

ONR International S&T

Presented to:

American Chamber of Commerce Singapore

30 May 2008

CAPT Chip Fowler

Commanding Officer

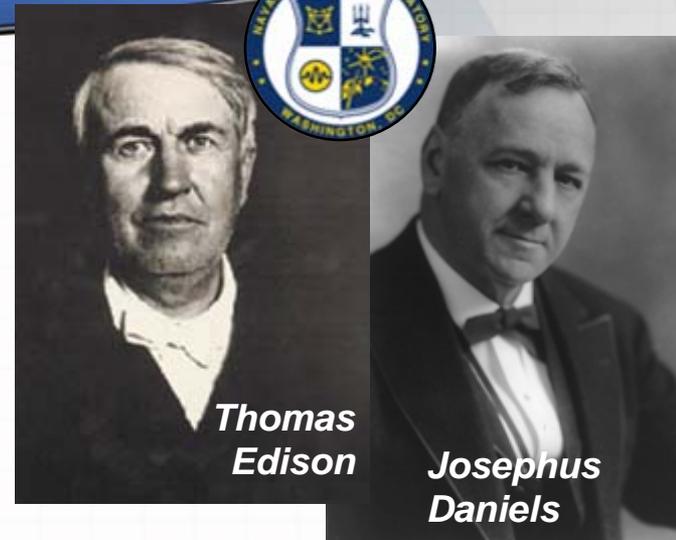
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Naval Research Statutory Mission

- Naval Research Laboratory (Appropriations Act, 1916):
“*[Conduct] exploratory and research work...necessary... for the benefit of Government service, including the construction, equipment, and operation of a laboratory....*”
- Office of Naval Research (Public Law 588, 1946):
“*... plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security....*”



Thomas Edison

Josephus Daniels



Vannevar Bush

Harry S Truman

- Transitioning S&T (Defense Authorization Act, 2001):
“*...manage the Navy’s basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test, and evaluation.*”



A Technological "Perfect Storm"?

For decades, Western militaries have held a decisive technological advantage...



"It is by devising new weapons, and above all by scientific leadership, that we shall best cope with the enemy's superior strength."

--**Winston Churchill**

Today, enemies are able to acquire weapons and technology quickly and cheaply...



"Acquiring weapons for the defense of Muslims is a religious duty. If I have indeed acquired these weapons, then I thank God for enabling me to do so. And if I seek to acquire these weapons, I am carrying out a duty. It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harm on Muslims."

--**Osama bin Laden**

And there also are adversaries willing to invest significantly in new technology...

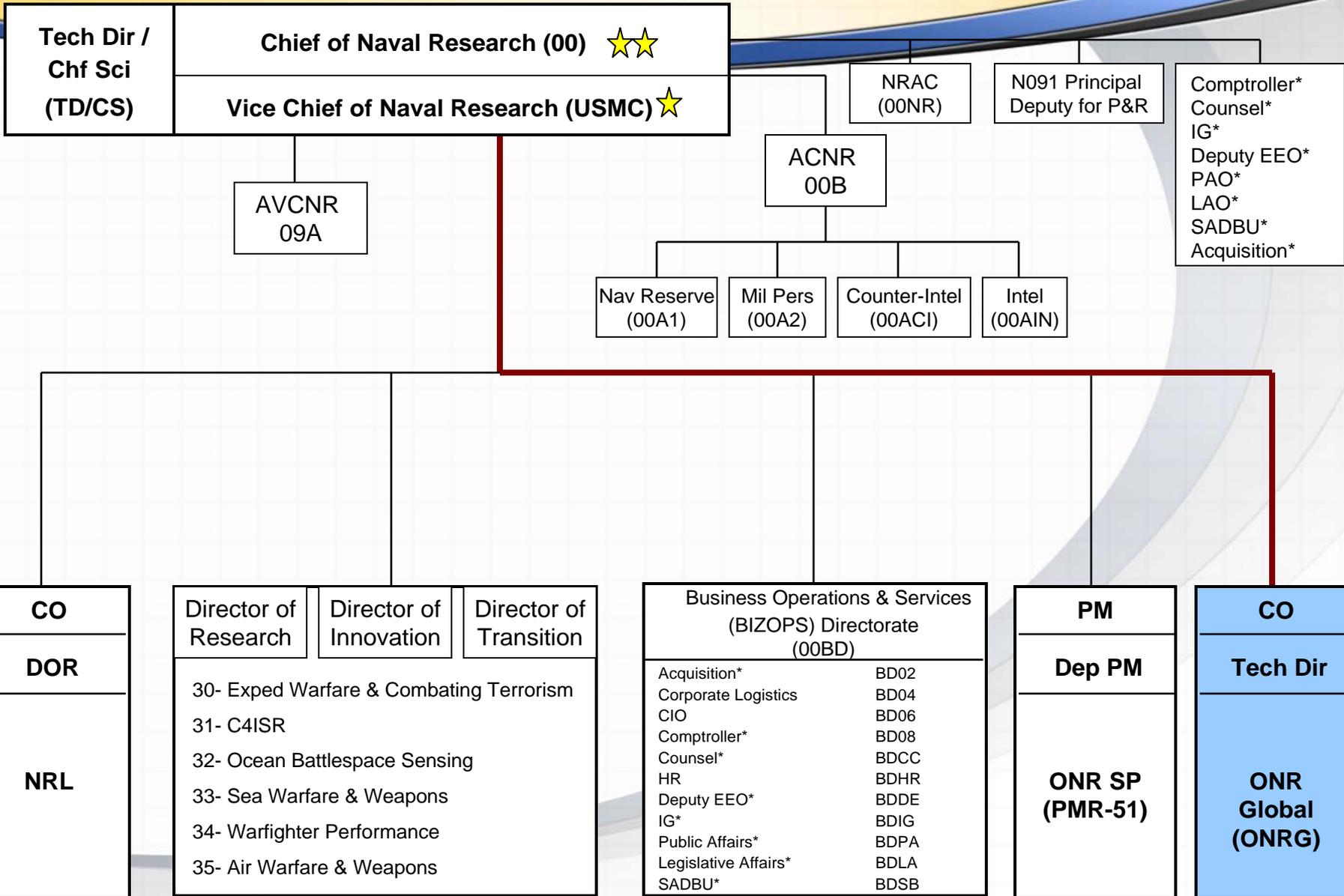


"The 21st Century is also going to be an age of scientific change, with certain cutting-edge technologies likely to be applied to naval warfare...high-tech arms will make direct attacks on naval battlefields possible from outer space, remote altitudes and remote land bases...superconduction technology will bring superconductor ships to the naval order of battle, enabling ships to travel faster without noise...submarines will be able to go faster and deeper, with the seabed being the ideal place to build military bases."

o) --**Chinese Naval Officers at the Navy Research Institute in Beijing**



Office of Naval Research





ONR's Mission

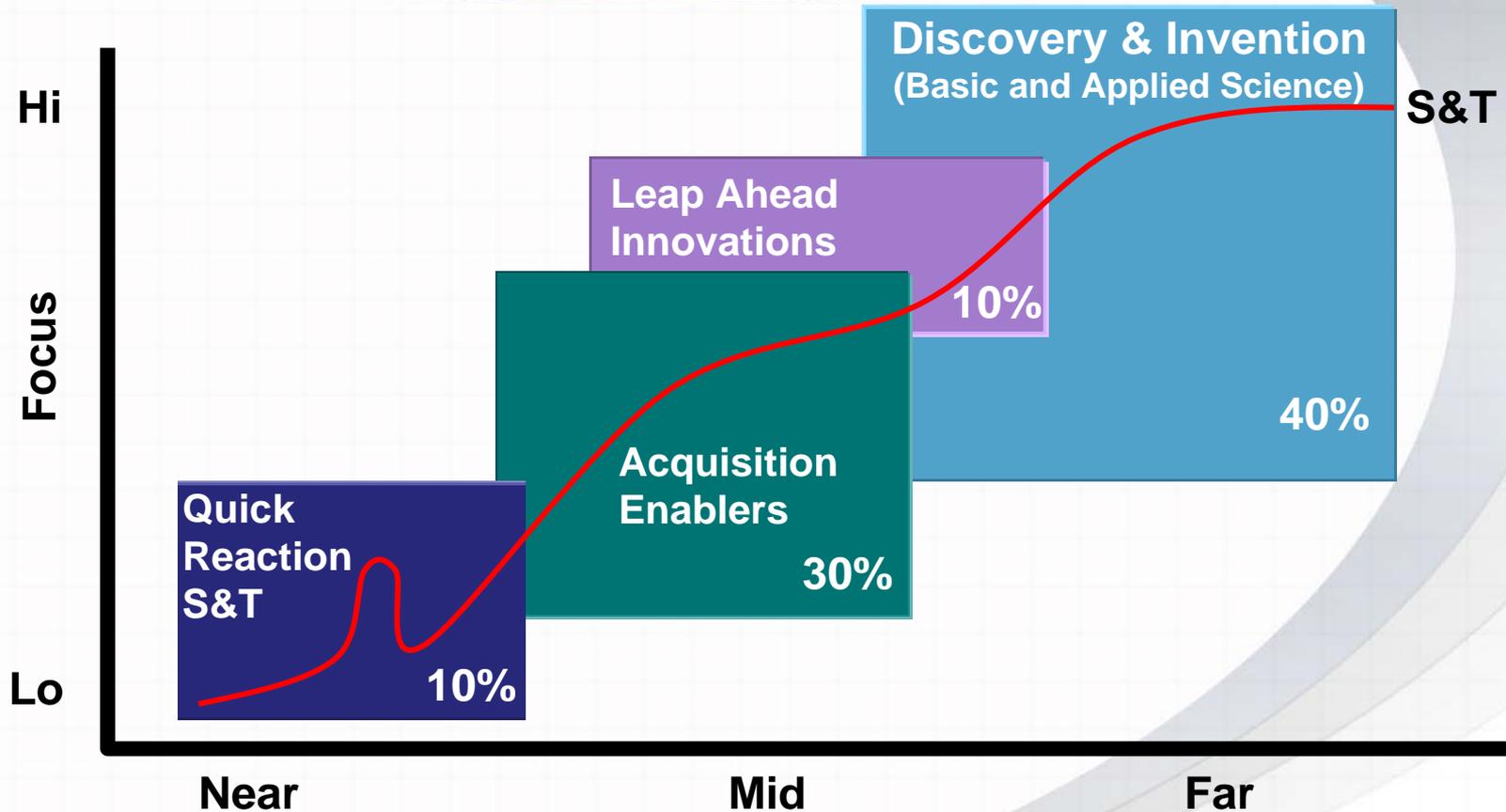
To foster, plan, facilitate, and transition scientific research in recognition of its paramount importance to enable future naval power and the preservation of national security.



The Office of Naval Research's job is to enable the innovative operational concepts of the Navy and Marine Corps so that Sailors and Marines can fight today's—and tomorrow's—wars more effectively.



ONR S&T Portfolio Balance

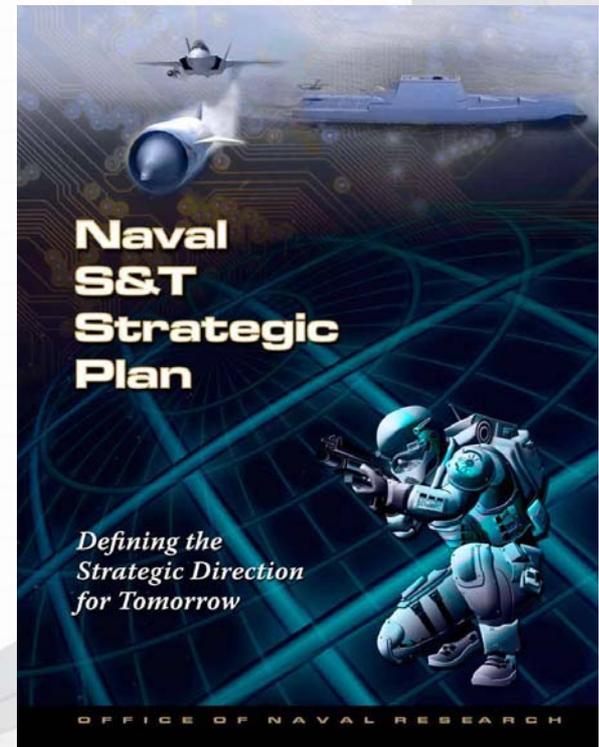


S&T has a long-term focus but is responsive to near - term Naval needs



Naval S&T Strategy

- Ensure alignment of Naval S&T with Naval missions and future capability needs
- Communicate the S&T vision and approach to senior decision makers, key stakeholders, S&T partners, customers and performers
- Balance and manage the S&T portfolio based on some key tenets:
 - Strive to touch intellectual capital worldwide
 - Leverage U.S. and global technology insights
 - Sponsor primarily external performers
 - Maintain NRL in-house research capability as the Navy/Marine Corps Corporate Laboratory
 - Manage a balanced portfolio with technical Program Officers





Naval S&T Strategic Focus Areas

Enabler -- S&E Workforce/Performer Base
Enabler -- Global Technology Awareness

Naval S&T Focus Area	Naval Warfighting and Support Functions
Power & Energy	• Power Generation and Storage • Assured energy sources • Man Portable & Lightweight • High-Density Power
Operational Environments	• Oceanography & Survey (Ocean/Hydro/River) • Meteorology • Space Environmental Effects
Maritime Domain Awareness	• ISR collection & integration • CBRNE (Explosives & WMD Detection) • Port/Base Security • Swimmer Detection • Wide Area & Battlespace Surveillance • Social/Cultural Understanding • MIO Sensing • HLS Ship Tracking
Asymmetric & Irregular Warfare	• Operational Adaptation • Maritime/Riverine Interception Operations • Expeditionary Security • Boat/Vehicle Disabling (Apply Non-Lethal Systems & Effects) • Forensic Site Exploration • Tactical Evidence Collection • Counter IED/Snipers • Riverine Operations • Regional Domain Awareness • Homogeneous Cultural Integration of Forces • Tactical Tagging and Tracking
Information, Analysis and Communication	• Assured and Secure Communications • Electronic Warfare • Computer Network Ops • Operations Security • Military Deception • Cross Cultural Communications • Threat Intent Determination • C4
Power Projection	• Rapid Tactical Precision Targeting • Time-sensitive strike • Neutralization (lethal/non-lethal) • Effects-scaled weapons • Integration & Control of Naval fires • Maneuver
Assure Access and Hold at Risk	• Persistent Surveillance & Monitoring • Tagging/Tracking & Locating • Shaping and Information Operations • Strategic Target ID/Tracking • Information Verification • Vessel/vehicle-stopping • MIO/Boarding • ASW & MCM • Spoof/Decoy
Distributed Operations	• Distributed Logistics • Small Unit ISR/Intel Collection/Dissemination/Fusion & Engagement • Tactical Maneuver & Mobility • Control of Integrated Fires • Training Operations in Urban/Extreme Environments • Large target lethality with reduced combat loads • Control Collateral Damage
Naval Warrior Performance and Protection	• Personal Protection • Endurance • Decision-Making Tools • Decision/Training Tools • Casualty Prevention/Care • Undersea Medicine • Enhanced Human Performance • Operating in Extreme/Austere Environments • Expeditionary Security • Training Operations in Urban Environments
Survivability and Self-Defense	• Missile Defense • Torpedo Defense • LO/CLO • Tactical EW • Damage Control/Prevention • Force Protection • Time-Critical Terminal Defense
Platform Mobility	• Platform Performance & Agility • Power-Dense Propulsion • Operational Adaptation • Tactical Maneuver Mobility
Fleet/Force Sustainment	• Seabasing • Operational Logistics • Maneuver
Affordability, Maintainability, and Reliability	• Increased warfighting capacity • Reduced logistics cost optimization reduced failure rates • Automate Naval engineering • Aircraft Propulsion Design • Reduce Manning • M&S Automation • Reduce Upgrade Costs

Global Technology Awareness Enabler

Vision: Tap global innovation to address naval challenges and mitigate technological surprise.

Objectives

OPPORTUNITY: Capitalize on global innovation and investment to solve Naval S&T challenges.

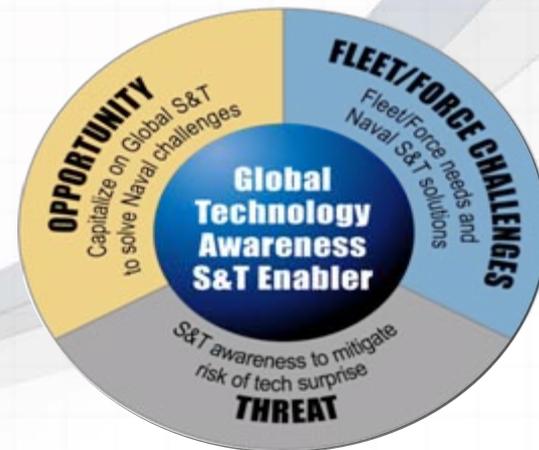
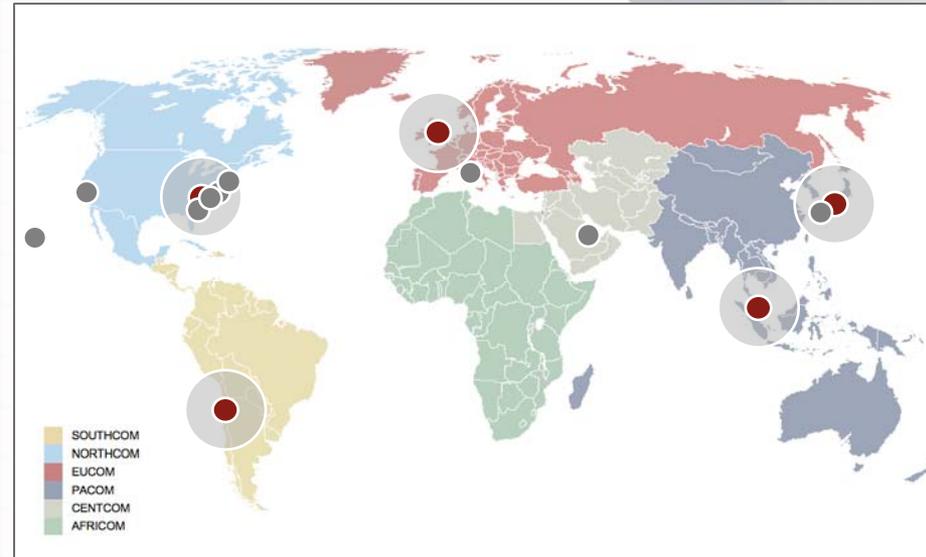
- Provide access and establish relationships with international leaders in relevant research fields
- Establish direct collaborations between ONR and NRL scientists with foreign scientists
- Provide mature technology to international partners and test and evaluate foreign technology

THREAT: Build global S&T awareness to mitigate risk of potential technological surprise.

- Provide international trends, accomplishments, and centers of excellence for Naval S&T strategic areas
- Identify geographically significant trends and advances to forecast threats and trends in global S&T

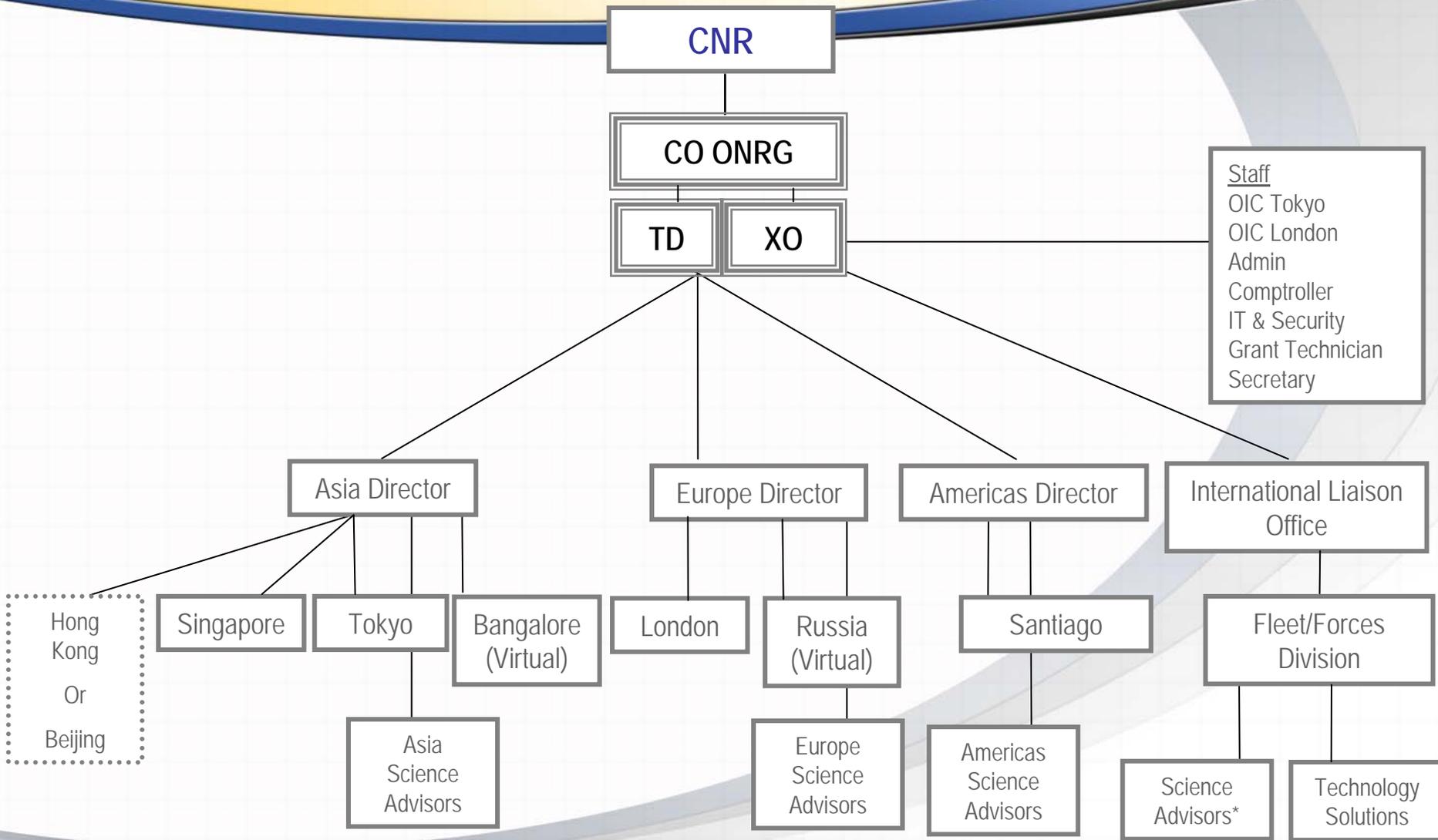
FLEET/FORCE: Ensure Fleet/Force capability needs are communicated to the Naval S&T community, and facilitate delivery of Naval S&T solutions to the Fleet/Force.

- Embed Science Advisors within the Fleet/Force to provide direct communication of current and emerging S&T challenges
- Utilize Science Advisors to provide relevant, timely Naval S&T solutions to Fleet/Force needs
- Utilize Naval S&T to assist in carrying out theater security cooperation priorities globally
- Provide rapid-response S&T solutions to immediate deck-plate level issues in response to Warfighter requests.





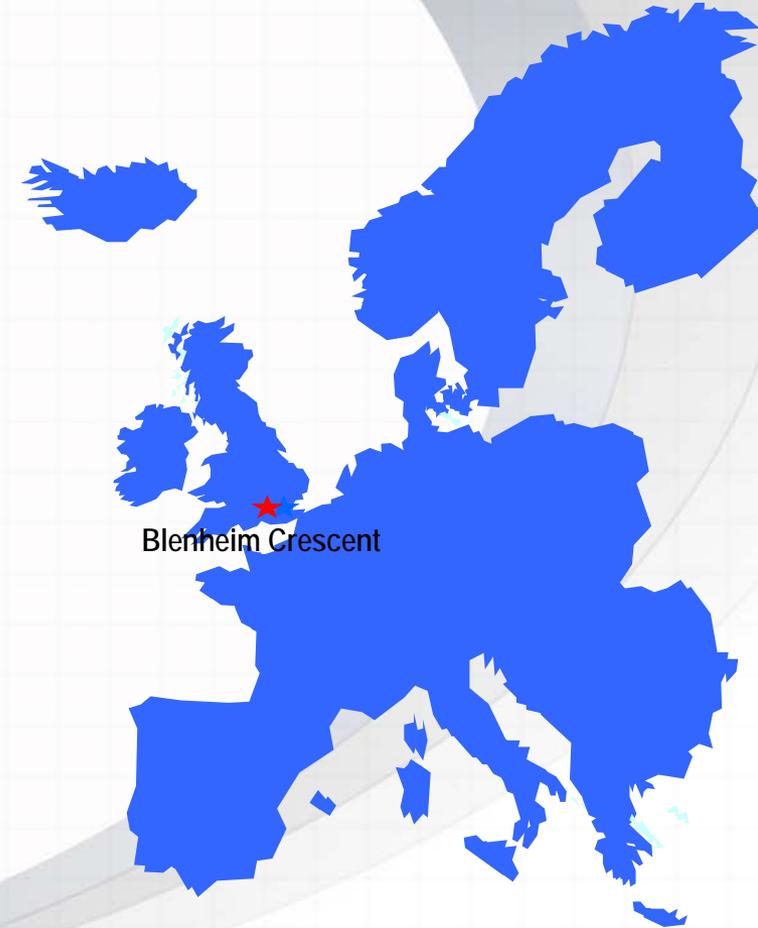
Organizational Overview





History

- 1946 – ONR Branch London Office created to survey, assess and report on European S&T Activities
- 1974 – ONR European and Tokyo Office opened to liaise and assess Asian S&T activities. OSD supports Tri-Service Office at Edison House
- 1977 – ONR European and Tokyo Offices combined to form the International Field Office in order to implement a single International DoN S&T Strategy for fostering international collaborations
- 2003 – ONR Global formed through the merger of the Naval Fleet/Force Technology Innovation Office and the International Field Offices





Increasing Risk of Tech Surprise

- Rampant technology advancements
- Globalization of S&T
- Relative dilution of US technology base
- Accelerating commercialization of S&T
- Integration of developments from multiple technical disciplines
- Regional and country-specific differences in needs and S&T capabilities
- Volatility in geopolitical alignments

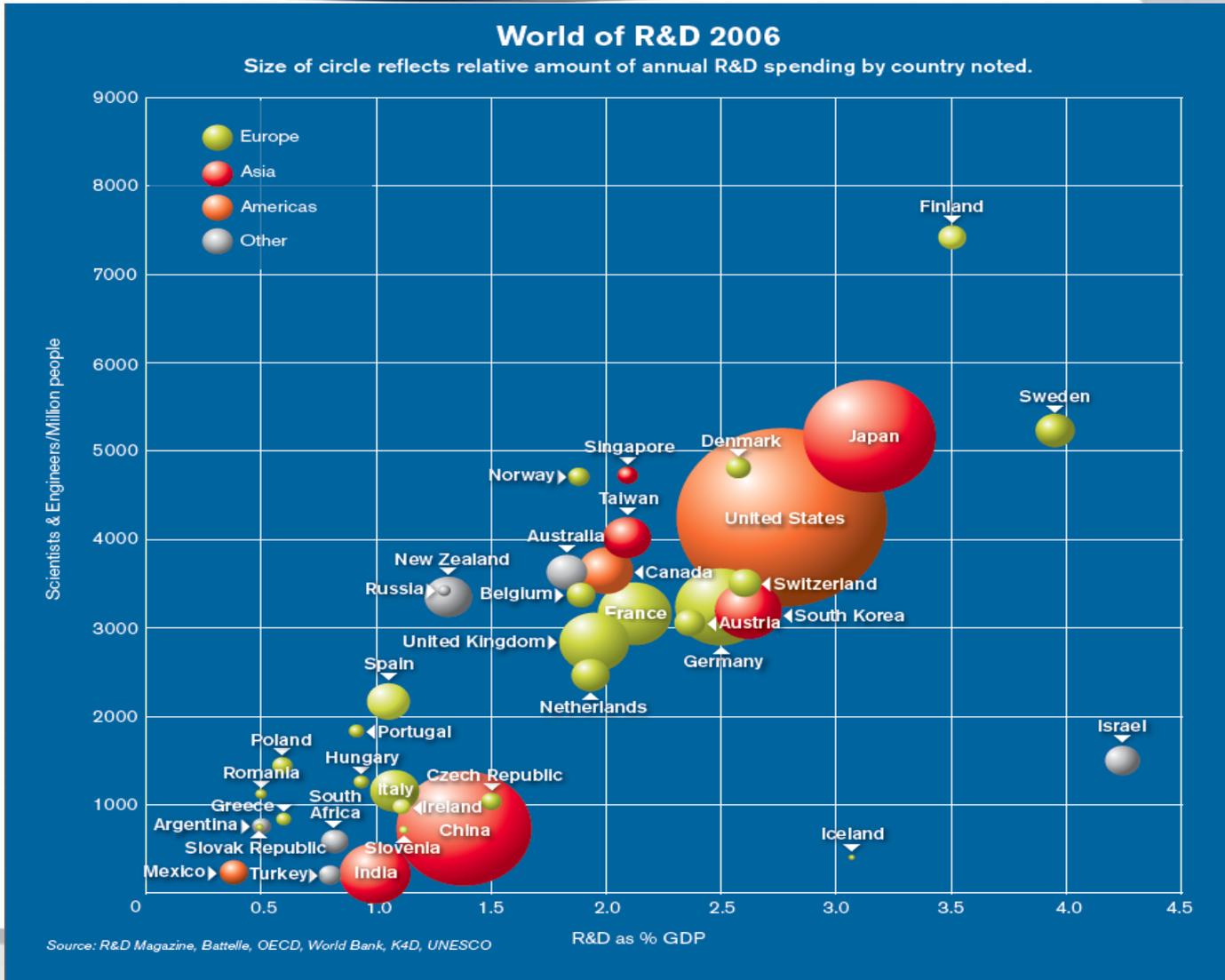
Ref: John Meyer, USPACOM S&T Workshop, April 2008



Warning indicators ...

- 2005, only 4 US companies were among top 10 receiving US patents
- Recent ranking by OECD, US in 22nd place in fraction of GDP devoted to nondefense research
- End 2007, China & India account for 31% of global R&D staff, up from 19% as recently as 2004
- China has supplanted the United States as the world's number 1 *high-tech* exporter
- Of new R&D sites planned in next 3 years by 177 companies queried in recent survey, 77% to be built in China or India, often using US corporate financing

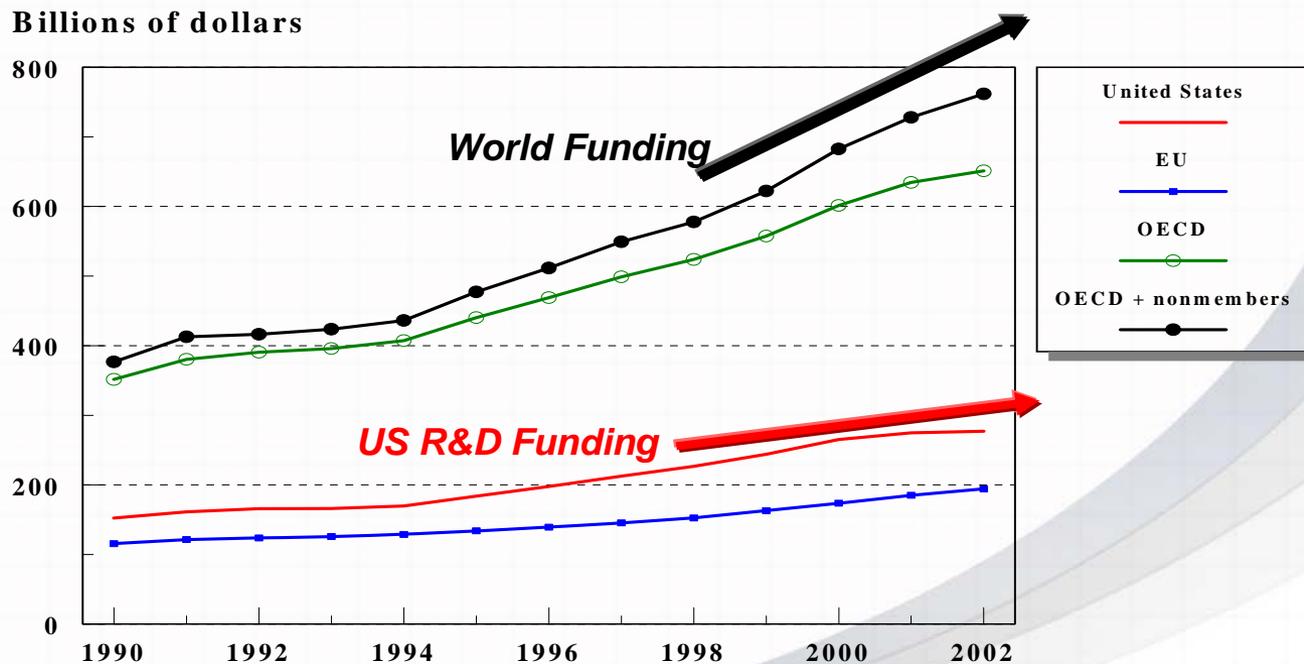
World of R&D



International R&D Trends

- R&D expenditures are increasing robustly around the world, driven by both governments and industry.

Figure 1. Estimated worldwide R&D expenditures: 1990-2002



NOTE: Billions of current dollars converted with purchasing power parities.

EU data since 1998 include 10 new member countries.

SOURCE: OECD, Main Science and Technology Indicators database, November 2004

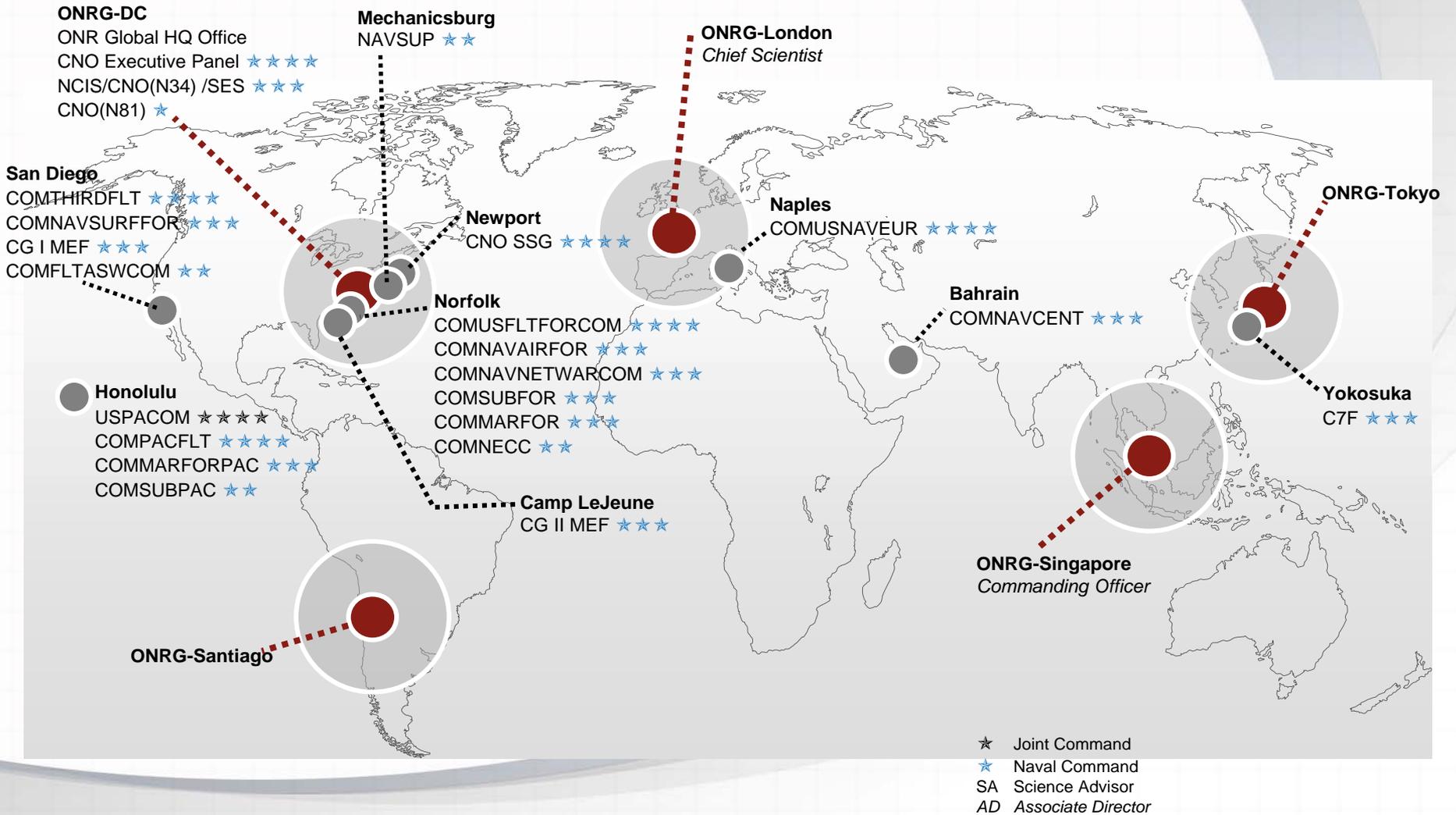


ONRG Mission Statement

To search the globe for promising, emerging scientific research and advanced technologies to enable the Office of Naval Research to address the current needs of the Fleet and Force effectively and to investigate and assess revolutionary, high-payoff technologies for future Naval missions and capabilities.



ONR Global Presence





ONRG International Engagement

NORTHCOM:

- Canada
- Mexico
- Puerto Rico
- USA
- Virgin Islands

EUCOM:

- | | | | |
|------------|-------------|-------------|----------|
| Armenia | Austria | Azerbaijan | Belgium |
| Bulgaria | Croatia | Czech Rep. | Denmark |
| Estonia | Finland | France | Georgia |
| Germany | Greece | Hungary | Ireland |
| Italy | Latvia | Lithuania | Moldova |
| Montenegro | Netherlands | Norway | Poland |
| Portugal | Romania | Russia | Slovenia |
| Spain | Sweden | Switzerland | U.K. |
| Ukraine | | | |

SOUTHCOM:

- Argentina
- Bolivia
- Brazil
- Chile
- Colombia
- Ecuador
- Peru
- Uruguay

AFRICOM:

- Egypt
- Ghana
- Guinea
- Mauritania
- Morocco
- Sierra Leone
- South Africa
- Tunisia

CENTCOM:

- Bahrain
- Israel
- Turkey

PACOM:

- Australia
- China
- Hong Kong
- India
- Indonesia
- Japan
- Mongolia
- Malaysia
- New Zealand
- Philippines
- Korea
- Singapore
- Taiwan
- Thailand
- Viet Nam

Based on FY 2008 Regional Action Plans
as of 1 May 2008



Major Programs

Science Advisor Program

- **Ensure Fleet/Force decision makers are aware of potential technology solutions resident in the Naval Research Enterprise (NRE).**
- **Articulate urgent Fleet/Force capability needs to the NRE in a manner that would allow for a technology solution (if possible)**

Science Program

- **Access and assess international S&T/R&D in areas of naval interest.**
- **Leverage relevant international S&T/R&D activities to enhance NRE research initiatives.**
- **Serve as an international node for ONR and the NRE**

Tech Solutions Program

- **Provide the Fleet/Force with prototypes that delivers near-term solutions to Sailor/Marine needs.**

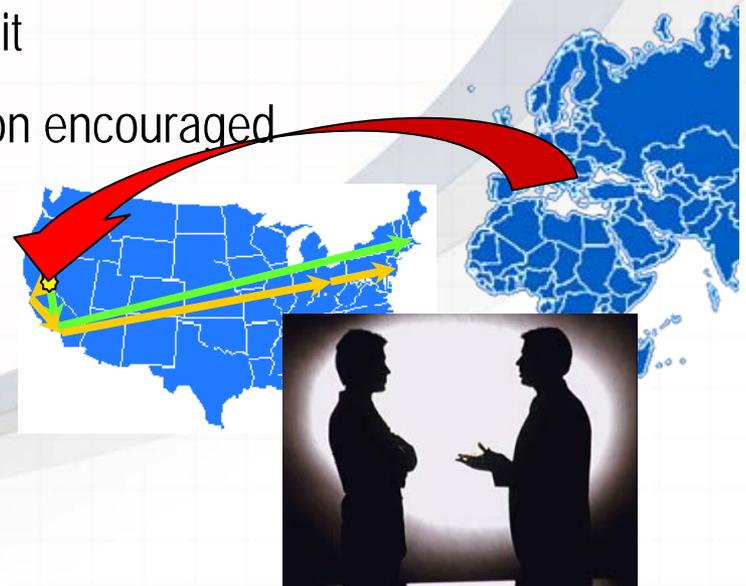


Science Programs Tools

- Liaison Visits – Associate Director visits to international S&T institutions to develop access and to find cutting edge science and technology
 - 535 visits by 36 scientists
- Visitor Support Program (VSP) – support travel of foreign scientists to US to socialize new S&T ideas or findings within the NRE
 - supported travel of 100 scientists from 31 countries
- Conference Support Program (CSP) – support foreign or international conferences of Naval interest
 - supported over 100 conferences with 34 countries
- Naval International Cooperative Opportunities in S&T Programs (NICOP) – Support the insertion of innovative, international S&T into core ONR programs, the NRE, and Acquisition Programs
 - identified and supported over 50 projects with scientists from 18 countries

Visitor Support Program: A Window on Science

- Scientists brief their research to U.S. researchers supporting USN / NRE needs
- Used to gauge the quality of a scientist's work
 - Leads to further investment or collaboration
- Covers cost of transportation, lodging, conference fee, etc.
 - Target multiple sites/organizations per visit
 - Naval Academy and NPS visit/presentation encouraged
- Not for supporting research





Conference Support Program

- Promote conferences and workshops on topics of interest to USN / NRE
 - Gather disparate European/Asian Scientists in one place to facilitate NRE assessment
 - Expand availability of proceedings to US researchers
 - Support Department Research Initiatives (DRI) / Discovery & Invention (D&I) efforts by stimulating international interest
- Increased focus is on smaller, targeted workshops
- The Limits
 - Conference must be held outside North America
 - Funds cannot be used to pay for travel expenses of US based Government personnel



NICOP Philosophy

- A NICOP is a funding mechanism to:
 - Introduce emerging technology into the NRE from international sources earlier than it would otherwise happen
 - “Kick-start” collaborative research of benefit or interest to the NRE
- Technology Transfer Agreement (TTA) not required
- Does require an NRE commitment from a funded line of research

- Example:

	<u>FY07</u>	<u>FY08</u>	<u>FY09</u>
■ ONRG NICOP	70,000	35,000	17,500
■ NRE Source	8,000	46,000	68,500
■ Foreign Source	41,000	43,000	45,000



Changing Environment

■ In the beginning

- Focus: W Europe
- Finance: Strong \$
- Staffing: ~50
- Connectivity
 - Regional
 - Phone + Visits
- Large US military presence
 - Support infrastructure in place and readily accessible

■ Now

- Focus: > 100 countries covering
 - Europe
 - the former Soviet Union
 - the Middle East
 - Africa, Asia, the Americas
- Finance: Weakening \$
- Staffing: < 20
- Connectivity
 - Global
 - + Fax + Internet + VTC
- Rapidly shrinking and re-aligning military presence
 - Support infrastructure disappearing
 - US citizen local-hire pool shrinking


[ONR Global](#) > [ONRG Operations](#) > [Regional Action Plan](#)

Regional Action Plan

This list is for management of the Regional Action Plan

New		Actions												
ID		Edit	ONRG POC	Activity Date	Activity Days	World Region	Country 1	Country 2	Activity Name	Activity Type	Activity Reason	Self Priority	COM Priority	ONR Research Areas
93			Pitton	JAN-08	5	Americas	United States		Spitfire Brief	Meeting	Direction - ONR/NRL	High		Operational Environments
94			Roman	Mar-08	20-23	Americas	Dominican Republic		Western Hemisphere Information Exchange Conference on Renewable Energies	Conference	Direction - COCOM	High	Medium	Power and Energy Technology
95			Hodges	JAN-08		Europe	United Kingdom		Biometrics Working Group (BWG)	Workshop	Direction - DOD/OSD	Medium		Warrior Performance and Protection
96			Hodges	Mar-08		Europe	United Kingdom		ONRG S&T Database	R&D Project	Direction - ONR/NRL	Medium		Support
97			Pitton	Jan-09	4	Europe	Norway		31st Scandinavian Symposium on Physical Acoustics	CSP	Interest	High		Operational Environments
98			Zimmerman	Jan-08		Europe	Republic of Moldova		Tour information fusion lab	Site Visit	Support - NRE	Medium	Medium	Information Analysis and Decision Support
99			Frank	Jan-08		Europe	Switzerland		Visit to Edison House by Dr. Botond Roska (FMI in Switzerland) to discuss NICOP results of bio-inspired vision research and genetic engineering of mice retina to restore sight.	Meeting	Interest	High		Autonomous Systems

[View All Site Content](#)

Documents

- Operations Documents

Lists

- Regional Action Plan
- ONRG Master Calendar

Discussions

- Ops Discussion

Sites

People and Groups

- Recycle Bin



Country at a glance

- Ranks first in IT services on outsourcing
- S&T investment to exceed \$8 billion by 2018
- Current S&T effort supports 2900 institutes and R&D facilities
- Substantial new investments in S&T infrastructure: support for 20 new national research centers, 220 universities, and 200 laboratories
- Indian govt. plans to establish 4 new institutes for nanoscience & nanotechnology
- Clusters of expertise are emerging: IT in Bangalore and Hyderabad; Life Science and Chemicals in Mumbai; Software and Biotech in Bangalore; Software in Delhi and Hyderabad; Telecom in Hyderabad; nano and materials science at IIT Kanpur and Mumbai, ISC Bangalore, National Metallurgical Lab. Jamshedpur
- The 8 Indian Institutes of Technology (IIT) are some of the top research facilities in India and the world
- DRDO and CSIR are major funding organizations for top National Labs., IITs and other R&D centers
- India plans to purchase over 100 fighter jets from U.S. and >100 rotary aircraft from EU (France) by 2020

Regional Action Plan (RAP) Strategy

- Organize US and India S&T Forum to further cooperative R&D in materials science, power and energy, biotech, methane hydrate exploration, photonics, wide band gap semiconductors, etc.
- Conduct site visits to improve interaction between ONR Global and S&T organizations and institutions
- Promote joint efforts in human factors, engineering, information technology, ship and submarine designs, sonar systems, nano-carbon chemistry, non-linear dynamics etc.

Asian/Pacific Rim Recent Accomplishments



"Satellite Remote Sensing of Spratly Islands"

Edited by Antony Liu



HIGHLIGHTS

Japan

- Expanded engagement with commercial section – Toshiba battery
- Stand up of the IT and ADMIN hubs
- Roll out of the Knowledge Management System

Taiwan

- "Satellite Remote Sensing of Spratly Islands" edited by Dr. Liu published

Singapore

- BILATS October '07
- 5 active Project Agreements

China

- Four conferences attended since Mar '07, pursuing follow-on visits

Mongolia

- Site visit in September '07

Asian/Pacific Rim Recent Accomplishments



HIGHLIGHTS

Korea

- Two team visits to 9 electric ship and power related S&T organizations
- 2 New NICOPs, 3 CSPs and 2 VSPs

India

- Increased engagement
- 7 workshops and 2 NICOPs
- 2nd S&T Roundtable IISc Bangalore

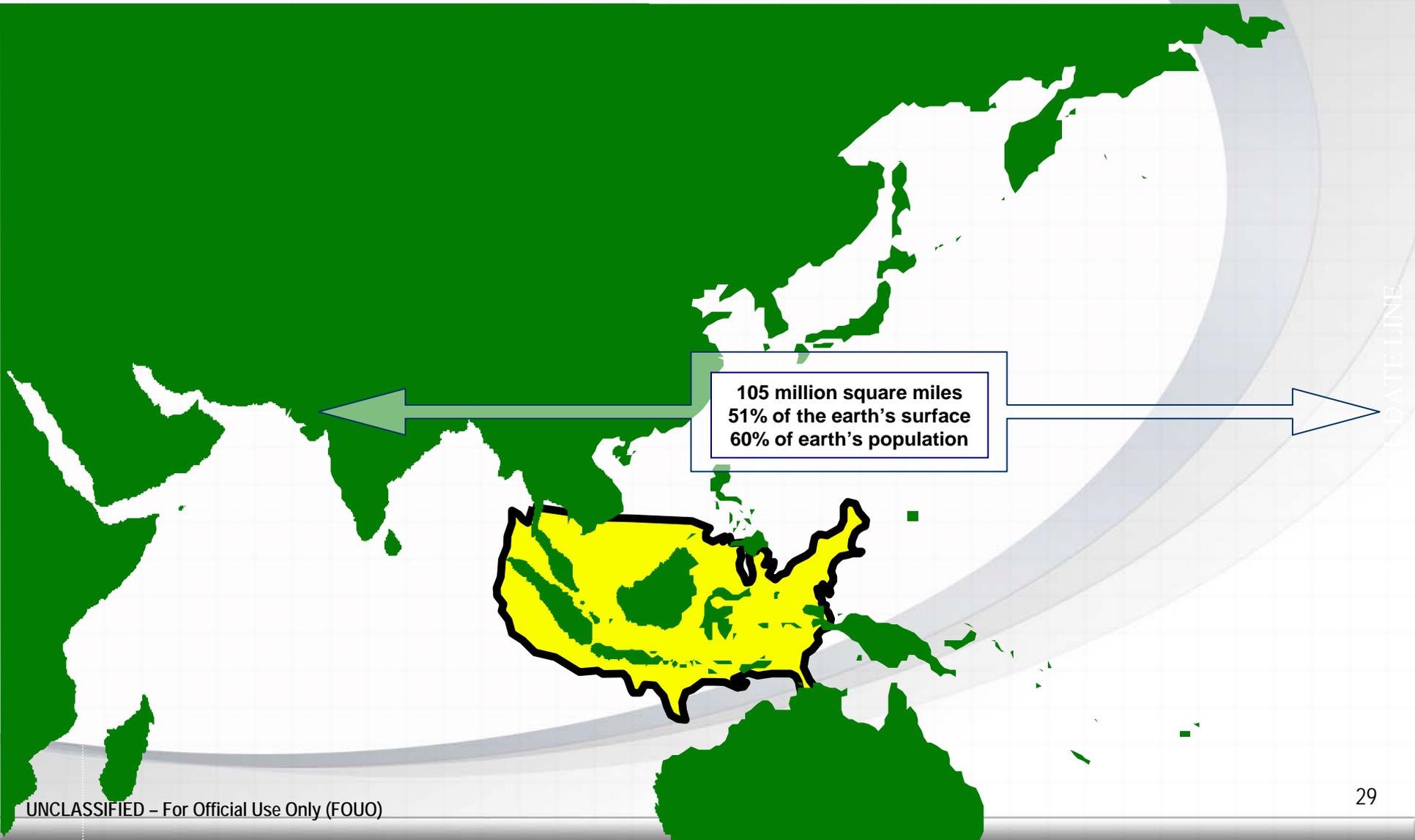
Australia

- BILAT in Oct '07
- 7 NICOPs



Asian/Pacific Rim Summary –

A lot of territory to cover





Asian/Pacific Rim Summary

- Opportunity Abounds
 - Unique Tri-Service interaction/engagement; increasing collaboration efforts
 - Enhance communications with area SA's and PACOM and PACFLT staffs
- Staffing challenges to be mitigated by end of summer 08
 - Staff to increase by 4 in Tokyo (Distributed Ops, Power Projection, Fleet/Forces Sustainment, Systems Science*)
 - Staff increase in Singapore. CDR Johnson onboard APR 08 and hiring GTA position
- Continue planned visits to China. Pending DoD strategy for DoD engagement with China in Science and Technology

Questions?



Musa Al-Shaer / AFP



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