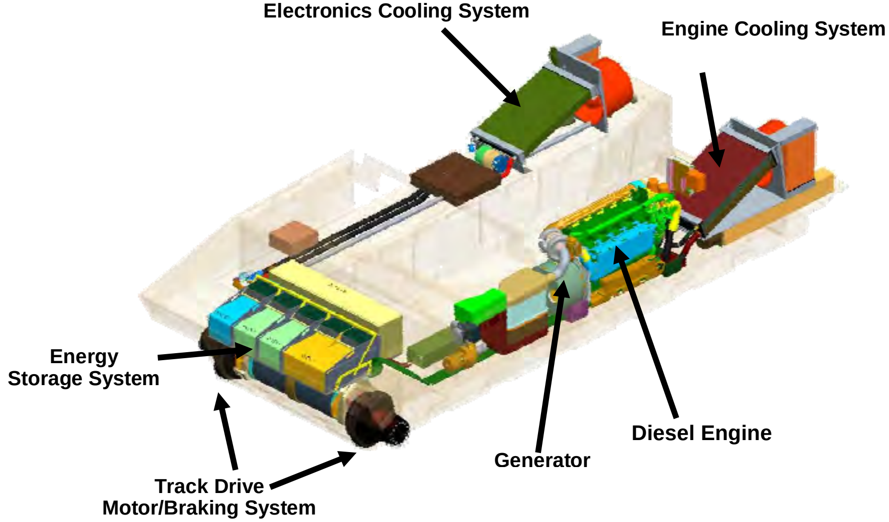
- Electrically Based Architecture is Fundamental to FCS MGV
- High Power Density Diesel Engine with Advanced Technology Generator Supporting FCS MGV
  - **Improved efficiency for more available power**
  - **Improved reliability to increase system availability**
- Advanced Power Management and Energy Storage System
  - **Monitoring and controlling loads maximizing available power**
  - **Improved batteries to increase Silent Watch/Mobility capability**
- Cross Drive System for Track System
  - **Improved efficiencies reduces:**
    - **Radiator size**
    - **Density reduces weight**

The FCS MGV Has an Unprecedented Need for Electrical Power

Electric Architecture Benefits Comparison



Conventional Drive Train



Electric Drive Train

Design Benefits

No Mechanical Link
No Drive Shaft
Design Flexibility
Improved Maintainability
Lower Silhouette

Battery Requirements

AN/PVS 14 (Night Vision)
(2) AA
.1 lbs

Melios
(1) BB 516
.59 lbs

HTWS (Night)
(6) AA
.3 lbs

M68 CCO (Day)
(1) DL 1/3N
.04 lbs

Sure Fire Light
(2) CR-123A
.12 lbs

Mag Lite
(2) AA
.1 lbs

Head Set
(2) AA
.1 lbs

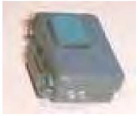
PEQ-2A
(2) AA
.1 lbs

MBITR
(1) BB 521,
.88 lbs

DAGR
(4) AA & (1) ½
.22 lbs

ICOM F43
(1) BP 196
.35 lbs

P-Beacon
(1) 9V
.1 lbs



Battery Requirements for the Platoon Leader

Total: 8 types of batteries, 34 batteries, 3 lbs

Infantry Formation Power Usage

- Infantry Platoon battery requirements
  - 8 types of batteries
  - 2,587 total batteries
  - Weight: 364 lbs.
  - Cost: $10,103.80

- Current costs are approximately $1.5 M for 5 day supply of batteries for an Air Assault Infantry Brigade.

ULTRACELL XX25 DEVELOPMENT

Objective

Provide a portable fuel cell power source which can extend mission runtimes through improved energy density while decreasing overall mission equipment weight

Benefits for Military Applications

The XX25 will allow the military to have increased runtimes of electronics equipment while lowering the overall mission weight. The military will be able to power communication devices, man-wearable electronics (LW/FFW programs), as well as provide emergency power and serve as a remote field recharging unit.

CERDEC POC: Beth Ferry, 410-278-1319

elizabeth.ferry@us.army.mil

Project Status

The XX25 is a 25 Watt portable Reformed Methanol Fuel Cell (RMFC) system – quieter and more efficient than electric generators, and smaller and lighter than long runtime battery solutions. Developed by UltraCell with funding from the U.S. Army CERDEC, the XX25 is a field ready fuel cell system available today.

In 2007, UltraCell achieved milestones including MIL-STD 810F testing which validated system ruggedness and reliability and beta system field testing confirming usability.

The UltraCell Gen.II, being developed in 2008, will further increase energy density, benefiting the soldier by saving weight.

UltraCell XX25 **UltraCell Gen.II**

Funding

FY 06, FY 07(Joint DARPA/CERDEC)

Total UltraCell Cost: FY 06 >$2M, CERDEC cost $1.1M

Total UltraCell Cost : FY07 >$3.8M, CERDEC/DARPA Cost $1.75M (ends May 2008)

FY08 Next Gen Effort (Start May 2008)

Total UltraCell projected Cost : FY08 $>2.8M, CERDEC Cost $1.4M (ends May 2009)

- Joint CERDEC/DARPA Funding

Deliverables: consistently throughout program as updates are made

Tactical Garbage to Energy Refinery

- Deployable tactical system which converts military field waste (paper, plastic, scrap-wood, packaging and food waste) into biofuels (ethanol and fuel-gas)
- Biofuels used to fuel onboard 60Kw generator set and provide thermal utilities from excess thermal energy (e.g. hot water)
- Conserves approximately 100 gallons of diesel fuel per day and reduces waste disposal cost and overhead
- "Hybrid system" integrating thermochemical and biocatalytic technologies
- Outputs are carbon dioxide and ash. With the exception of conversion of petroleum based plastics the system is "carbon neutral"

Future

New biocatalysts R&D

Supply chain R&D for "green" plastics and polymers

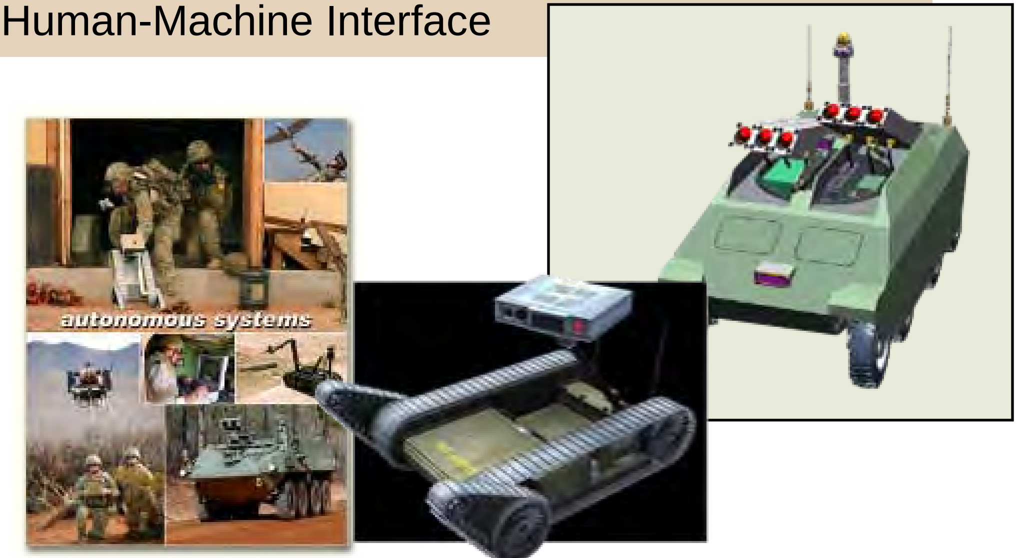
Future Technologies / Capabilities

- Survivability
  - Vehicles
  - Soldier
- C4ISR
  - Fusion of Asymmetric Sensor Data / Intel
  - Information Assurance
  - Spectrum Usage / Management
- Power and Energy
  - Hybrid Electric Technologies
  - Improvements in Soldier Power
  - Alternative Energy Sources (Fuel Cells, Battery Chemistries, Solar)
- **Robotics**
  - **Autonomous Systems**
  - **Manned / Unmanned Teaming**

Autonomous Systems

Corporative Agreement established to advance science in three areas:

- Advanced Perception for Autonomous Mobility
- Intelligent Control Architectures and Tactical Behaviors
- Human-Machine Interface



- Cooperative Agreements: Provide a vehicle for collaboration with industry and academia to rapidly transition innovative research into the hands of the Soldier
- Impact: Safe operation of unmanned vehicles in populated environments

Industry Members

- General Dynamics Robotic Systems
- Alion Science and Technology
- Applied Systems Intelligence
- BAE Systems
- Jet Propulsion Lab
- Sarnoff Corporation
- SRI International
- PercepTek, Robotic Research
- Signal Systems Corporation
- SkEyes, Inc

Academia Partners

- Carnegie Mellon University
- University of Maryland
- Florida A&M University
- Howard University
- North Carolina A&T University
- University of Pennsylvania

Future Technologies / Capabilities

- **Chem-Bio Detection and Decontamination**
  - **Standoff Detection**
  - **CB Agent Decontamination**
- Training
  - Immersive / Synthetic Environments
  - Personal Learning Assistance
- Human Dimension
  - Human-Network Interaction
  - Human Cognition / Performance Modeling
- Lethality
  - Increased / improved Soldier lethality
  - Tailorable Effects

Changing Role of Explosives Sensing

- Traditional military application of explosives detection applied to finding mines.
  - Magnetometry, Ground Penetrating Radar

- DHS/TSA focused on detection of explosives prior to an event in a relatively "clean" environment (i.e. airports…)

- Law Enforcement focused on post blast analysis of residue for attribution, prosecution.

- Current military environment involves all three. Required to detect an explosive threat prior to detonation in a complex, dirty environment.

The IED Threat

Chemical to HME Detection

- Joint Services Lightweight Standoff Chemical Agent Detector (JSLSCAD)
- JSLSCAD Block I - integrated into the Stryker-NBC Reconnaissance Vehicle
- General Dynamics Armament and Technical Products/Honeywell currently under contract through JPM-CA
- Conducting a feasibility study on using a JSLSCAD to detect Nitric Acid
- Algorithm development and software only modification required

- Chem-Bio Detection and Decontamination
  - Standoff Detection
  - CB Agent Decontamination
- **Training**
  - **Immersive / Synthetic Environments**
  - **Personal Learning Assistance**
- Human Dimension
  - Human-Network Interaction
  - Human Cognition / Performance Modeling
- Lethality
  - Increased / improved Soldier lethality
  - Tailorable Effects

Bi-lateral Negotiation (BiLAT) Simulation

PC-based, cognitive training tool used by Soldiers in both institutional and operational training environments to increase knowledge and develop skills in how to plan for and conduct bi-lateral meetings or negotiations in different cultural settings (current scenarios are focused on Iraq)

Game-Based Technology for Coalition Training

Massively Multiplayer On-line Game (MMOG) technology used to provide a flexible and scalable simulation environment that would support training for a wide range of Coalition Warfare operations. Allows training among US and Coalition ground forces on a wide variety of tasks, such as working with local authorities and first responders after an IED/terrorist attack.

Stand Alone Patient Simulator (SAPS)

The Stand Alone Patient Simulator (SAPS) is the world's first wireless, rugged, physiologically-based patient simulator. SAPS introduces the capability for medical care providers to train as they fight. The provider must assess and treat the patient in difficult terrain while extricating and evacuating him to higher levels of care.

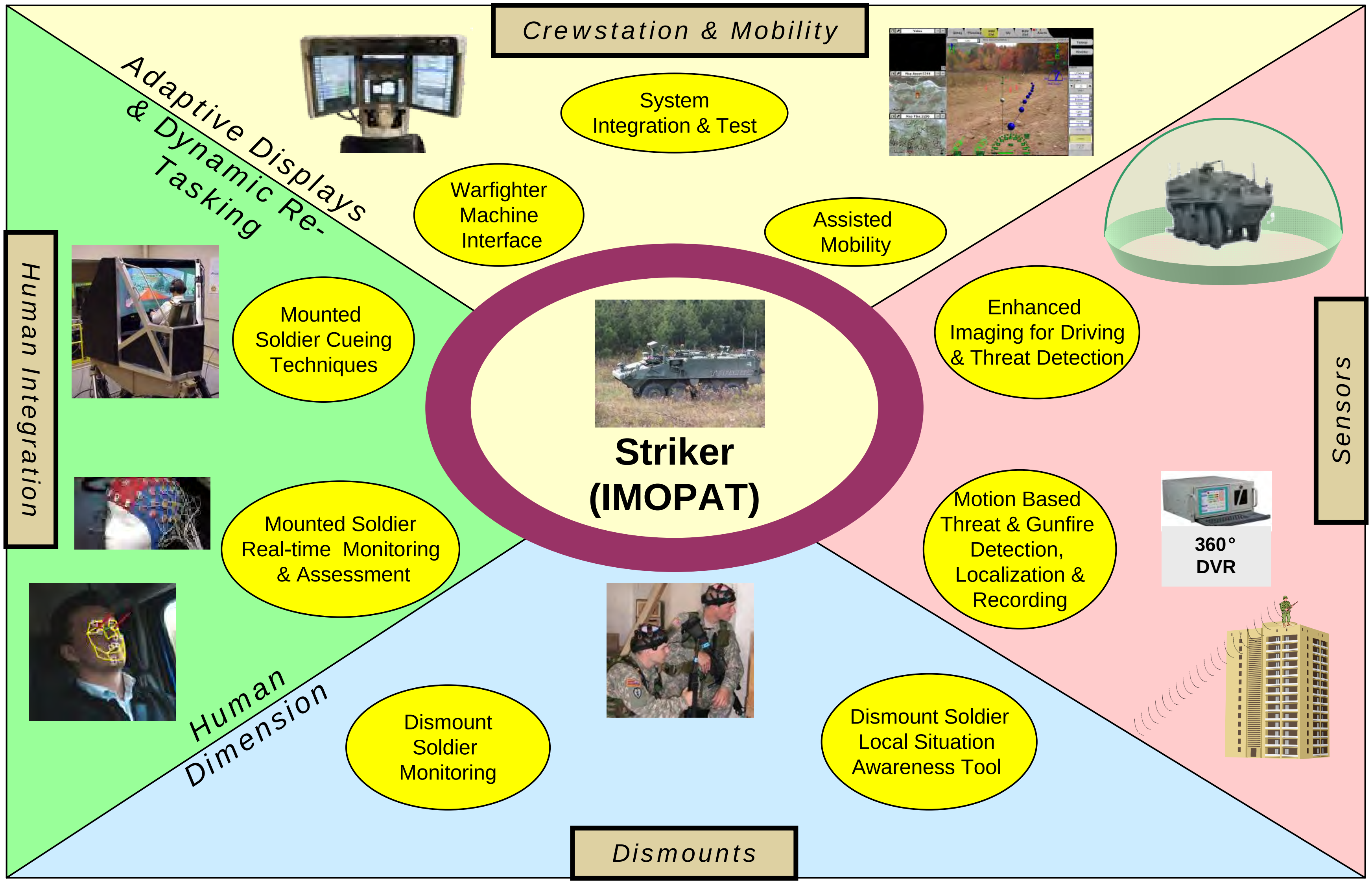
Future Technologies / Capabilities

- Chem-Bio Detection and Decontamination
  - Standoff Detection
  - CB Agent Decontamination
- Training
  - Immersive / Synthetic Environments
  - Personal Learning Assistance
- **Human Dimension**
  - **Human-Network Interaction**
  - **Human Cognition / Performance Modeling**
- Lethality
  - Increased / improved Soldier lethality
  - Tailorable Effects

Human Dimension

- **Human Dimension: That which encompasses the cognitive, physical, and moral components of Soldier, leader, and organizational development and performance essential to raise, prepare, and employ the Army in full spectrum operations.**
  - Cognitive Component: Within the human dimension, what a Soldier must know, process and understand in order to perform essential intellectual tasks and functions.
  - Physical Component: Traditional aspects of physical fitness such as strength, endurance, tolerance, flexibility, and coordination, along with holistic fitness, an approach that considers mental and medical contributions to physical performance
  - Moral Component: In relation to the human dimension, it consists of three elements; warrior spirit element, moral-ethical development, and socio-cultural awareness

Human Network Interaction



Future Technologies / Capabilities

- Chem-Bio Detection and Decontamination
  - Standoff Detection
  - CB Agent Decontamination
- Training
  - Immersive / Synthetic Environments
  - Personal Learning Assistance
- Human Dimension
  - Human-Network Interaction
  - Human Cognition / Performance Modeling
- **Lethality**
  - **Increased / improved Soldier lethality**
  - **Tailorable Effects**

Electromagnetic Gun

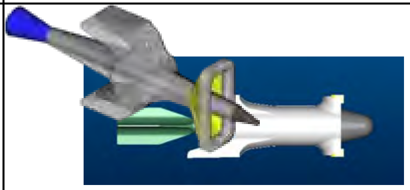
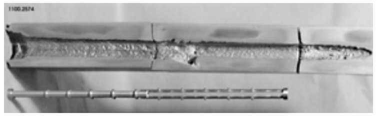
Warfighter Payoffs:

- Increased lethality and robust defeat of future threats
- Improved survivability (reduced launch signature & elimination of chemical propellants)
- Lower sustainment burden (reduced weight/volume rounds)

Approach:

- Separately demonstrate key components - pulsed power, launcher, and projectile
- Provide supporting analyses that establishes substantial benefits on the battlefield

EMGUN

Key Accomplishments:			
Built and proof tested key pulsed power components	Built and tested practical launcher prototypes	Demonstrated highly efficient KE and HE projectiles	Demonstrated novel hypervelocity penetrators
			

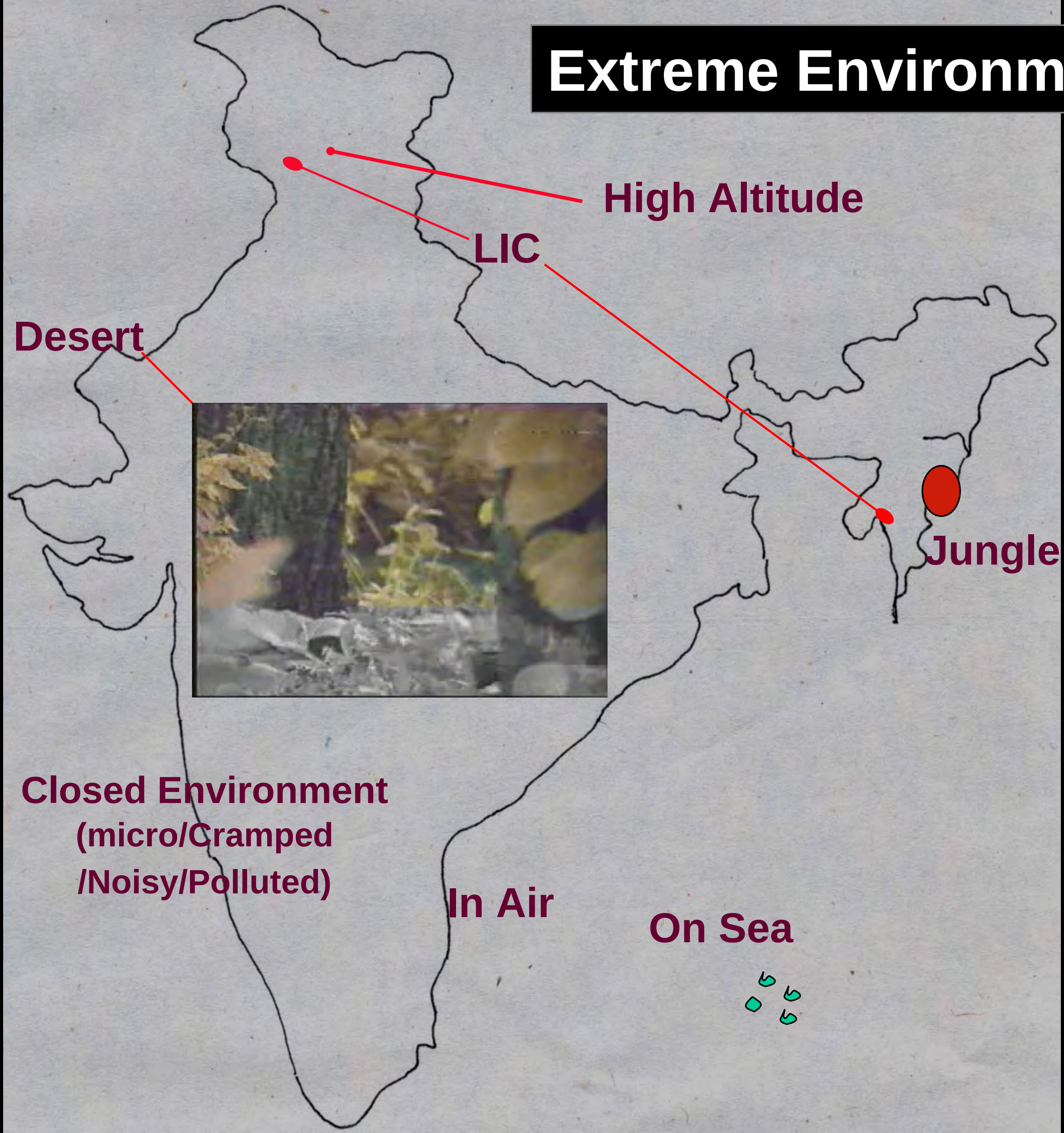

US ARMY
RDECOM
TECHNOLOGY DRIVEN.
WARFIGHTER FOCUSED.

LIFE SCIENCES IN SERVICE OF THE SOLDIER

बलस्य मूलं विज्ञानम्

Dr. W.Selvamurthy
Distinguished Scientist
Chief Controller R&D, DRDO

Extreme Environments



Mission of Life Sciences Labs

To enhance the ability of soldiers for

Lethality

Survivability

Efficiency

Sustainability

CANVAS OF LIFE SCIENCES R&D

SELECTION

MOTIVATION

FOOD

MAN-MACHINE INTERFACE

CLOTHING

TRAINING

PROTECTIVE EQUIPMENT

SHELTER

PERFORMANCE ENHANCEMENT

HEALTH

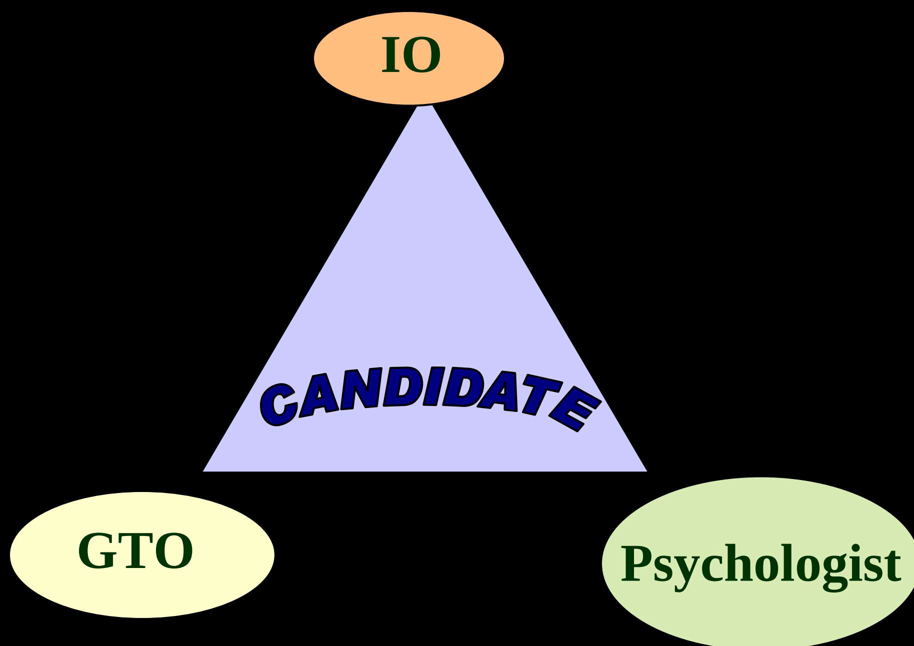
Personnel Selection

Selection Standards

- Physical
- Physiology
- Psychology

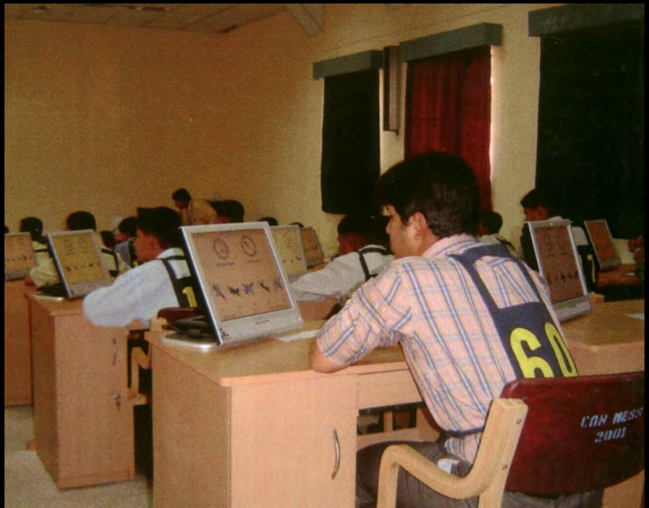
Officer Like Quality (OLQ)

Test
- Intelligence
- Personality
- Aptitude



PERSONNEL SELECTION

- ➢**Selection Procedure**
- ➢**Trade Allocation**



HIGH ALTITUDE OPERATIONS

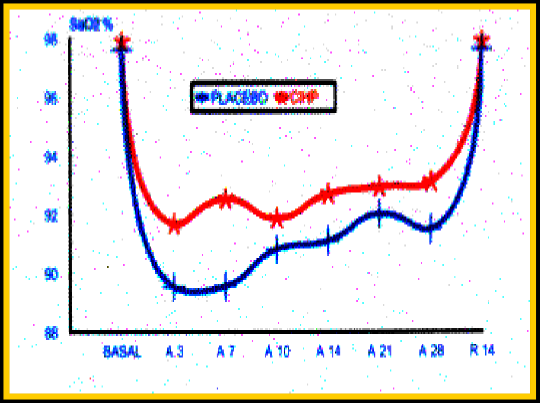
DRDO Developed Procedures in use

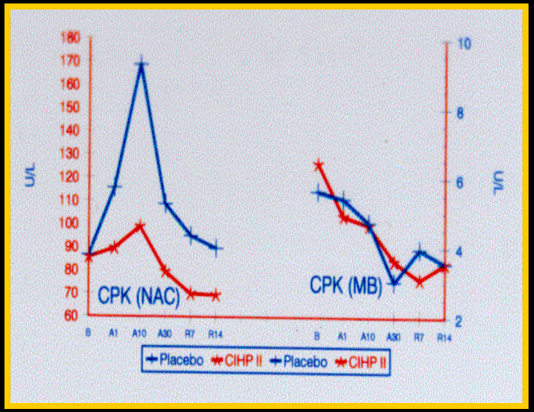
- **Staging of acclimatisation**
- **Tenure of posting**
- **Physical Efficiency & Load Carriage**
- **Nutrition & Clothing**
- **Enhancing performance**

INDIAN SYSTEMS FOR SOLDIERS

Yoga

CIHP





PROTECTIVE EQUIPMENT

Life Support System

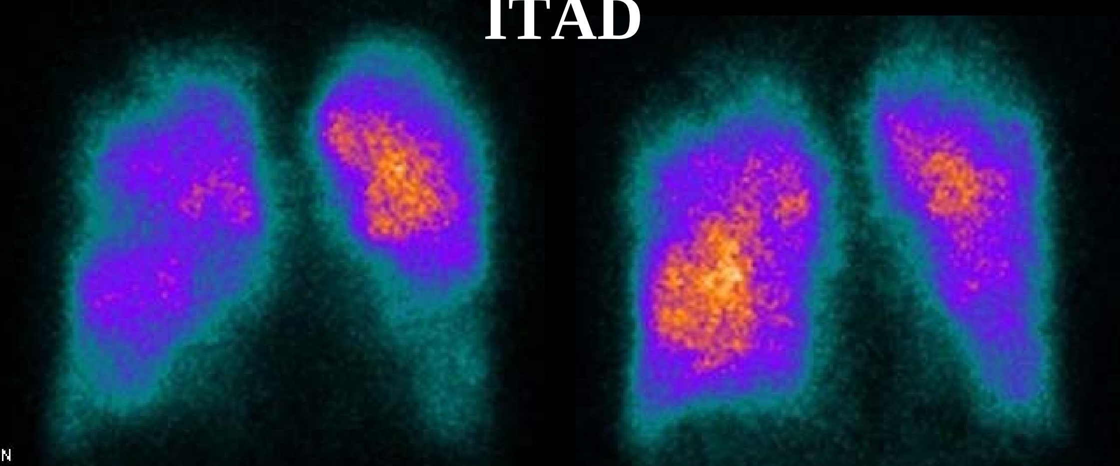
HAPO Bag

Improved HAPO Bag

Future-Fuel Cell Driven

NITRIC OXIDE – OXYGEN THERAPY FOR HAPO

ITAD



Pre-therapy Scan

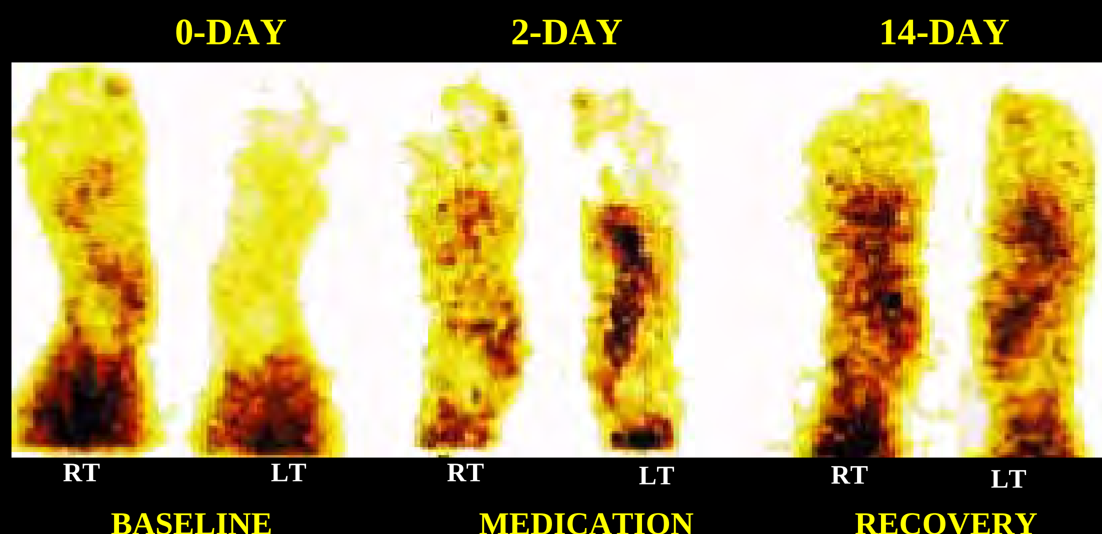
Post-therapy Scan

COLD INJURIES

New Treatment Modality:

Pentoxyphylline, Aspirin &Vitamin C

- **Rewarming – Tea Decoction Medium (37º – 41º C)**
- **Aloe Vera Cream**



HEATING GLOVES AND SOCKS

Biodigester

60 Units functional at Siachen Sector

Combat Free Fall

LIVE JUMP TRIALS FROM 30,000 FT

DESERT OPERATIONS

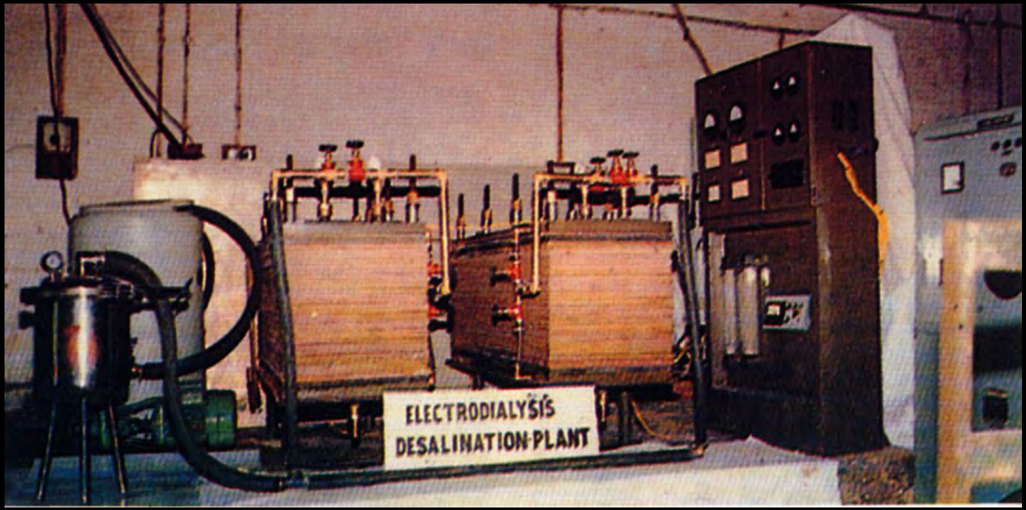
PELTIER Effect

Thermoelectric Cooling Suit

- **Work-Rest Schedule**
- **Ergogenic drink**

VORTEX TUBE TECHNOLOGY

Provision of Potable water

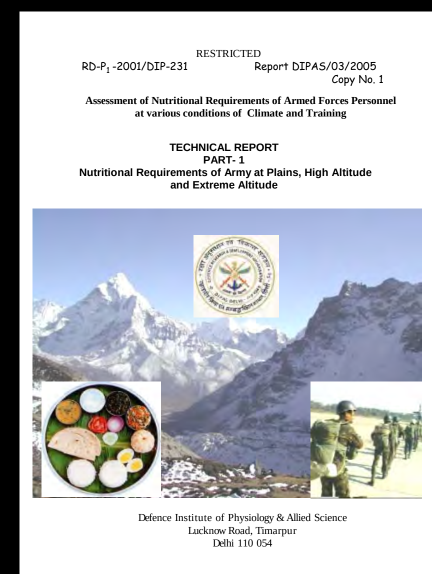


Water De-salination Plant

Iron Removal Unit

NUTRITIONAL REQUIREMENTS OF INDIAN ARMED FORCES

- **DIFFERENT CLIMATIC & OPERATIONAL CONDITIONS**
- **Calorific Requirements**
- **Ration Scales (N=18) Formulated by DRDO is in Vogue**
- **Composition**
- **Food Supplements**



RESTRICTED

RD-P_1 -2001/DIP-231 Report DIPAS/03/2005

Copy No. 1

Assessment of Nutritional Requirements of Armed Forces Personnel at various conditions of Climate and Training

TECHNICAL REPORT
PART- 1
Nutritional Requirements of Army at Plains, High Altitude and Extreme Altitude

Defence Institute of Physiology & Allied Science
Lucknow Road, Timarpur
Delhi 110 054

FRESH FOOD

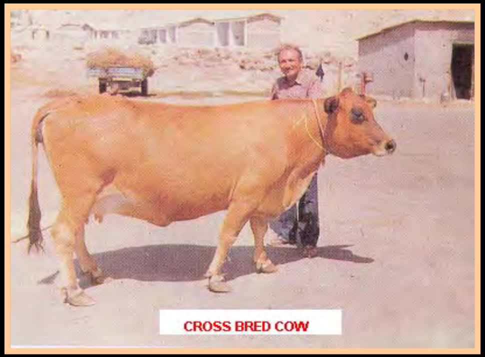
52% of Vegetables requirement in Ladakh region met by local cultivation based on DRDO Agro-technologies

Fruit - New varieties

Cultivation of Medicinal plants

Dairy- Breed improvement for yield of milk

- Suitable breed of sheep - Broiler Sheep.



Embryo Transfer Technology

Transgenics - Vegetables

- Resistance to cold
- Osmotin gene integration

PROCESSED FOOD

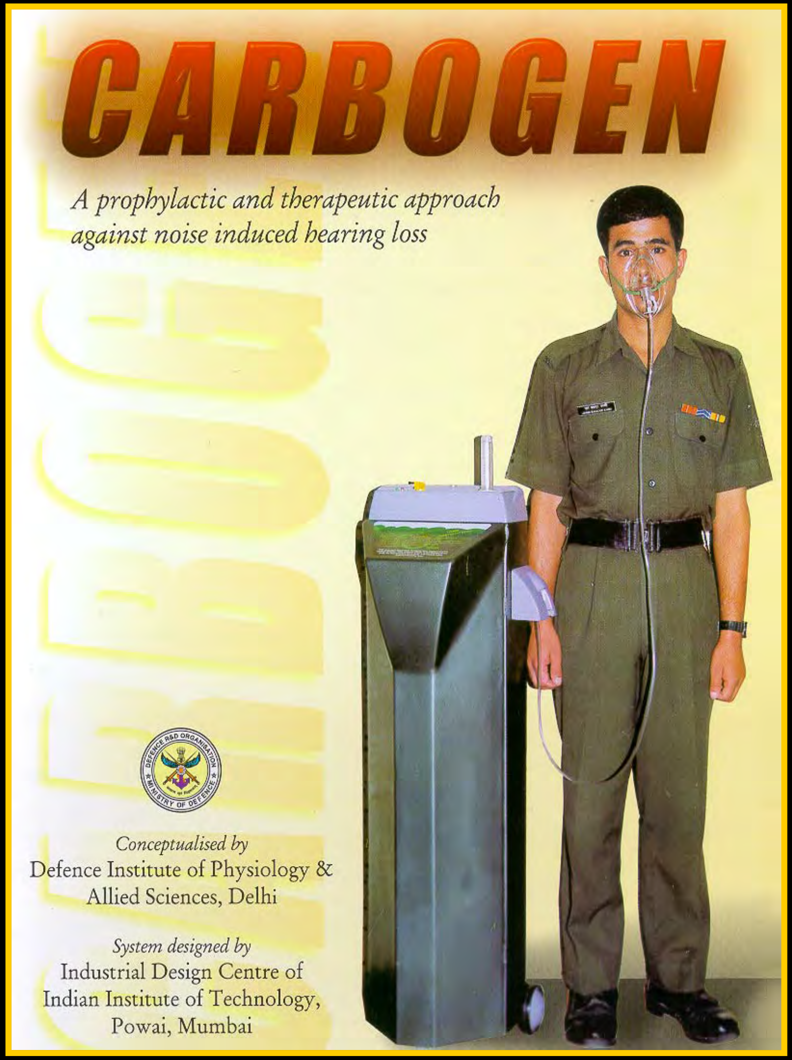
Ready to Cook & Reconstitute
Preserved fresh fruits &vegetables
One Man Compo Pack
Mini Compo Pack

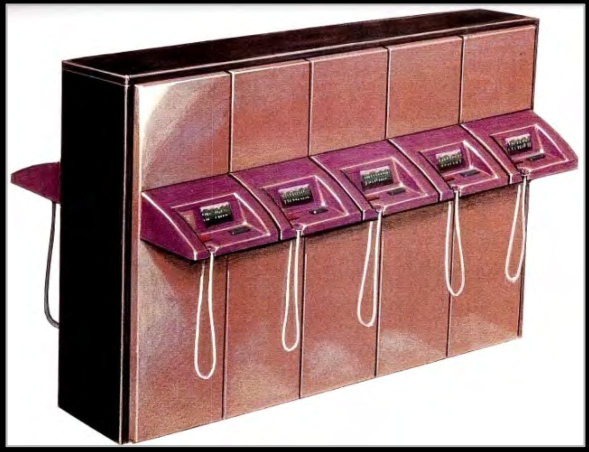
Ready to Eat
Emergency Survival Ration
Emergency Flying Ration

Appetizers for high altitude
Nutraceuticals & Functional foods

Self heating food containers
Active/Smart/High barrier package

Carbogen –Protection against Noise





Man-Machine Interface

PROTECTIVE EQUIPMENT

Haemodynamically Activated Anti G Suit

NBC Protective Technology

RVD

Autoinjector

NBC Suit

Mk IV

PDK

Portable GC

NBC Canister

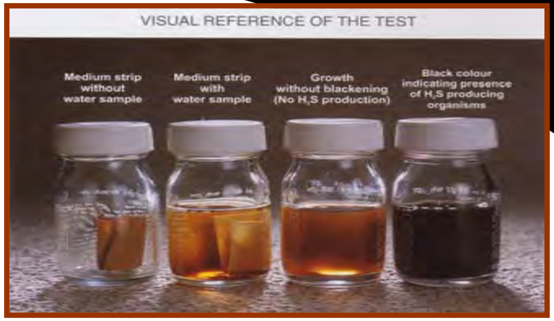
First Aid Kit

Recce Vehicle

Shudika

HEALTH CARE

Infection Imaging



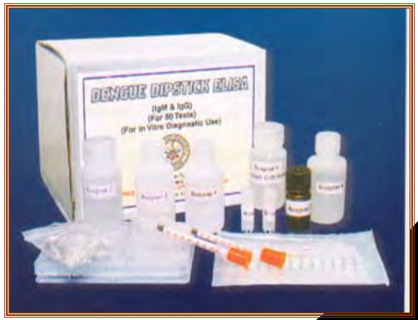
Water Testing

Malaria

Typhoid

Plague

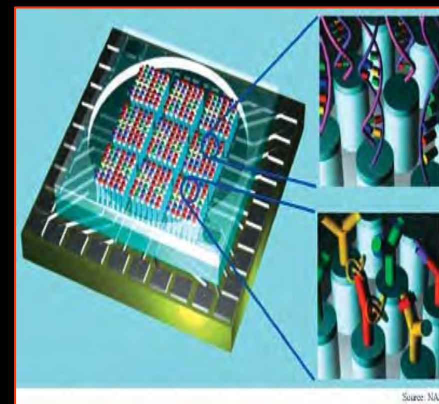
Leptospirosis



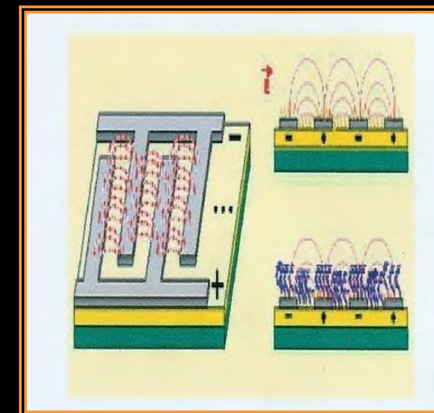
Dengue

BIOLOGICAL AGENT ISOLATION & DETECTION

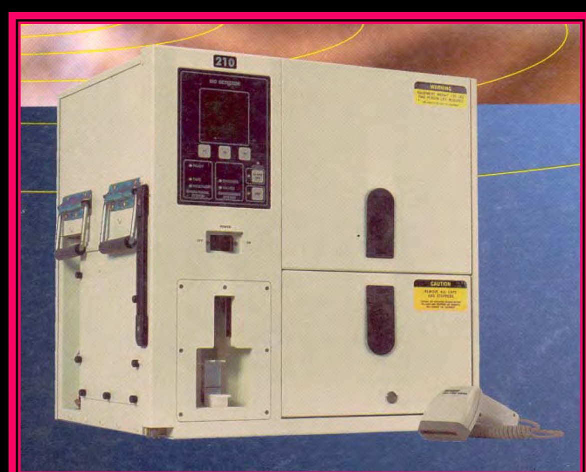
- **Repository of BTW Agents**
- **CNT Based Biosensor**
- **Laser Based Detection System**
- **Microarray Based Detection**



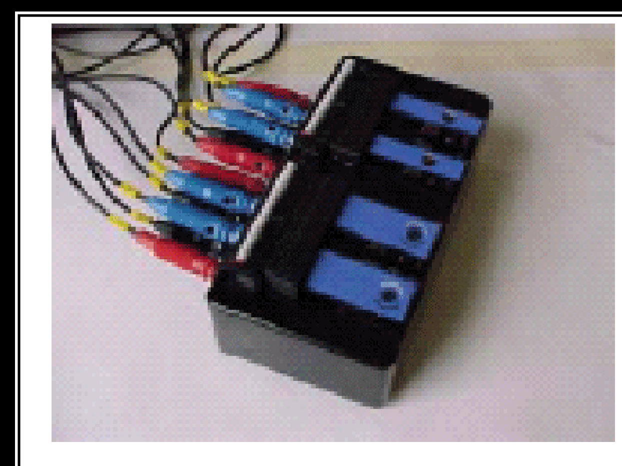
CNT ARRAY BIOSENSOR



NEMS Based Bio-sensors



IMMUNOASSAY BASED BW DETECTOR



IMMUNO ASSAY SENSOR ARRAY

Cloth impregnated with repellent against Leech

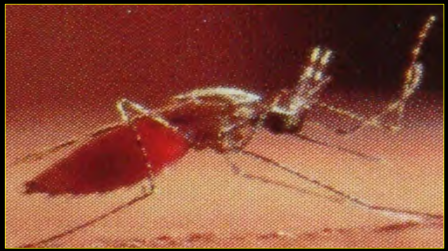
Synthetic & Herbal

Timur Oil & Bottle Brush Oil

Protection against simulids

Repellents DEET & DEPA

Yellow Garments - Least attracted



Herbal medicine

- Skin Diseases

- Poisoning

Malaria Control

Personal protection

- Herbal Repellents, Vaporizer

Herbal medicine against P. falciparum

Mobile Clinic & Vaccine

Supplied to Army

HYPERBARIC OXYGEN CHAMBER

Indident

Dental Implant System

Institute of Nuclear Medicine & Allied Sciences,
DRDO, Min. of Defence, Delhi
&

Indident Medical Devices
(A Health Care Unit of GEPL)
Faridabad, India

Psychological Warfare

JATROPHA FOR BIODISEL

AT MILITARY FARM SECUNDERABAD

JATROPHA NURSERY

JATROPHA PLANTATION

Global Soldier

Future War

- Low intensity conflict
- Terrorism
- Extra-territorial warfare
- Biological & Chemical warfare
- Natural & Technological disaster
- Economy & Trade
- Energy & Water
- Peace keeping (overseas) & Joint exercises

Global Soldier

S&T Initiative

- EW – IW – PW Defence
- Non-lethal weapon system
- Warrior support (Soldier-as-a-System)
- Micro and Nano-technology
- Surveillance & Reconaissance
- NBC Radar
- Sensor mounted platform

Global Soldier

Human Capital Perspectives

- Profiling & Selection
- Training & Trade allocation
- Nutrition & Life support
- Organizational & Cultural adaptation

Global Soldier

- Global initiative
- Consortium approach
- Networking
- Resource & Knowledge sharing

“AFTER ALL,

IT IS THE MAN WHO MATTERS”

Defence Research and Development Organisation (DRDO)

Shaping technology for tomorrow while securing the frontiers of today

BRIDGING THE GAP
1958 DARPA 2008
50 YEARS
POWERED BY IDEAS

Defense Advanced Research Projects Agency PACOM S&T Conference

Dr. Anthony J. Tether
DARPA Director

DARPA Technical Offices

Director, Tony Tether
Deputy Director, Bob Leheny

Tactical Technology
Stephen Welby
Steve Walker, Dave Neyland

Air/Space/Land/Sea Platforms
Unmanned Systems
Space Operations
Laser Systems
Precision Strike

Strategic Technology
Barbara McQuiston
Larry Stotts, Brian Pierce

Space Sensors/Structures
Strategic & Tactical Networks
Information Assurance
Underground Facility Detection & Characterization
Chem/Bio Defense
Maritime Operations

Defense Sciences
Bob Leheny (Acting Director)
Leo Christodoulou

Physical Sciences
Materials
Biology
Mathematics
Human Effectiveness
Bio Warfare Defense

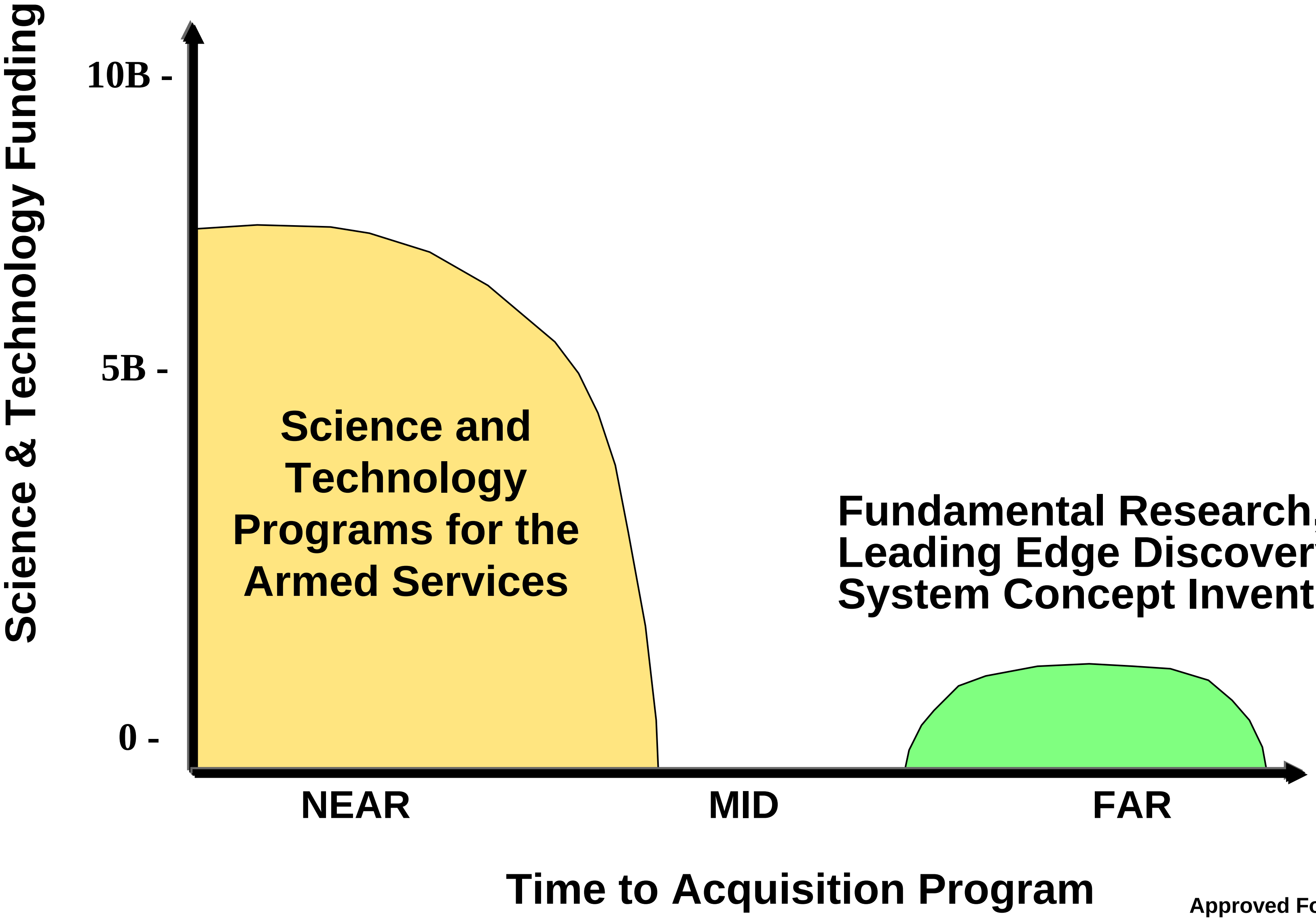
Information Processing Techniques
Chuck Morefield
Charlie Holland, Mark Davis

Cognitive Systems
Command & Control Systems
Computer Language Translation
High Productivity Computing
Sensors & Processing

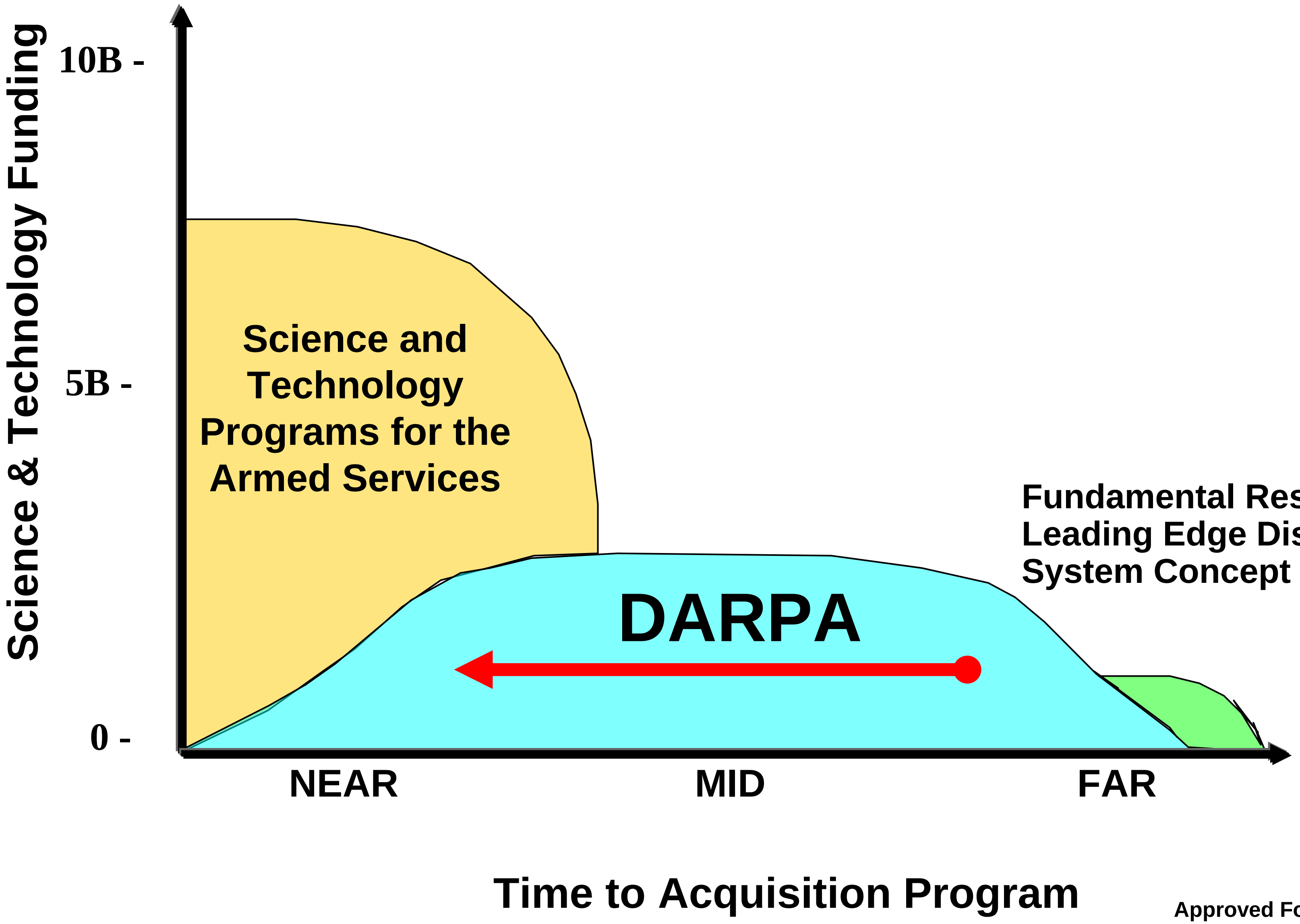
Microsystems Technology
Greg Kovacs
Dean Collins

Electronics
Photonics
MEMS
Algorithms
Integrated Microsystems

DARPA Role in Science and Technology



DARPA Role in Science and Technology



DARPA Accomplishments

Approved For Public Release

50th Anniversary Movie

Future Icons

- Networks - Self-forming, Robust, Self-defending to enable true network centric operations
- Chip Scale Atomic Clock to replace communication devices' reliance on GPS time signal
- Real time language translation to replace linguists (Defense Language Institute, III → IV)
- Cognitive Computing to reduce workload
- High-productivity computing system – peta scale computer for important DoD applications
- Air Vehicles - Fast Access, long loiter
- Networked Sensors – Determine, track, and neutralize elusive threats, such as IED factories
- Alternative Energy Sources for military operations, such as jet fuel from plants
- Casualty care that dramatically increases survival rates past the golden hour
- Accelerate Development & Production of Therapeutics & Vaccines from 12+ years to 16 weeks or less
- Prosthetics to enable a Soldier's return to the unit without loss of capability
- Space capabilities to enable global military operations
- High Energy Liquid Laser Area Defense System as a penetration aid to replace stealth
- Submarines – reduce size and cost while maintaining existing capabilities

Key Areas

- Networks
- Language Translation
- Sensors
- Air Vehicles

Key Areas

- **Networks**
- **Language Translation**
- **Sensors**
- **Air Vehicles**

Military Operations Structure

Strategic Network

- Large backbone and infrastructure
- Provides information, resources, and sustainment connectivity

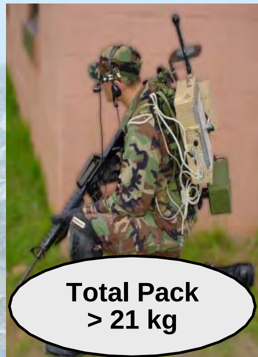
Bridge the Gap

Tactical Network

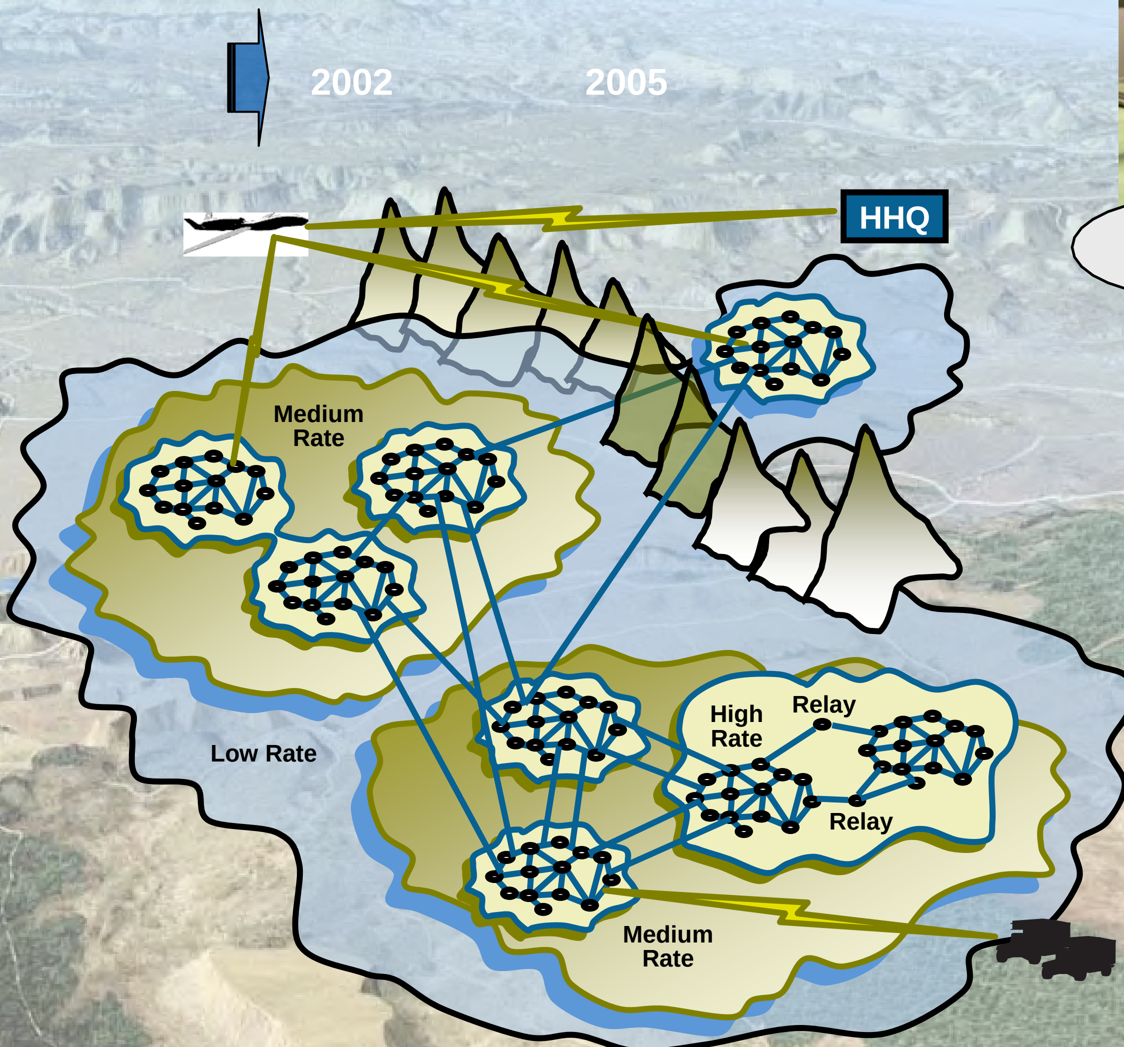
- Links effects to targets
- No infrastructure: cell towers, fiber, etc.

Self Forming Mobile Ad Hoc Networking

SUO-SAS
Phase 3 Prototype

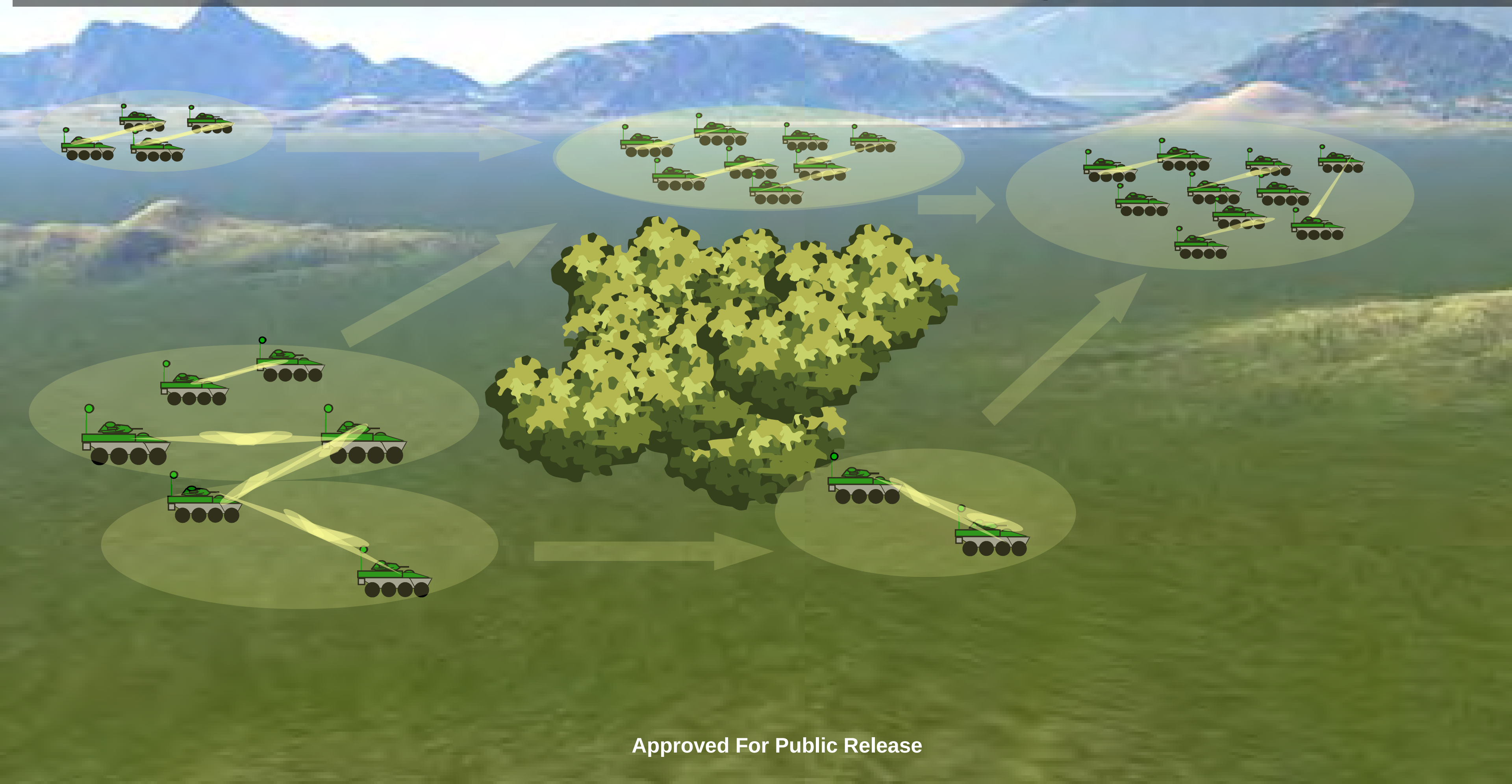


ITT Soldier Radio
(IRAD Funded)



Network Centric Radio System

Mobile ad-hoc network *dynamically* reconfigures during operations to *automatically* maintain network connectivity



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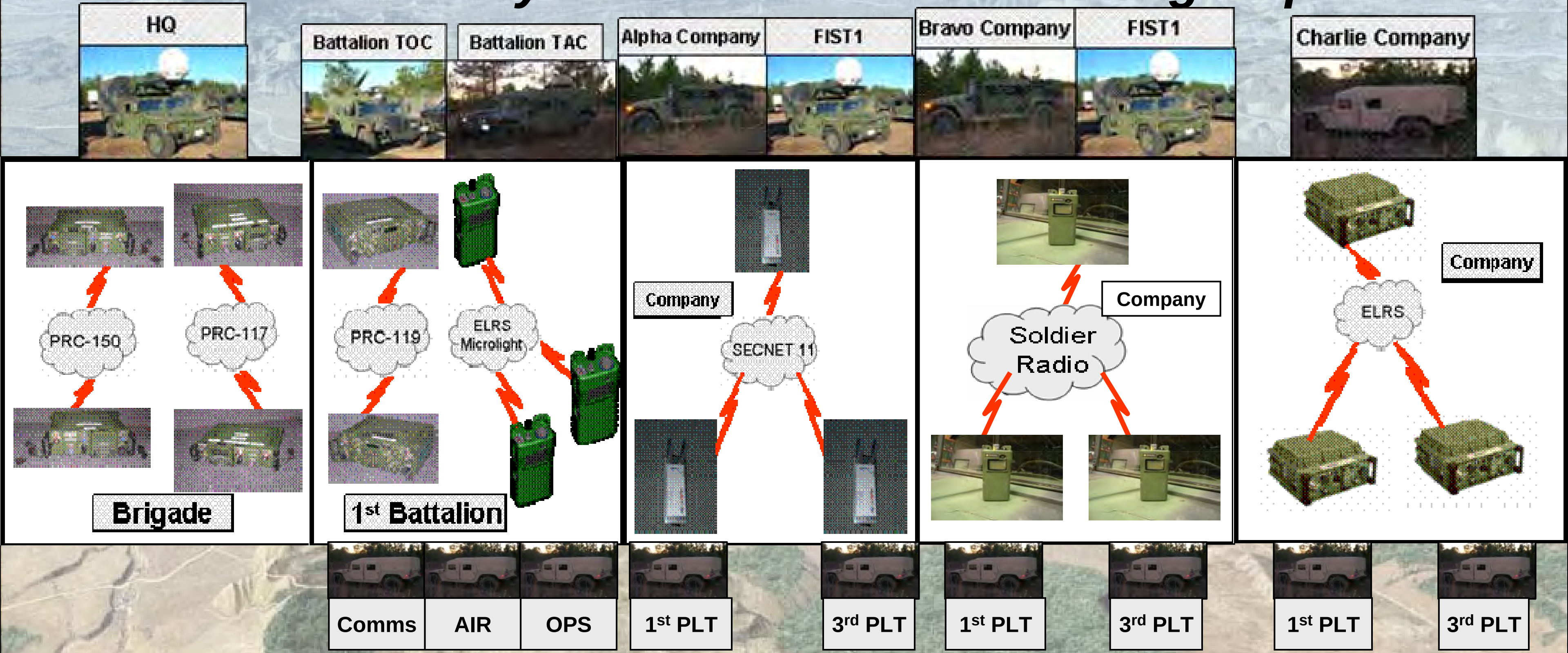
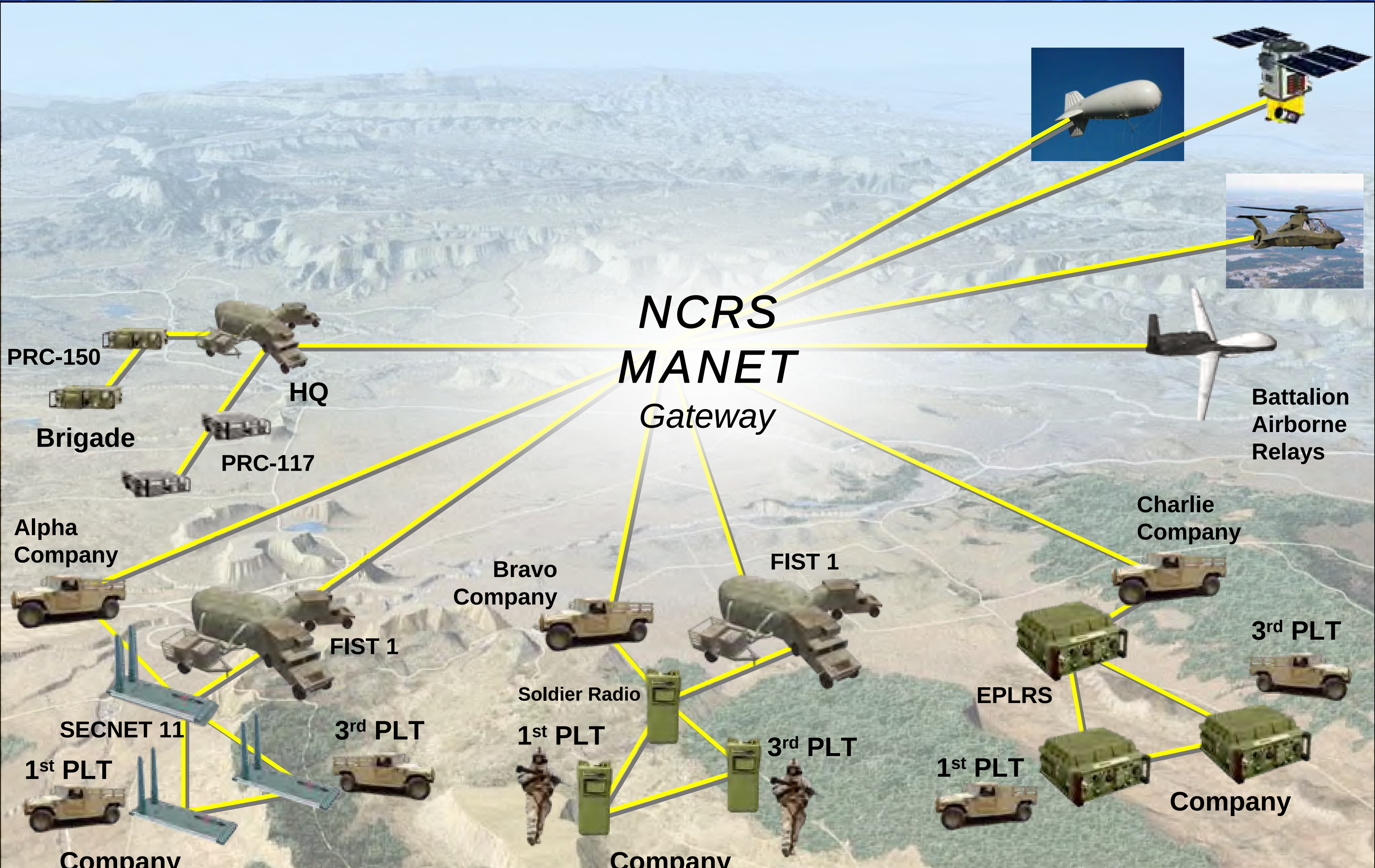
Challenge: Network Connectivity

- ***Individual units***
  - ***Different radio systems***
    - ***Can only communicate within the group***



Network Centric Radio System NCRS



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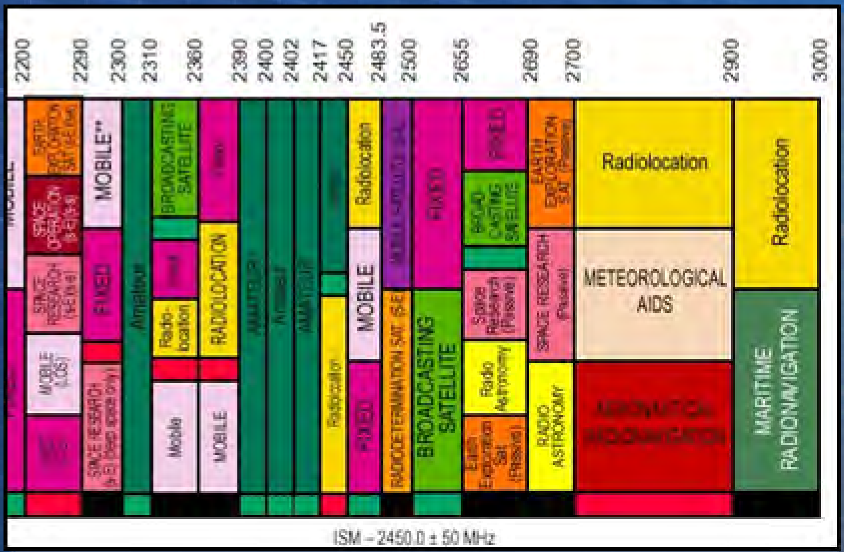
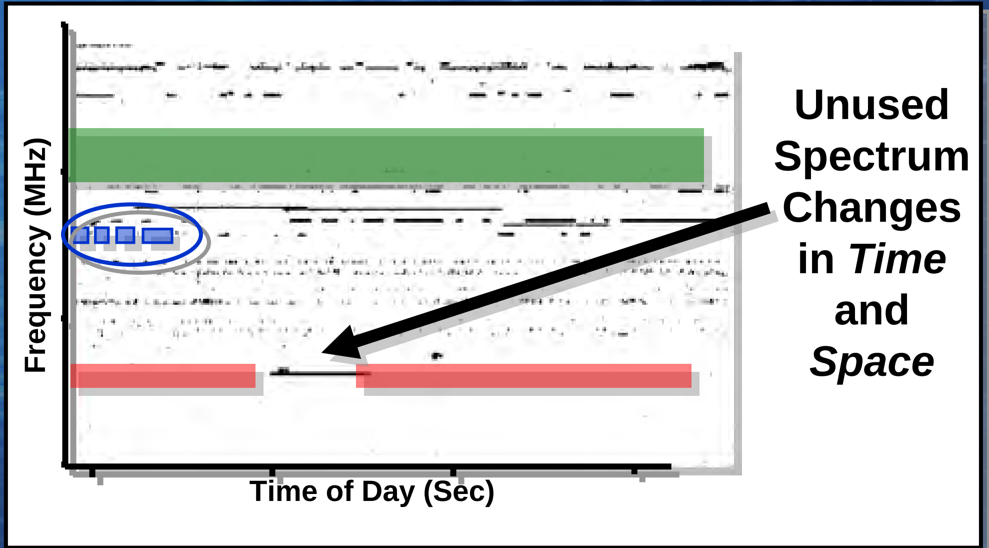
Dynamic Spectrum Access

LICENSED



100% Allocated

AVAILABLE



90-95% not being used!

Demonstrate Factor of 10 Increase in Spectrum Access

neXt Generation (XG) Communications

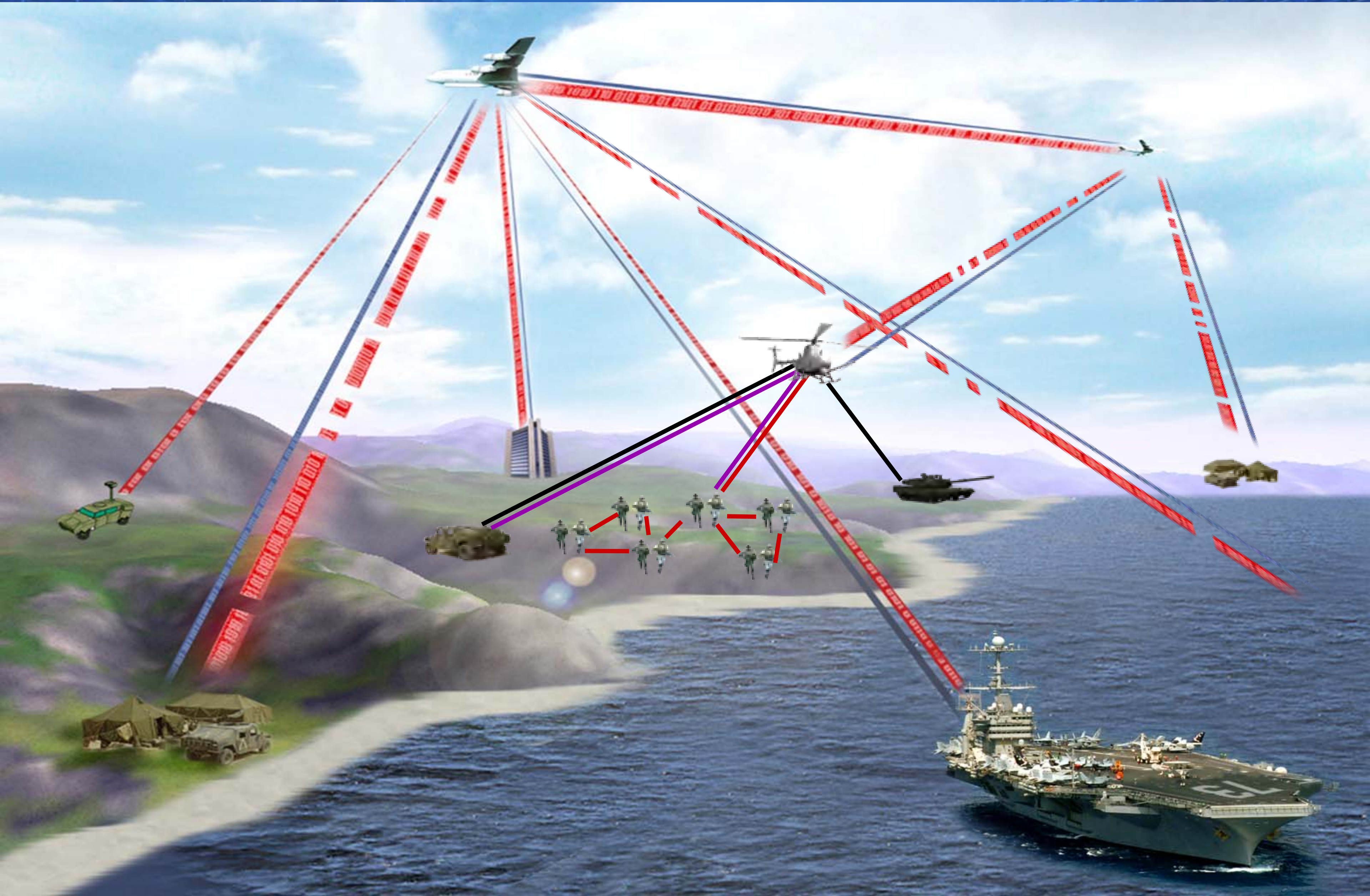
Wireless Network After Next Radio

Frequency	900 MHz to 6 GHz
Power	1W per Channel
Data Rate	Adaptable to10 Mbps
Range	Up to 3 KM for Voice, 30 KM with Relay

- **Wide Frequency Coverage**
- **Dynamic Spectrum Access**
- **MIMO -** *Reliability in Urban Environments*
- **Multiple Channels (4)**
- **Dynamic Security Associations**
- **Interoperability -** *legacy Wired*

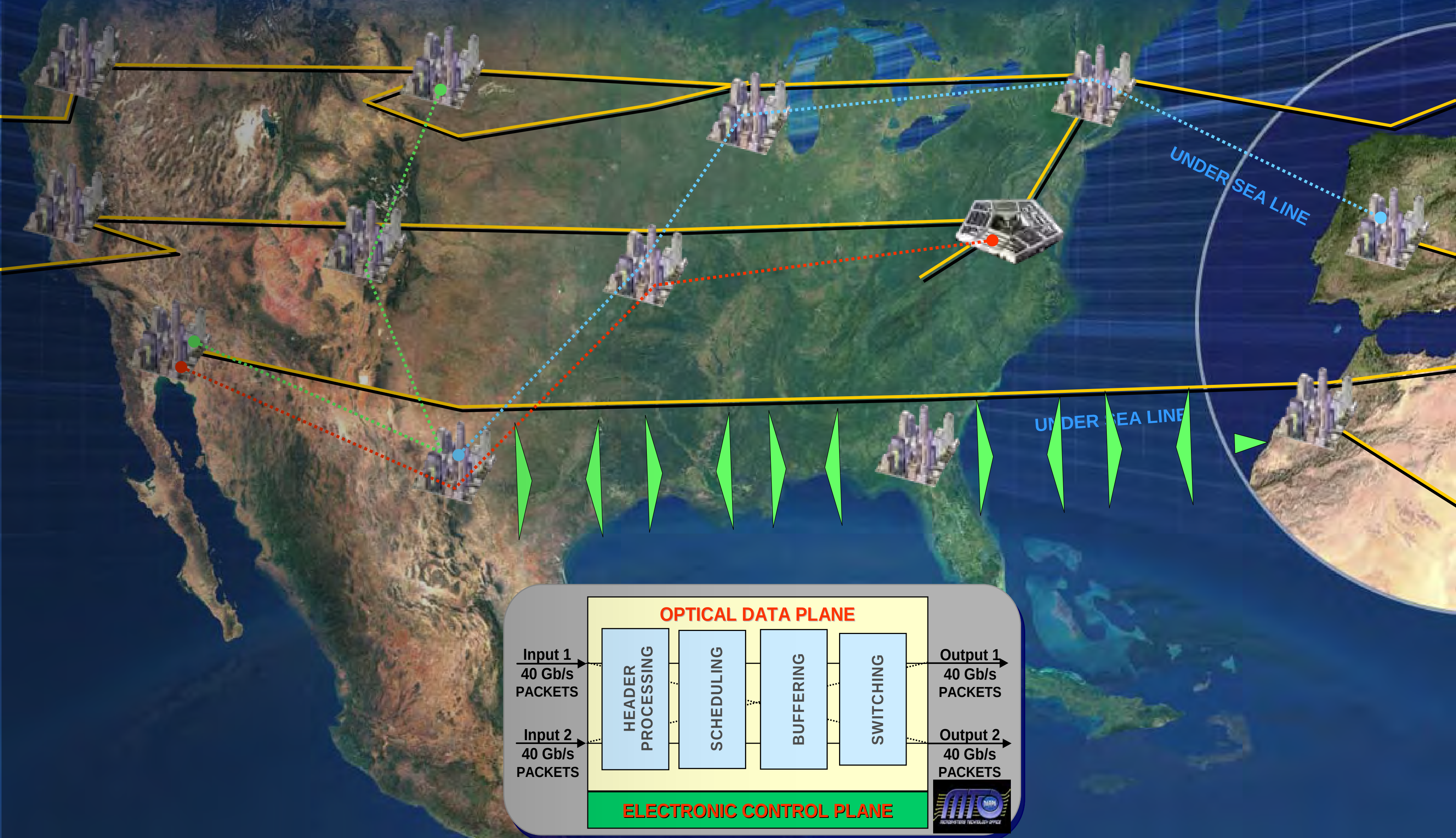
$500 per Unit

Combined Optical RF Communications



Next Generation Core Optical Networks

Goal: Increase Optical Network Throughput



Key Areas

- Networks
- **Language Translation**
- Sensors
- Air Vehicles

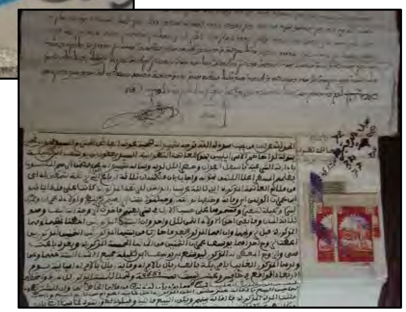
Language Translation

Speech

TRANSTAC

Handwriting

MADCAT



Media


الحياة

من اجل اعادة نظر بالتاريخ الليبي

الدستور والشبح البديل

GALE

Speech

One-way voice translator

Map English to pre-programmed foreign phrases

Simple one-way translators currently deployed in Iraq and Afghanistan

“Please open the trunk”

Voice and touchpad-activated handheld

رجاءً إفتح الصندوك

Future capability: Two-way voice translator

Spontaneous speech under real-world conditions

“Where do you live?”

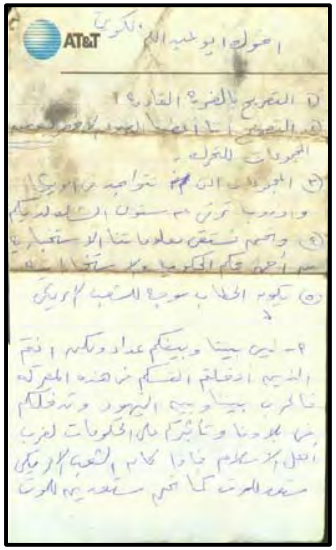
“Across the street.”

Integrated laptop, microphone, remote control, and loudspeaker

وين تعيش؟

عبر الشارع

Handwriting



Summary of Document:

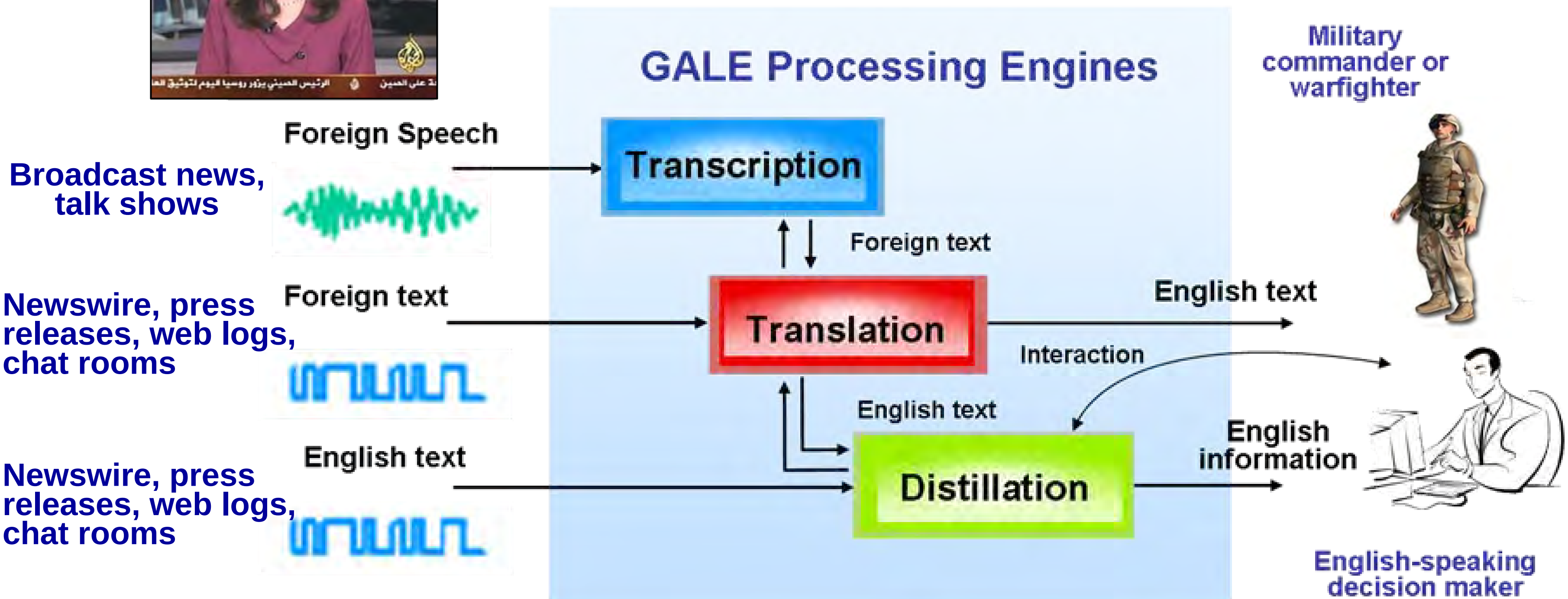
A letter from Abu ‘Abullah Al-Kuwaiti outlining the next attack against the Americans, and issuing a statement to the Americans to let them know of their fighters’ readiness to kill hundreds of thousands with their nuclear and biological arsenal.

(Another letter dated November 10, 2001 from Abu Yousef Al-Qannas to Khallad Al-Kuwaiti informing him that he is moving north by orders of the Sheikh (Osama Bin Laden), and that he will join him in a week’s time.)

- **Exploit time-critical information**
- **Convert captured “documents” into readable, searchable English**

Global Autonomous Language Exploitation

Foreign media translation



Input Languages:
- **Arabic**
- **Chinese**

From "Media" to User with
No Intervening Human Linguists

Broadcast Media

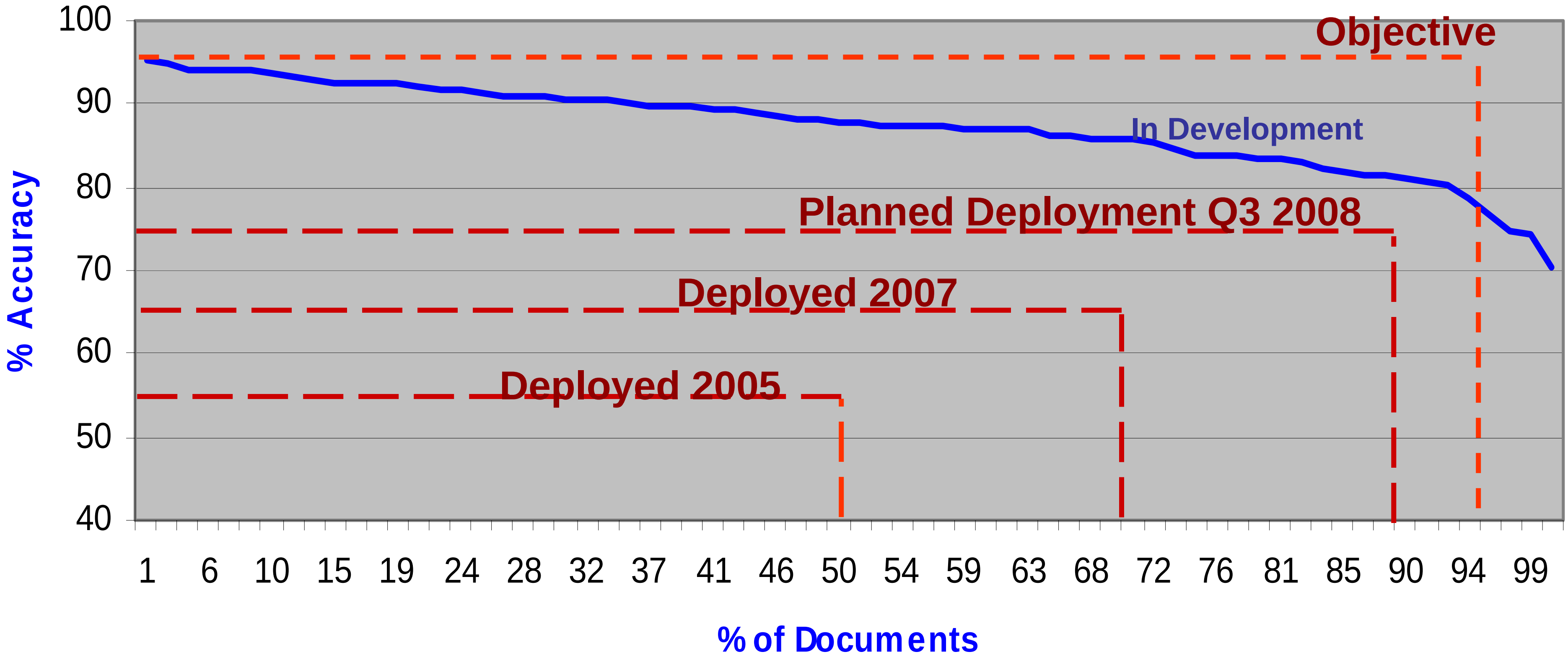
3 Automatic **translation** of Arabic transcript

2 Automatic **transcription** of Arabic speech

1 Real-time streaming video (~5 min delay)

Deployed to 15 Locations

Arabic Newswire Accuracy



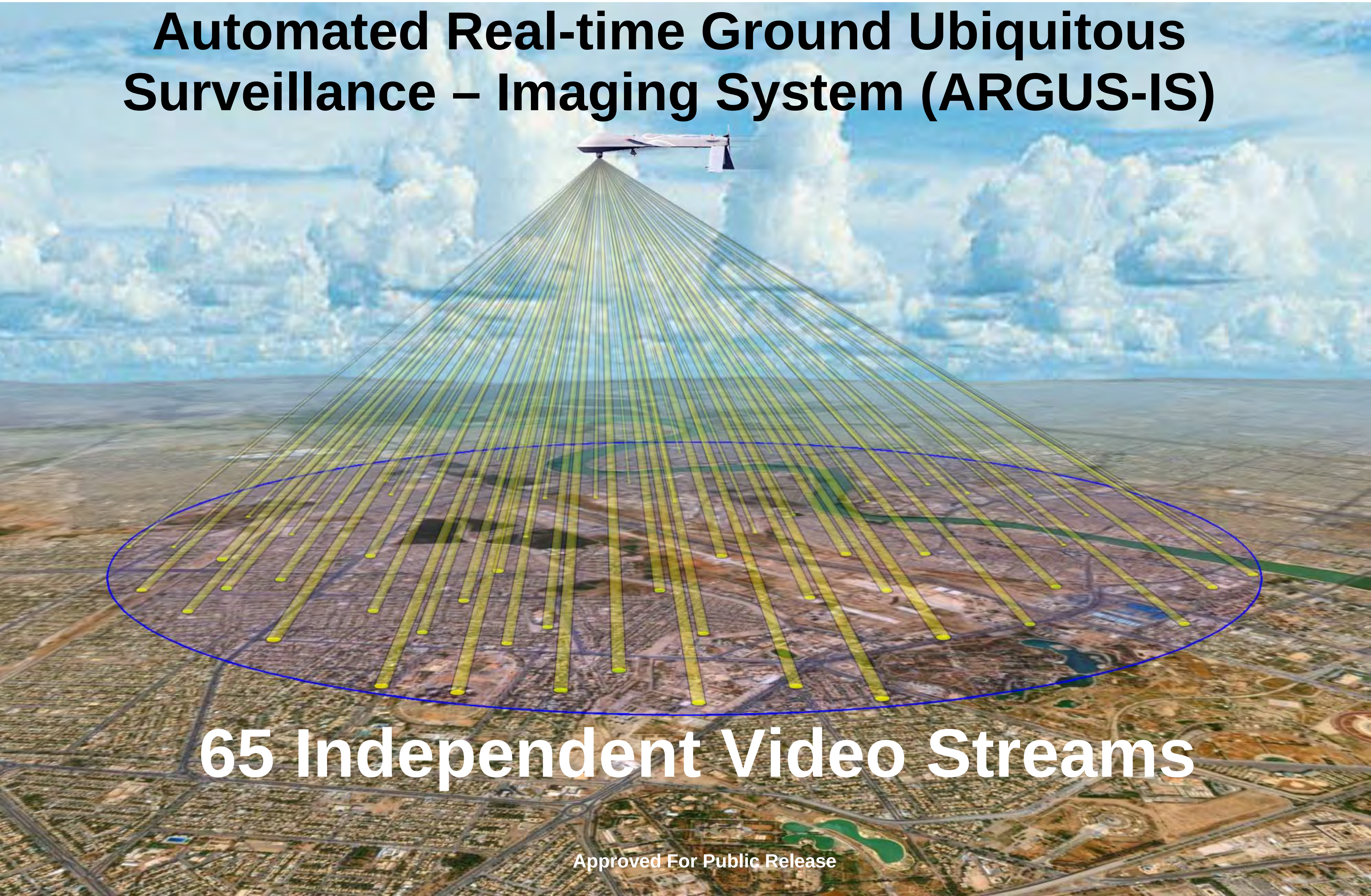
Key Areas

- Networks
- Language Translation
- **Sensors**
- Air Vehicles

Foliage Penetration Reconnaissance, Surveillance Tracking and Engagement Radar

Predator Today

Predator Tomorrow



Key Areas

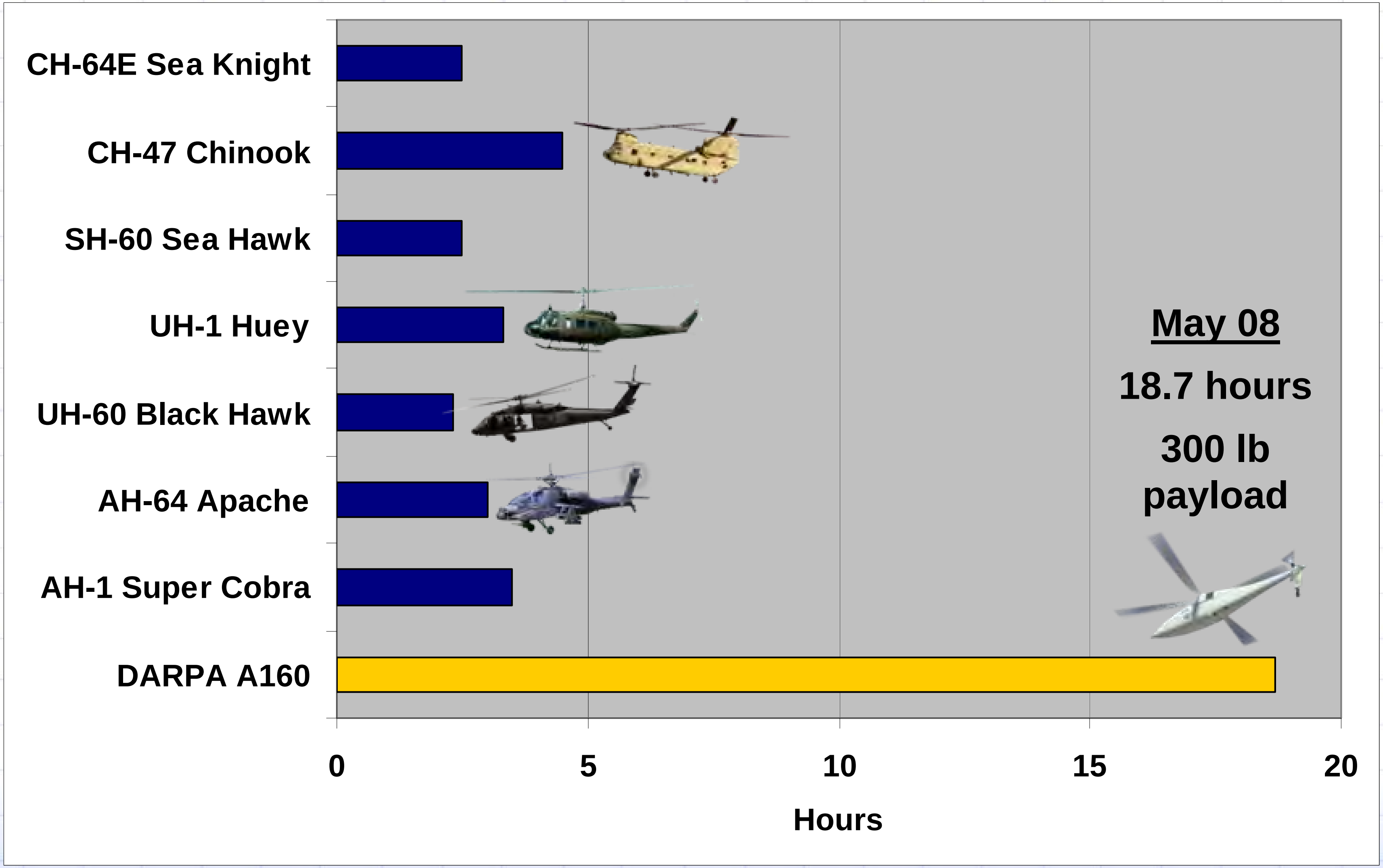
- Networks
- Language Translation
- Sensors
- **Air Vehicles**

A160 Rotorcraft

Long endurance, high altitude capable, VTOL UAV

- 18 - 20 hours endurance with 300 lb payload
- Flight capable to 30,000 feet
- 2,200 nautical mile range
- Airspeeds to 140 knots

A160 Endurance



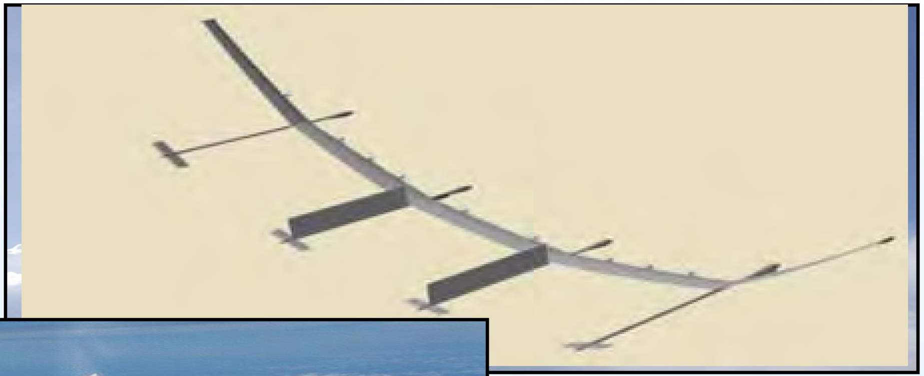
Autonomous Air Refueling

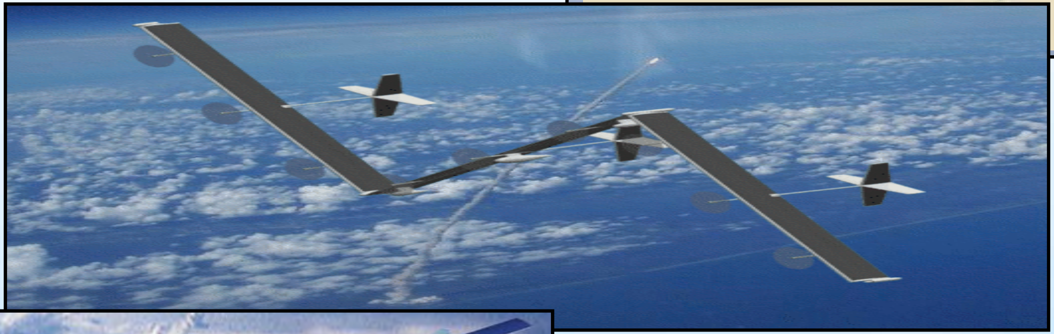
Worlds first autonomous aerial refueling engagement

30 August 2006 – Edwards Air Force Base, California

Vulture – A Five Year Aircraft

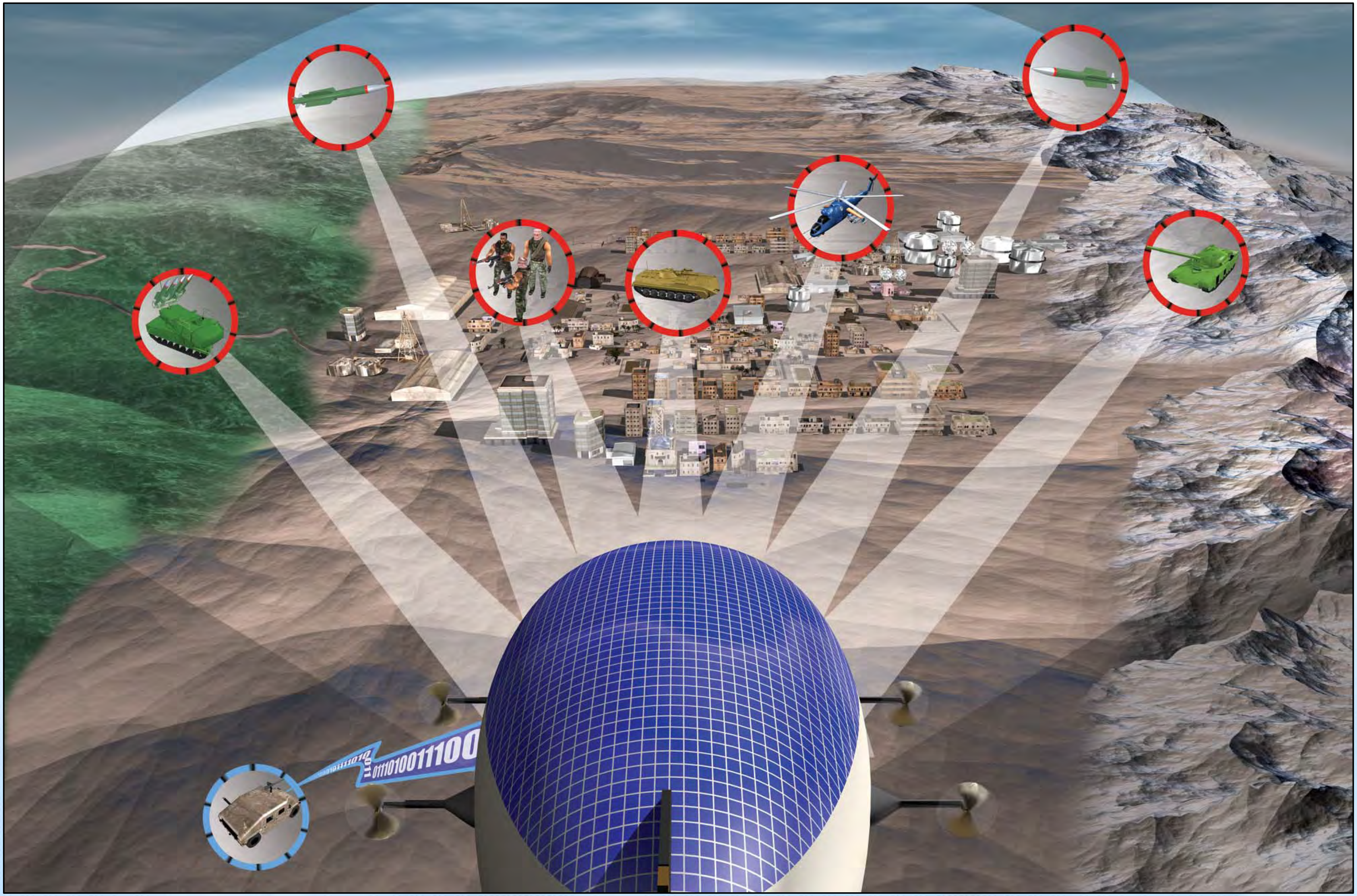
- Spacecraft-like reliability
- Environmental power



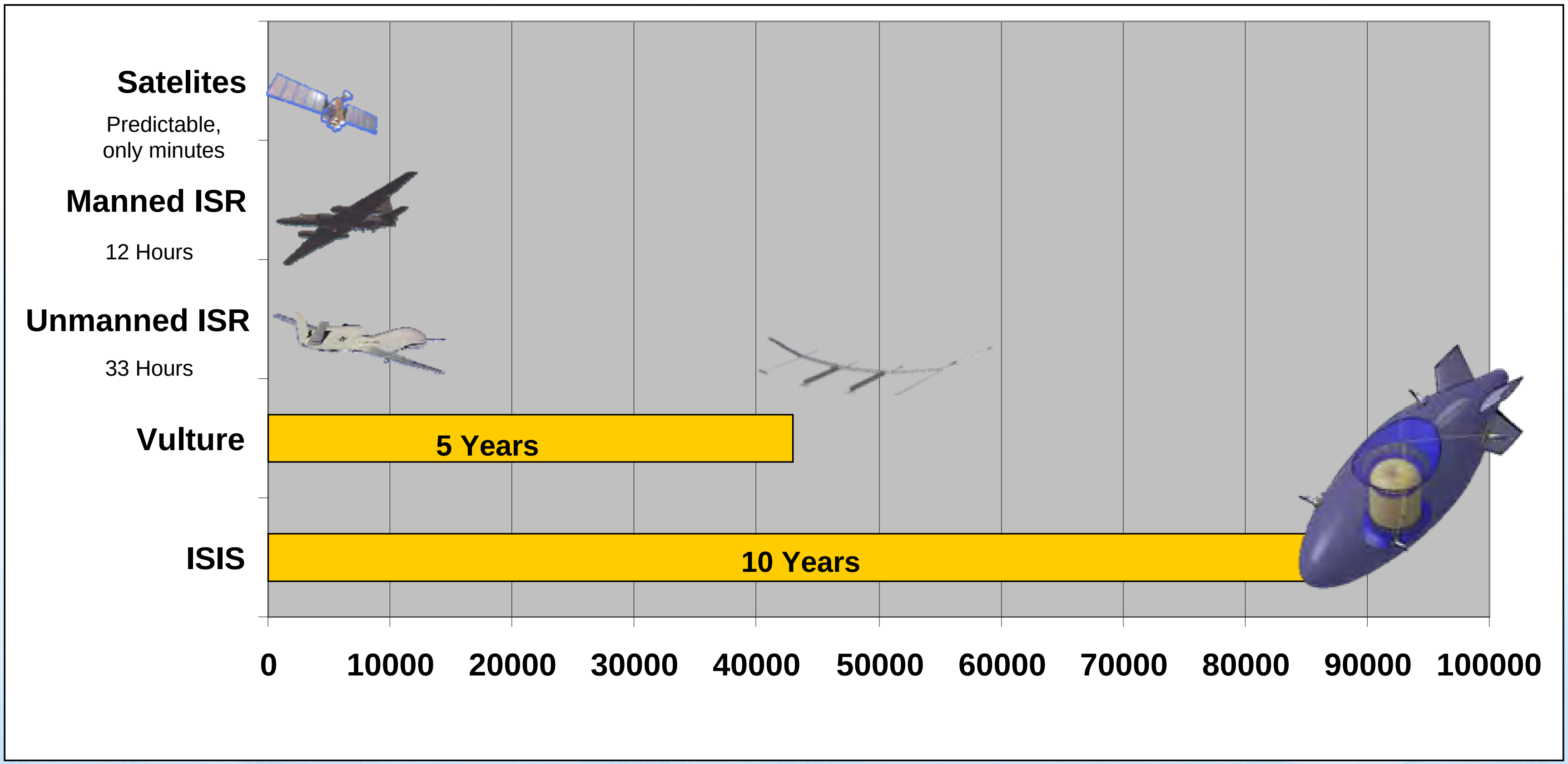


Integrated Sensor is Structure (ISIS)

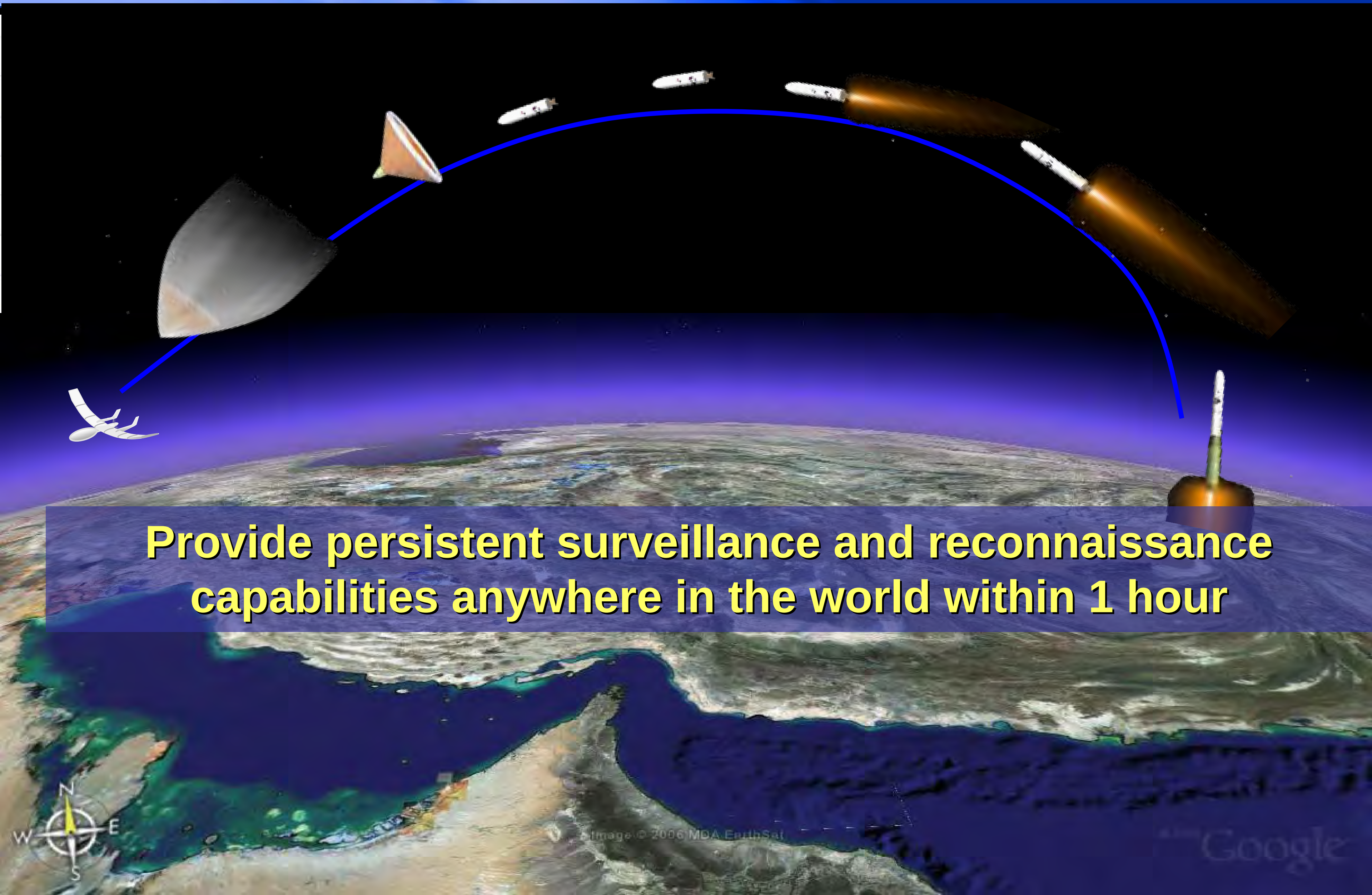
Persistent ISR for ALL moving targets across the battlefield



Persistent Intelligence, Surveillance, and Reconnaissance (ISR)



Rapid Eye

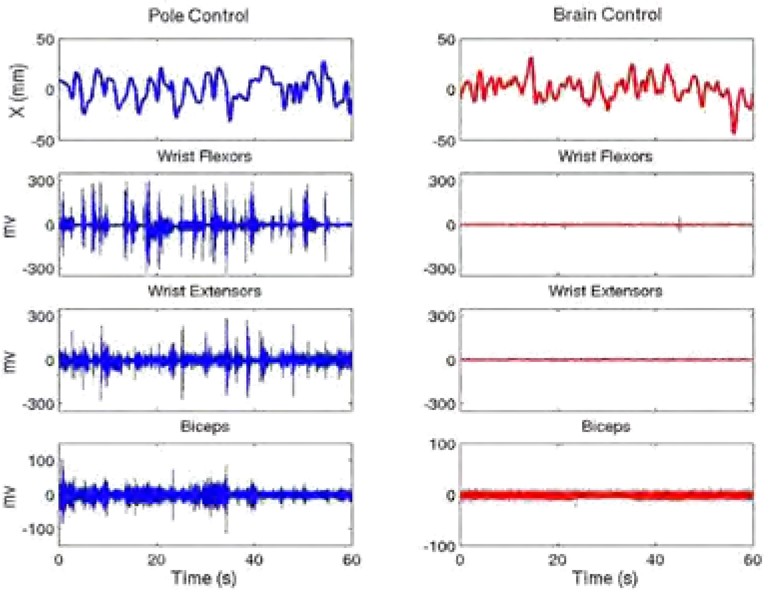


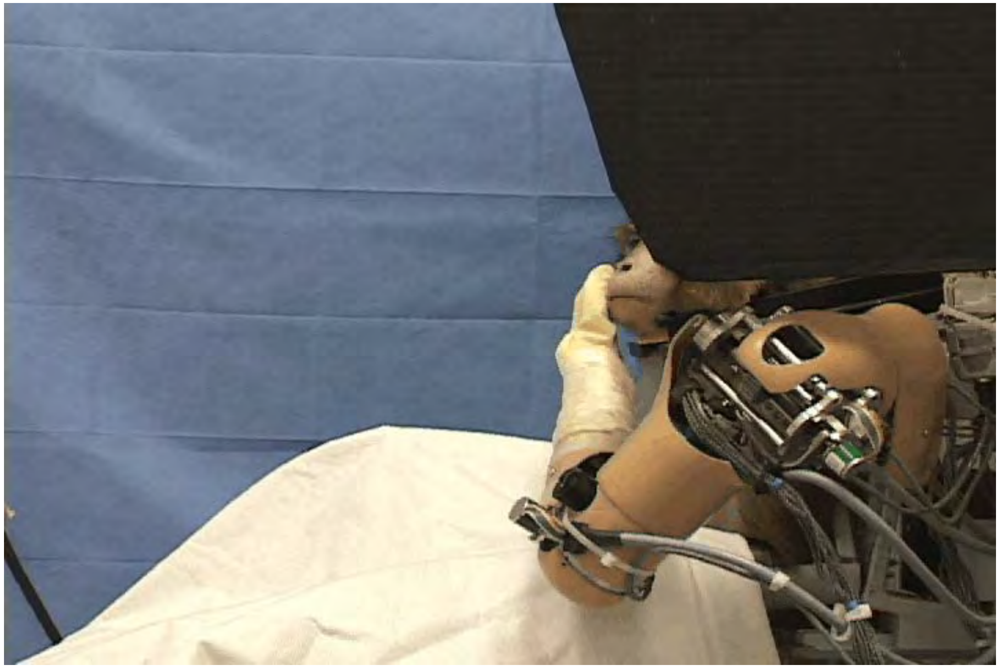
Provide persistent surveillance and reconnaissance capabilities anywhere in the world within 1 hour

Big Deal

Understanding the Language of the Brain

Commands to the Arm Muscles





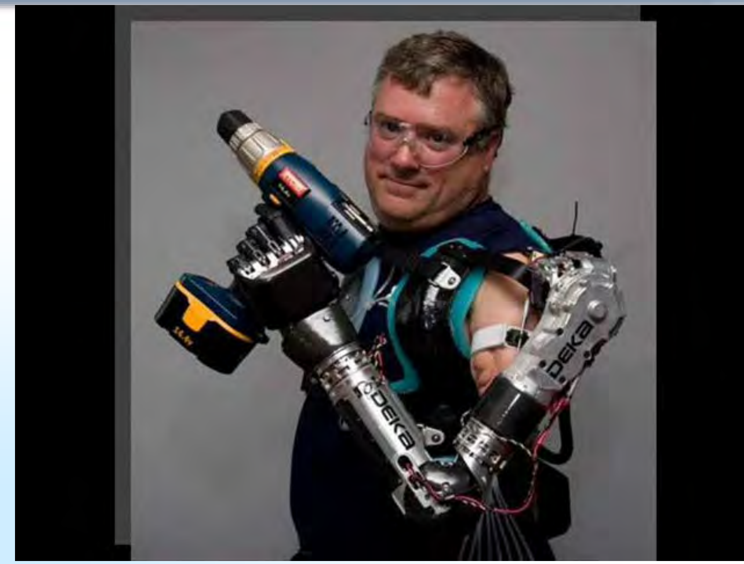
Revolutionizing Prosthetics

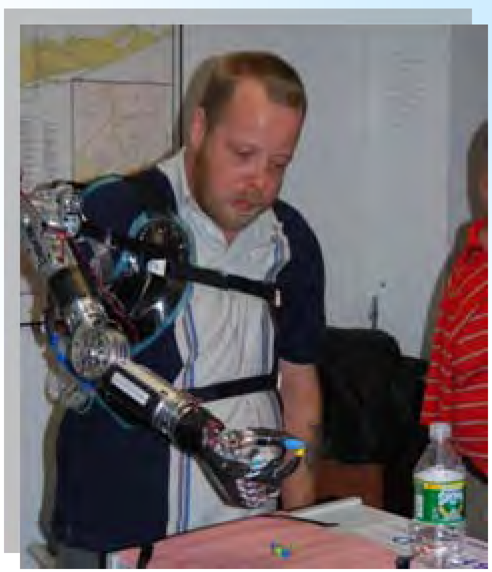
State of the Art: Utah arm

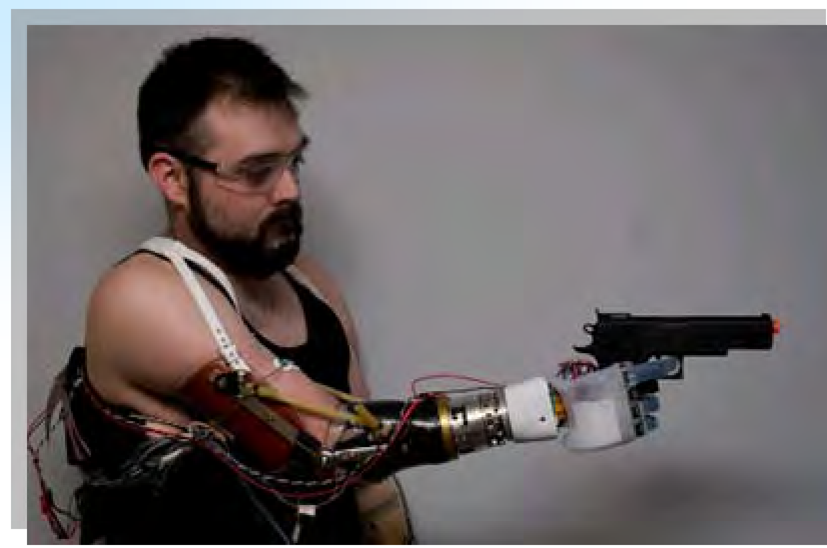
Mechanically Superior

Neurally Integrated

2007
Mechanically Superior Arm







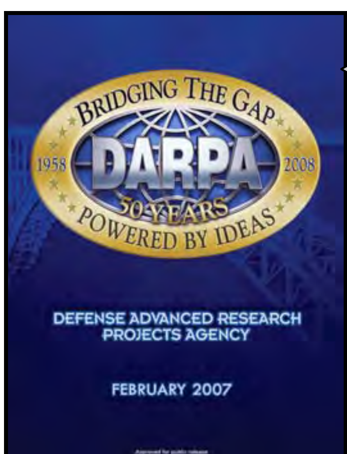
Revolutionizing Prosthetics

Working with DARPA

DARPA Always Interested in Innovative Ideas

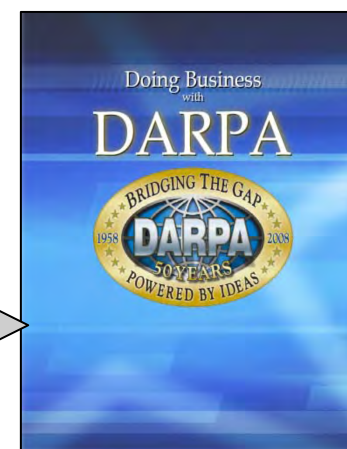
- Solicitations: **www.darpa.mil**
- Talk to DARPA Program Managers
- Become a DARPA Program Manager

Videos on the DARPA Website
http://www.darpa.mil/body/pms_video.html



DARPA Strategic Plan
www.darpa.mil/body/mission.html

Doing Business with DARPA
http://www.darpa.mil/body/dobdar.html



BRIDGING THE GAP

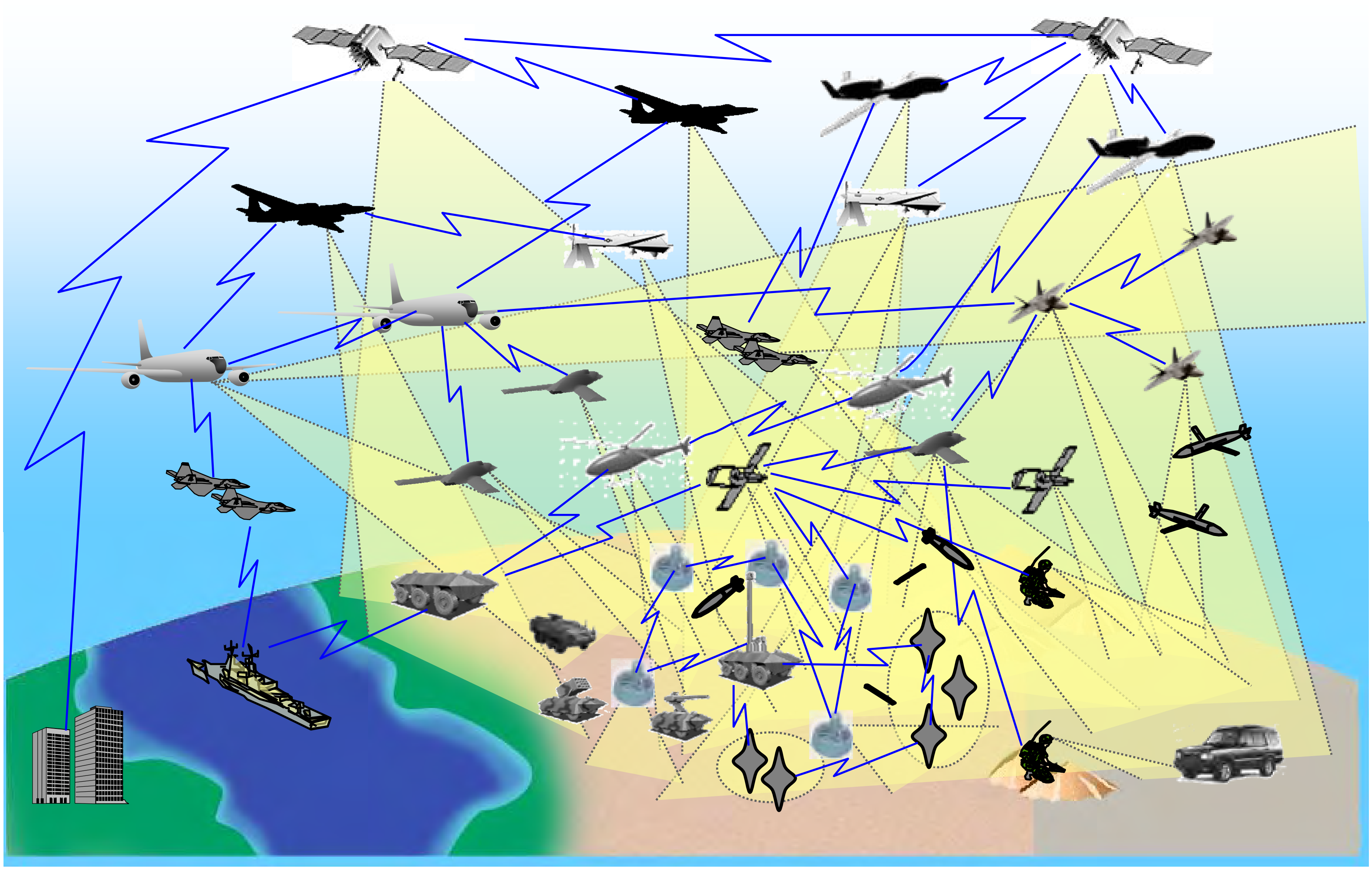
1958 DARPA 2008

50 YEARS

POWERED BY IDEAS

BACK UP

Robust, Secure, Self-Forming Networks



DARPA Air Vehicles

Autonomous Air Refueling Demonstration (AARD)

Autonomous Air Refueling Demonstration (AARD)

In-air refueling = Increased range = Persistence

Thirteenth Air Force

Integrity - Service - Excellence

Opportunities and Challenges in the Pacific

Lt Gen Chip Utterback
Commander

Mission

Present Air, Space and Cyber Power across the full spectrum of operations in the Pacific

****

Conduct:

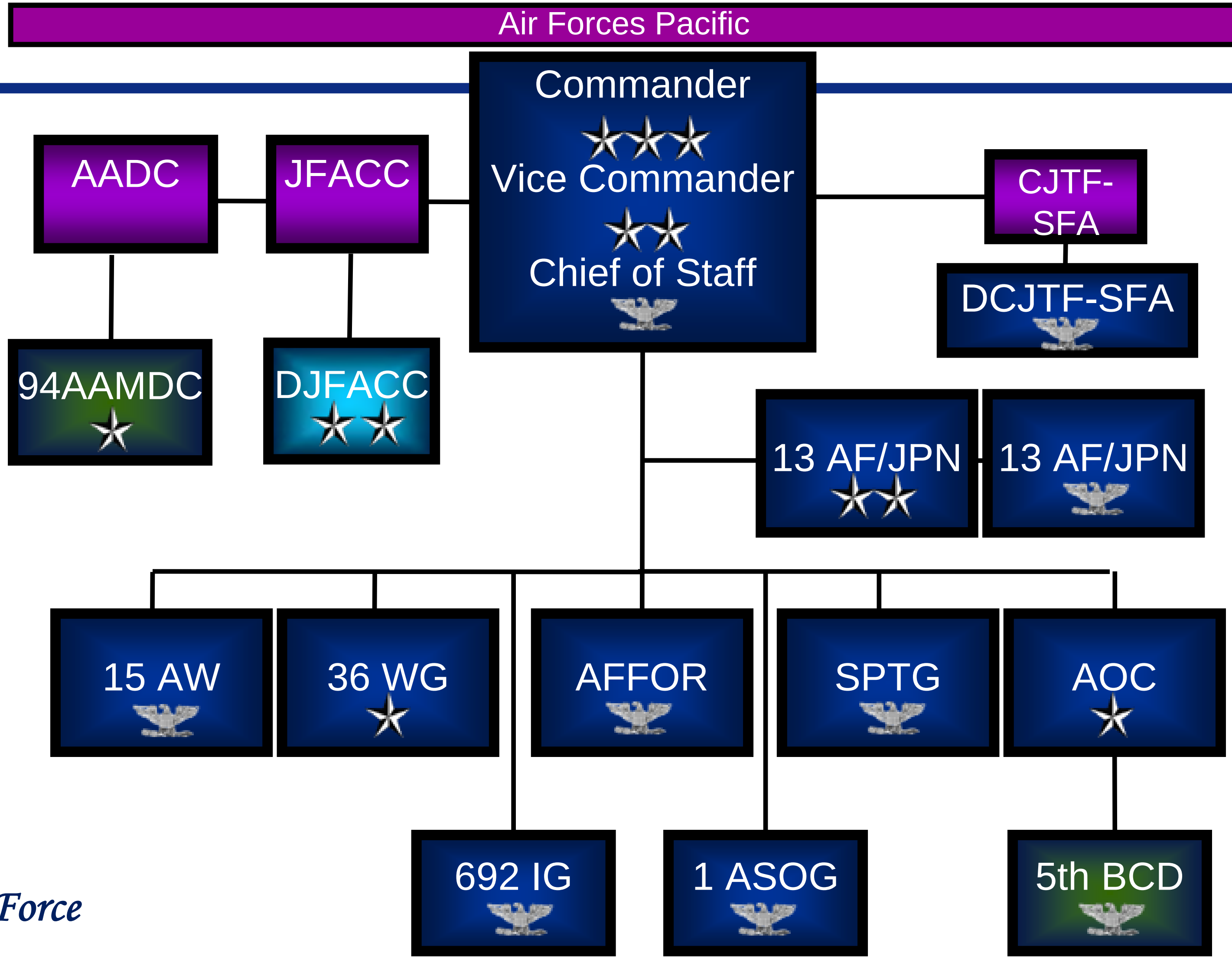
- **Operational Planning**
- **Command and Control (C2)**
- **Assessment**
- **Regional Engagement (39 Nations)**

- **Joint Forces Air Component Commander (JFACC)**
  - **Create effects from strategy to task, to meet USPACOM regional objectives**

Mission Sets

- **Standing JFACC**
- C2 of ISR
- HA/DR
- CJTF - SWA
- Security Cooperation
- Air Mobility
- AADC
- Air & Missile Defense
- Search/Rescue
- Space Coord
- Global Strike

Organization



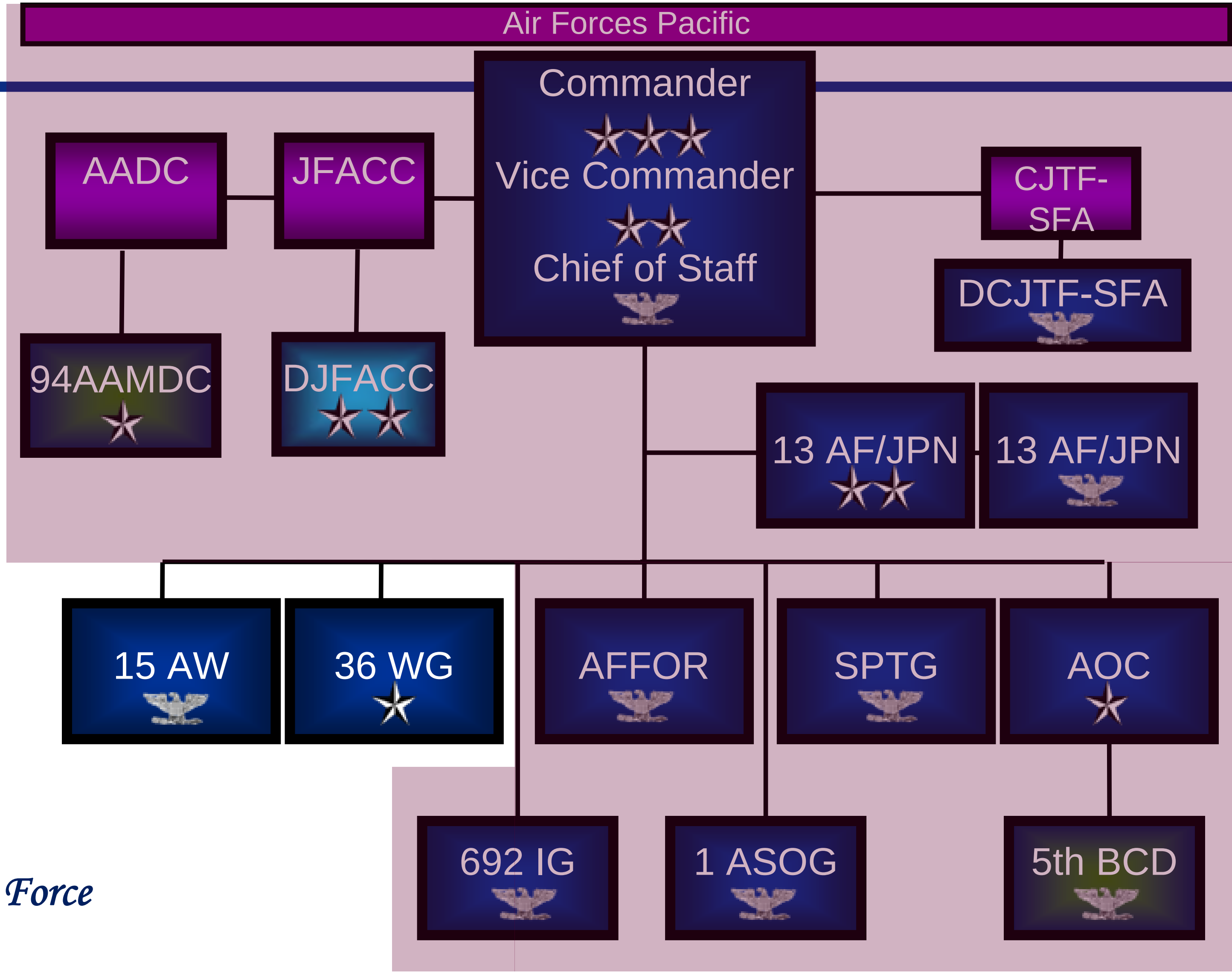
HABITUAL PARTNERSHIPS

3rd FLEET
7th FLEET
157 AOG
10th AF
HIANG

Jungle Air Force

Art of Command & Science of Control

Organization



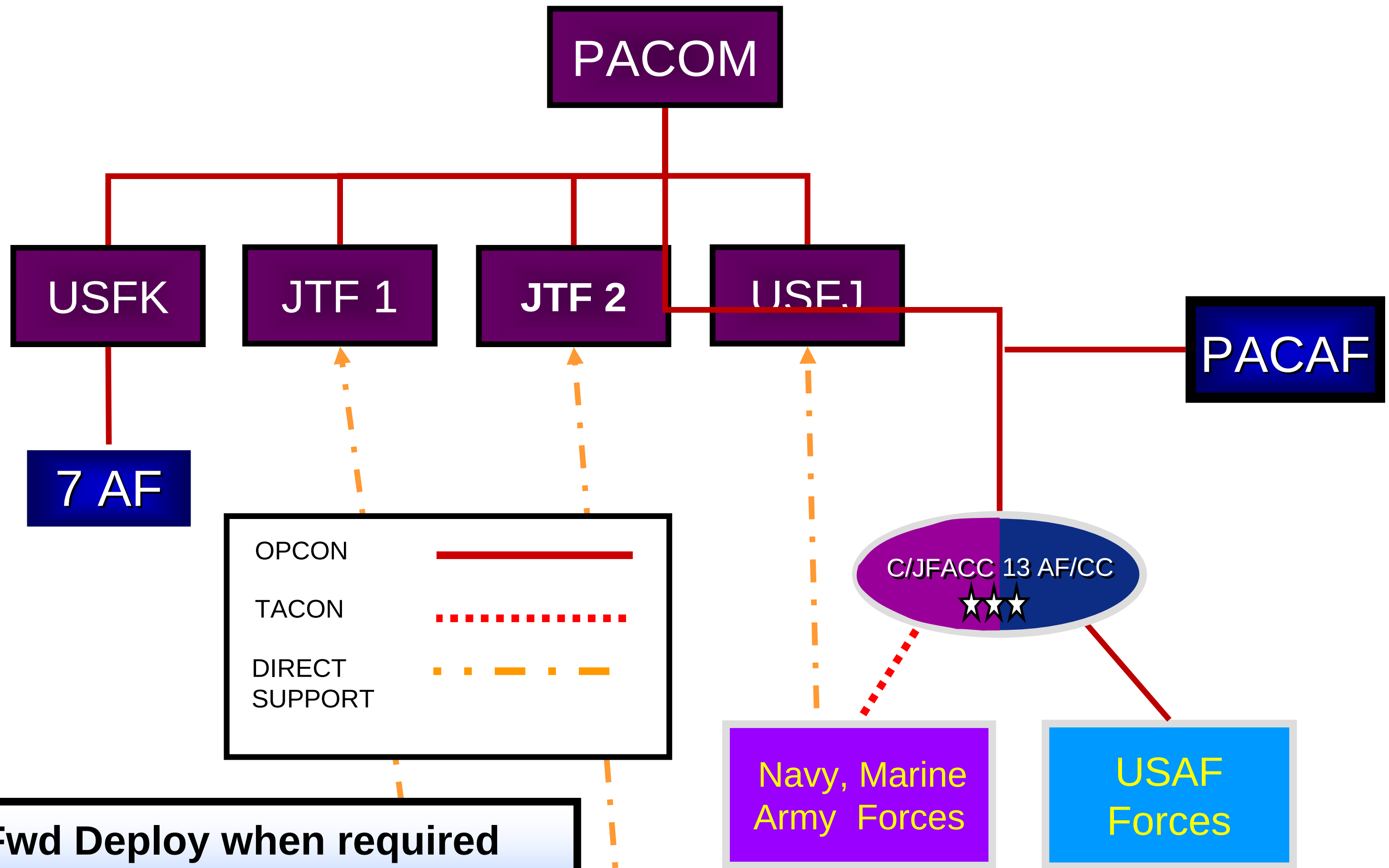
HABITUAL PARTNERSHIPS

3rd FLEET
7th FLEET
157 AOG
10th AF
HIANG

Jungle Air Force

Art of Command & Science of Control

Theater JFACC



- **JFACC**: **Fwd Deploy when required**
- **Scalable manning / augmentation**

Command and Control

- **613th Joint Air and Space Operations Center (JAOC)**
  - **Joint Networks**
    - **Robust and Flexible**
    - **Operates within Defense Information Systems Agency Global Information Grid**
    - **NIPR, SIPR, JWICS**
      - TBMCS, GCCS, JADOCS (40 warfighting applications)
- **JAOC SIPRNET is the core warfighting enclave Theater Air and Space C2**

Mission Enhancement - Training

- Table Top Exercise Training
  - Low-tech, relatively inexpensive
  - Scenario development, participant interaction, issue identification
  - Provides valuable training
  - Incorporated into larger exercises
  - Successfully utilized in Ex PACIFIC LIFELINE 08

Mission Enhancement - Training

- Live / Virtual / Constructive Training
  - Saves fuel, aircraft hours, and reduces ops tempo while still maximizing training opportunities
  - Successfully utilized in NORTHERN EDGE 08
  - Must invest in:
    - High fidelity simulation
    - Multiple Echelon computer models and game simulations
    - Distributive mission operations to leverage this capability

Mission Enhancement
Coalition Interoperability

- **Combined Communications Interoperability Program (CCIP)**
  - **Several nations fielding compatible capabilities**
    - **Japan, South Korea, Australia, New Zealand, Philippines, Singapore, Thailand, Malaysia, and Taiwan.**
  - **Benefits:**
    - **Leveraging host nation strengths**
    - **Promoting openness and cooperation**
  - **Deterrents:**
    - **Technology expenses**
    - **Laws and regulations**
    - **Preference for bilateral vs multilateral relationships**

Focus

- **Reliability and Redundancy of Networks**
  - **Must have operable COOP plan in place**
- **Homeland Defense: Zero Defect – only 1 shot**
  - **Operation Noble Eagle – Homeland Defense**
  - **Integrated Air and Missile Defense**
  - **Command and Control nets / Emergency Action Cell**
- **Munitions control and movement**

Threats and Consequences

Fighter Proliferation

- 4th gen fighters being sold around world
  - Russia…Su-30/ & MiG-35/
  - China…F-10 & JF-17

- Electronically scanned intercept radars
- Long-range active radar missiles
- Highly sophisticated advanced jammers
  - Digital Radio Frequency Memory threat
- US legacy fighters at risk—second best?

Terrorism – The Long War

- Al Qa'ida (AQ) remains greatest terrorist threat to US interests worldwide—nature of threat changing
- No longer monolithic threat; leaders providing less direct operational influence, emphasis on propaganda

- Smaller, looser networks proliferating—less, understood, predictable
- Signals Intel / ISR

Advanced SAM Proliferation

- Legacy systems entering larger threat rings than ever before
- Longer-range double digit SAMS
  - SA-10 (49NM), SA-20 (108NM), HQ-9 (81NM)
  - Near future…SA-21 (advertised as 200+ NM)
  - Complicating potential future air ops
    - Taiwan Strait and Middle East

- Naval SAMS
  - Longer ranges pushing out air defense umbrella
    - SA-N-20 / HQ-9
- Detection capabilities also increasing
  - Anti-stealth and anti-cruise missile

Training Gaps

- US Advantage historically both technological & superior training
- Avg Indian, Chinese pilot training now comparable
- Total fighter hours in USAF fighter units continues to drop from historical averages

- Range upgrades to meet realistic 5th Gen training

Conclusion

Past

• Cold War Mentality
• Strategic Reserve
• Hand Me Down Equipment

Present And Future

• Meeting Traditional & Asymmetric Threats
“State Of The Art” Equipment
• High Operations and Deployment Tempo
• Joint and Coalition Interoperability

New Challenges and Opportunities


13
THIRTEENTH AIR FORCE
KENNEY HQ

Emerging Technologies & Security

Dr. Richard Van Atta
Introduction to
Emerging Technologies Panel
PACOM Operational S&T Conference
July 16, 2008

Assessing Emerging Tech

- **Understanding "emerging technologies"**
  - What are those new developments at cusp of science and application that may have major impacts on global society overall and in particular on "security" aspects of society?
    - **What are tech trends and prospects?**
    - **Who is likely to have what capabilities?**
- **What are implications of "emerging technologies" on security?**
  - Must also understand the policy processes and mechanisms for "emerging techs" and their prospects—who is doing what to explore, develop and *implement* the technology?

Emerging technologies don't "just emerge"—they're made to emerge through purposive action

Emerging Technologies [one list…]

- **Technotronics**—from microelectronics to nanotronics, quantum-spintronics and biotronics
- **MEMs**
- **Nano Tech**—nanomachines, self assembly, nanotubes
- **Mobile telecommunications networks**
- **Sensors and Sensing systems—**smart sensors, distributed sensing, RFID, sensor nets and swarms, biosensors
- **Info tech**—virtual reality, ubiquitous computing, grid computing
- **Robotics**—intelligent systems, robot teams, nanobots, human augmentation
- **Autonomous Systems**—unmanned combat air vehicles, organic air vehicles, micro air vehicles, UGS, UUVs/USVs
- **Biotech**—genetic engineering, bio-diagnostics, bio-remediation, bio-weapons
- **Energy & Propulsion**—fuel cells, directed energy, superconductors

Emerging Technology—other prospects…

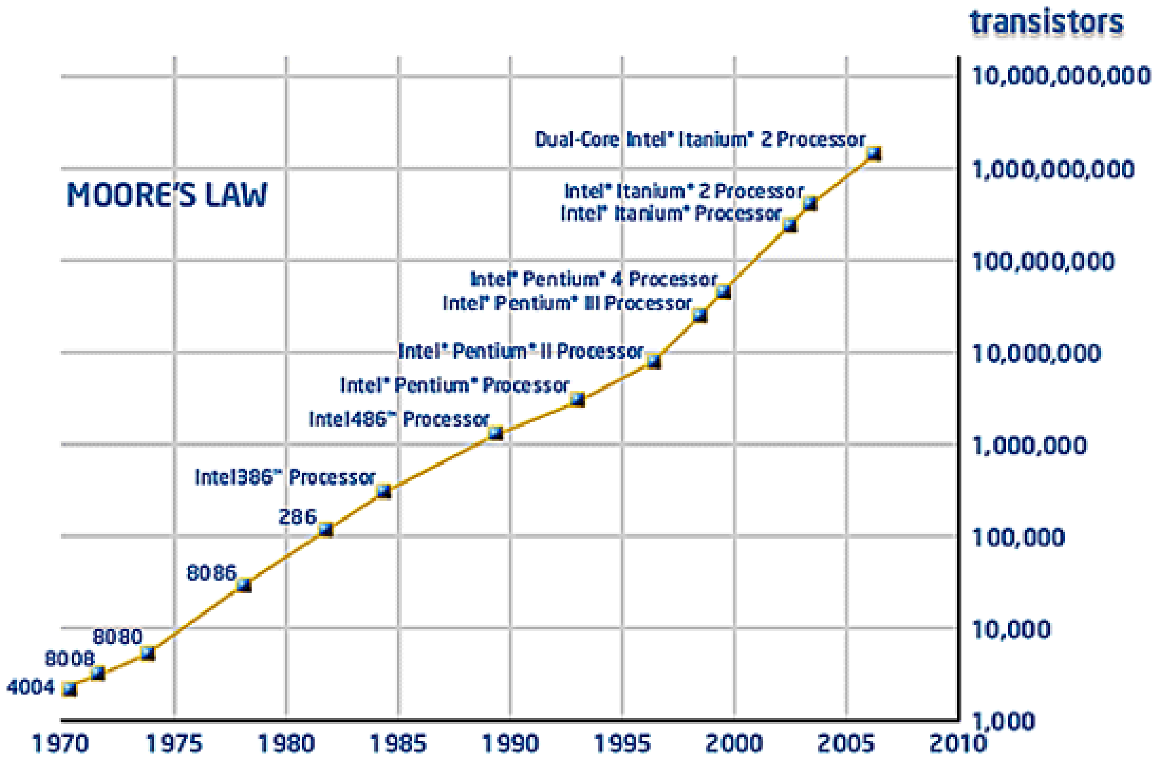
- Engineered materials—application-specific materials--electrically active polymers, bio-engineered materials
- Advanced displays—flexible displays, holographics
- Cognitive processing—aided cognition
- Universal translation
- Alternative energy—biomass; solar; fusion…
- T-rays (terahertz radiation)
- Synthetic fuels
- Alternative propulsion—nutating engine, etc.
- Microfluidic optical fibers
- Volumetrically controlled manufacturing
- Telegenics—virtual tele-presence
- Psycho-pharmaceuticals
- Synthetic biology
- Bayesian machine learning
- Humanoids……

Any list of emerging tech is
[1] arbitrary
[2] judgemental
[3] partial

Technotronics

The technological wherewithal that makes cyberspace possible

Cyberspace--nexus of computer systems and networks, in which electronic data are stored and communication takes place.

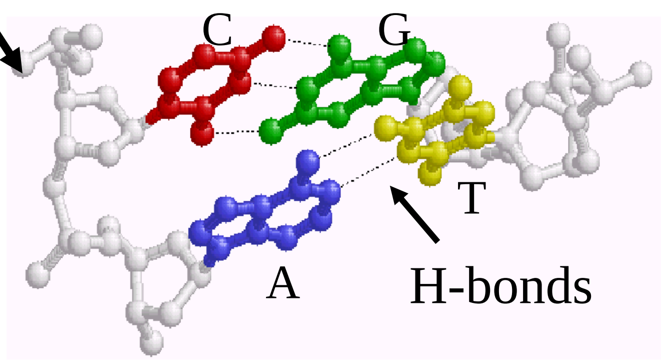


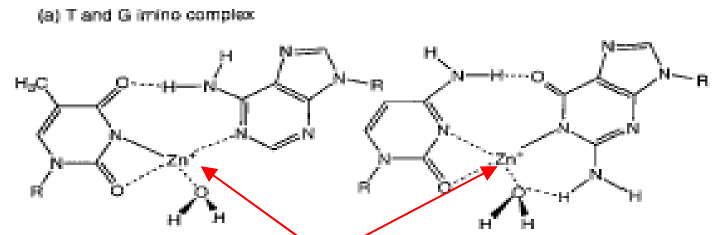
– **Approaching physical limits**
  - **"Moore's Law"—the implications of smaller feature size**

- **Moore's Law is a *behavioral projection* based on faith in human ingenuity and business opportunity—it is not a physical law.**

Beyond Moore's Law: Spintronics / Biotronics?

- **Spintronics**
  - Uses electron's "spin" to determine its state with potential to create computing devices that are considerably faster than current silicon devices.
  - Spintronics should also, in theory, dissipate little heat
- **Biotronics?**





Molecularly changing DNA's conductivity by replacing imino protons of base pairs by metal ions

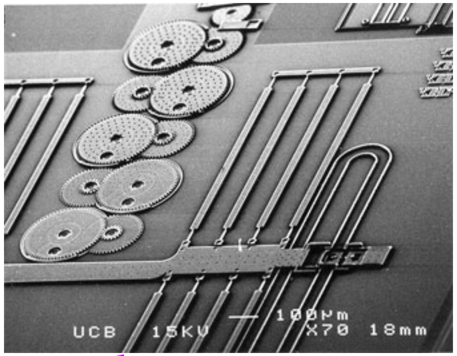
What do we get?

Metallic Conduction through Engineered DNA: DNA Nanoelectronic Building Blocks

A. Rakitin,[1] P. Aich,[2] C. Papadopoulos,[1] Yu. Kobzar,[1] A. S. Vedeneev,[1,3] J. S. Lee,[2] and J. M. Xu[1]

MEMS → MEMSification

- Accelerometers for controlling auto air bags, arming and safing of weapons
  - Today, because of MEMS, the accelerometer and electronics are integrated on a single chip at a cost of under $10. The small size (about the dimensions of a sugar cube) provides a quicker response to rapid deceleration.
  - Intelligent tires….
- Fail-safe locks for nuclear weapons
- Micronozzles that direct the ink in inkjet printers
- Miniature robots (micro-robots);micro-tweezers
- Video projection chips with a million micro-mirrors
- Defense and aerospace
  - Navigational gyroscopes,
  - Sensors--border control, environmental monitoring
  - munitions guidance
- Medicine
  - Microfluidic DNA Analysis
  - Disposable blood pressure transducers
  - Hearing aids
- Telecommunications
  - Cell phones—integrated systems-on-chip
  - MEMS-based optical switches



Nanomems

Nano-MEMS

- Nano→ molecular-level, self assembly of system
- Chemical
  - Nano-wires
  - "Three-dimensional MEMS with functionalized carbon nanotubes"
  - Nanoelectronic building elements for nanoMEMS and bioMEMS
  - Carbon and ceramic microcoils for MEMS by microwave CVD
- Biological
  - DNA-based structures
  - Virus generated

MEMS-based nano-systems may be key to future sensing and perhaps future autonomous robotics

3rd Generation Information Technology

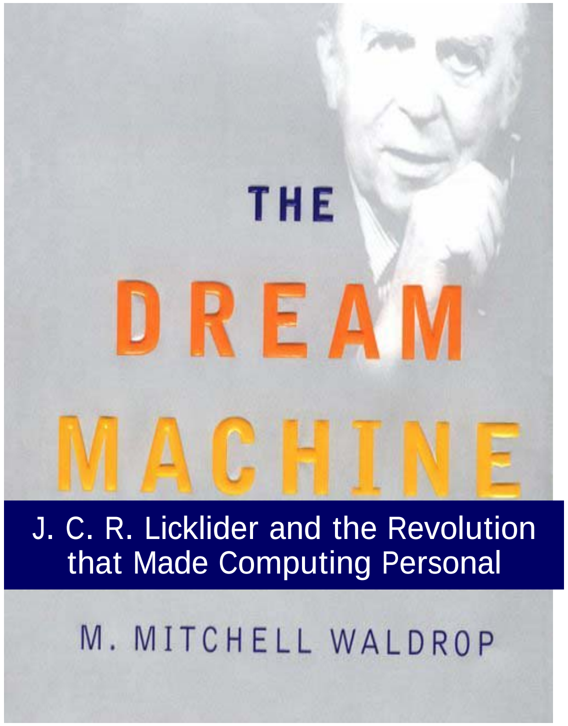
DARPA impact — From computers to Interactive Information

- DARPA and Info Tech—“Toward Man Computer Symbiosis”
    - Making computers interactive
    - Internetted computing
    - Virtual reality

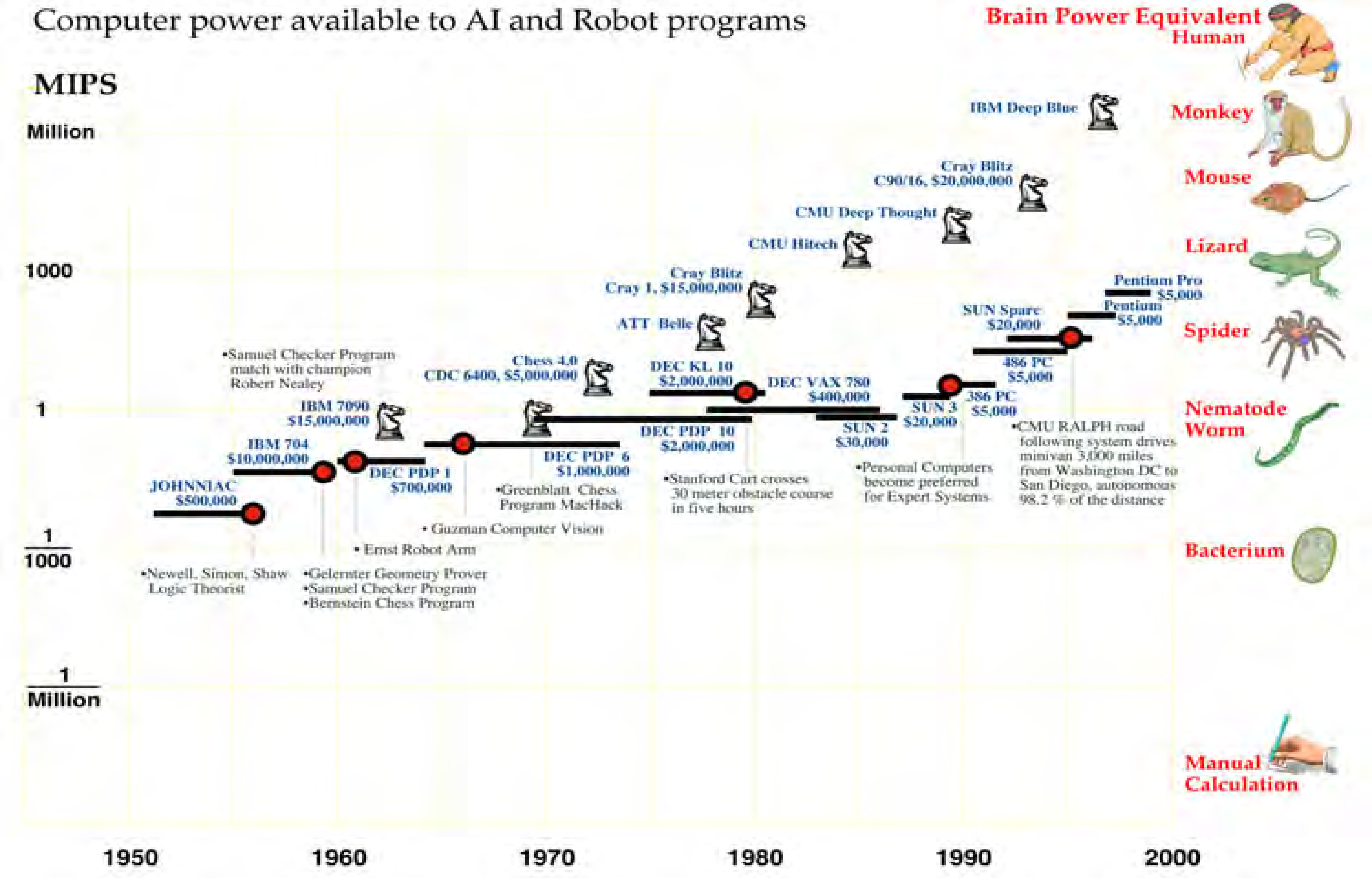
Intelligent systems

- **Are “cognitive” cybersystems our goal?**
- **Should they be?**

How close to Licklider’s Vision are we getting?



COGNITIVE COMPUTING

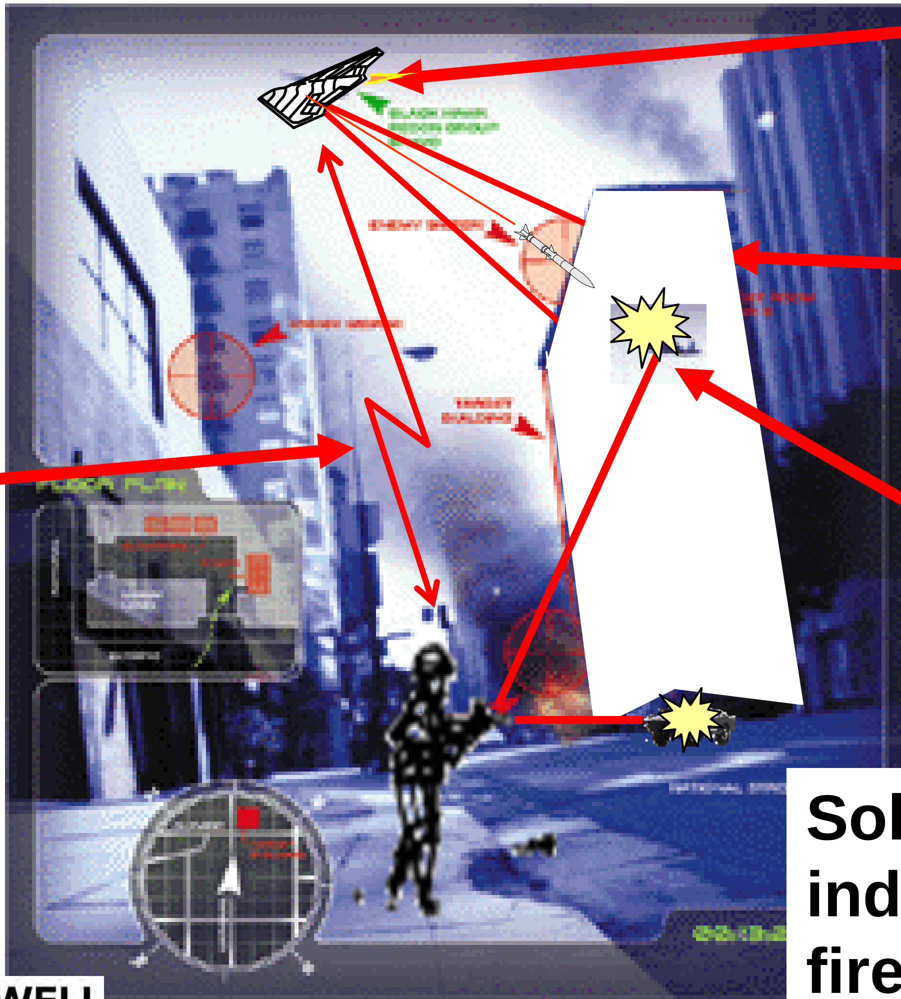


Cognitive Systems:

"Systems that know what they're doing"

- A cognitive system
  - can reason, using substantial amounts of appropriately represented knowledge
  - can learn from its experience so that it performs better tomorrow than it did today
  - can explain itself and be told what to do
  - can be aware of its own capabilities and reflect on its own behavior
  - can respond robustly to surprise

Augmented Reality: Virtual “X-Ray” Zoom Vision with Intelligent Rifle



UAV images behind building

Building pixels are stripped from image

Comm. link

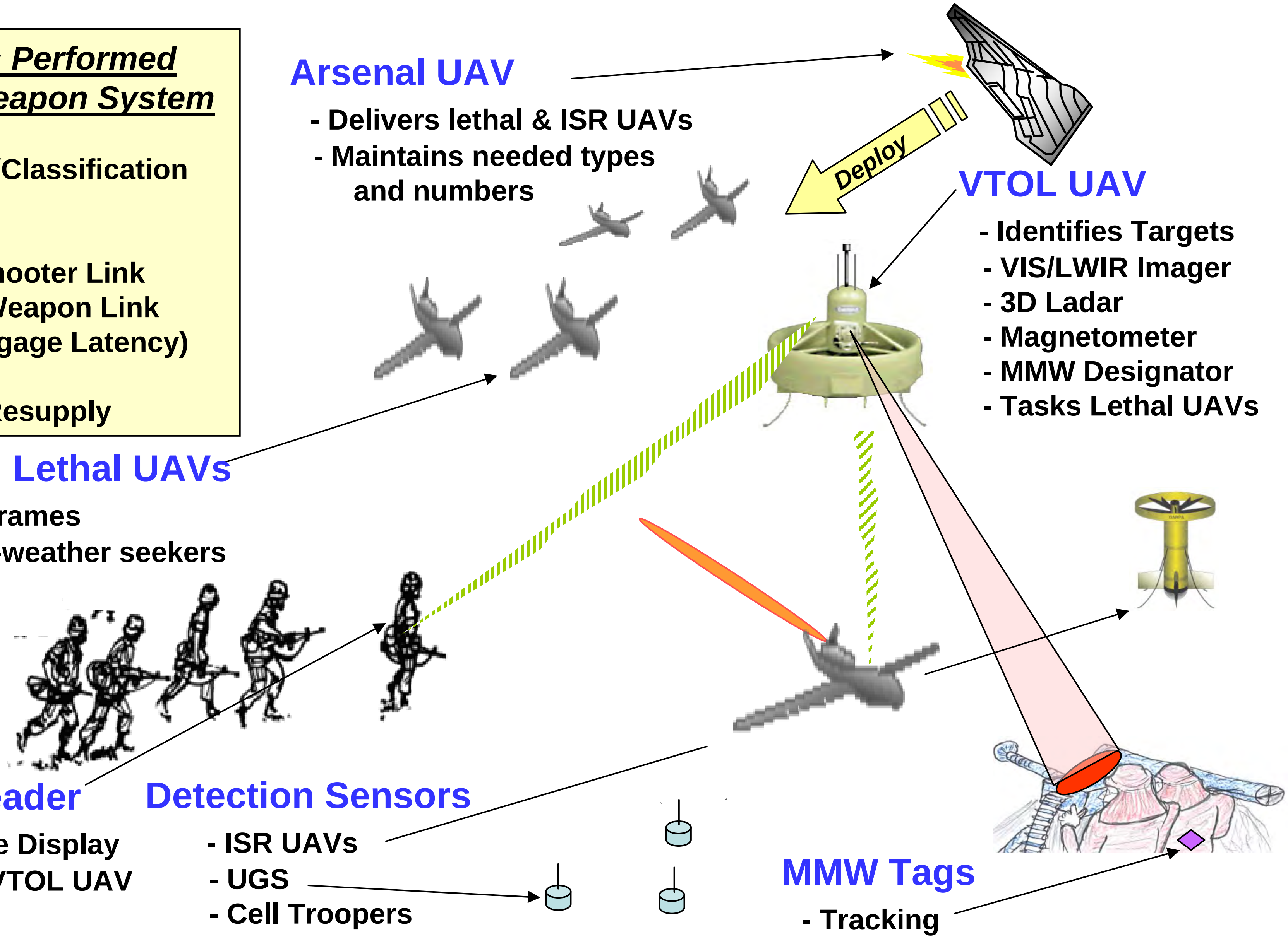
Threat is rendered

Soldier calls indirect or direct fires using rifle

Rockwell Scientific

A Possible Vision:
Tactical-Level "ISR/Weapon" System of Systems

Functions Performed By ISR/Weapon System
- C^2
- Detection/Classification
- ID
- Tracking
- Sensor-Shooter Link
- Shooter-Weapon Link (<5sec Engage Latency)
- BDA
- Weapon Resupply



Emerging Technologies and Security: Issues

- Information technology has fundamentally transformed our society economy and our lives
- Emerging technologies will transform information technology in fundamental ways—and this emerging infotech will provide the basis for greater wealth, healthier and longer lives, and improved security capabilities
- Technological convergence of bio-nano-info techs present phenomenal new prospects—and raise daunting ethical concerns
- All of these developments raise potential as well for misuse and have security down sides…..

Emerging Technologies and Security: Issues

- Security cannot be **assured** by technological measures
  - Security is an on-going process
  - Security requires forethought and constant vigilance
  - If it can be used for bad—it will be…. And others will have access to it….
- A fundamental flaw in our thinking has been the assumption that we can maintain technological superiority without making substantial investments in it….
- Others globally are becoming just as good as we are—we have to recognize this as the new reality

Pacific Operational
Science and Technology Conference

The Art and Science
of the
Joint Warfight

Lieutenant General Bob Wood
USJFCOM

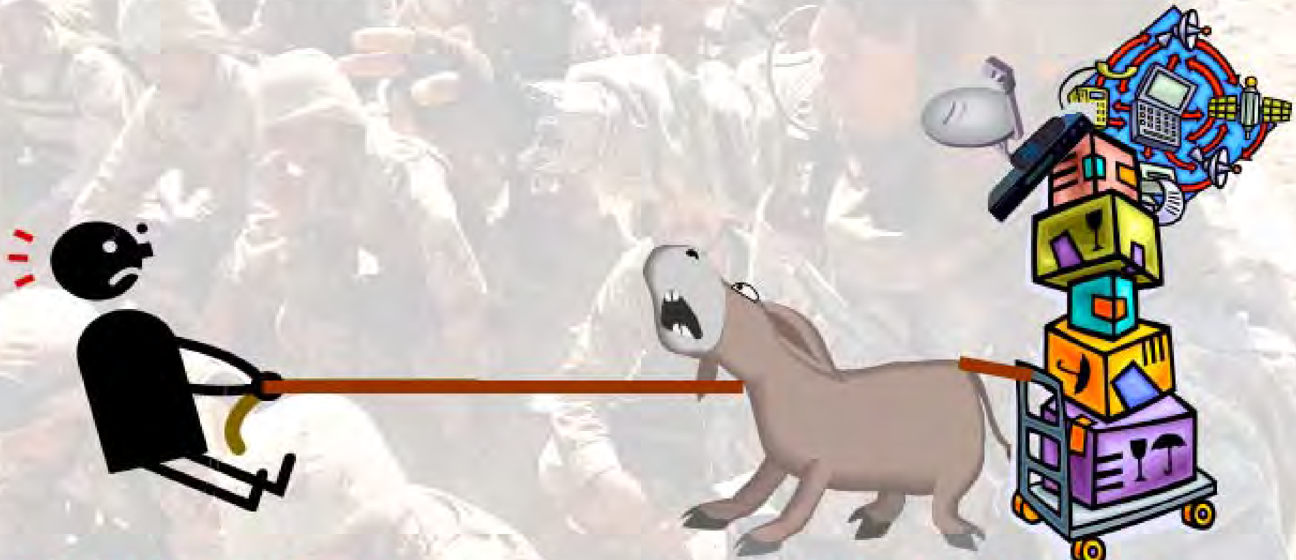
16 July 2008

Joint Warfighting

- Jointness is not a natural state – Deserves our best effort
- Our enemy means every word it says
- We will fight future wars with partners
- Our military must improve capability in the irregular fight
- Maintain our conventional dominance
- Design integrated, properly structured joint command and control

Joint Warfighting is Human Endeavor;
Technology is a Key Enabler but Not a Silver Bullet

"Command and Control (C2) is first and foremost a human endeavor... While materiel solutions, processes, and engineering can enable decision making, command and control is not synonymous with network operations or the employment of advanced technology, rather it maintains the flexibility to exploit both." --- *Gen Mattis' C2 Vision*



Leader Requirements **Technology Solutions**

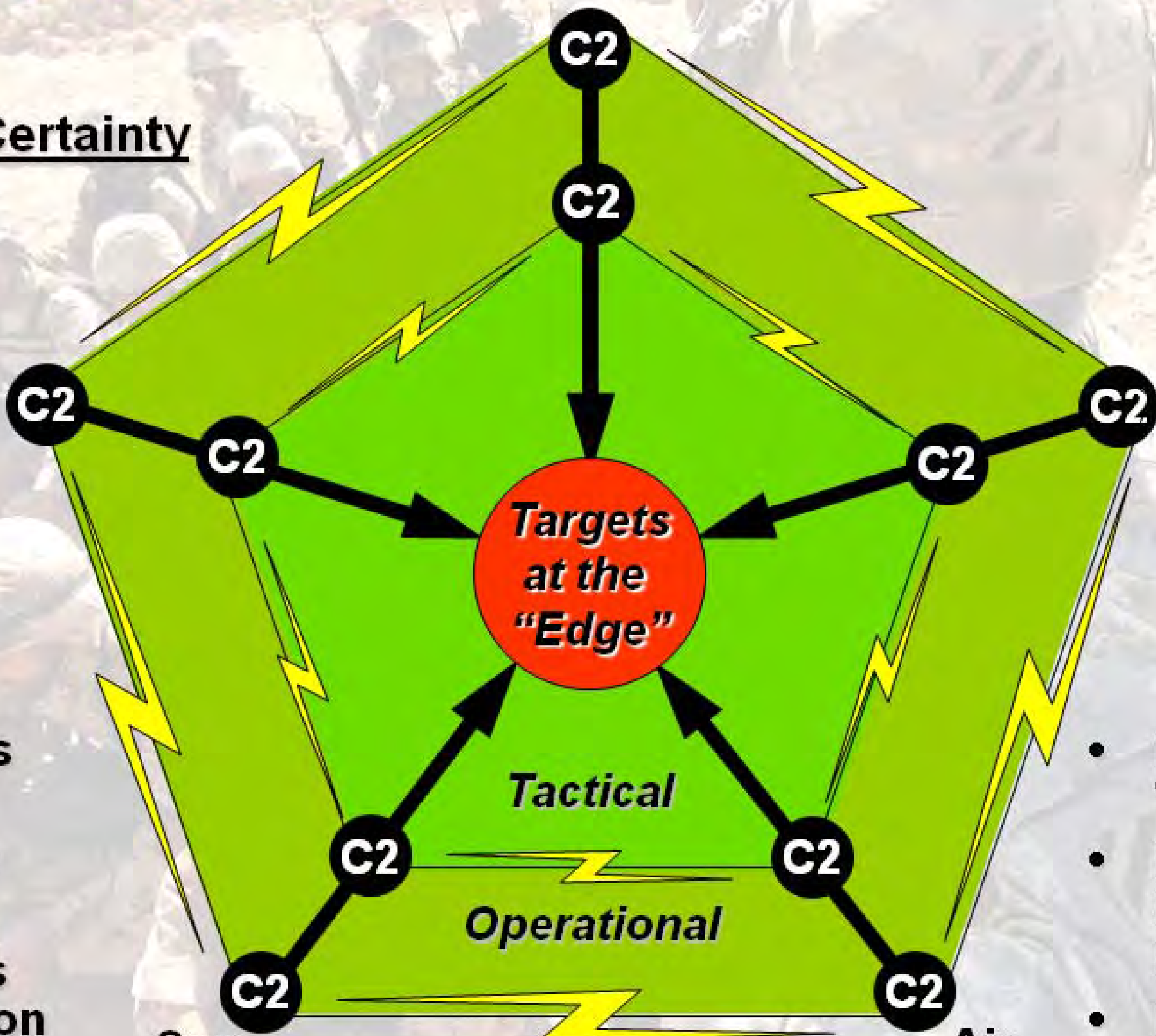
Who's Serving Who ?

Key to Success…
Achieving the Balance between Leader Requirements & Technology

The Art and Science of War
… Analyzing the Operating Space

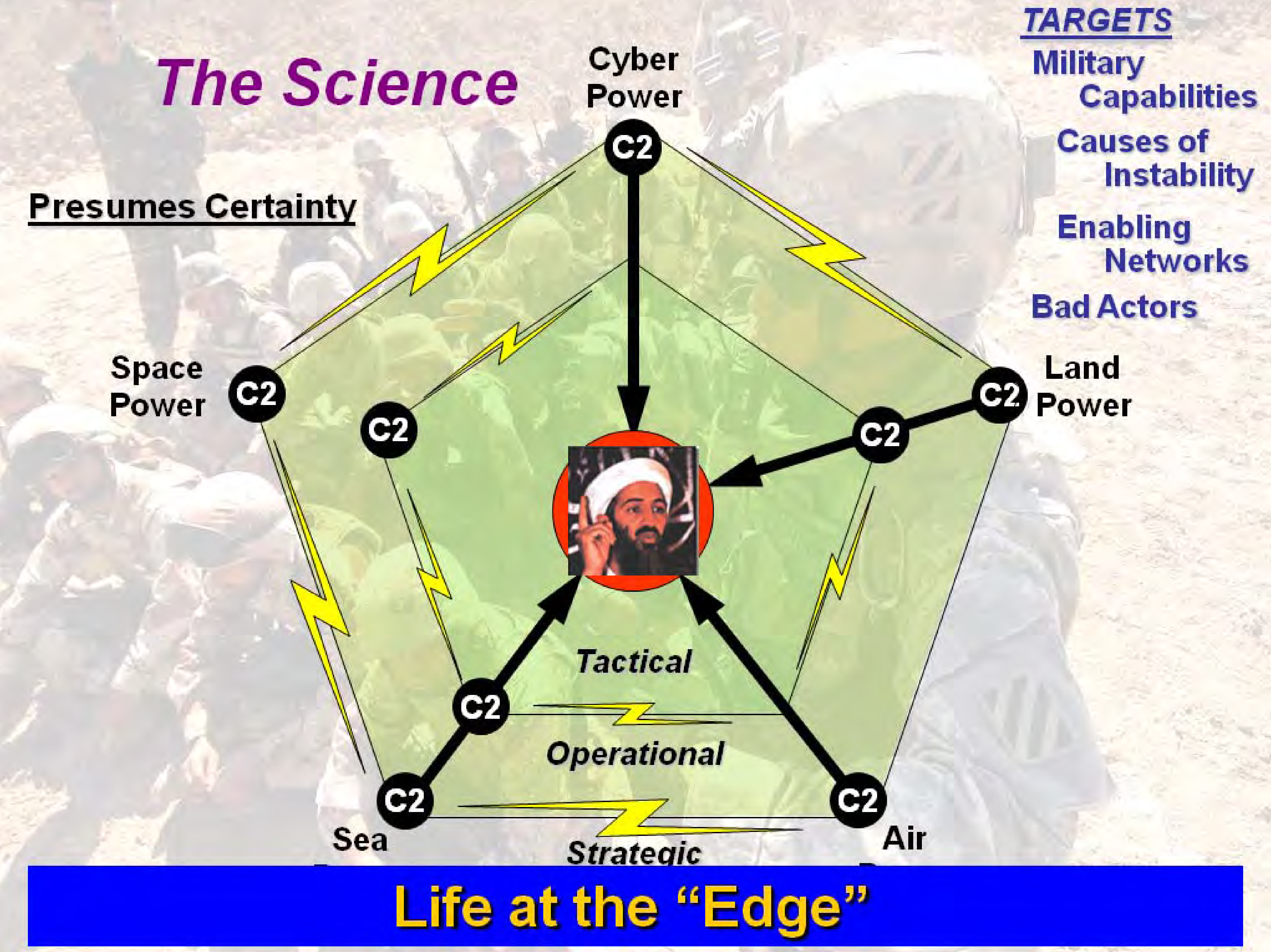
The Science

Presumes Certainty



- Engineers Solution
- Improves Analysis
- Expedites Information Processing

- Emphasizes Technology
- Enables Planned Execution
- Promotes Machine-to-Machine Opns


The Science
Presumes Certainty
TARGETS
Military Capabilities
Causes of Instability
Enabling Networks
Bad Actors
Cyber Power
Space Power
Land Power
Sea
Air
C2
Tactical
Operational
Strategic
Life at the "Edge"

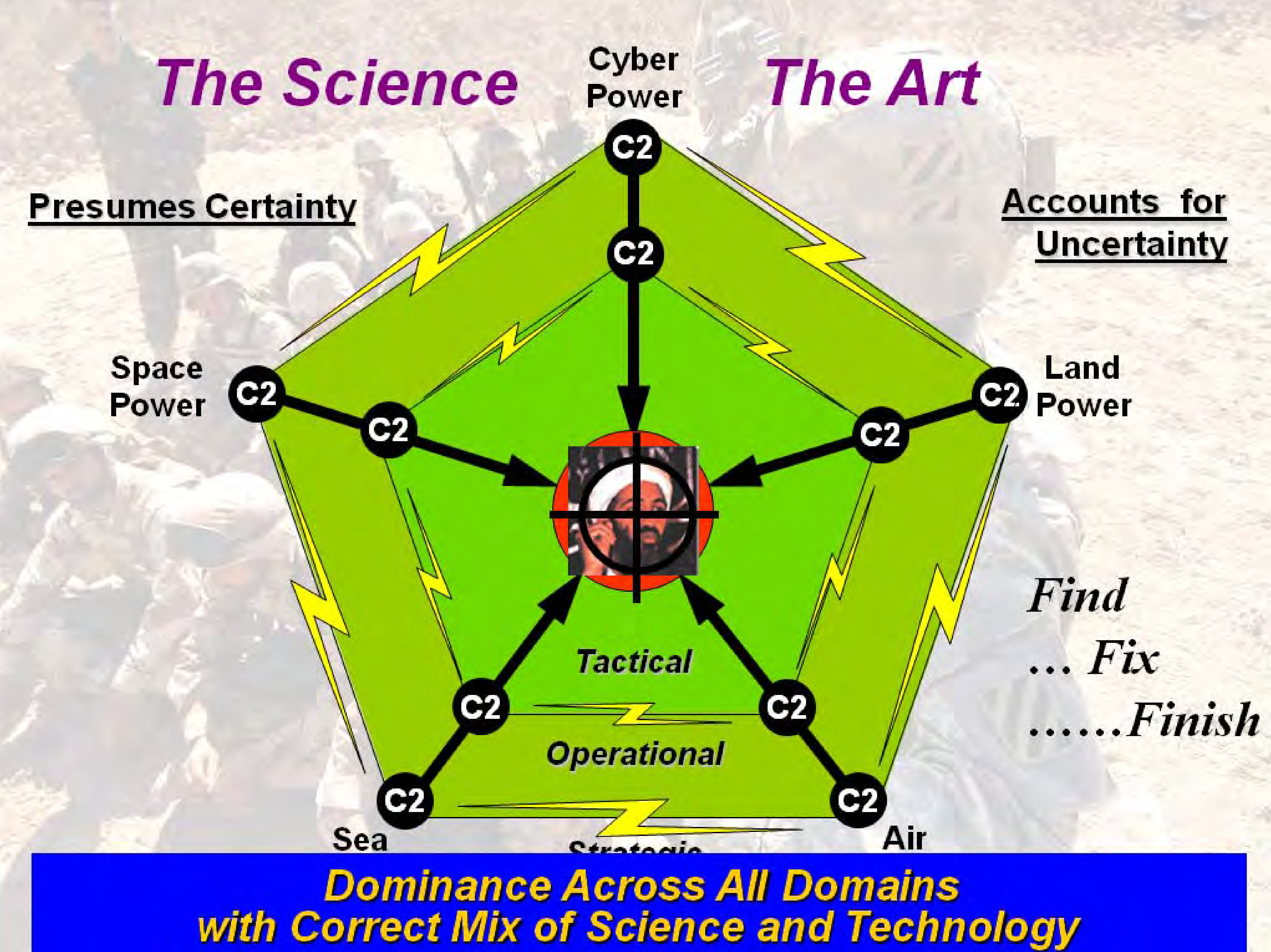
The Science / *The Art*

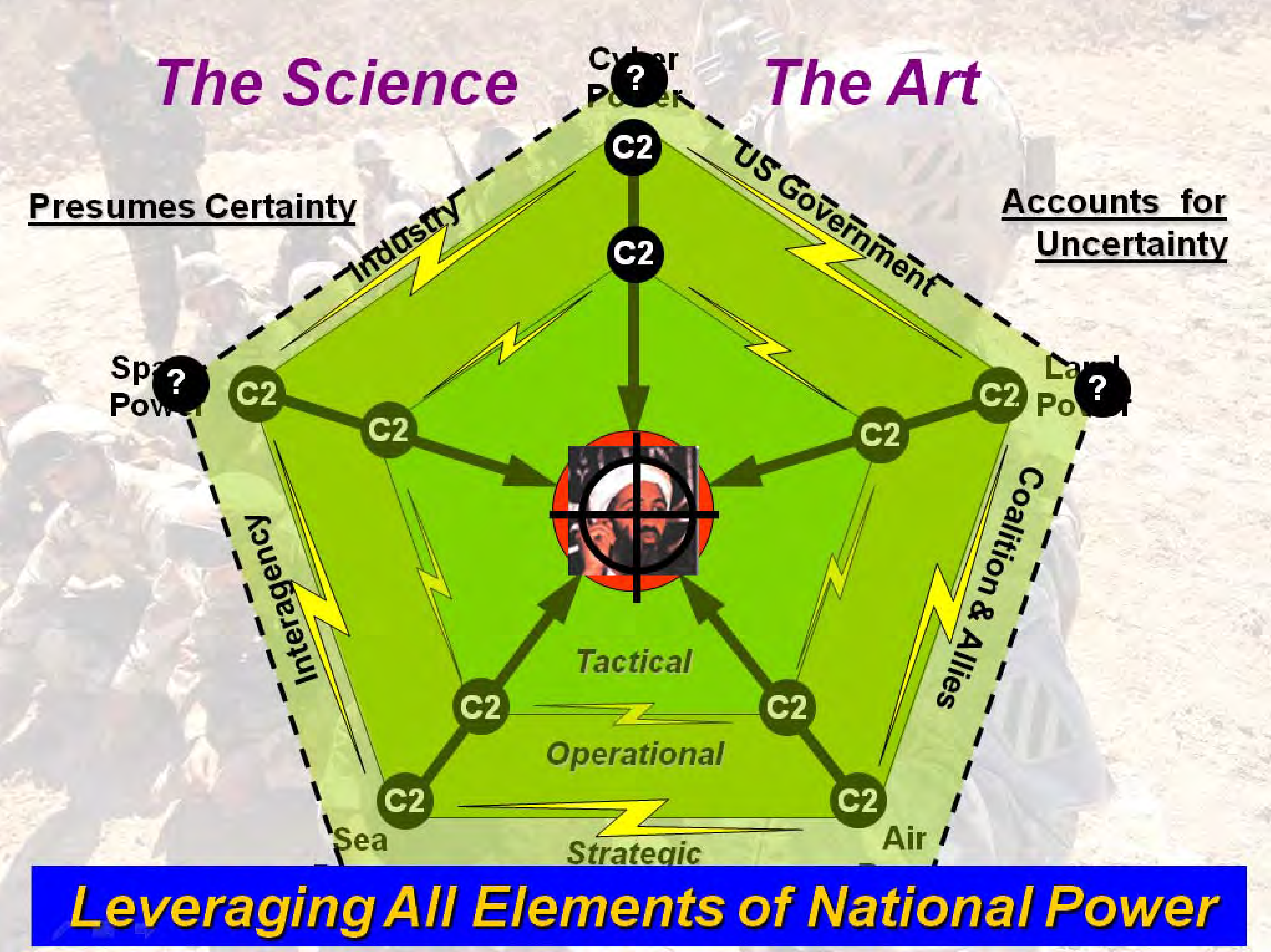
Presumes Certainty

- Leverages Strengths
- Exploits Opportunities
- Advantages Initiative

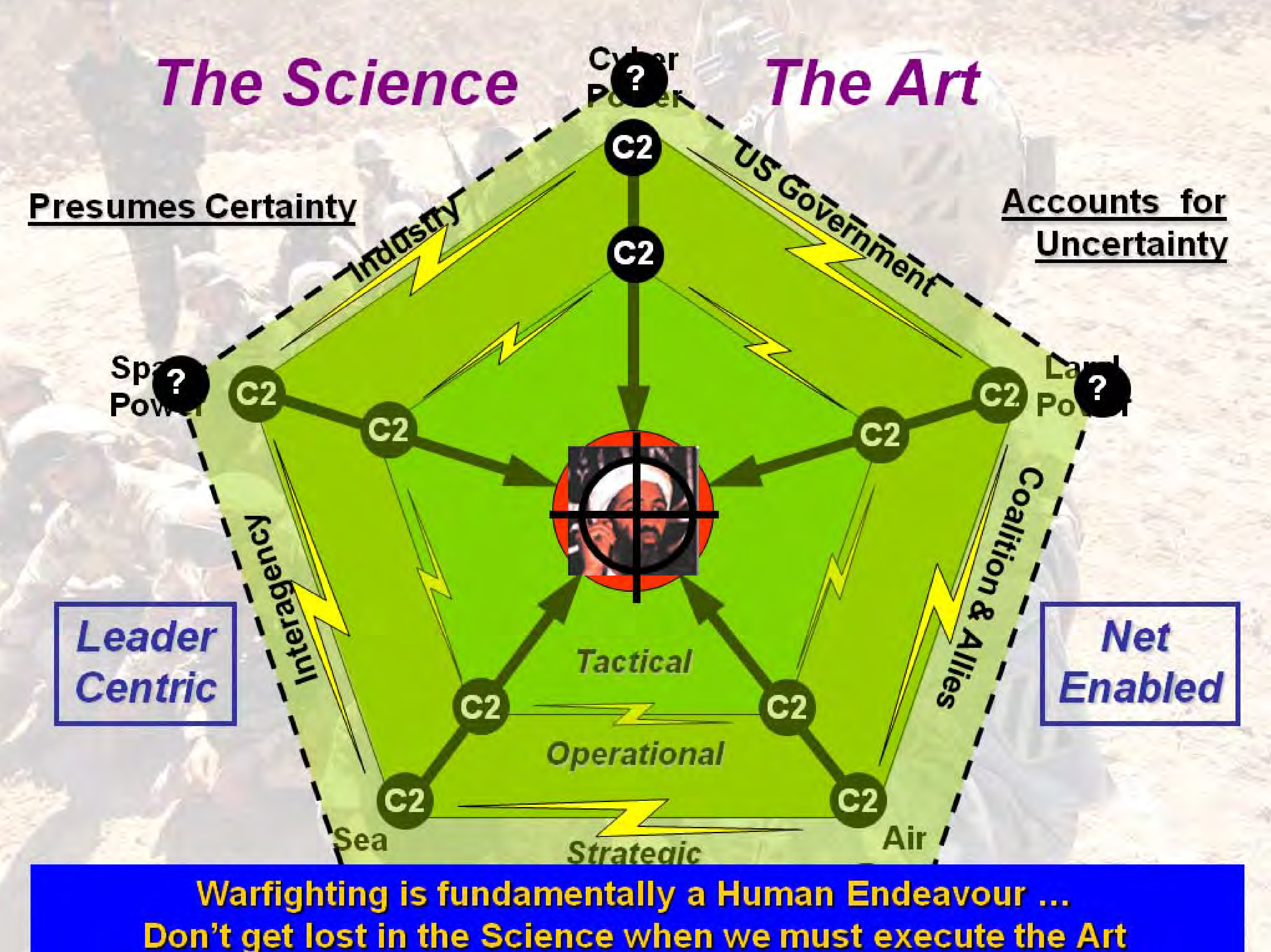
Accounts for Uncertainty

- Emphasizes Human Factors
- Decentralizes Execution
- Promotes Collaborative Partnerships


The Science
Cyber Power
The Art
Presumes Certainty
Accounts for Uncertainty
C2
Space Power
Land Power
Tactical
Operational
Sea
Air
Find
... Fix
......Finish
Dominance Across All Domains
with Correct Mix of Science and Technology



The Science
The Art
Presumes Certainty
Accounts for
Uncertainty
Industry
US Government
Interagency
Coalition & Allies
C2
C2
C2
C2
C2
C2
C2
C2
C2
C2
Tactical
Operational
Strategic
Sea
Air
Leveraging All Elements of National Power


The Science
The Art
Presumes Certainty
Accounts for Uncertainty
Industry
US Government
Interagency
Coalition & Allies
C2
?
Leader Centric
Net Enabled
Tactical
Operational
Strategic
Sea
Air
Warfighting is fundamentally a Human Endeavour …
Don't get lost in the Science when we must execute the Art

CENTCOM C2 Best of Breed Project

Over 4000 Systems/Applications in AOR – over 1000 considered "C2"

– Continued delays in development/fielding joint programs of record result in continued proliferation of 'niche' applications, and there's no limit to vendors willing to help.

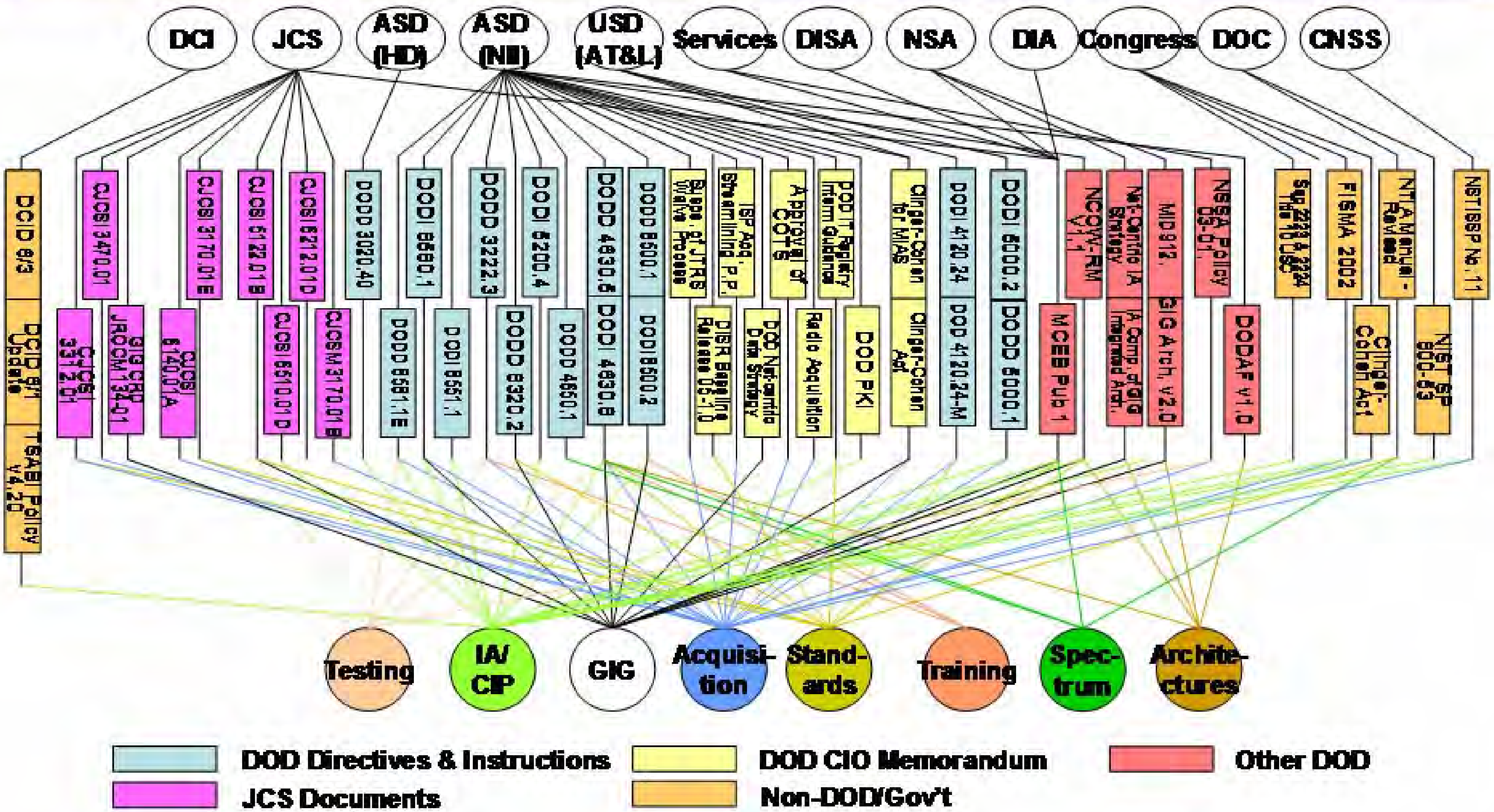
– Each operational rotation of forces results in technical integration challenges as they bring their own unique applications.

System/Application proliferation leads to:

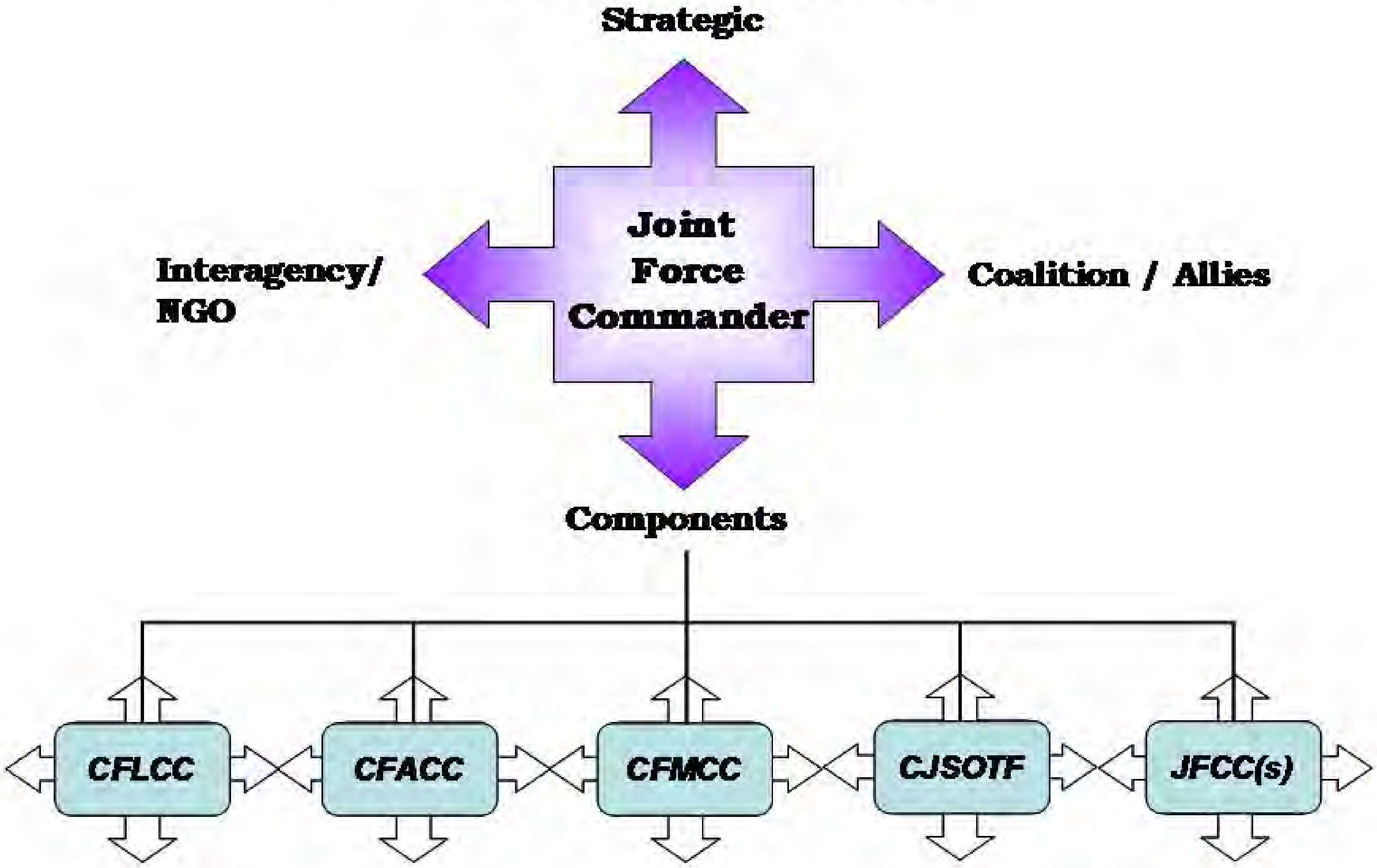
- Poor network situational awareness
- Lack of interoperability
- Network inefficiencies
- Supportability issues
- Network vulnerabilities

Global Map of DOD Interoperability-Related Policy Documents

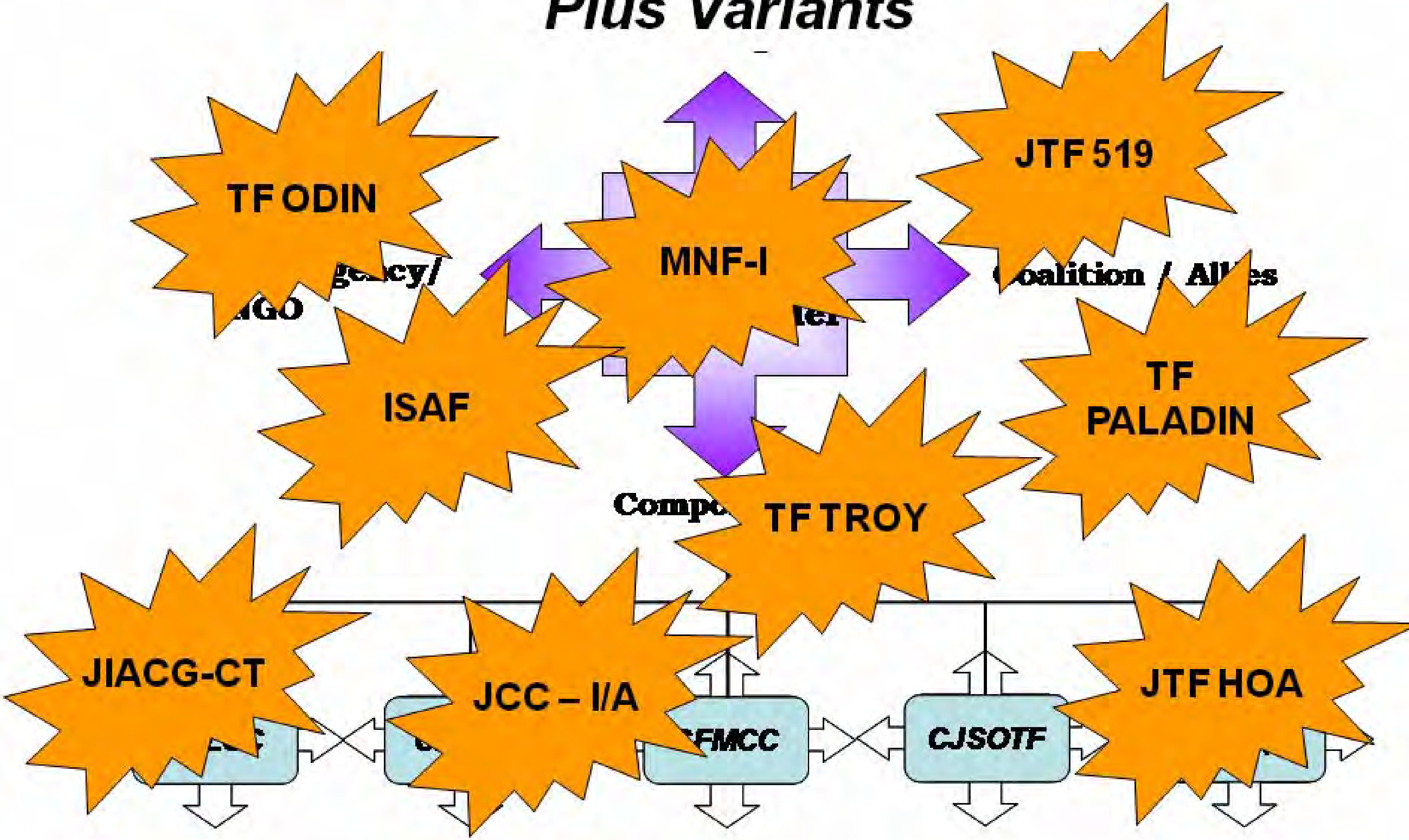
Current Assessment: Excessive Complexity Among Policy Inhibits Effective Interoperability



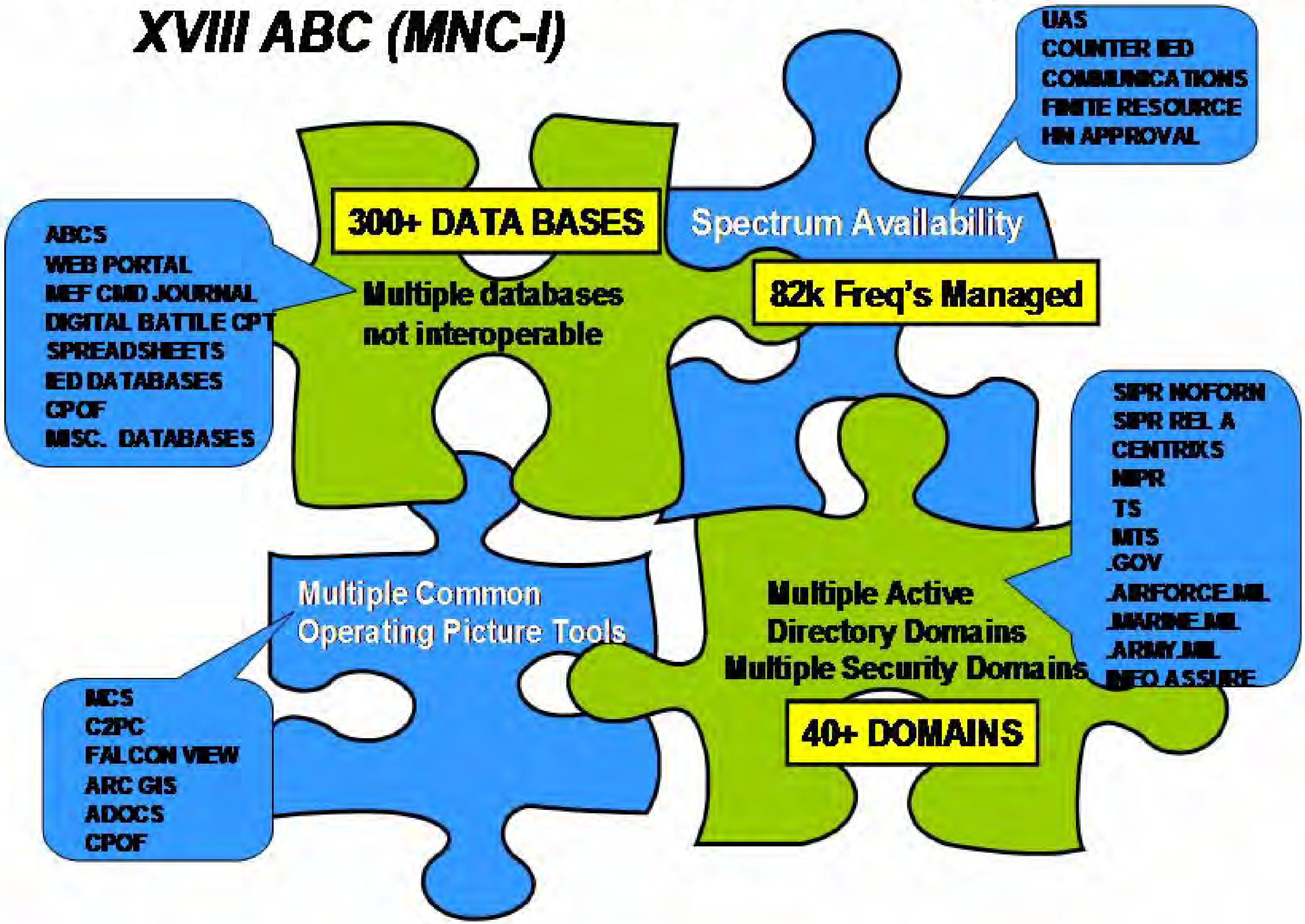
The JC2 Domain



24 JTFs and Counting... Plus Variants



Battle Command Information Challenges
XVIII ABC (MNC-I)



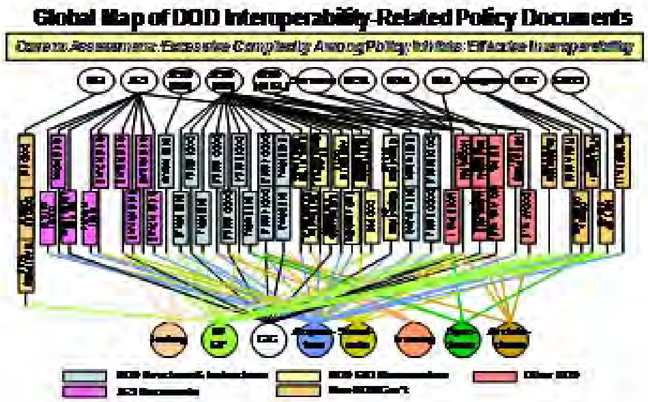
COCOM Science and Technology Challenge

CENTCOM C2 Best of Breed Project

Over 4000 Systems/Applications in AOR – over 1000 considered "C2"

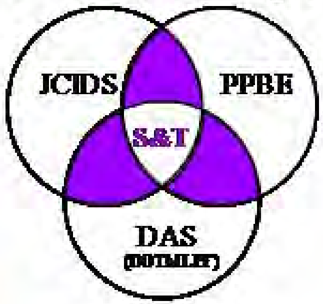
– Continued delays in development/fielding joint programs of record result in continued proliferation of 'niche' applications, and there's no limit to vendors willing to help.
– Each operational rotation of forces results in technical integration challenges as they bring their own unique applications.

System/Application proliferation leads to:
- Poor network situational awareness
- Lack of interoperability
- Network inefficiencies
- Supportability issues
- Network vulnerabilities

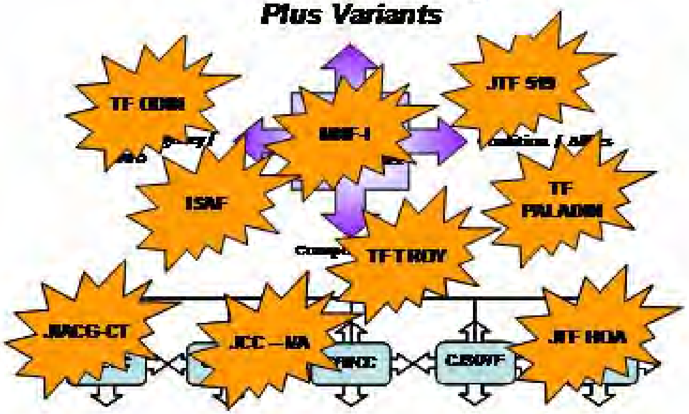


COCOM Management Challenge

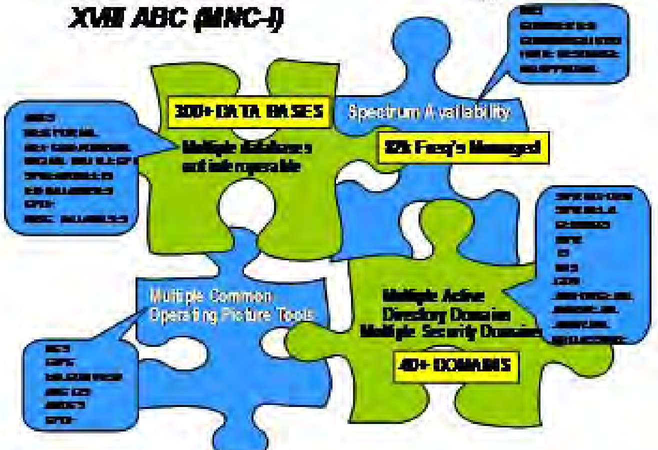
Assess, Coordinate, Manage, & Integrate



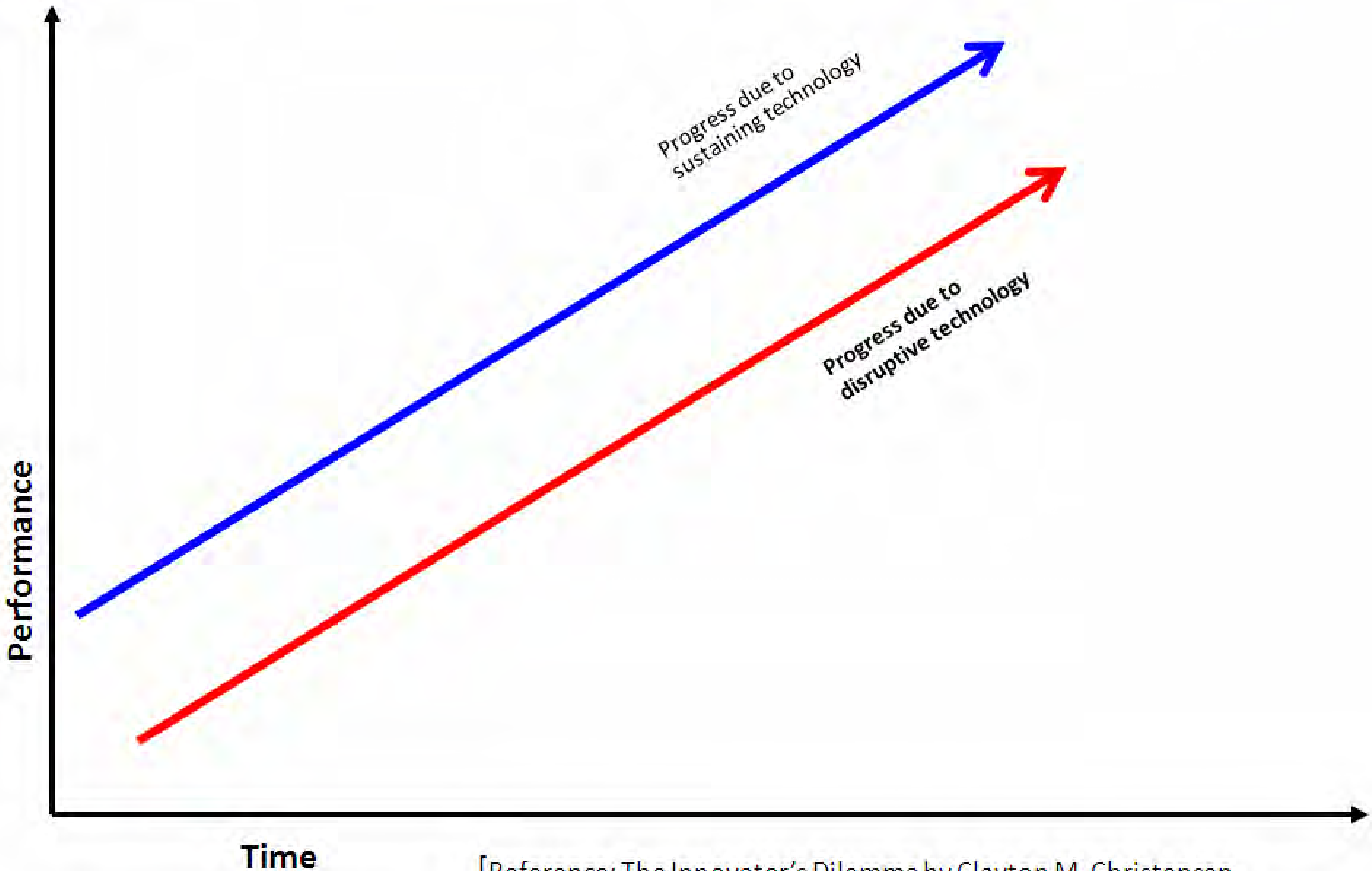
24 JTFs and Counting... Plus Variants



Battle Command Information Challenges XVIII ABC (MNC-I)



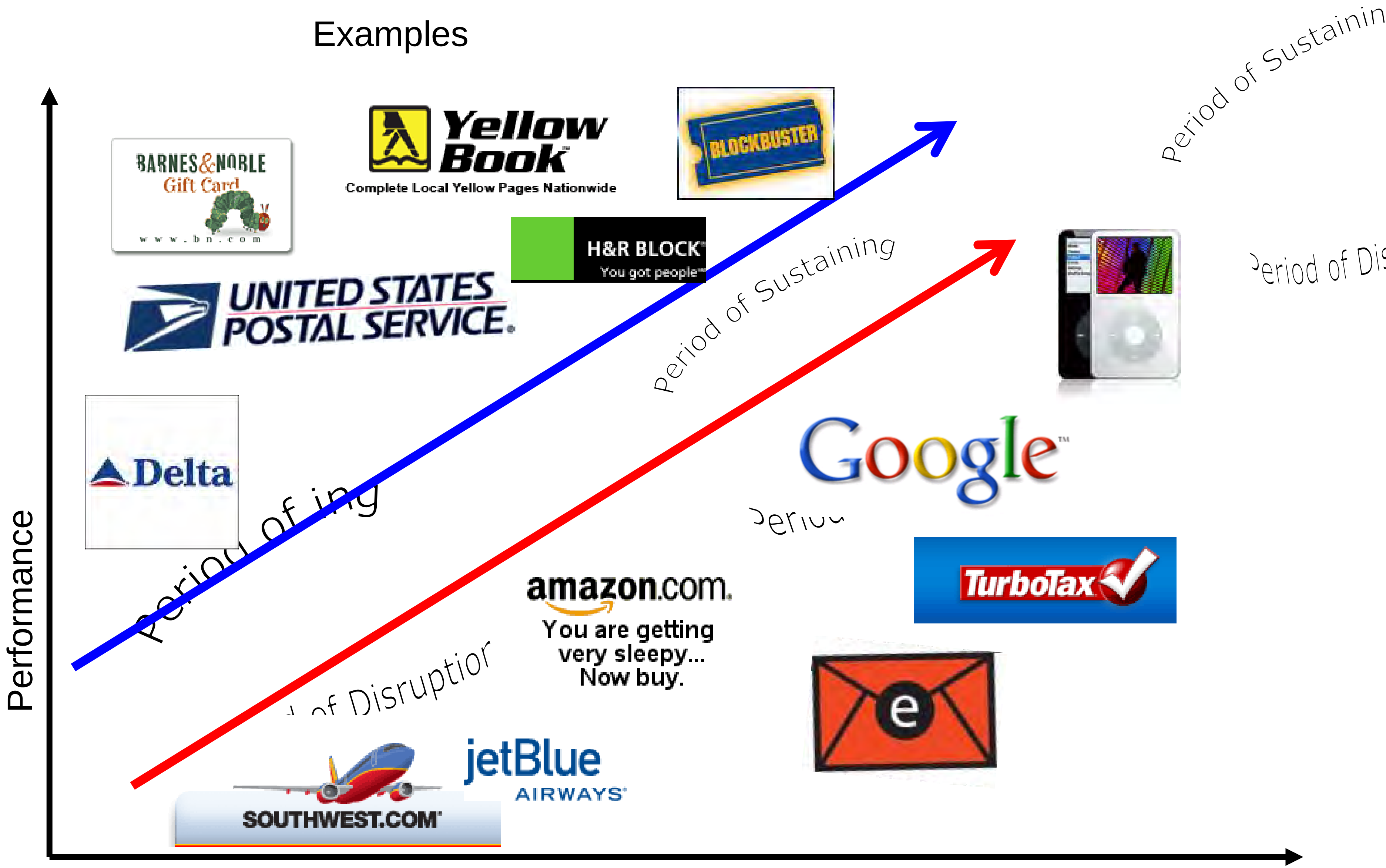
Alternative Business Models



[Reference: The Innovator's Dilemma by Clayton M. Christensen

Alternative Business Models

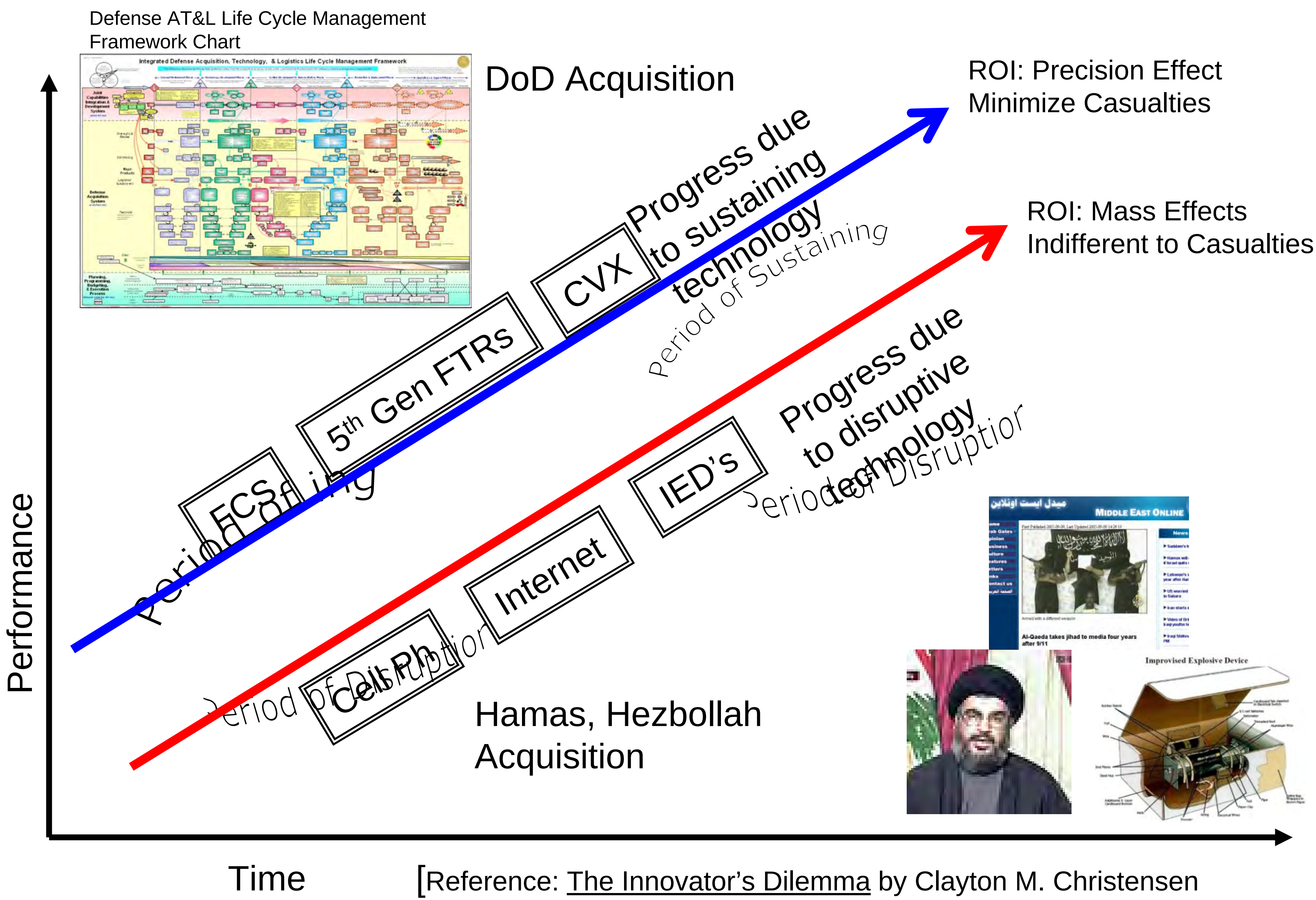
Examples



Time

[Reference: <u>The Innovator's Dilemma</u> by Clayton M. Christensen

Alternative Business Models



[Reference: <u>The Innovator's Dilemma</u> by Clayton M. Christensen

Final Thoughts

- Must build to the Joint capability requirements of both irregular war and the conventional fight
- One aspect of our future we can't overlook or underemphasize is our own human capital situation and solutions
- Time Dilemma
    - COCOMs are in the here and now; S&T is predominately in the future
    - Must recognize/exploit S&T opportunities early vice reliance on long term research
    - Future may be now, more than we care to admit it
- An Art and Science imbalance exists by the lack of COCOMs authorities and resources to direct S&T
- S&T and Warfighters need Rosetta Stone
    - Adopt the right lexicon -- a capabilities-based language
- Need better exposure of S&T to exploit the realm of technology
- Technologies don't emerge; they're made to emerge

Technology Dominance is not a Privileged U.S. Domain … A Clever and Adaptive Enemy Can Prevail