

Foro Ciencia, Tecnología e Innovación para la Prosperidad: Perspectivas y Aportes del Sector Defensa y Seguridad

Octubre 4 de 2011

Ministerio de Defensa Nacional
República de Colombia



Libertad y Orden

Memorias del evento

Contenidos

El offset como catalizador de desarrollo industrial y en defensa.

John Black, Director, Desarrollo de Comercio Internacional, Motorola.

Transferencia y comercialización de tecnología.

Glenn Robinson, Gerente, Negocios Internacionales, Instituto IC², Universidad de Texas.

Ciencia, Tecnología e Innovación en Defensa. El caso de Corea del Sur.

Seung-Kyu Hong, Departamento de Investigación y Desarrollo, LIG Nex1.

Ciencia, Tecnología e Innovación en Defensa. El caso de España.

Esther Álvarez González, Presidente, Grupo In-Nova.

Ciencia, Tecnología e Innovación en Defensa. El caso de Canadá.

Eric Fresque, Director del Departamento de Ciencia y Tecnología de Relaciones Exteriores, del Departamento de Investigación y Desarrollo de la Defensa de Canadá. Ministerio de Defensa de Canadá.

El offset como catalizador de desarrollo industrial y en defensa.

John Black, Director, Desarrollo de Comercio Internacional, Motorola.

Using Offset to Attract R&D

John Black

Director, Global Cash Management and Offset
Motorola Solutions, Inc.



SEPARATION

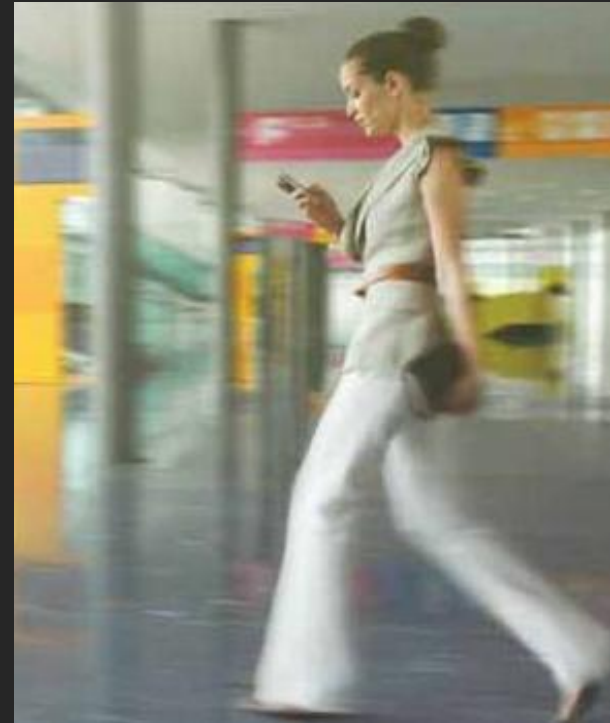
On Jan. 4, 2011, Motorola, Inc. spun off its Mobile Devices and Home businesses, which became Motorola Mobility Holdings, Inc., and changed its name to Motorola Solutions, Inc.



MOTOROLA SOLUTIONS

GOVERNMENT & ENTERPRISE FOCUS

NYSE: MSI



MOTOROLA MOBILITY

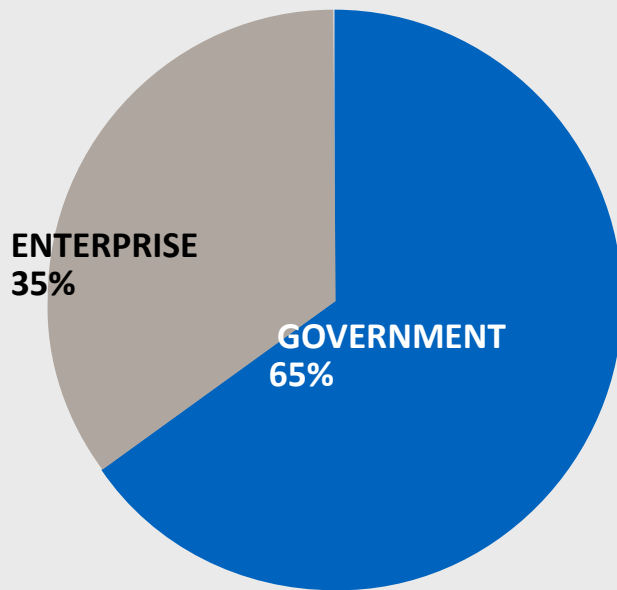
CONSUMER FOCUS

NYSE: MMI

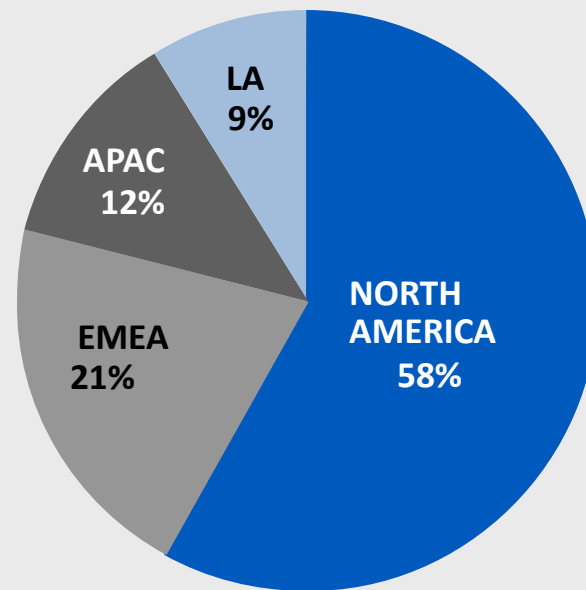
MOTOROLA SOLUTIONS REVENUE

2010 REVENUE: \$7.9 BILLION

BY SEGMENT



BY REGION



GOVERNMENT

- RADIO SYSTEMS
- RADIO DEVICES
- INTEGRATED COMMAND & CONTROL
- SERVICES

ENTERPRISE

- MOBILE COMPUTING
- ADVANCED DATA CAPTURE
- WIRELESS NETWORKS
- SERVICES

10/4/2011

MOTOROLA SOLUTIONS' VISION



GOVERNMENT



ENTERPRISE

TO BE THE **LEADING GLOBAL PROVIDER**
OF MISSION-CRITICAL COMMUNICATIONS FOR
GOVERNMENT AND ENTERPRISE CUSTOMERS

TECHNOLOGY LEADERSHIP

\$1 BILLION ANNUAL R&D INVESTMENT

STRONG IP PORTFOLIO

- 10,000 GRANTED AND PENDING PATENTS

LEADER IN STANDARDS DEVELOPMENT

DRIVING MISSION-CRITICAL TECHNOLOGY

TARGETED INVESTMENT IN NEXT-GENERATION INNOVATIONS AND ADVANCED SERVICES



SCALE & GLOBAL PRESENCE



PRIMARY R&D IN 6 COUNTRIES

23,000 EMPLOYEES IN 65 COUNTRIES

MANUFACTURING IN 4 COUNTRIES

SALES IN OVER 100 COUNTRIES



PRIMARY R&D CENTERS

MANUFACTURING

What is Offset?



Agreement to perform certain targeted economic benefits in customer country in return for sale to government – a quid pro quo

Typically stated as a percent of sale, e.g. 100% per Colombia guidelines

Forms of Offset may include local production, local R&D, investment, tech transfer, training, purchases, exports etc.

What make a country attractive for R&D investment?

- Educated , Skilled and Reasonable Cost Employees
- Proximity to World Class Research Institutions/Universities
- Reasonable Costs for Land, Buildings, Training, Taxes, Imports
- Government Grants or Incentives
- Good Infrastructure
 - Transportation and Communication
- Link to Increased Sales
- Political Stability
- Safety/Security/Quality of Life
- If Don't Offer Above, May Not be able to Attract R&D Related Offset
- R&D Highly Sought by Governments Worldwide!

Why Is R&D Viable for Offset?

- Large defense system integrators looking for partners for development and supply
 - Willing under right circumstances to outsource development of parts or subsystems
- Software and other technology expertise exists worldwide
- Open system architecture, open source software and technology portals contribute to technology sharing
- Suppliers are looking to technology partners for solutions to problems
- Lack of funding can create a gap in getting products from lab to market – offset can help bridge that gap
- R&D can potentially generate very large offset credits at a reasonable cost
- R&D well received by customer as part of offset package
- Corporations have large research budgets and may allocate some of this to offset obligations if strategically important and resulting R&D competitive

Potential Types of R&D for Offset

- Cash spend on Corp R&D
- Technology Transfer
- Cooperation on Technical Training Institutes
- Lab or Test Equipment
- Software - Much of product functionality is software defined
- Tools
- Portal and Sale promotion
- Technology Park or Incubator
- Cooperation with Universities or Govt Research Institutions
- Co-Development
- Outsourcing
- Supplier Development
- SME Development
- Licensing of Technology for R&D purposes
- 3rd party sponsored activity

R&D Includes Many Forms of Development

- Venture Capital
- Development Stage Funds
- Technology or other Funds
- Strategic Investment
- Mentoring/Training/Strategic Advisors
- Finance Access
- Export or Local Sale Assistance
- Some companies are willing to make investments – others are not
- MSI has a venture group dedicated to strategic investment – we have engaged them for offset

MSI Experience with R&D for Offset

- Corporate Software Development Centers
- Applied Research Centers/Centers of Excellence
- University Coop Programs
- Application Development Partners and Portal
- Lab Provision
 - Hardware, Software, Tools, Test Equipment
- Software Tools
- Brazil – Tax Incentives require R&D spend
 - Motorola (Mobility)
 - Motorola has done a variety of R&D, including SW integration & test, product and application development

Motorola Explored Development Opportunities for Potential Offset

- Venture Capital Fund
- Development of Network Operators
 - SPV
 - Minority stake in emerging technology investment consortia, e.g. WLAN, ISP's
- Leverage New Products for New Ventures
- Assist Supplier Development of Parts
- Service Ventures
- Some were implemented, some were not

Offset R&D Challenges

- Highly Uncertain outcomes – can cause higher offset credit risk and cost
- Must compete against BRIC's and other low cost countries
- Investment requires Senior Management approval – expense budget easier
- Don't want to create competitors or lose customers
- Companies limit key technology sharing
- Government Licensing Restrictions Limit Technology Sharing
- Limited research budget must be spent on strategic priorities
- Bias against “Not invented here”
- Offset can be a factor in siting R&D, but country must be commercially competitive with alternate locations
- R&D is more difficult and less common than other offset forms

R&D Investment Benefits

- Builds Customer Goodwill
- Need to Spend Money on R&D Somewhere
- Technical Expertise is Worldwide – Get best Ideas
- Use Partners for Product Development
- Plays to Strengths of Suppliers – don't force them to areas they don't know

Joint Strike Fighter

- A New Paradigm for Use of R&D in Offset
- Partners get development opportunities for their country based on procurements and development spending
- Partners not allowed to apply traditional offset requirements

To Make R&D Workable for Offset

- Cost of Credits Must be Reasonable
- Credit Risk and other Risks Acceptable
- IP Ownership and Control Workable
- Must have Good Business Case
- Allow Flexibility and Creativity from All Parties
- Not Mandatory
- Receive Normal Investment Incentives in Country
- Can Treat as Investment, not Sunk cost- Exit allowed eventually
- If not Workable, Supplier may avoid R&D, Raise prices or No Bid
- Must be Right Fit at Right Time for Supplier – there is typically a window of opportunity

Conclusions

- Offset can Provide a Means to Attract New or Increased R&D in a Country
- Focused R&D can Bring Development in Government's Strategic Areas if Fit with Vendor Strengths
- Need to Allow for Flexibility and Creativity
- Must be Win/Win for Government and Vendors
 - Offset credit costs and risks must be reasonable
- Be Realistic. Volume of Offset R&D is Linked to Procurements.

Transferencia y comercialización de tecnología.

Glenn Robinson, Gerente, Negocios Internacionales, Instituto IC²,
Universidad de Texas.

Global Technology
Commercialization:
Empowering Economic
Development

Glenn Robinson
Director Business Development
Global Commercialization Group

October, 2011

The University of Texas at Austin

- Founded in 1883
- 350-acre main campus
- 21,000 faculty and staff, 16 colleges and schools, and almost 50,000 students.
- More than 3,500 research projects, 90 research units and annual research funding exceeding \$600 million = one of the nation's leading public research universities.
- More than 400 patents awarded to the university since its inception. Licensing deals generate more than \$5 million annually.
- Over the past six years, The University of Texas at Austin has created a total of 37 new companies to commercialize UT Austin technology.

IC² Institute Background

IC² = Innovation, Creativity and Capital

- A “think and do” research lab whose mission is to generate wealth, jobs, and shared prosperity
- Founded in 1977 by George Kozmetsky
- Fellows in 19 countries around the globe

“Ecosystem” for Wealth Creation

- **GCG** - International program development & management
- **ATI** - Austin Technology Incubator
- **MSTC** - Master’s of Science degree in technology commercialization (McComb’s School of Business)
- **BBR** – Bureau of Business Research
- 32 Years of know-how and methodologies developed



IC² Institute and GCG

- IC² Institute at The University of Texas at Austin has devoted over 30 years to establishing itself as a leader in technology commercialization and wealth creation.
- The Global Commercialization Group (GCG) implements IC²'s lessons learned and best practices globally.
- GCG employs technology commercialization and technology-based venture creation to drive economic development.
- GCG's model simultaneously generates real business results while transferring know-how to partners so that they can sustain a system for wealth creation.



Global Footprint

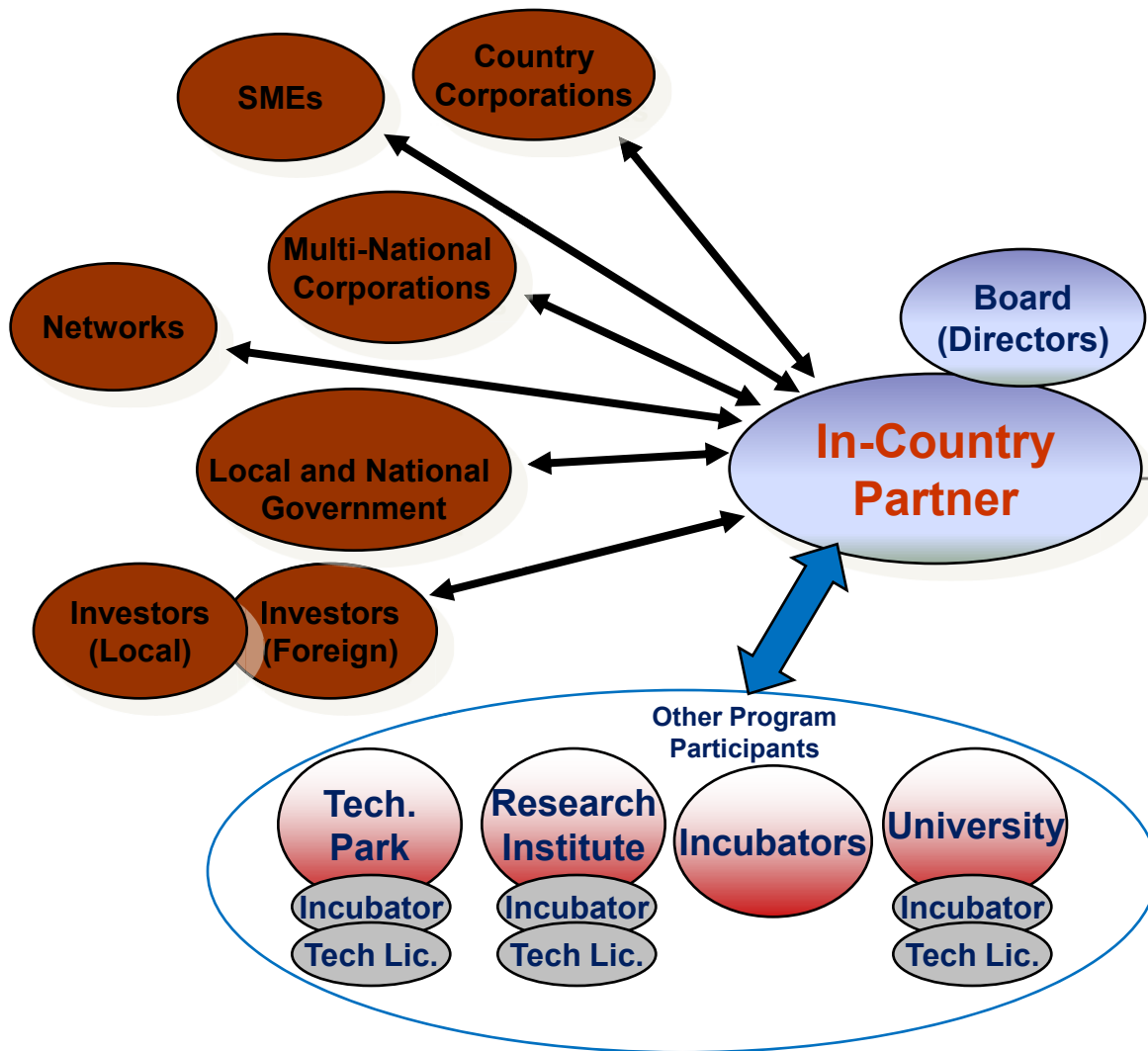


Global Commercialization Group
IC² Institute, The University of Texas at Austin

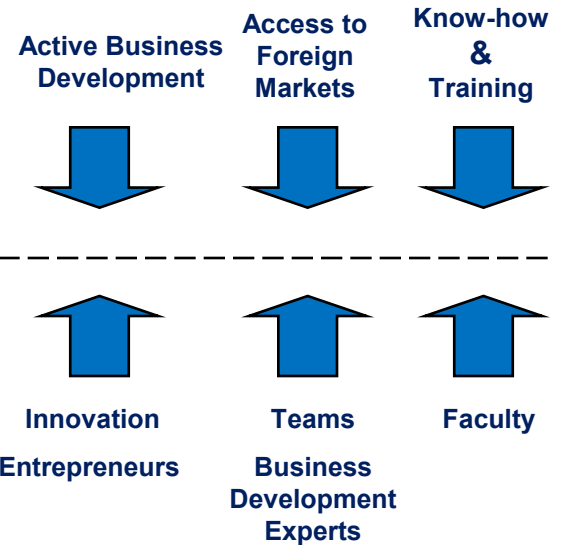


- We measure ourselves by business results generated
- Currently active programs in 5 countries
- Over 100 foreign technology commercialization agreements executed in the US in last 3 years

GCG Eco-System Model



Program Contributions



Participants/Regions

Four Pillars of Success

1. Global Competitiveness

- Develop human capital
- Identify most competitive technology
- Pursue most effective, global commercialization strategies
- Develop the Business capital to support entrepreneurs: Incubators, TTO, Accelerators, Centers of Excellence

3. Access to Markets

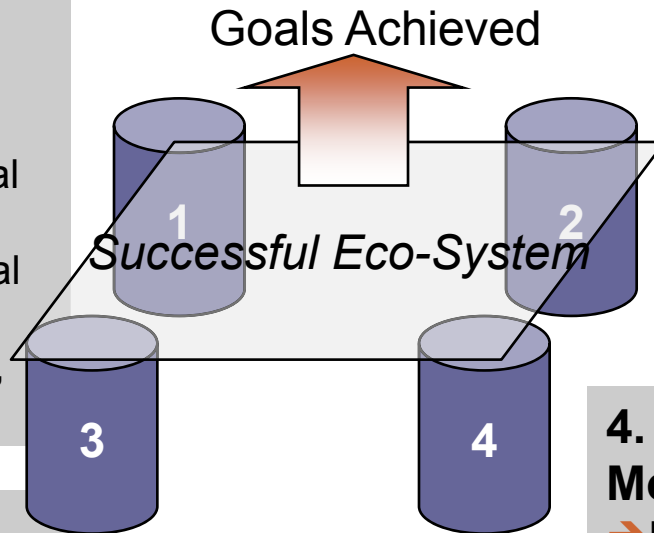
- Position companies in external markets
- Develop global business development resources
- Lower barriers to service & product delivery
- Strengthen local markets through technology and business model development

2. Access to Capital

- Develop angel and venture capital investment funds
- Attract economic development resource and capital
- Create conditions conducive to investments in all stages of venture development

4. Sustainability & Momentum

- Develop know-how to support the ecosystem = “train the trainers”
- Train entrepreneurs = develop a commercialization culture
- Develop global business partnerships & global access networks
- Develop global advisory networks, leveraging IC2 Fellows, alumni, diaspora



Step 1: Capacity-Building & Know-How Transfer

- Innovation Readiness (Online Training & Assessment)
- Incubator Management
- Entrepreneurship Training
- Market Assessment Methodology: Quicklook training
- Technology Transfer Office Management Mentoring

Step 2: Technology Commercialization Services

- Recruitment of Technologies

- Researcher centers
- Emerging technology companies
- PyMEs

- Screening and Validation of Technologies

- Market Assessments on selected technology companies
- Presentation competition to multinational investor review board

- International Business Development

- With GCG business development experts, contact network
- Goal: Business Engagement Agreements with interested parties

- Optional in-residence Business Accelerator

Result: measurable economic development and sustainable social impact

- **Technology transfer**, integration and adaptation in the country
- **Know-how transfer** and high-skilled job creation in country
- **Long-term sustainability** leading to improved economic value-add
- **Business results** leading to enhanced cooperation between local and international companies
- **Access to global markets** resulting in foreign investment
- **Specialized training** contributing to the development of a more efficient and productive labor force



Keys to successful technology commercialization

- Know-how transfer and capacity-building is the key to establishing sustainable foundation
- Early market assessment is crucial in order to avoid the mistakes inherent in the strategy of “if I build it, they will come”
- Primary research is key to “real” deals, and lets you hear the “voice of the market”
- A pre-wired investor network, and a crisp investor presentation, focused on benefits and Return on Investment, helps secure early-stage funding
- Learning the cultural intricacies of doing business in the target market is critical
- A partner with a large contact network and a solid reputation in both academia and commercial arenas helps open doors (ATI, TechBA = examples)

“Talk to lots of people, be real nice and give good service.” Jim Rohn, business philosopher

Ciencia, Tecnología e Innovación en Defensa. El caso de Corea del Sur.

Seung-Kyu Hong, Departamento de Investigación y Desarrollo, LIG Nex1.

1978
President Jung-Hee PARK
: first Surface-to-Surface missile

Reflections of ROK R&D for ROC R&D Build-Up



S. K. Hong
LIG Nex1



October 2011



Theme

Building up your Defense R&D Capability

S.K. Hong

- **LIG Nex1** **2011 ~ Present**
 - **Agency for Defense Development (ADD) '91-2011**
 - * **Technology Cooperation Director**
 - * **LOGIR Rocket PM**
 - * **Missile airframe/launcher dept. head**
 - * **Missile aerodynamics branch chief**
 - * **Korean CFD Society President / KIMST Secretary General**
 - **NASA Ames Research Center, USA** **1983 – 1991**
 - **Ph. D. Purdue University , USA** **1983**
 - **MS Univ. of Texas at Arlington**
 - **BS Seoul National University**
- all in Aerospace/Aerodynamics/Fluid Mechanics area

ADD's 40th Anniversary Conference, August 2010

Korea Institute of Military Science and
Technology (KIMST) Society
Jeju Island, Korea

PCFV Initiative:

“Presidential Council for Future and Vision”

Led “Defense R&D sector” Task Force

2009~2010

**“Reform Roles of Defense R&D and
Defense Industry Communities”**

Can Defense Sector be an Engine of Growth?

Exhibition at KIMST Conference, 2009

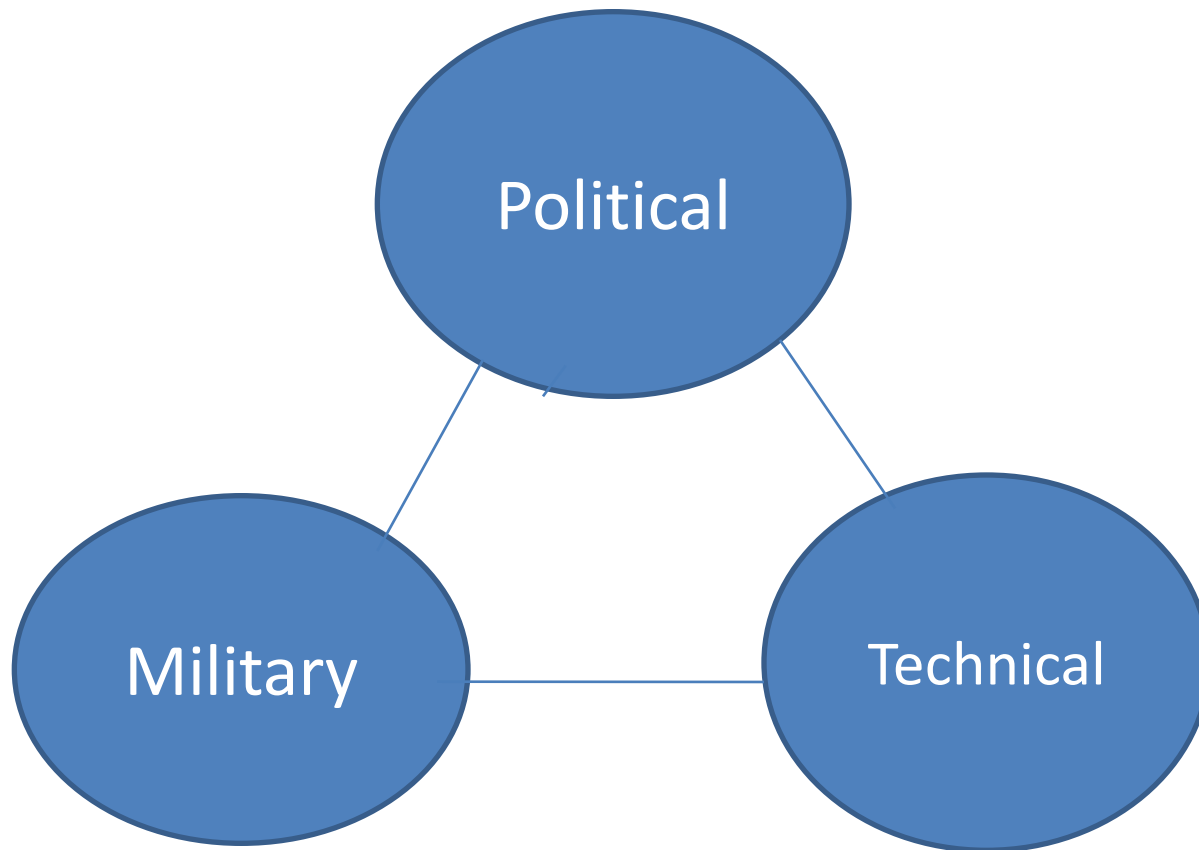
AF Chief of Staff

Tenacity

COLOMBIA Visit
Mr. Rodrigo Rivera Salazar
visited ADD
September 27th, 2010

KIMST 2011
Conference,
Jeju,
Korea

Three Dimensions of Acquisition Process



(1) Political Process - Social

**We may be world-apart, but
can share the same idea on defense.**



República de Colombia

- Korean Peninsula among the Super-powers



- Confrontation of Military Forces
- Modernization of Forces
- Conflict of Territory

Background (Colombia)

**Colombia's GDP \$430B in 2010, with \$6,273 per person.
Colombia is rich in natural resources; petroleum, coal,
coffee and agricultural produce, gold and emeralds.**

Tourism:

**Increase in military strength and police presence would
bring in tourists: “Lonely Planet picked Colombia as one of
top ten world destinations”**

**In 2005 over 30% of the population was under 15 years old,
compared to 5.1% aged 65 and over (young country).**

Ranked sixth in the world in the Happy Planet Index

Colombia

Human history began 10,000 BC near Bogotá.

**Population of 46 million; 2nd in the South America.
Independence from Spain in 1819 by Simón Bolívar.
The Republic of Colombia declared in 1886.**

**Its territory encompasses Amazon rainforest, tropical grassland and both Caribbean and Pacific coastlines.
Ecologically, Colombia is one of the world's more mega-diverse countries with large reserves of freshwater.**

At 8,500 ft (2,591 m), Bogotá is the highest city of its size.

Stories of Two Koreas

- 1950 Korea vs. 2010 Korea -

**North Korean Attack
June 25, 1950**

**North Korean Tanks
moving in Seoul,
June 28, 1950**

**Inchon Landing by Gen.
MacArthur, Sept 15, 1950**

Three-year Korean War Casualty (June 1950 – July 1953)

	Killed	Wounded
Colombian Soldiers	212	438
US Soldiers	33,000	105,000*
RoK Soldiers	415,000	429,000**
China & N.K. Soldiers	1.5 millions	?

* Total 5300 Colombian soldiers saw action for three years.

** ROK total casualty is estimated at 1.3Mil.

Colombia's Korean War Participation

- **Period: May 1951 ~ July 27, 1953 (truce signed)**
- **Size: Army Battalion, Navy Ship (Total 5,314 Participated)**
- **Main Battles: Kumsong ('51.10.13~21),
Kim-Hwa ('52.6.21),
Yeon-Cheon 180 ('53.3.10),
Yeon-Cheon "Old Baldy" ('53.3.23~25)**
- ✓ **Soldiers were known/praised for their bravery:
"Never retreat", "most disciplined"**

Korean War Memorial in Bogota

Colombia Battalion attached to US Army 7th
Division Jan 1952

A book written by a Colombian
Veteran

Colombia Battle Ship **Almirante Padilla** served in
May 1951

Devastation

Seoul, Nov. 1, 1950

Daejeon, Sept 30, 1950

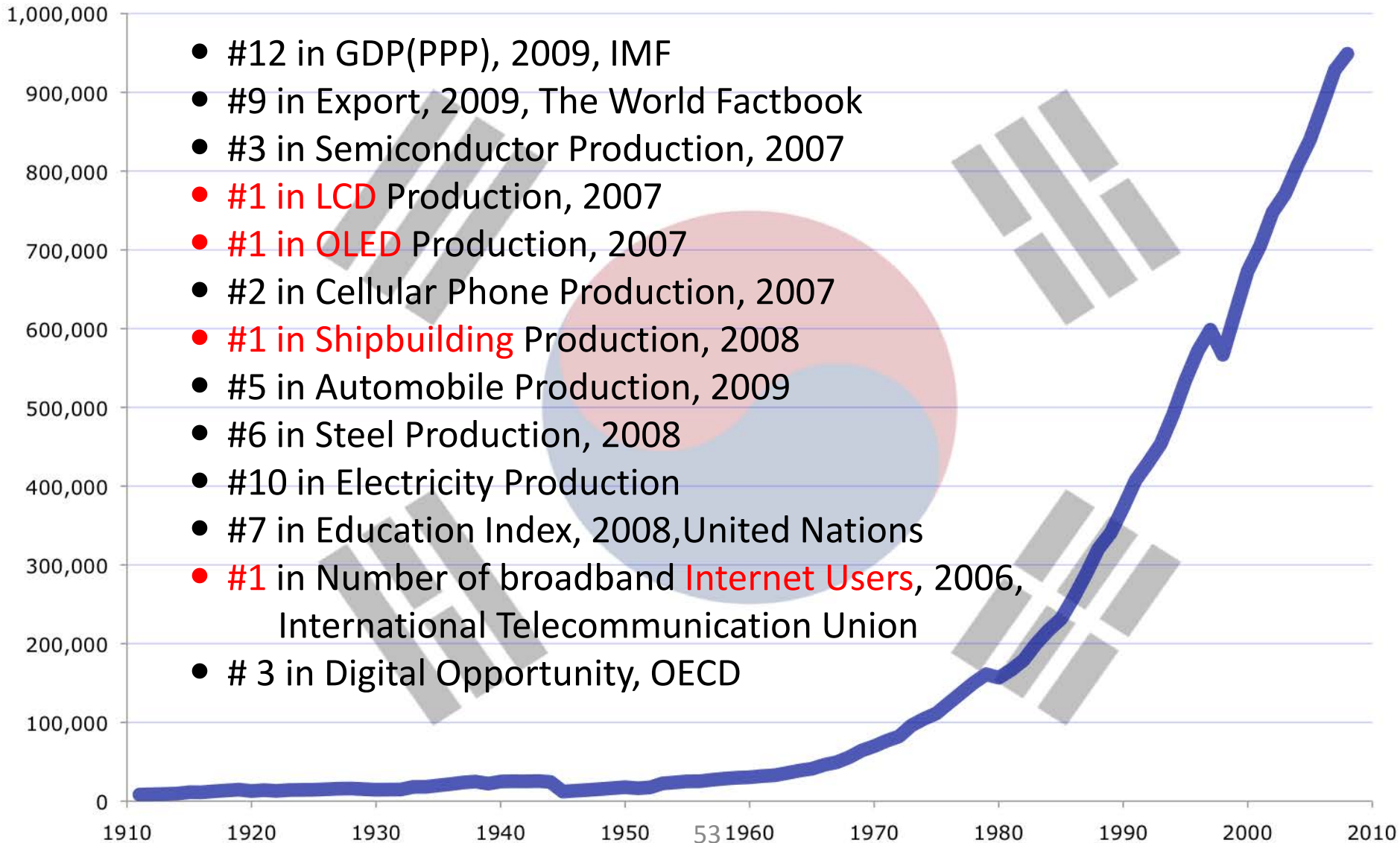
NK Provocation

- ❖ March 26, 2010 : Attacked Korean Navy **Cheon-An** Corvette; **Torpedo**
- ❖ Nov 23, 2010 : Fired artillery against west coast island Yeon-pyung
- ❖ Very high possibilities of military hovercraft attacks
 - Building new hovercraft base at 20 km off west coast island Bag-ryung

Missiles

Korea in 2010

- #12 in GDP(PPP), 2009, IMF
- #9 in Export, 2009, The World Factbook
- #3 in Semiconductor Production, 2007
- #1 in LCD Production, 2007
- #1 in OLED Production, 2007
- #2 in Cellular Phone Production, 2007
- #1 in Shipbuilding Production, 2008
- #5 in Automobile Production, 2009
- #6 in Steel Production, 2008
- #10 in Electricity Production
- #7 in Education Index, 2008, United Nations
- #1 in Number of broadband Internet Users, 2006, International Telecommunication Union
- #3 in Digital Opportunity, OECD



Korea in 2010

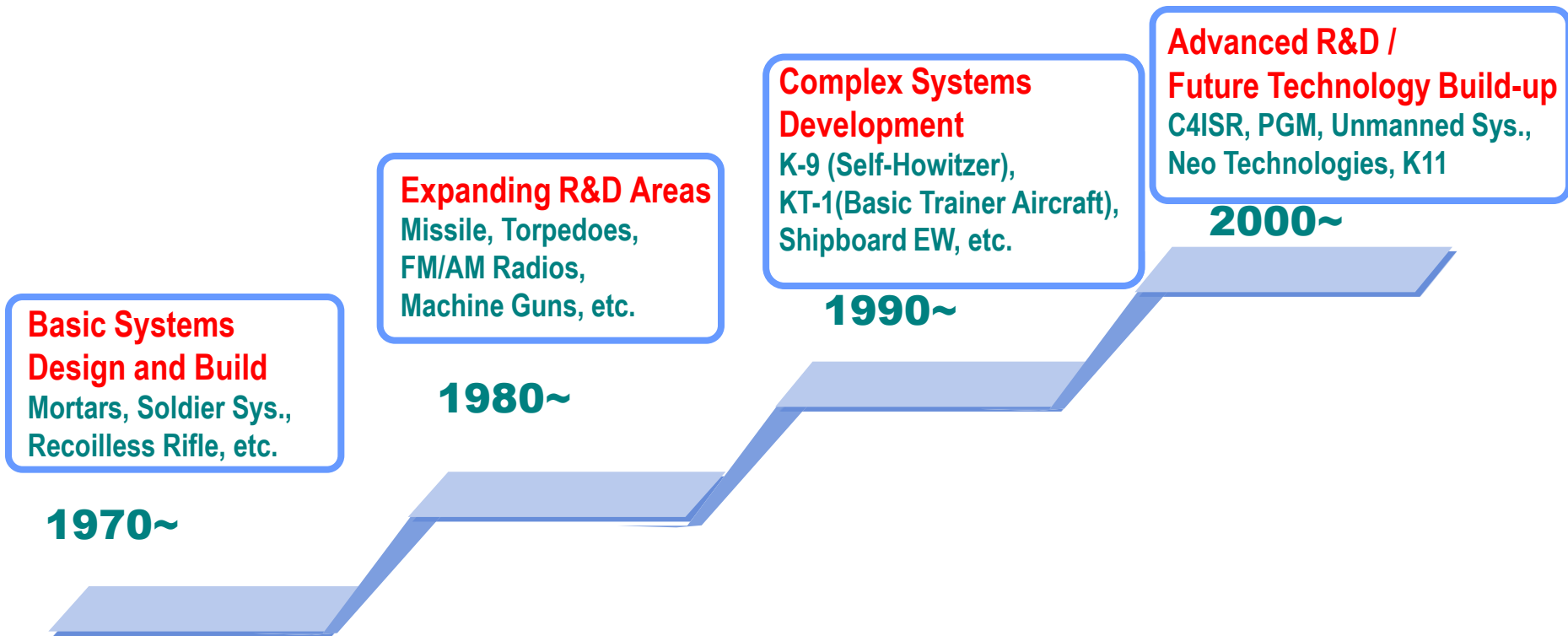
Seoul in 2010

Automobiles

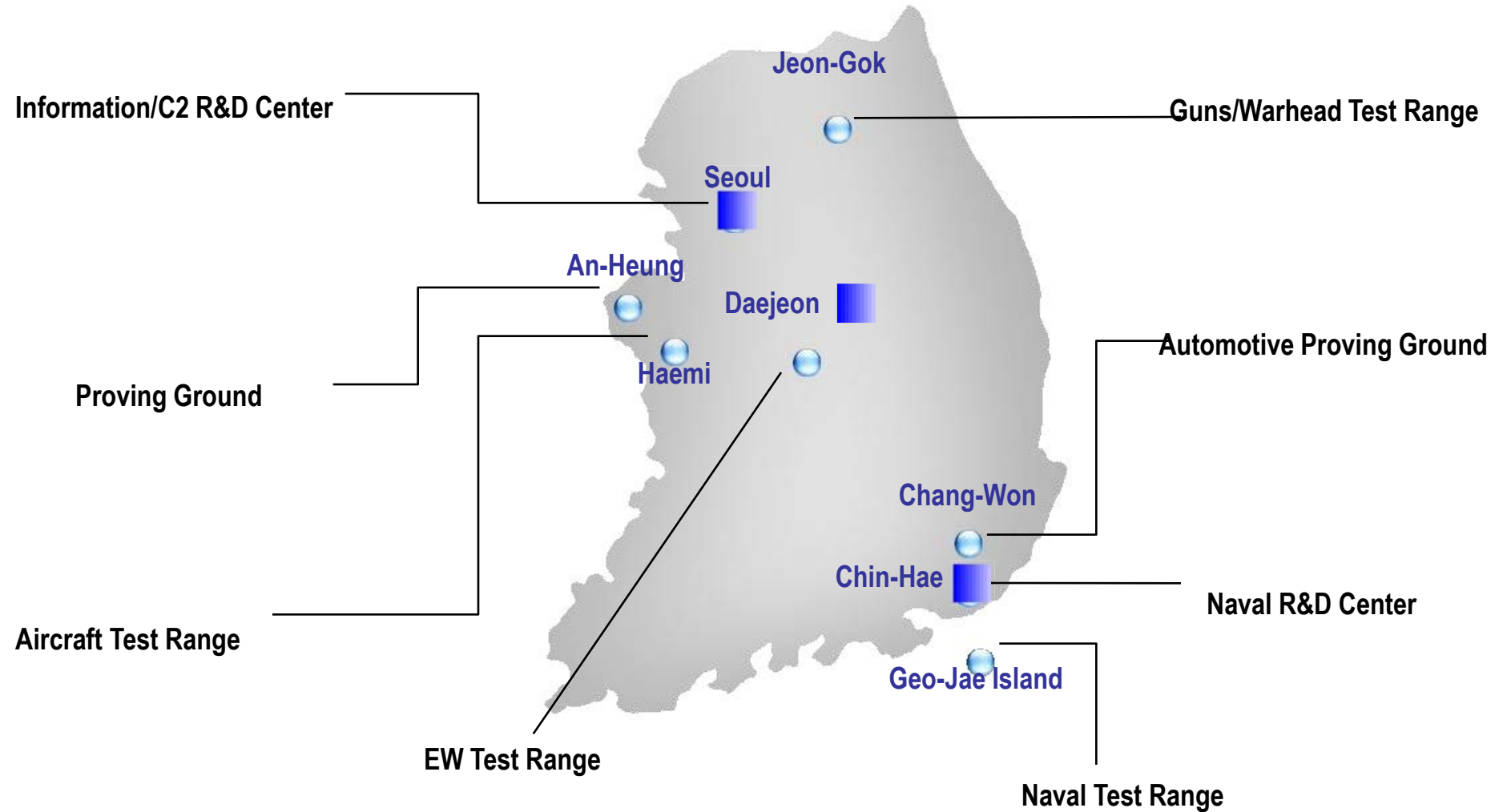
Ship Building

Mobile Phone and Internet

Defense R&D History



National Test Grounds



Test Facilities

▲ Changwon Proving Ground : Test Track

▲ An-Heung Proving Ground : Missiles Test

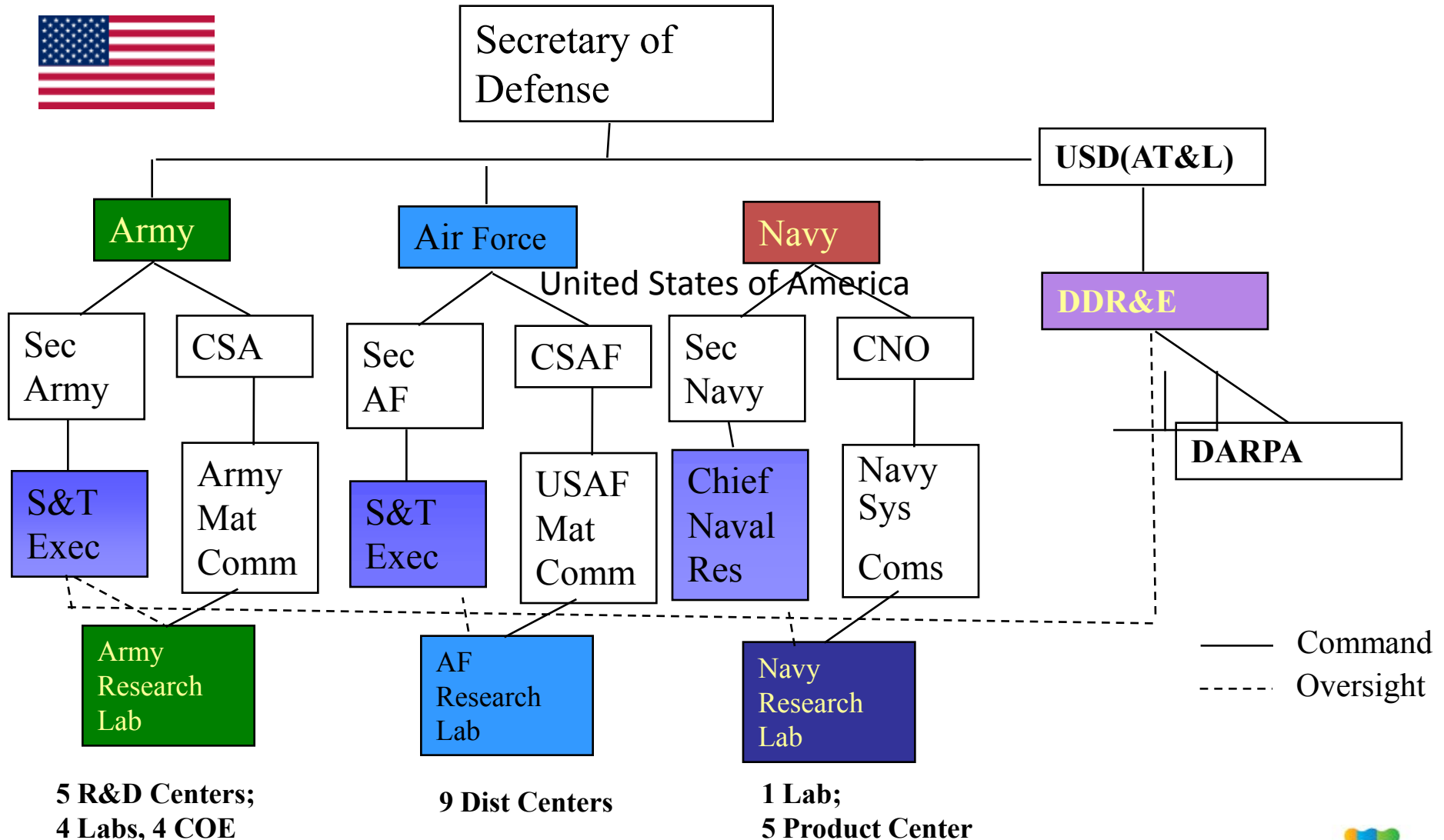
▲ Sled Test (*warhead/fuze tested*)

▲ Aircraft and Environmental Test

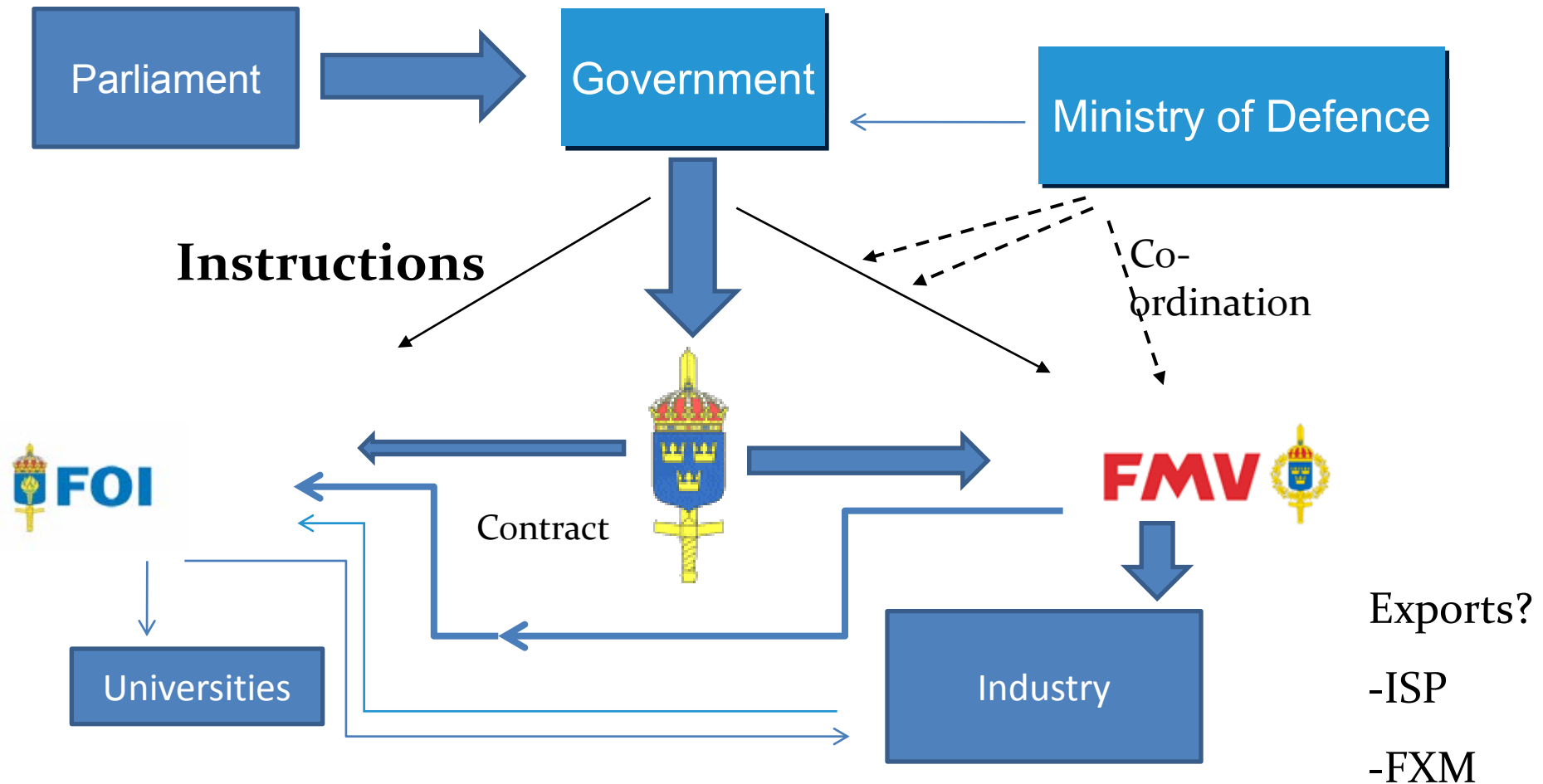
ROK Defense R&D Outcome in 2010

(2) Military Process

Organization of U.S. DoD S&T

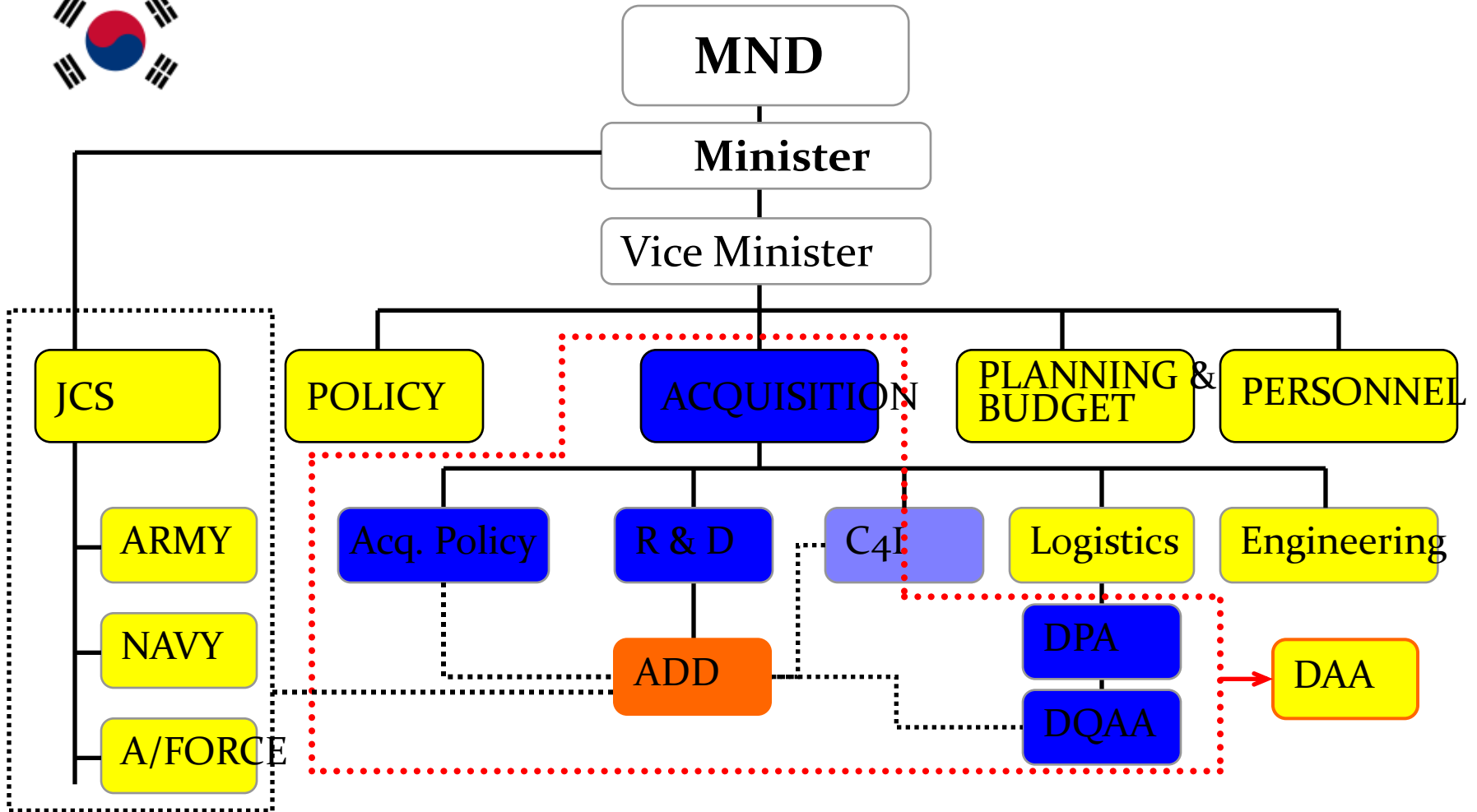


Swedish Defence Acquisition and R&D management



Govt=Cabinet members

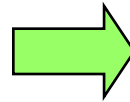
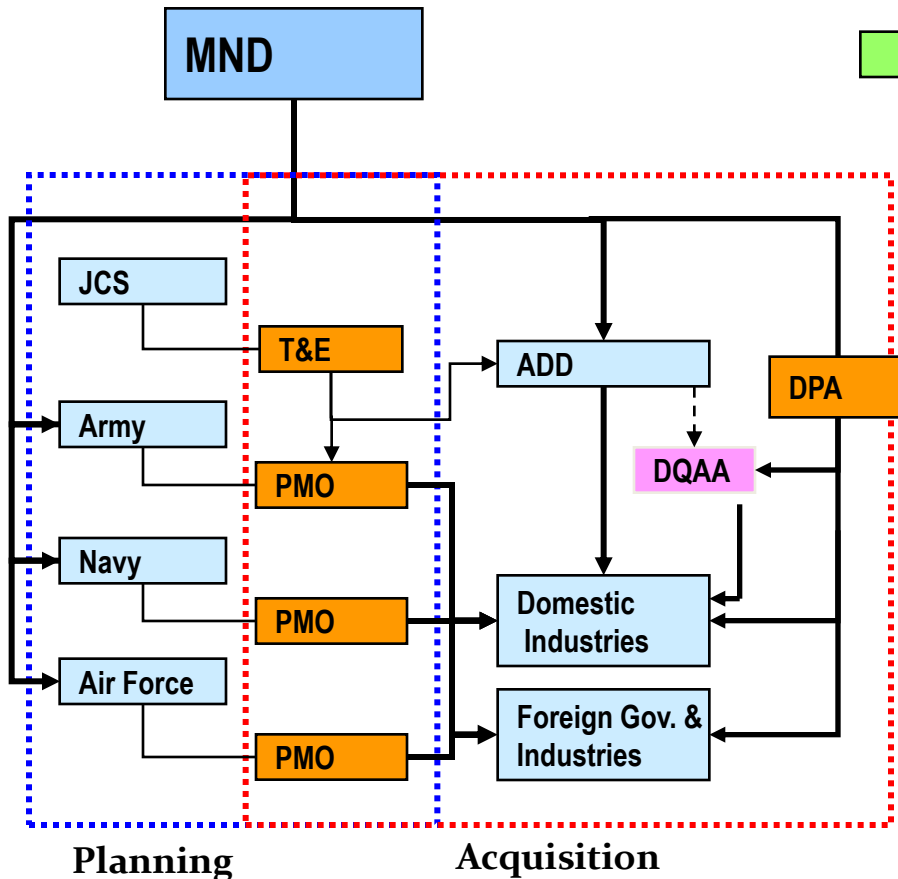
ROK Defense Organization



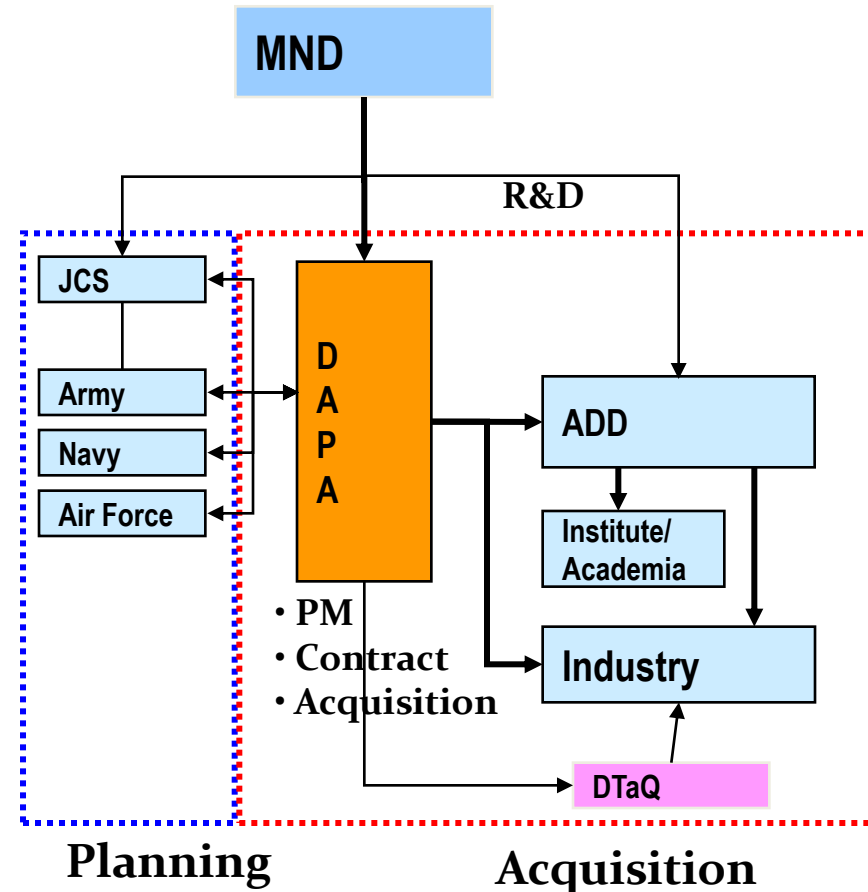
Korean Acquisition Restructuring

➤ Reorganization

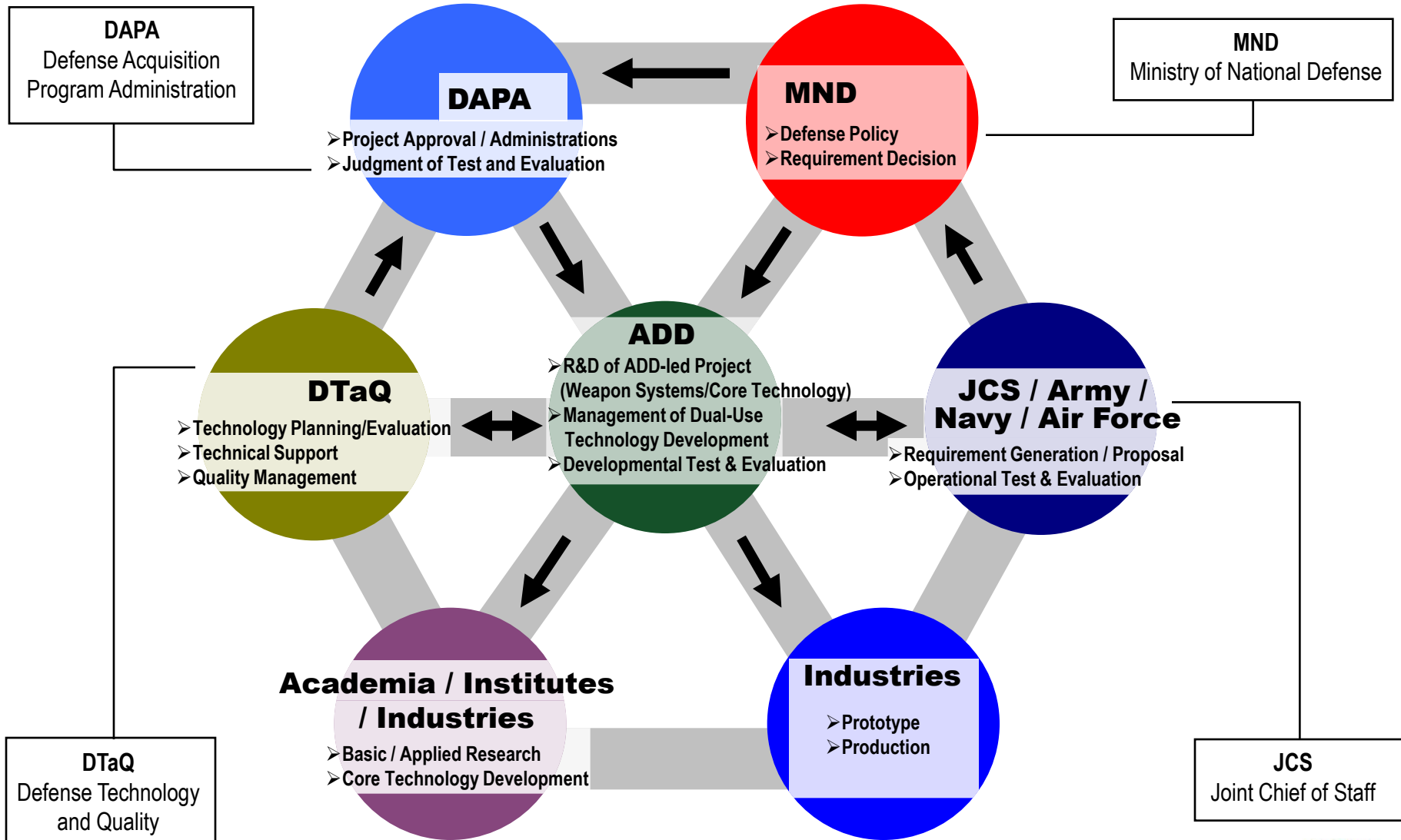
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Key Players





Defense:

The Army is formed by divisions, regiments and special units.

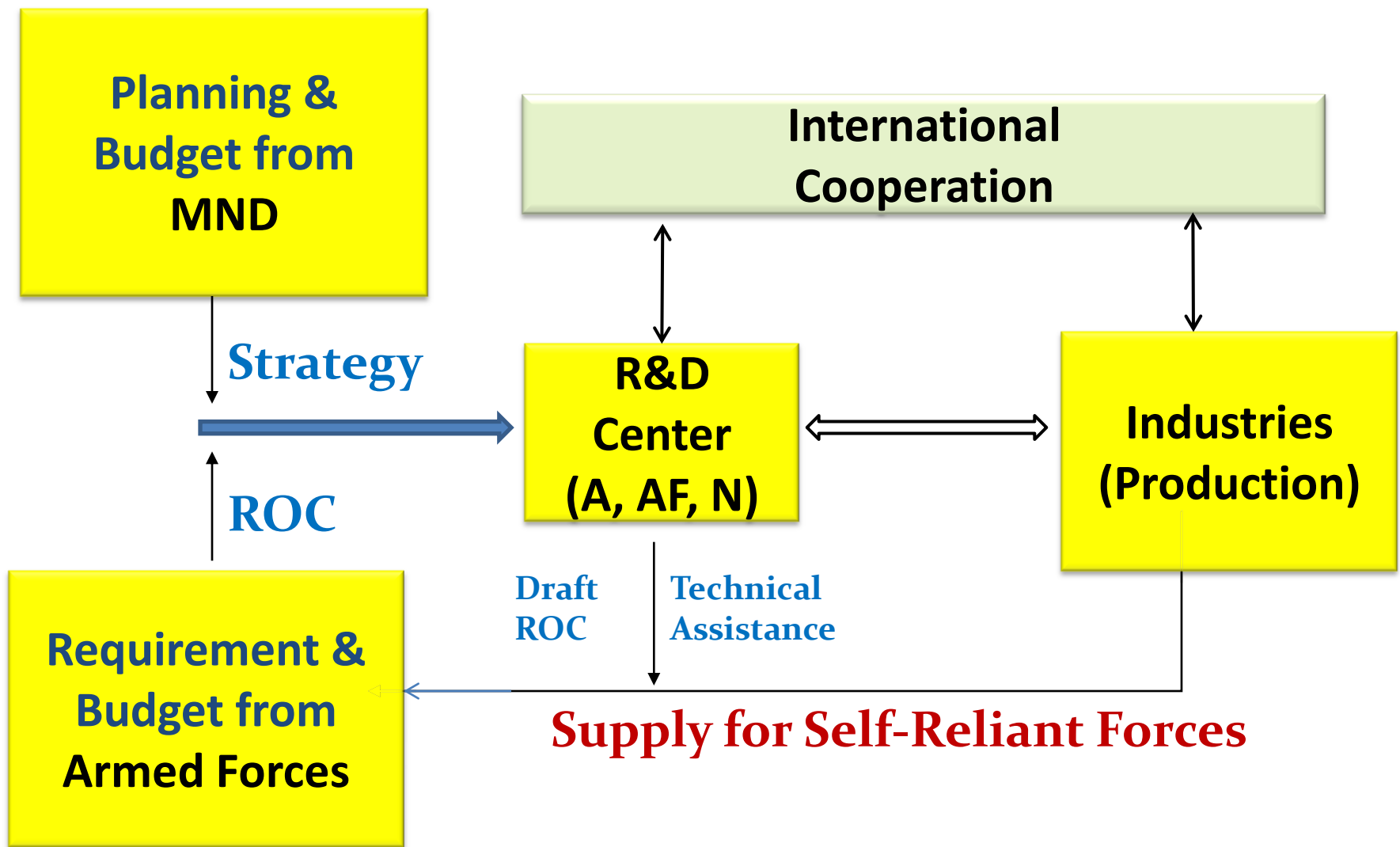
The Navy has Colombian Naval Infantry, Naval Force of the Caribbean, Naval Force of the Pacific, Naval Force of the South, Coast Guards, Naval Aviation.

The Air Force has 13 air units.

The National Police has presence in all municipalities.

**Colombian Navy ARC
Almirante Padilla frigate.**

Colombian Acquisition Flow **Proposal**



ROC : Requirement of Capabilities

(3) Technical Process - Defense R&D -



ROK Defense R&D History

=

Agency for Defense Development



ADD

- created as an agency
- had autonomy free from political processes
- had monopoly on defense R&D

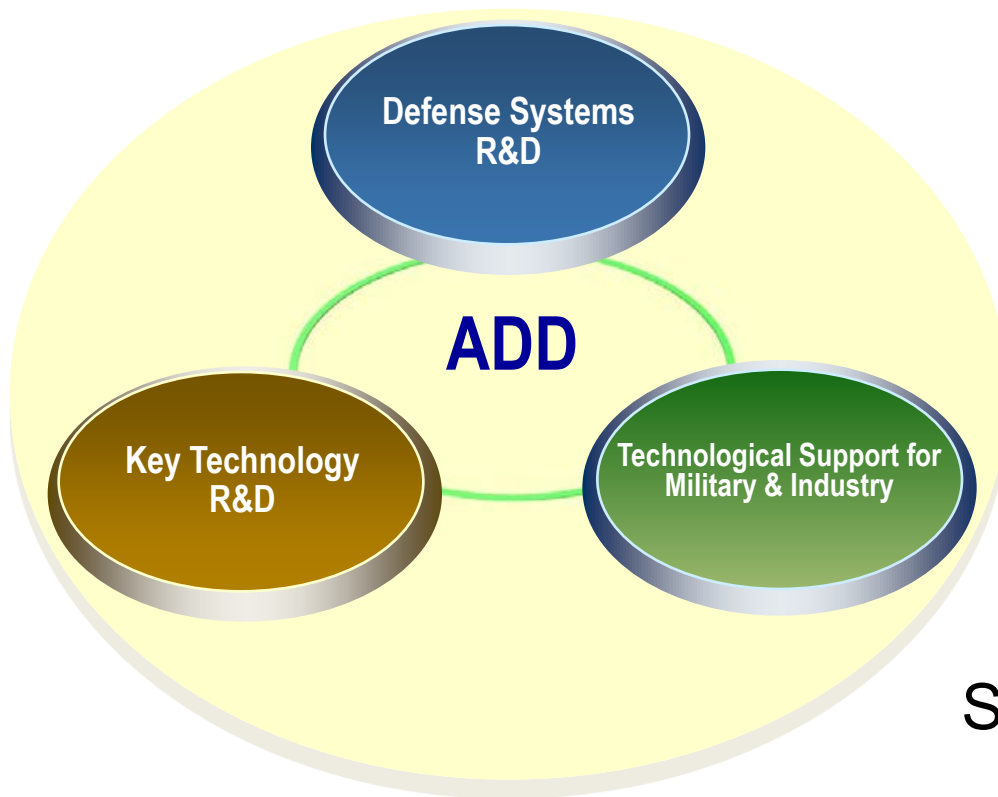
- advent of DAPA in 2006

Contribution to National Defense Capability

*World-Class ADD, Promoting National Security and
Nations' Well-Being*



MISSION



To Research, Develop, Test,
and Evaluate

Weapon systems,
Equipments, and Related
Technologies

to Reinforce Defense
Capability for
Self-reliant National Defense.

History

AUG. 1970 ADD was established in Seoul

FEB. 1974 R&D Center for Missile and Aircraft was established In Daejeon

MAY 1976 R&D Center for Naval Weapons was established In Chinhae

OCT. 1977 Defense Systems Test Center was established in Anheung

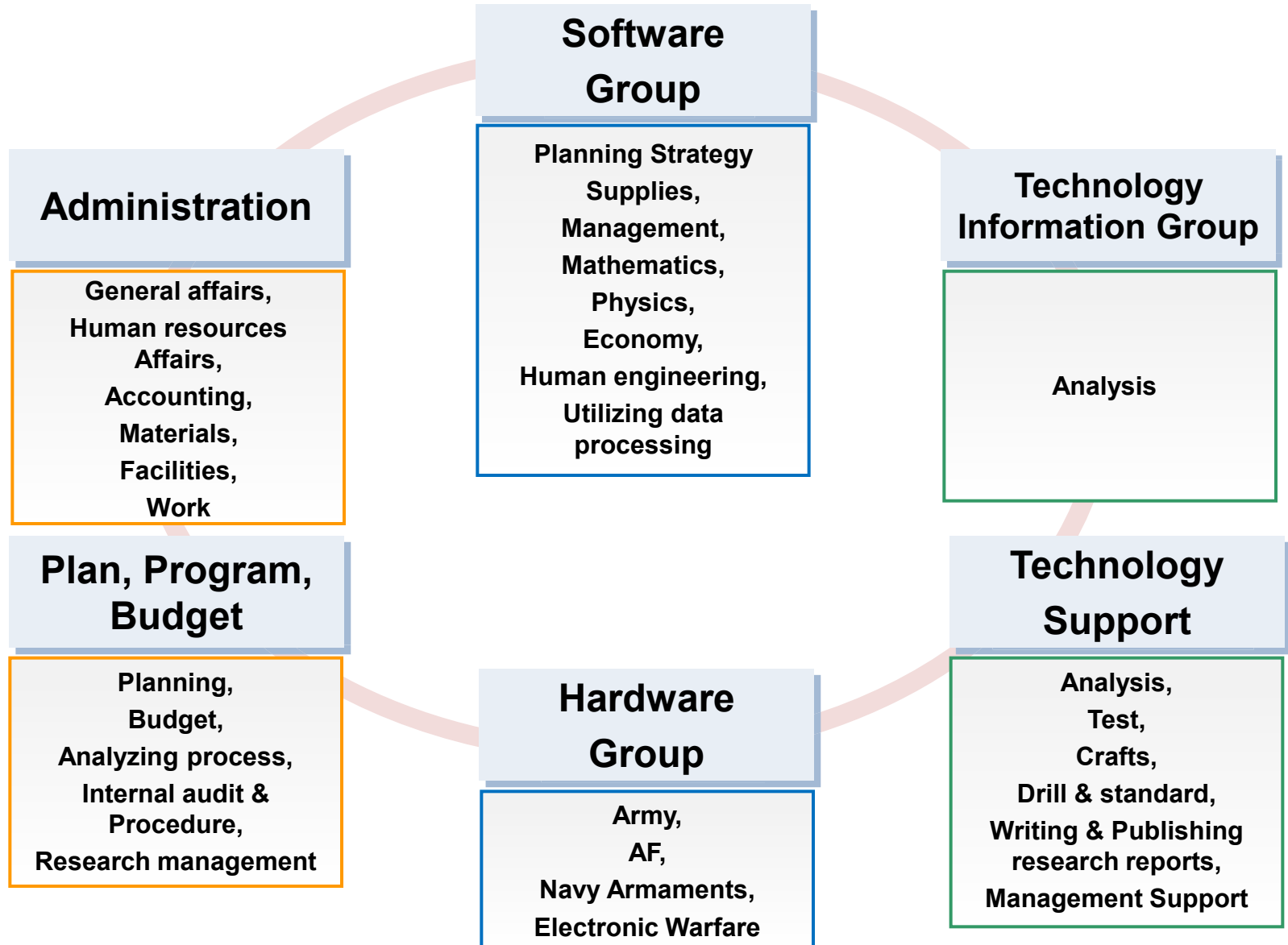
JAN. 1983 ADD Headquarter was relocated from Seoul to Daejeon

MAY 1995 Automotive Proving Ground & Naval Weapons System Test Range was established in Changwon

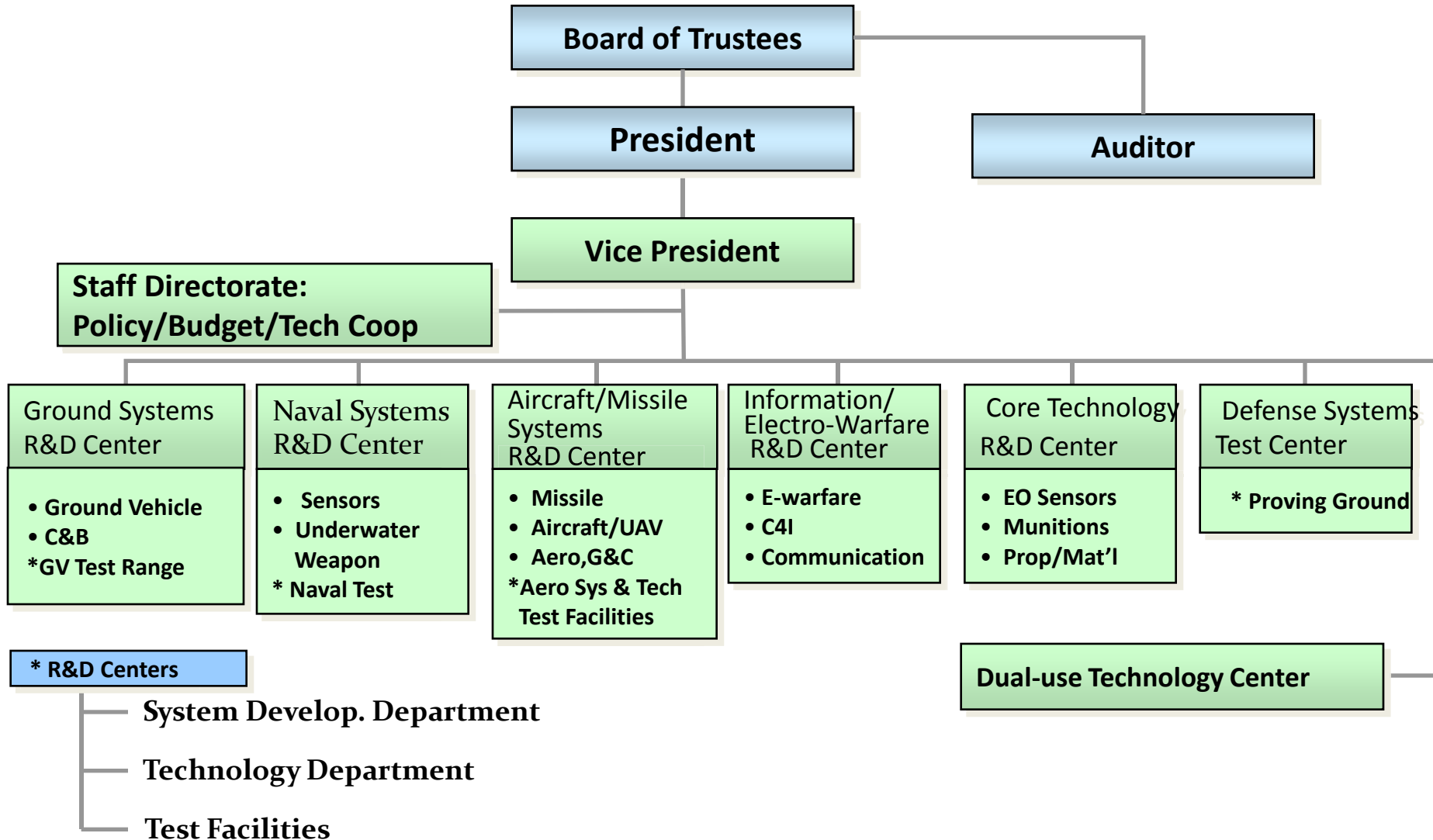
JULY 2007 Reorganization of ADD

AUG 2010 40th Anniversary conference

Basic Elements of early ADD Organization



ADD Organization (best)



Directorates and Technical Departments (1)

1st R&D (PGM)

- Guidance & Control
- Aerodynamics & **Wind Tunnel**
- Structures & Actuation Systems
- Fire Control and Launcher
- **Air-Breathing & Propulsion**
- **Rocket Propulsion**

2nd R&D (C4I)

- Communications
- Information Fusion Technology
- Information Software
- Network Technology
- **EW**

3rd R&D (SR)

- EO/IR Technology
- RF Systems Technology
- Seeker Technology
- Navigation Sensors & Systems

4th R&D (NEO)

- Neo- Technology
- High Energy-Density Technology
- Warhead and Fuze Technology
- Defense Material and Evaluation Technology

Directorates and Technical Departments (2)

5th R&D (Ground)

- Ground Systems M&S
- **UGV Technology**
- Automotive & Armament
- CBR Defense
- Changwon Proving Ground

6th R&D (Naval)

- Naval Systems M&S
- Underwater Surveillance Technology
- Underwater Sensor Technology
- Submarine Technology
- Naval Test & Evaluation

7th R&D (Aircraft)

- Aircraft Systems M&S
- **Aeronautical Technology**
- Avionics & Flight Control
- Aerospace Test & Evaluation
- MUAV Development
- Guided Weapon Systems Test
- Fire Power Systems Test

Laboratories

Area	Major Laboratories (56)	
Gun/Munitions	Warhead, Munitions Test	15
Surface/Underwater	Underwater Acoustic Test	10
Missile	Guidance Control Test	21
Electronics/Optic	EMI/EMC Test	4
Aviation	Structure, W/Tunnel Test	6

Structure strength test

W/Tunnel test

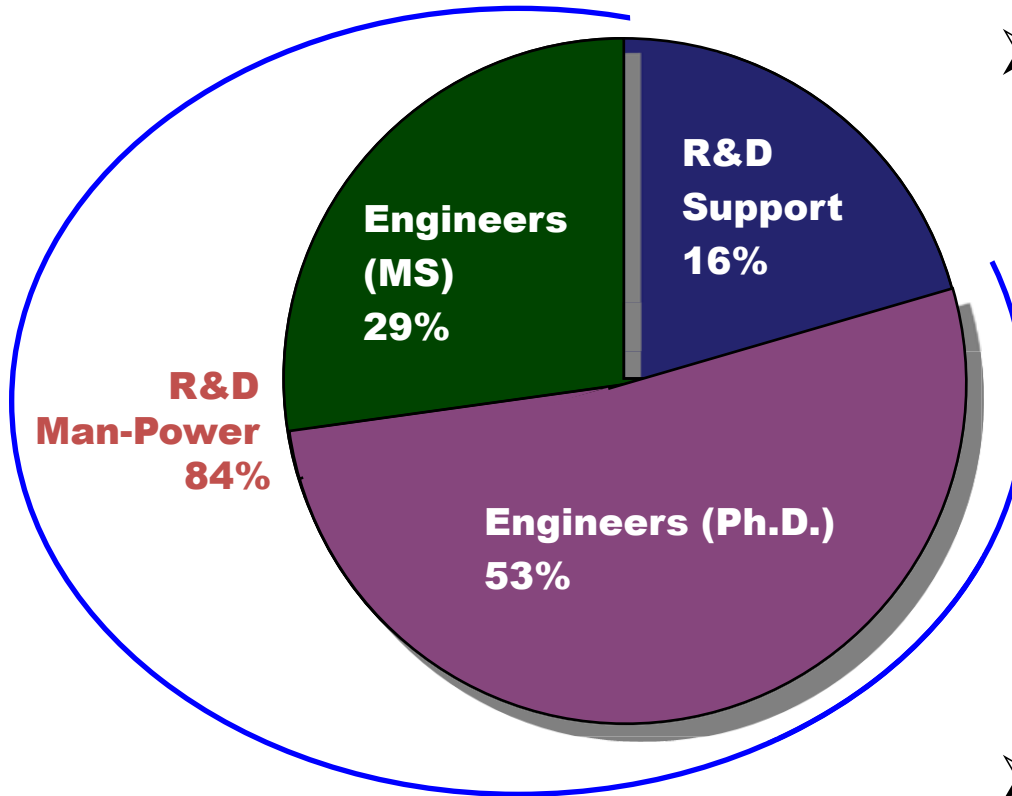
Warhead test

Underwater acoustic

Guidance control test

EMI/EMC test

Man Power

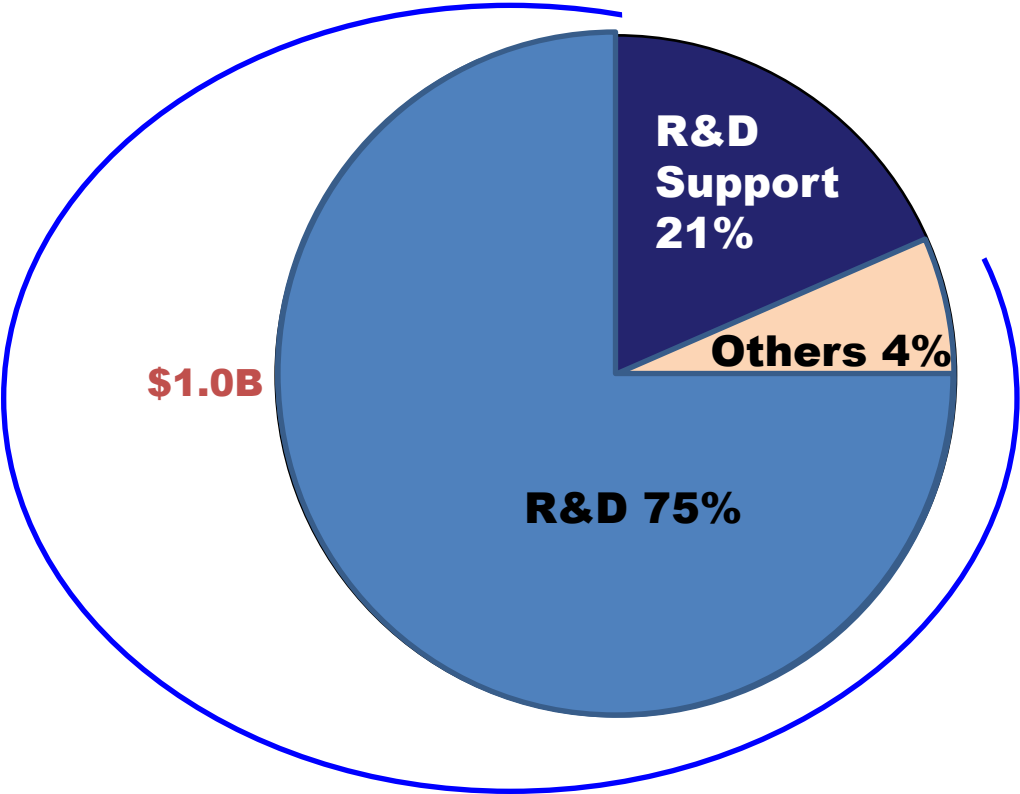


➤ **Employees: 2,522**

- Daejeon: 74%
- Chinhae: 10%
- Anheung: 7%
- Seoul: 5%
- Changwon: 2%
- Darakdae: 1.5%
- Haemi: 0.5%

➤ **Plus Contractors**

Budget

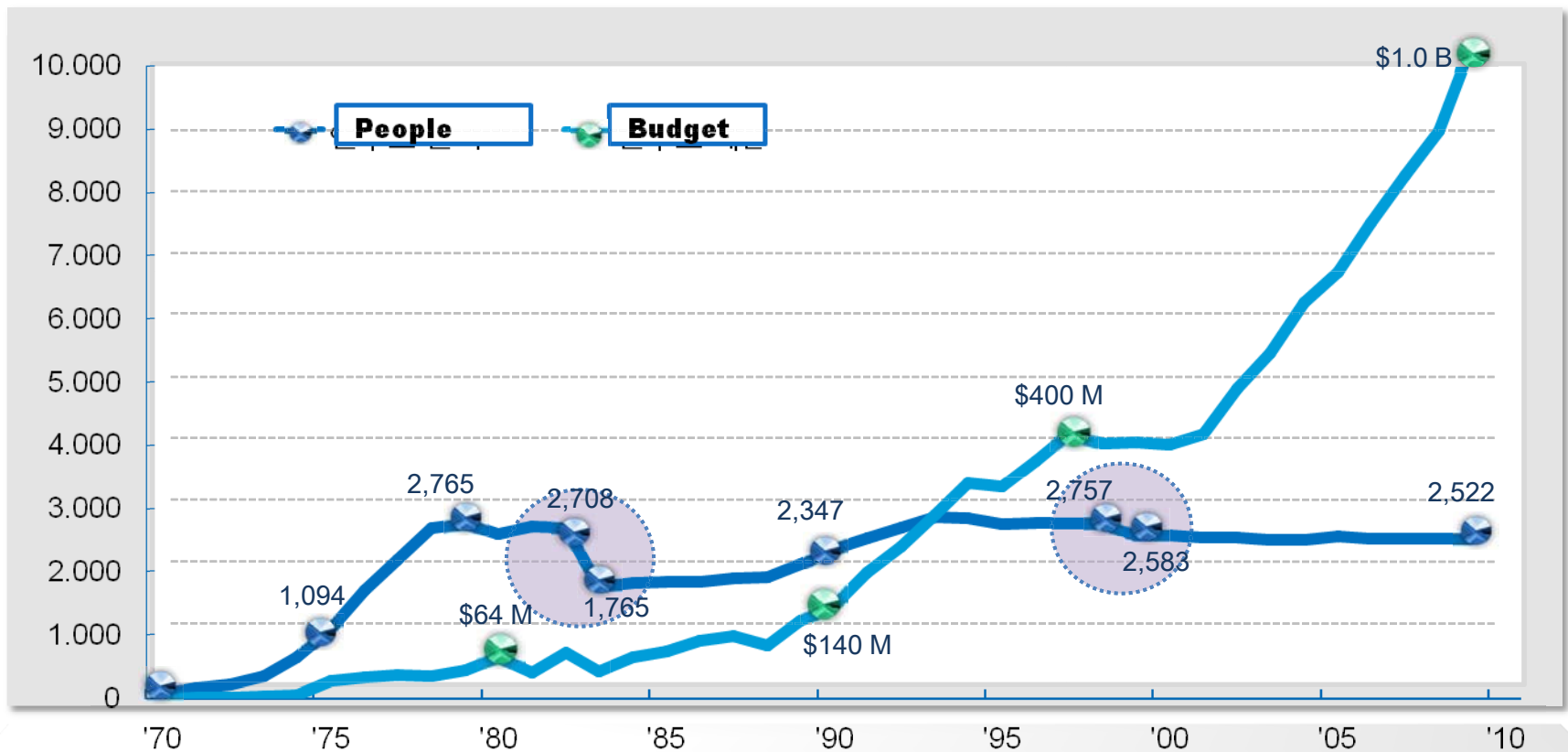


➤ Budget : ~\$1.0B

- R&D : \$700M
- R&D Support : \$200M
- Others : \$100M

Budget and Manpower History (1970~2010)

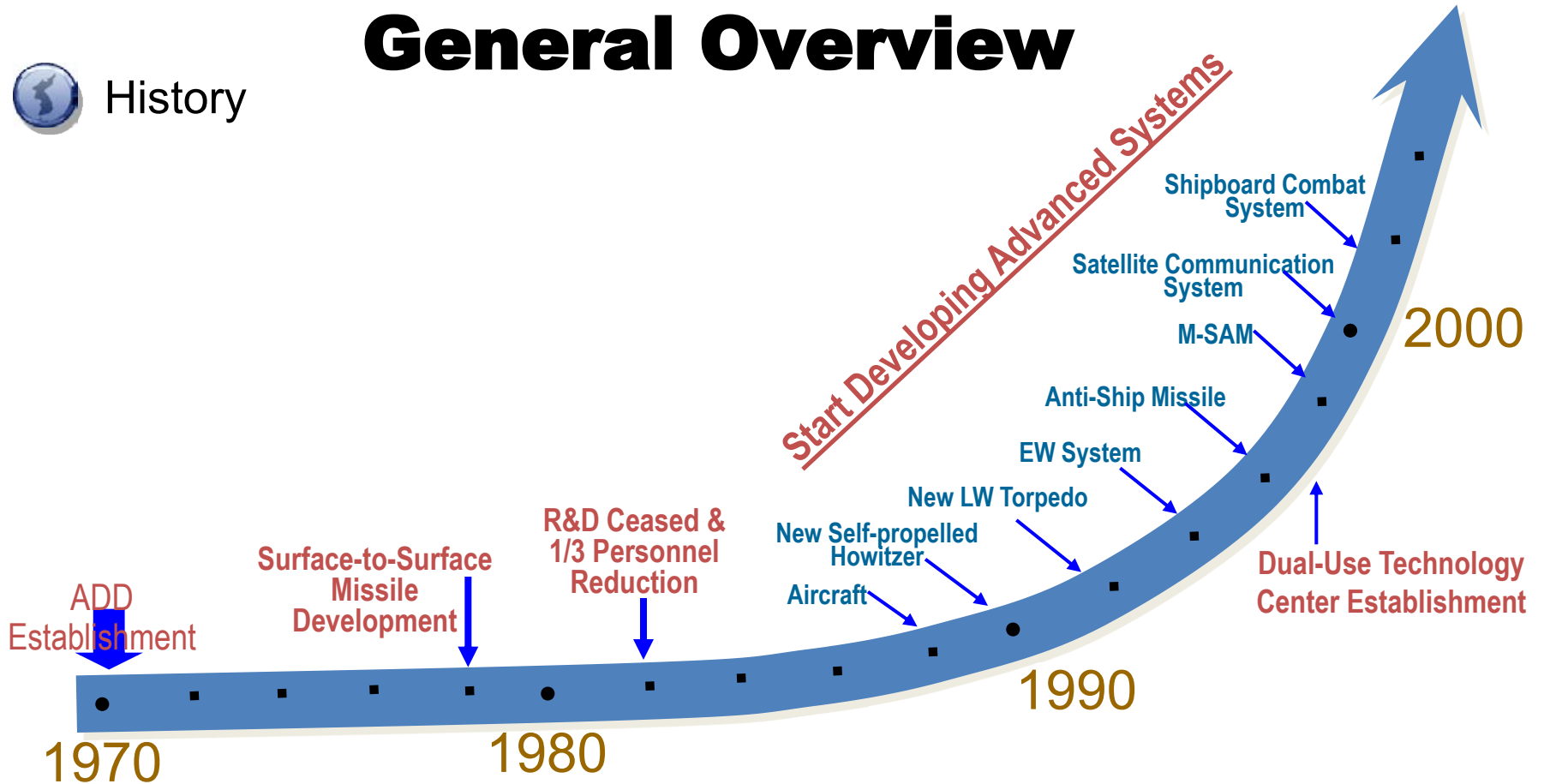
- Budget Per Capita : \$25,000(1980) → \$150,000(2010)
- Layoff : 1982(943), 1998(174), 2006(32)



General Overview



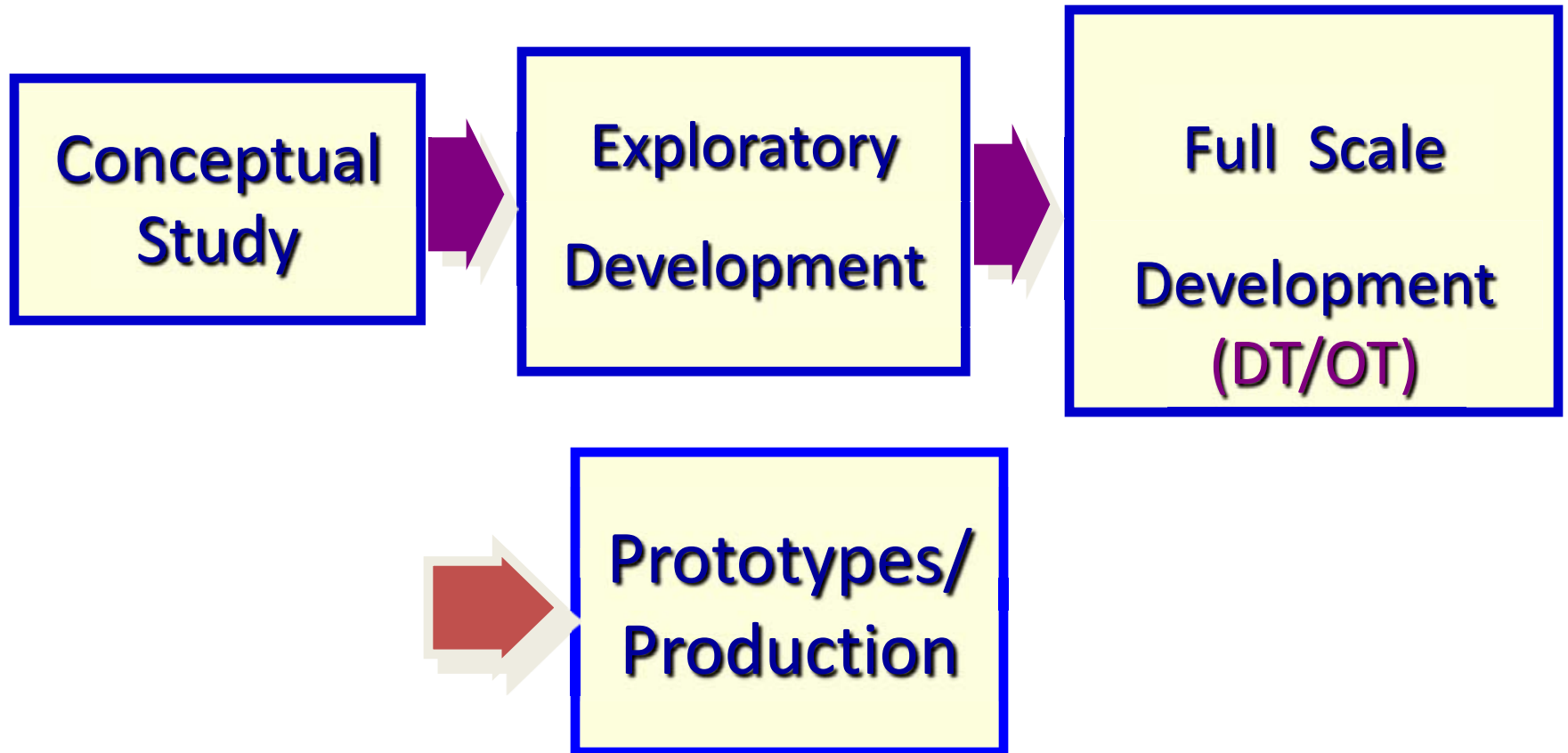
History



Function & Role

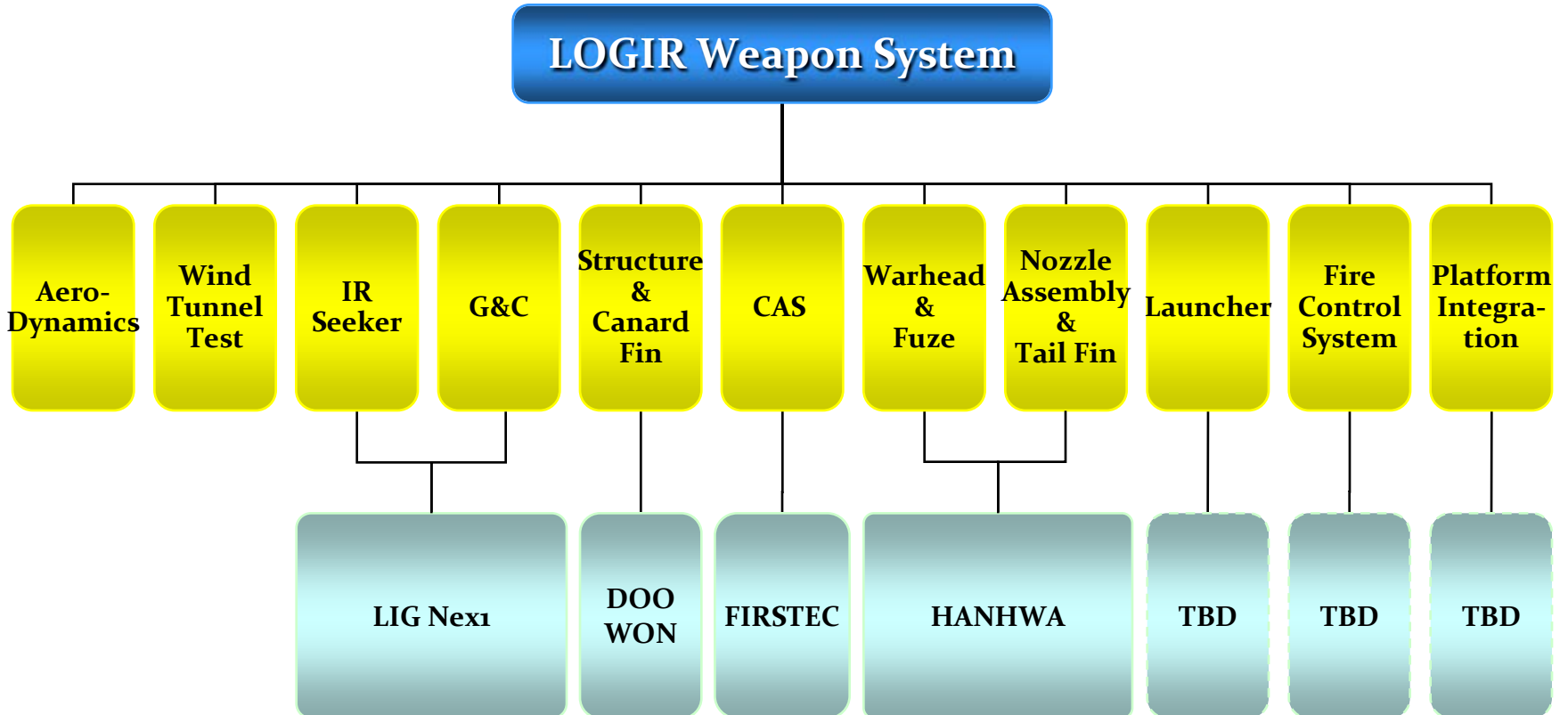
- Agency Function : Policy/Research/Plan/Project, Test and Evaluation of Systems (Authorized by Government-NMD)
- R&D Function : Research and Development of Defense System and Core Technology

System Development Process



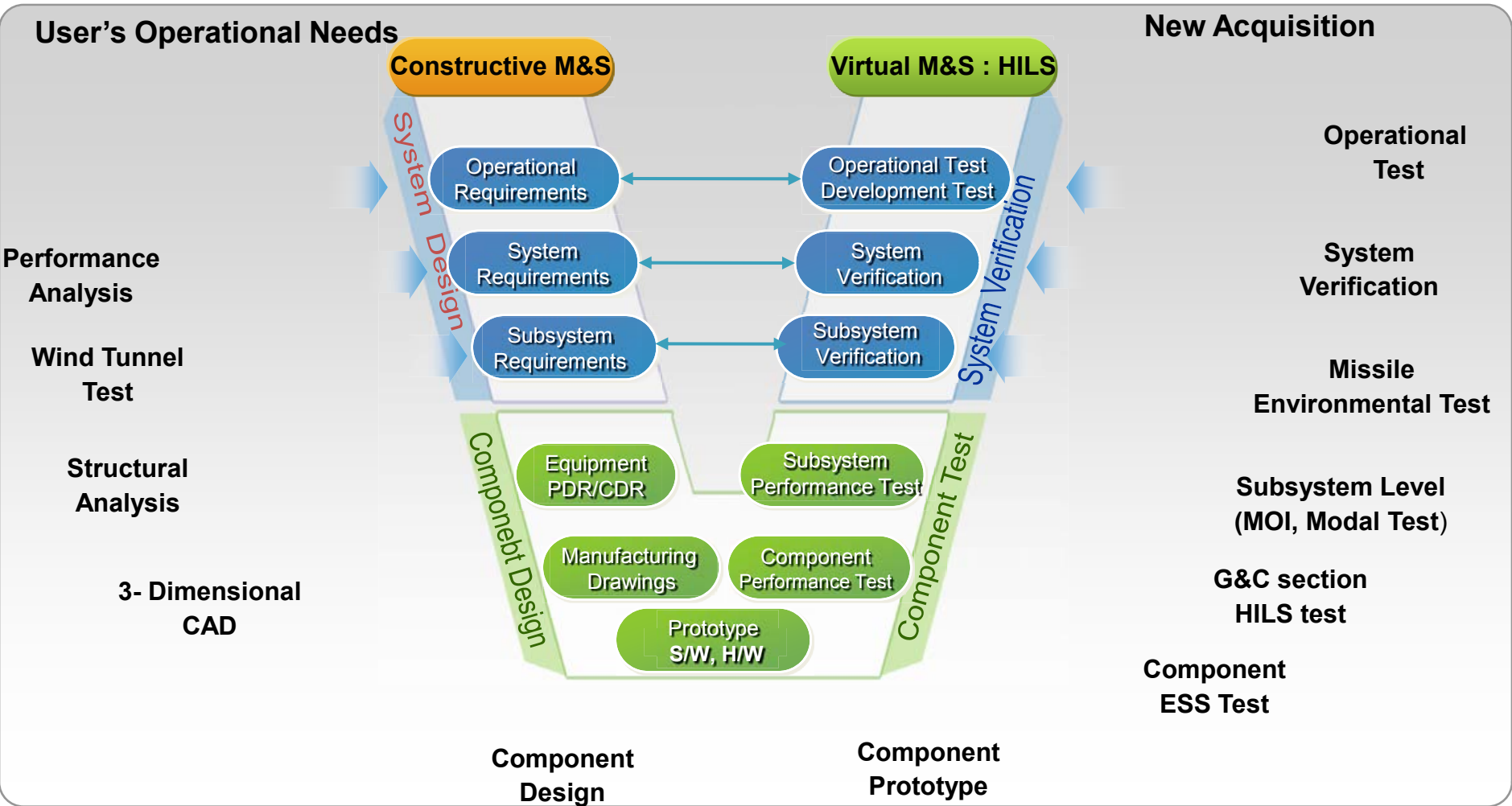
Technical Sub-systems Working for System Integration

Missile System Development Organization

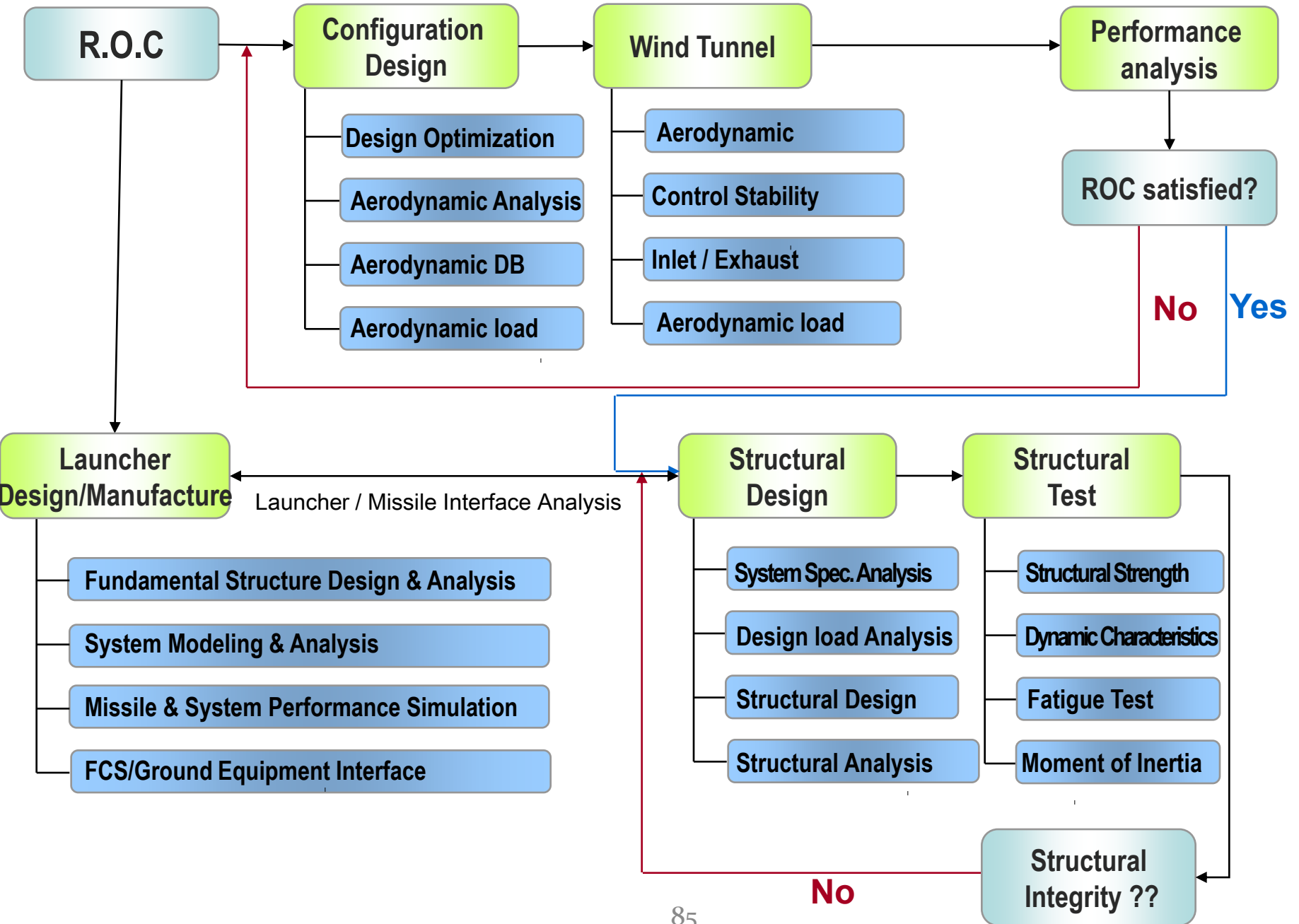


SE Process

EMD phase System Engineering Process



Configuration Design Process



Flow Simulation (1/4)

**We have design and
analysis tools!**

Mach=1.25

H=1.4km

AOA=0deg

Pc=130psia

$\Delta x = 0.5D$

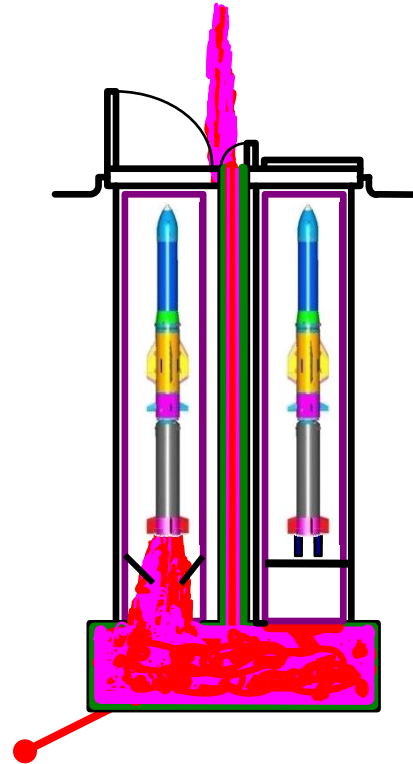
Mach Number

Pressure

Flow Visualization in Wind Tunnel (2/4)

We have test facility to verify the design!

Development of Vertical Launcher (3/4)



Carbon Composite

Test of Carbon Material

Launch on Land

Launch at Sea

Operational Test for Ship-to-Ship Missile (C-Star) (4/4)

Live Test (2003)

Deployment of C-STAR



ADD

- **Has the expertise for 40 years in**
 - **Defense Science and Technology**
 - **Systems Development**

- **Wears two hats:**
 - **Agency**
 - **R&D house**

What is happening in Korea?
- Dynamic
- Reform



400 (08)

800

5 (**it**/st/auto/elec. appl/ship)

20,000

What next ???

1

0.25%

PCFV Initiative:

“Presidential Council for Future and Vision”

Export \$400B

Defense export \$1B

**“Reform Roles of Defense R&D and
Defense Industry Communities”**

Make Defense Sector an Engine of Growth

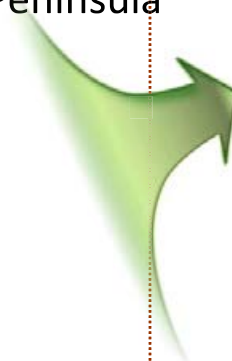
New Roles for ADD

● From Cornerstone to Challenge

“Cornerstone of National Defense”

President Park’s Mission

- Conventional Weapons
- Platforms
- Contribution to Peace in Korean Peninsula



“Creative Challenge”

President Lee’s Dictum

- **Advanced and Unmanned**
- **Defense Green Technology**
- **National and Regional Securities**

1970

2010

Future

National Paradigm:

National **Security** vs. **Economy** (Export)

Rifles Exported to Five Nations

K1A	K2	K3	K4
Colombia, Indonesia, Nigeria, Phillipines (7500 units)			

KT-1 Basic Trainer

Indonesia

Turkey

India

...

K11 Dual Barrel Rifle

US FCT, Oct 2009

US SOCOM

**US NDIA Demo,
May 2010**

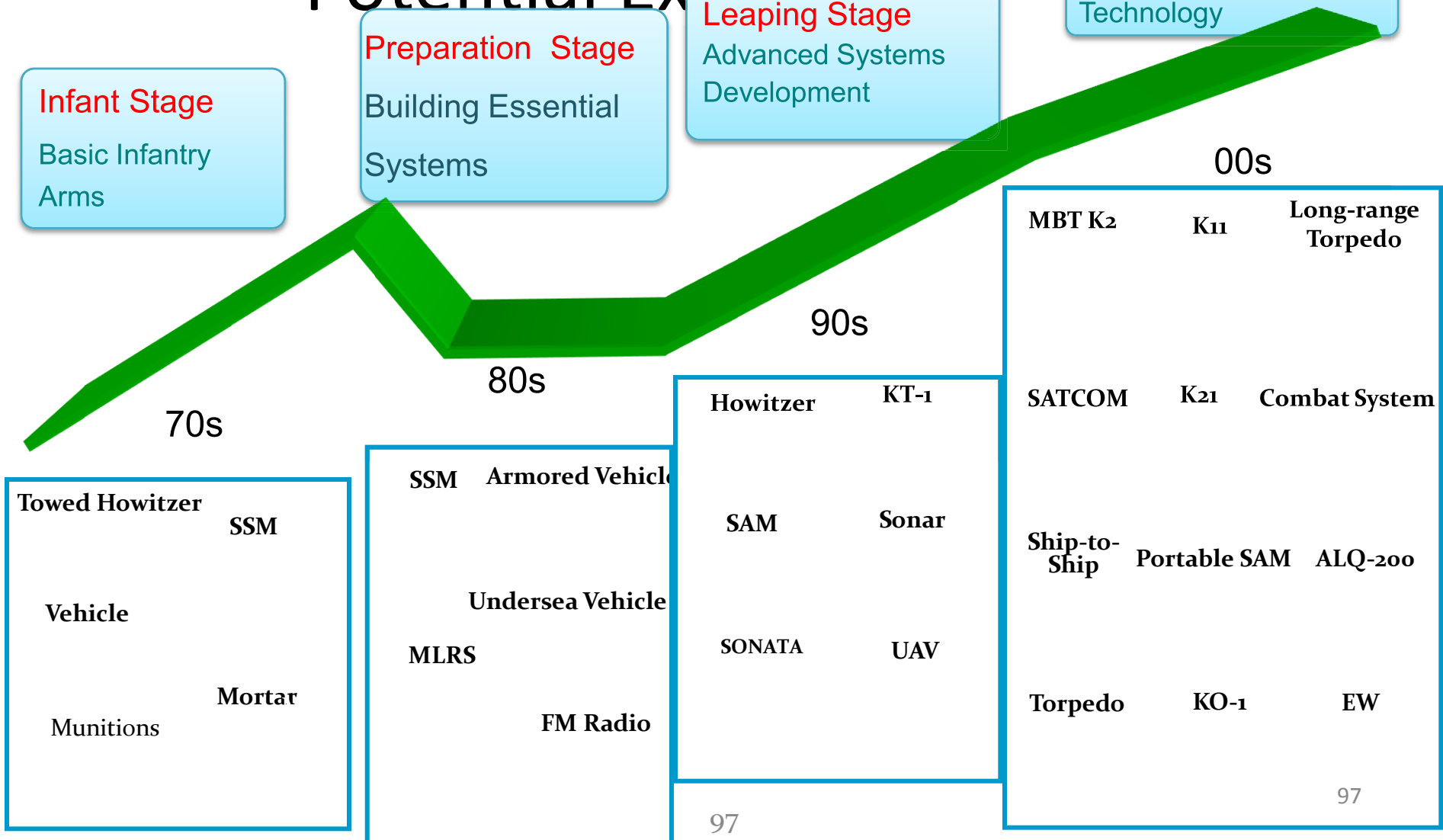
R&D Output = Potential Export

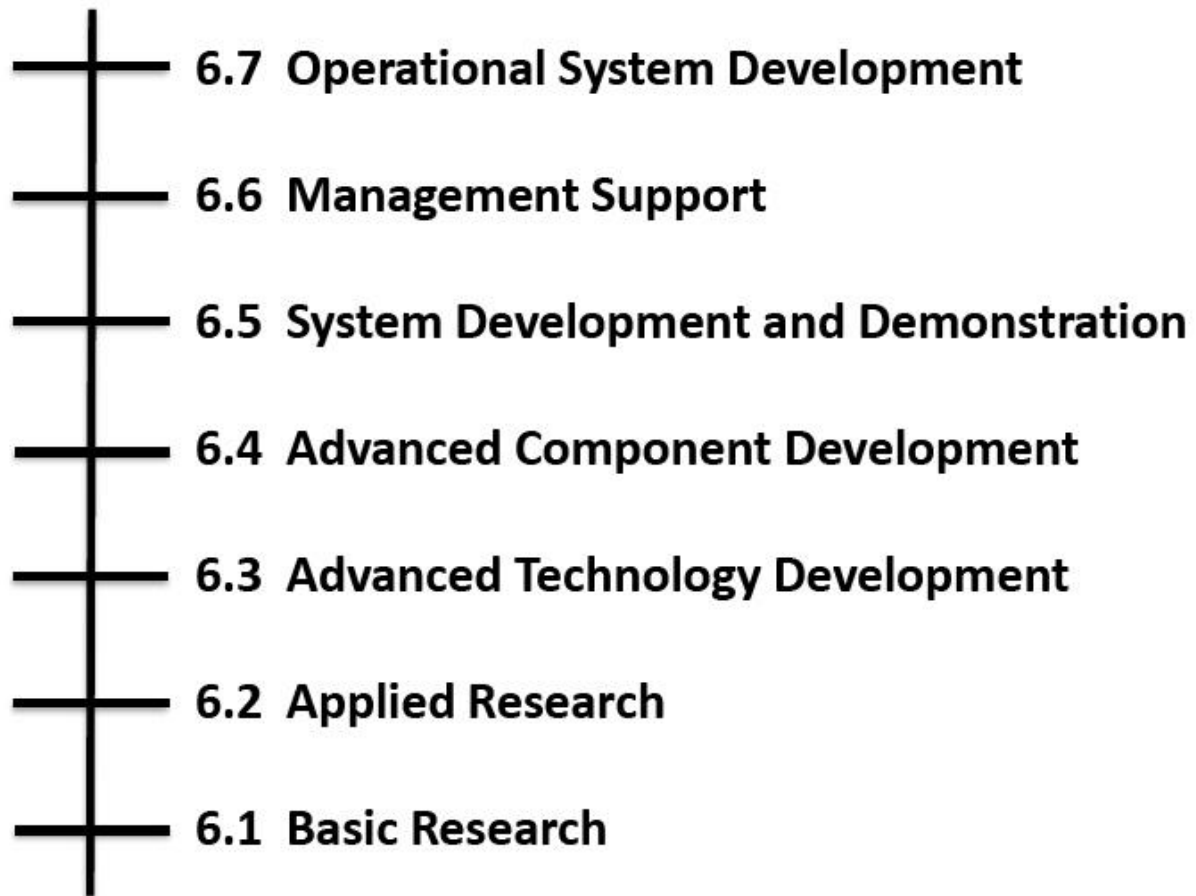
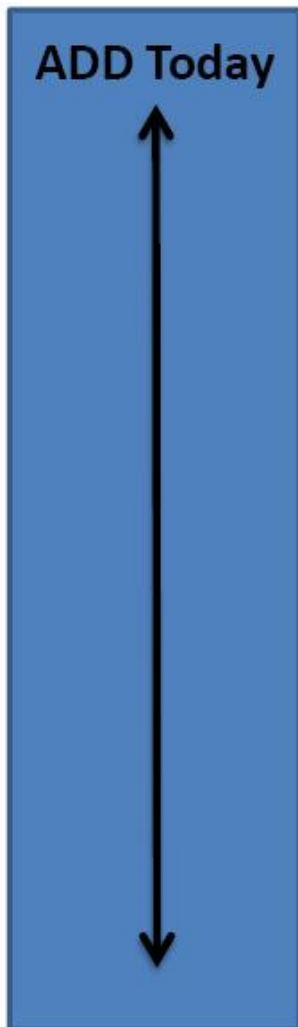
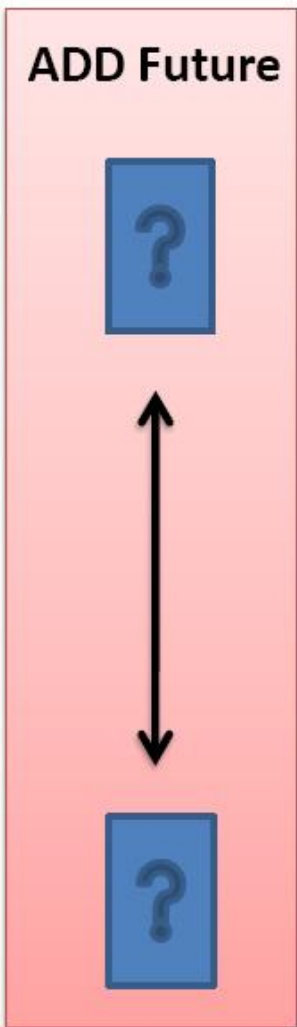
Infant Stage
Basic Infantry Arms

Preparation Stage
Building Essential Systems

Leaping Stage
Advanced Systems Development

Advancing Stage
World Class Systems & Technology





RDT&E Spectrum

Industry Leader

LIG Nex1 Overview



History

Leading Defense Company in Korea
with over 30 years of experience & technology



LIG Nex1 Organization

Vice
Chairman

CEO



LIG Nex1 Locations

Head Office

Seoul

Pan gyo

Yong-in

DaeJeon

Gumi

R&D Center

R&D Branch

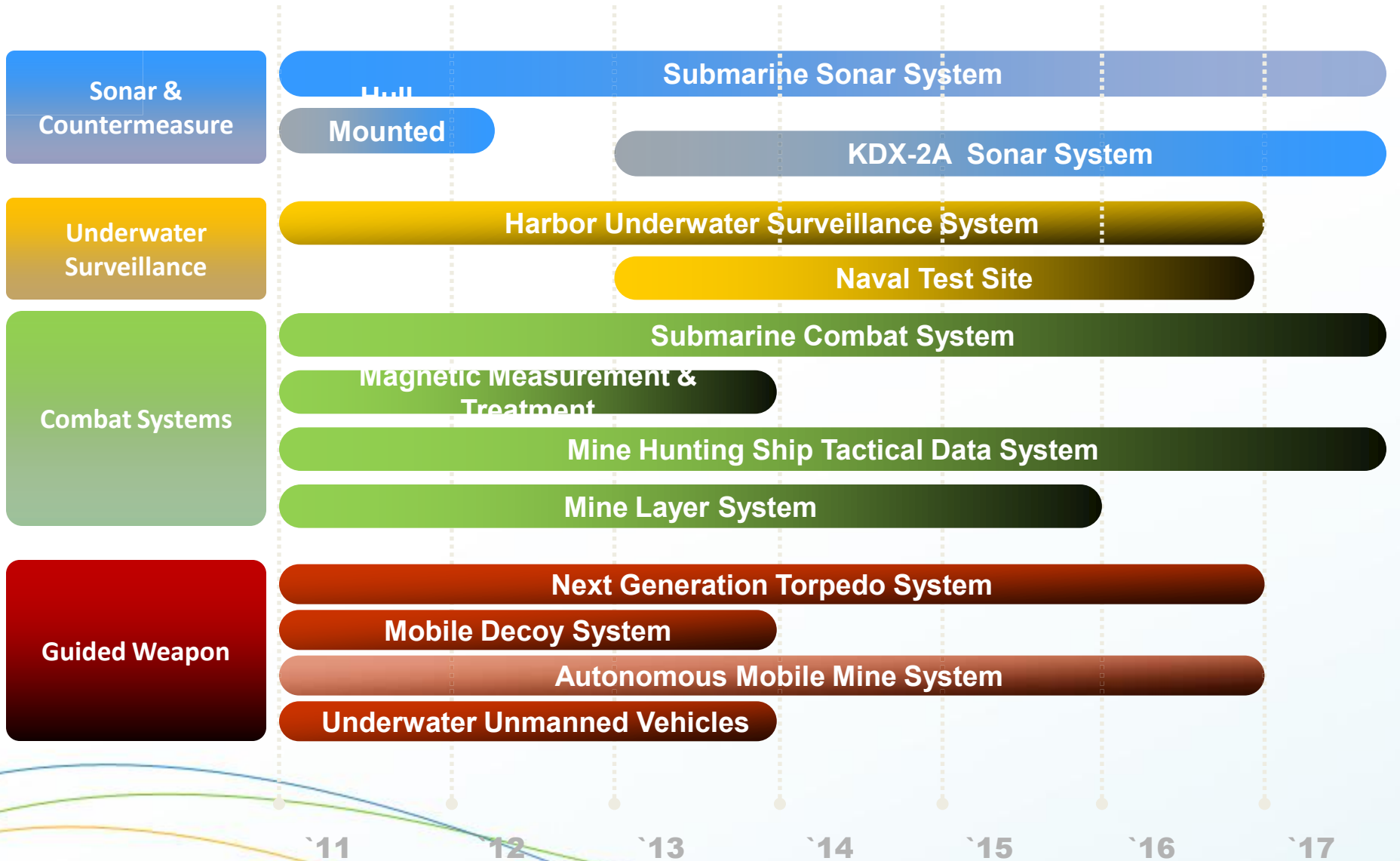
Gumi Plant

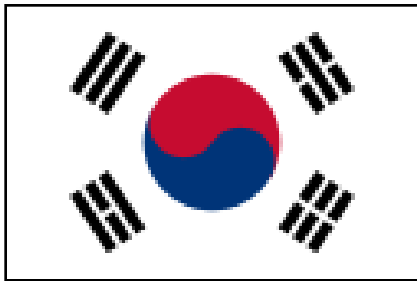
LIG Nex1 Strengths

Tactical
network,
Radio,
Radar



Maritime Projects Roadmap

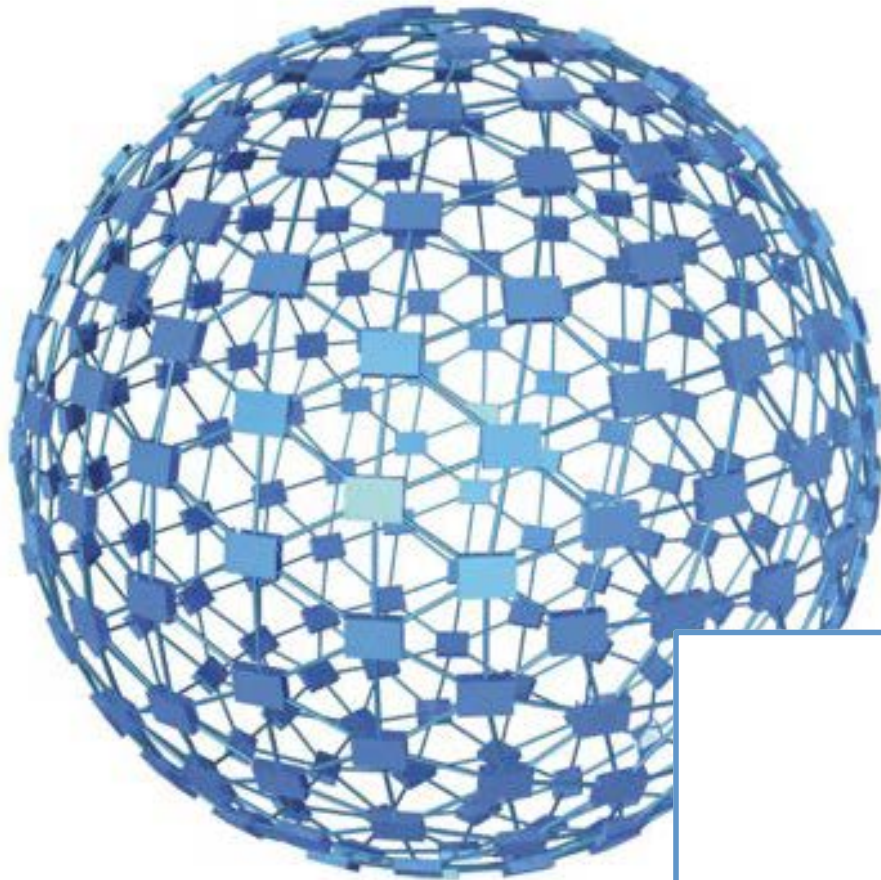




S. K. Hong
LIG Nex1
(82) 10-2926-5012

Ciencia, Tecnología e Innovación en Defensa. El caso de España.

Esther Álvarez González, Presidente, Grupo In-Nova.



Foro de Ciencia, Tecnología e Innovación para la Prosperidad: Perspectivas y Aportes del Sector Defensa

Bogotá, 4 y 5 de Octubre de 2011

Caso de España
Esther Álvarez

Contenido de la Presentación

Esta presentación contiene:

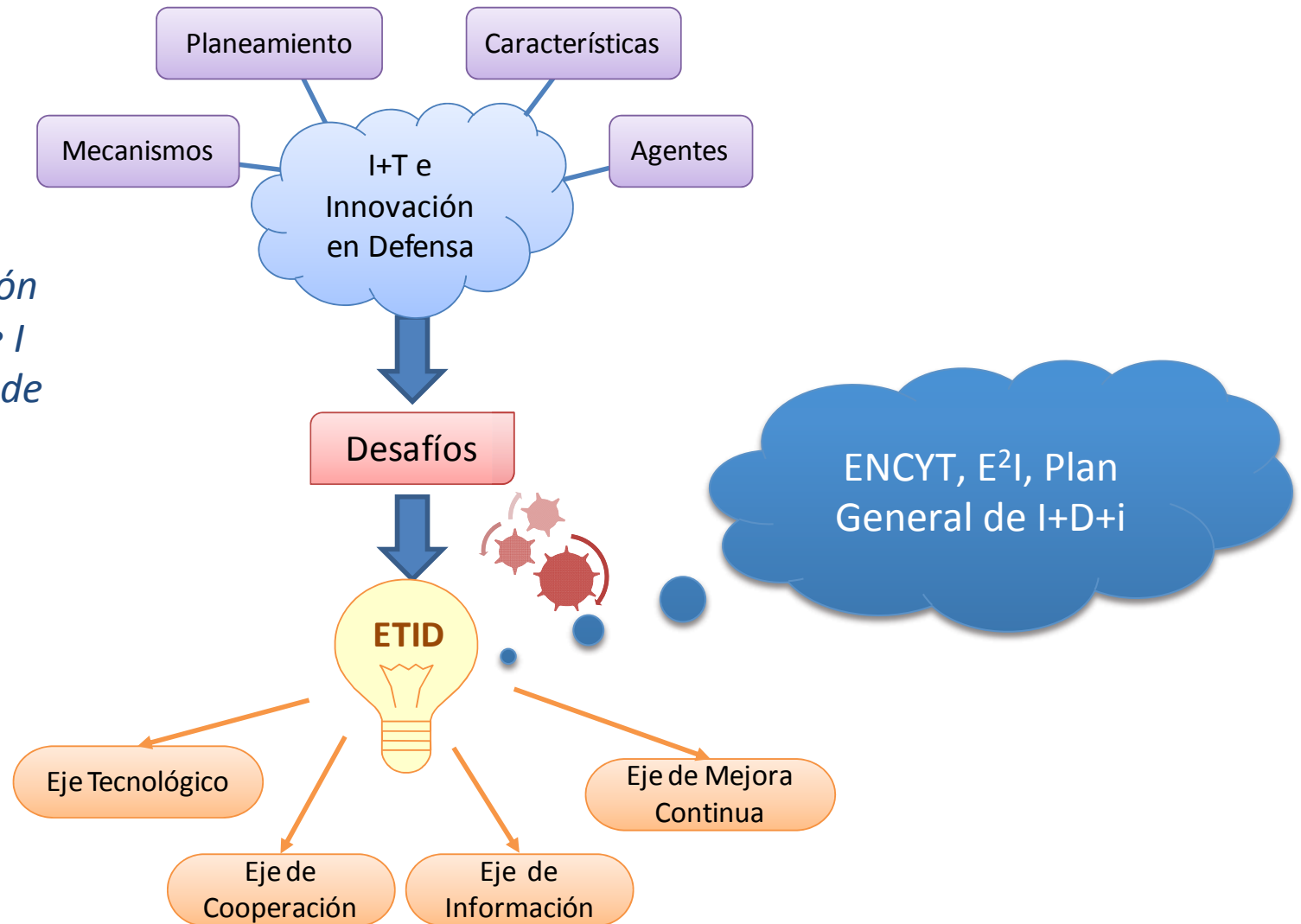
- Breve análisis de la **Estrategia de Tecnología e Innovación para la Defensa de España (ETID)**.
- Descripción del éxito en España: Presentación corporativa del **Instituto Tecnológico de la Marañosa** elaborada y cedida por esta entidad

Instituto Tecnológico de la Marañosa

Un complejo Dinámico e Innovador al
Servicios de las Fuerzas Armadas, la
Industria y la Sociedad



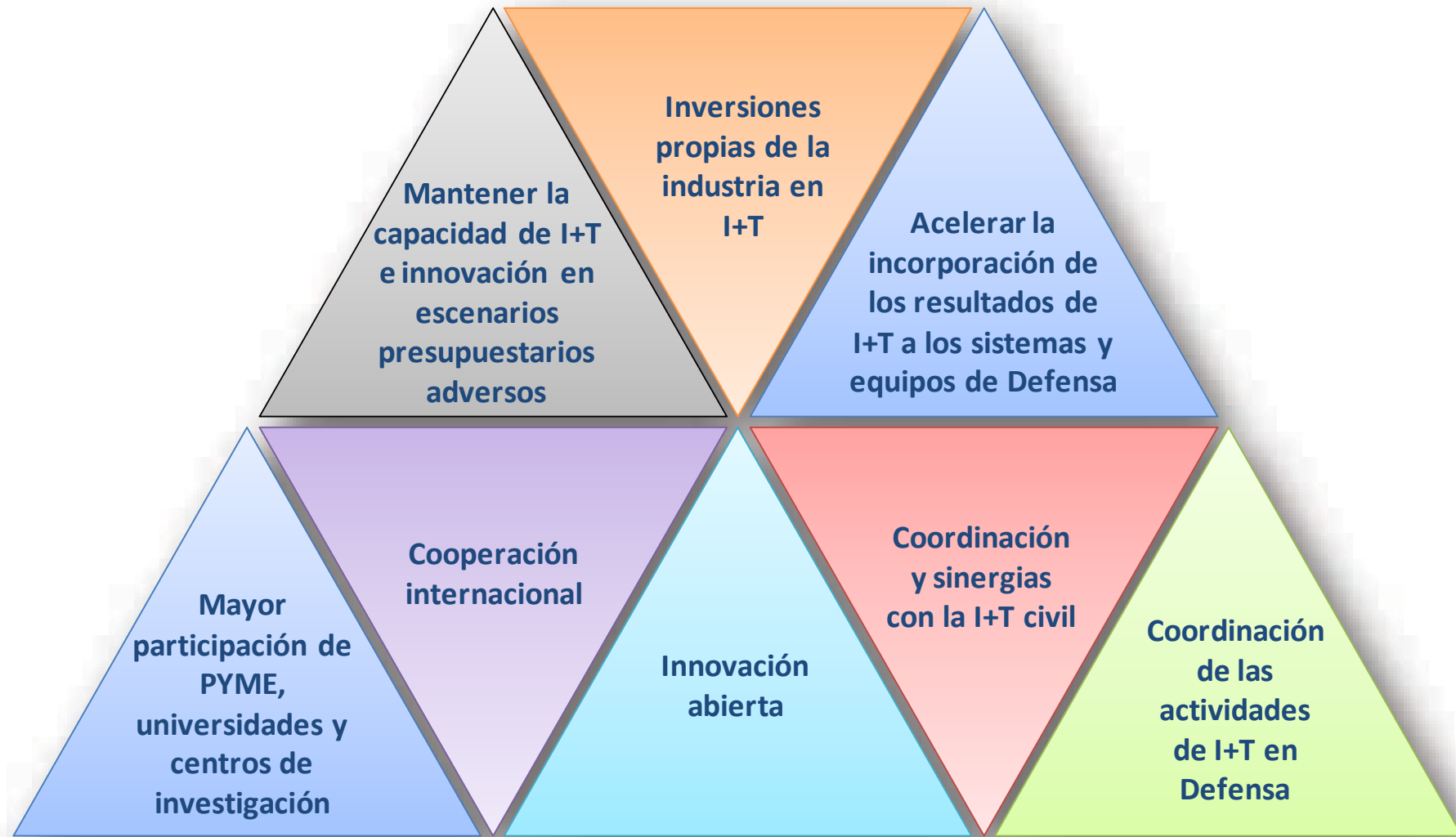
La ETID contribuye a centralizar la dirección de las actividades de I +D, a la priorización de capacidades tecnológicas estratégicas, y a la planificación de las actividades de I+D



Objetivos de la ETID

- Establecer una referencia pública respecto a las actividades de I+T e innovación tecnológica de aplicación a Defensa que considera prioritarias, indicando unos objetivos tecnológicos sobre los cuales establecerá su implantación
- Coordinar a los agentes nacionales en las actividades de I+T para Defensa en aras de una mayor eficiencia.
- Cooperar con los agentes involucrados, tanto usuarios como proveedores, en la definición y realización de las actividades tecnológicas.

Desafíos de la ETID



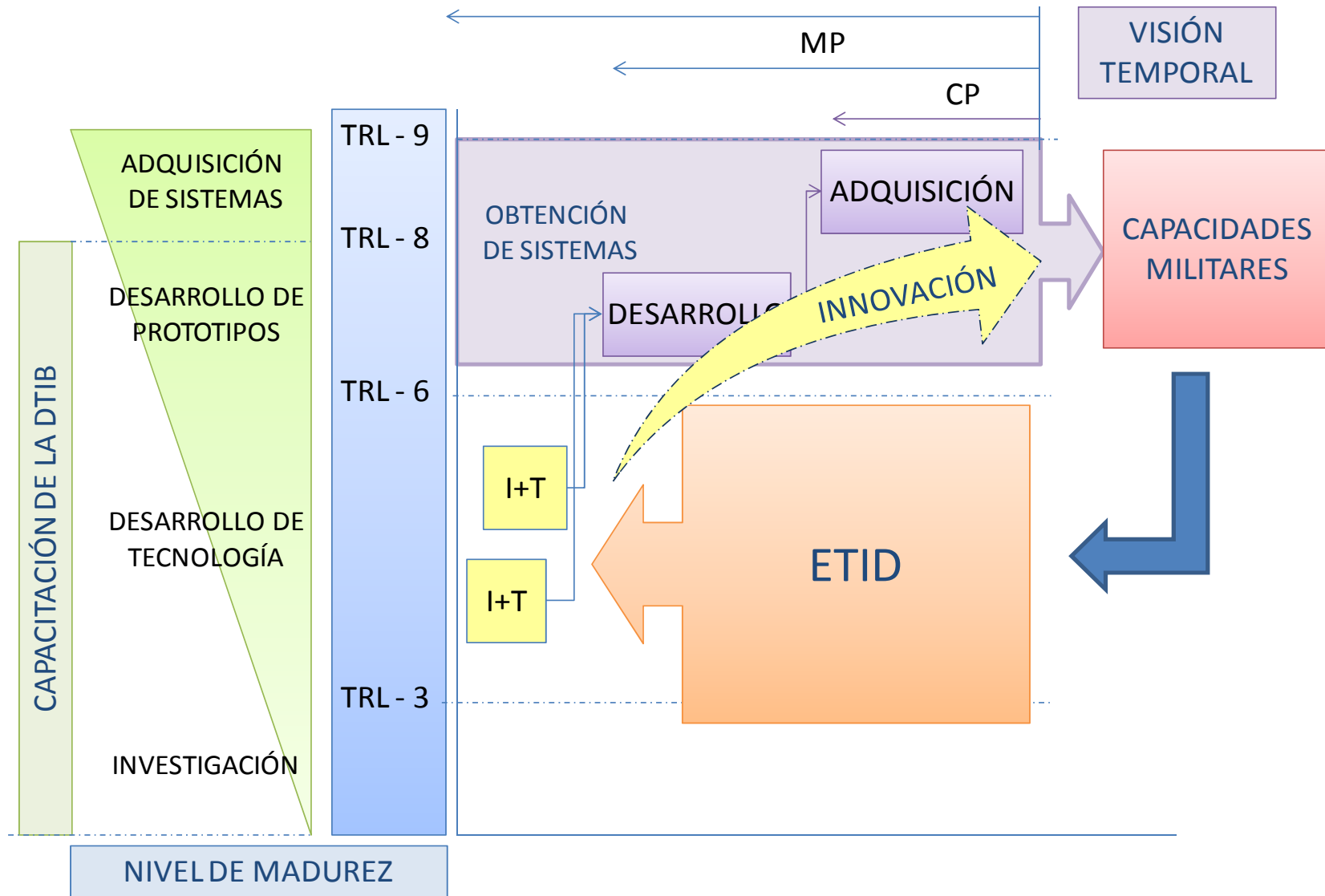
Beneficios de la ETID

- **Orienta la I+T a necesidades militares**, lo que permitirá optimizar recursos y obtener el máximo beneficio del esfuerzo inversor realizado, asegurando la satisfacción de las necesidades operativas de nuestras FAS.
- **Permite transmitir a todos los agentes las necesidades de I+T de Defensa**, eliminando las barreras para la participación en dichas actividades de I+T y ampliando así la base de suministradores de innovación para defensa.
- **Apoya las actividades de CD&E del Ministerio de Defensa**, orientando al Instituto Tecnológico de la Marañosa (ITM) sobre las áreas tecnológicas que serán protagonistas de las futuras actividades de desarrollo de conceptos y experimentación.
- **Permite trasladar al conjunto de la sociedad los beneficios de la I+T de Defensa**, reflejando cómo dicha I+T puede contribuir a crear un modelo de crecimiento sostenible basado en el conocimiento y la innovación, generando profesionales cualificados y competentes, y proporcionando mejor calidad de vida y bienestar al conjunto de la sociedad.

Beneficios de la ETID

- **Fomenta la competitividad industrial** mediante la racionalización en la inversión, la eficiencia en el empleo de los recursos, y el fomento de la cooperación.
- La ETID supondrá una **clara contribución** a los objetivos del Plan Nacional de **I+D+I 2008-2011**, de la Estrategia Nacional de Ciencia y Tecnología (**ENCYT**), y de la Estrategia Estatal de Innovación (**E²I**)
- Potenciará la investigación e innovación como fuente atractiva para el **inversor**, dinamizando los **factores económicos** hacia una **sociedad del conocimiento**, generando un **tejido industrial** y tecnológico nacional **competitivo** y facilitando su **internacionalización**.

Ámbito cubierto por la ETID

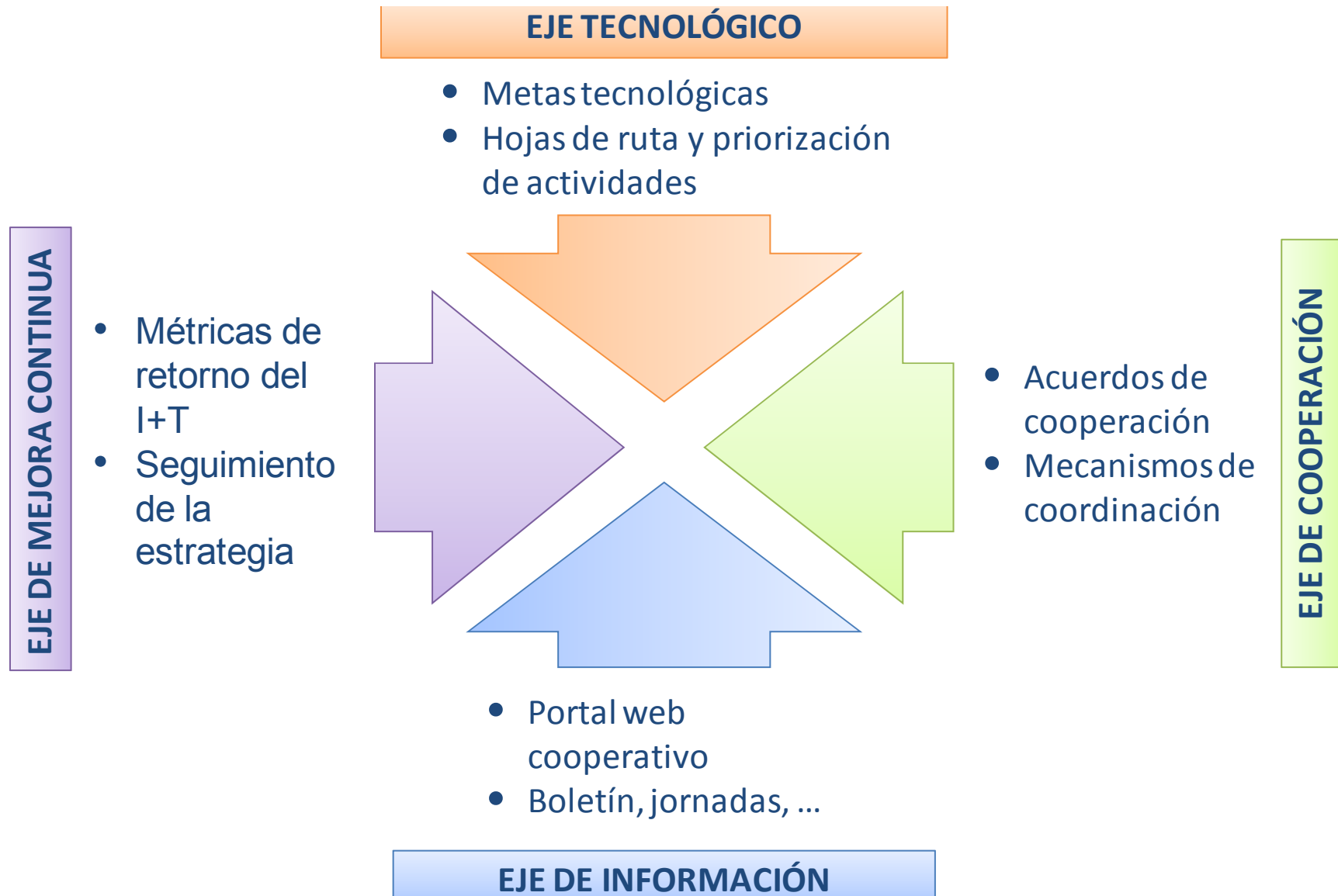


Nivel de Madurez Tecnológica

Technology Readiness Level



Ejes de Implantación de la ETID



Antecedentes



Centro de Ensayos de Torregorda (**CET**)



Centro de Ensayos y Análisis Radioeléctrico (**CEAR**)



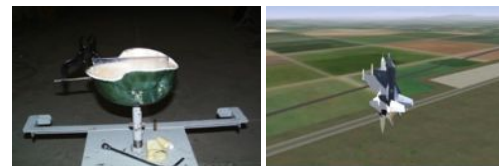
Centro de Investigación y Desarrollo de la Armada (**CIDA**)



Fábrica Nacional de "La Marañosa" (**FNM**)



Laboratorio Químico Central del Armamento (**LQCA**)



Polígono de Experiencias de Carabanchel (**PEC**)



Taller de Precisión y Centro Electrotécnico de Artillería (**TPYCEA**)

Antes del 2008



ITM Centro de I+D+i del Ministerio de Defensa



MARCO DE REFERENCIA

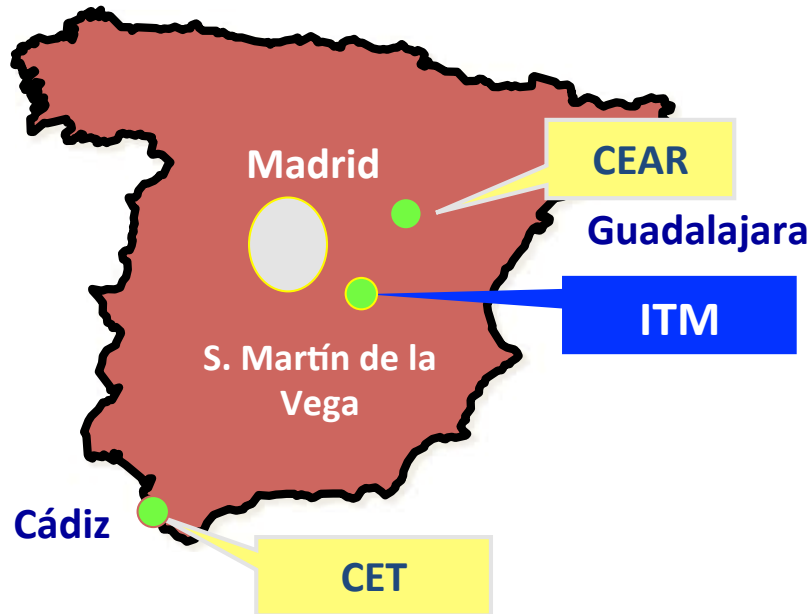
Estrategia de
Tecnología e
Innovación para la
Defensa (**ETID**).



MISIONES

Al servicio de las Fuerzas Armadas y de toda la sociedad española:

- Investigación, desarrollo tecnológico e innovación (**I+D+i**).
- Simulación, experimentación y validación de conceptos operativos (**CD&E**).

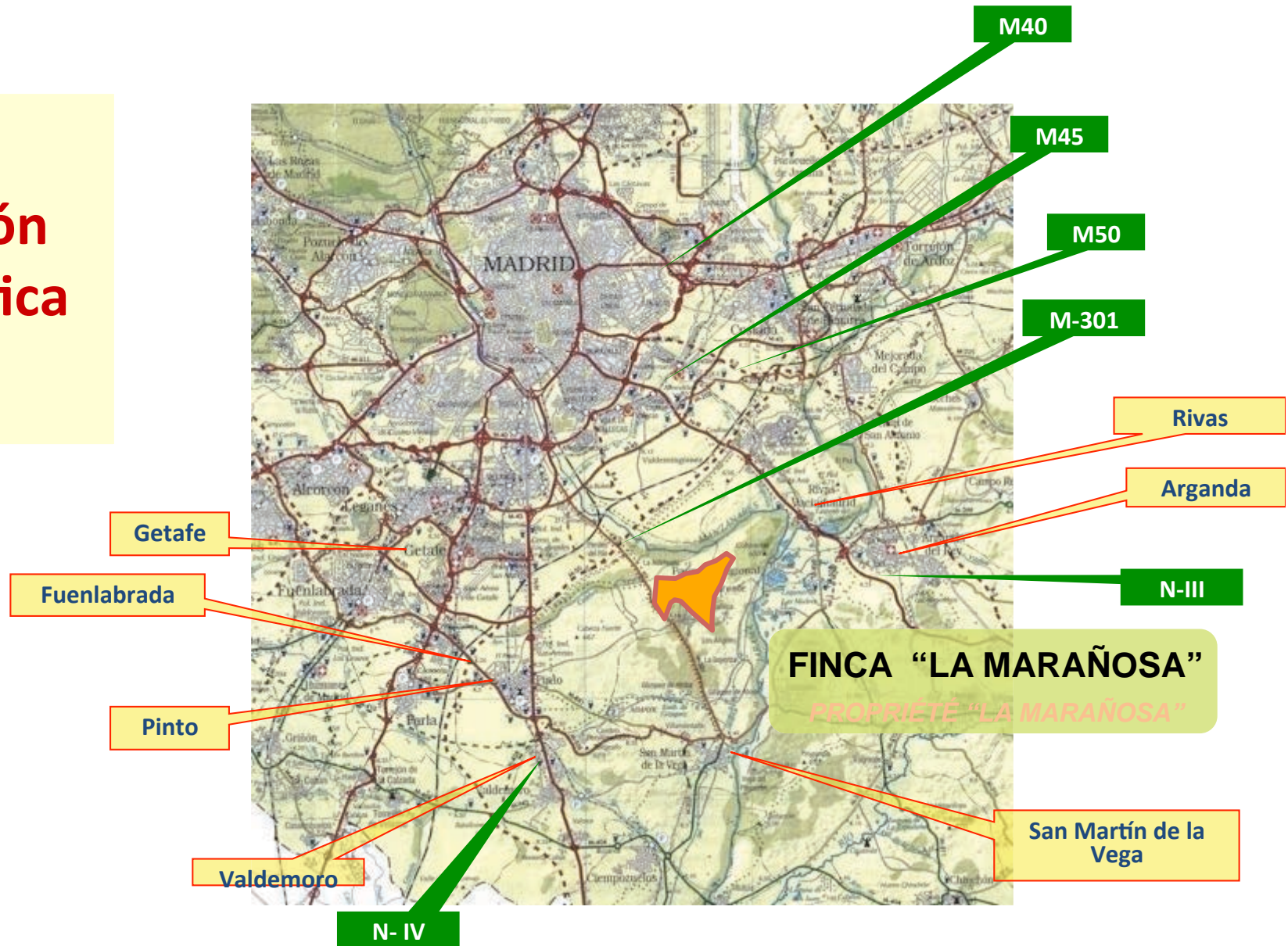


El ITM está distribuido en 3 emplazamientos:

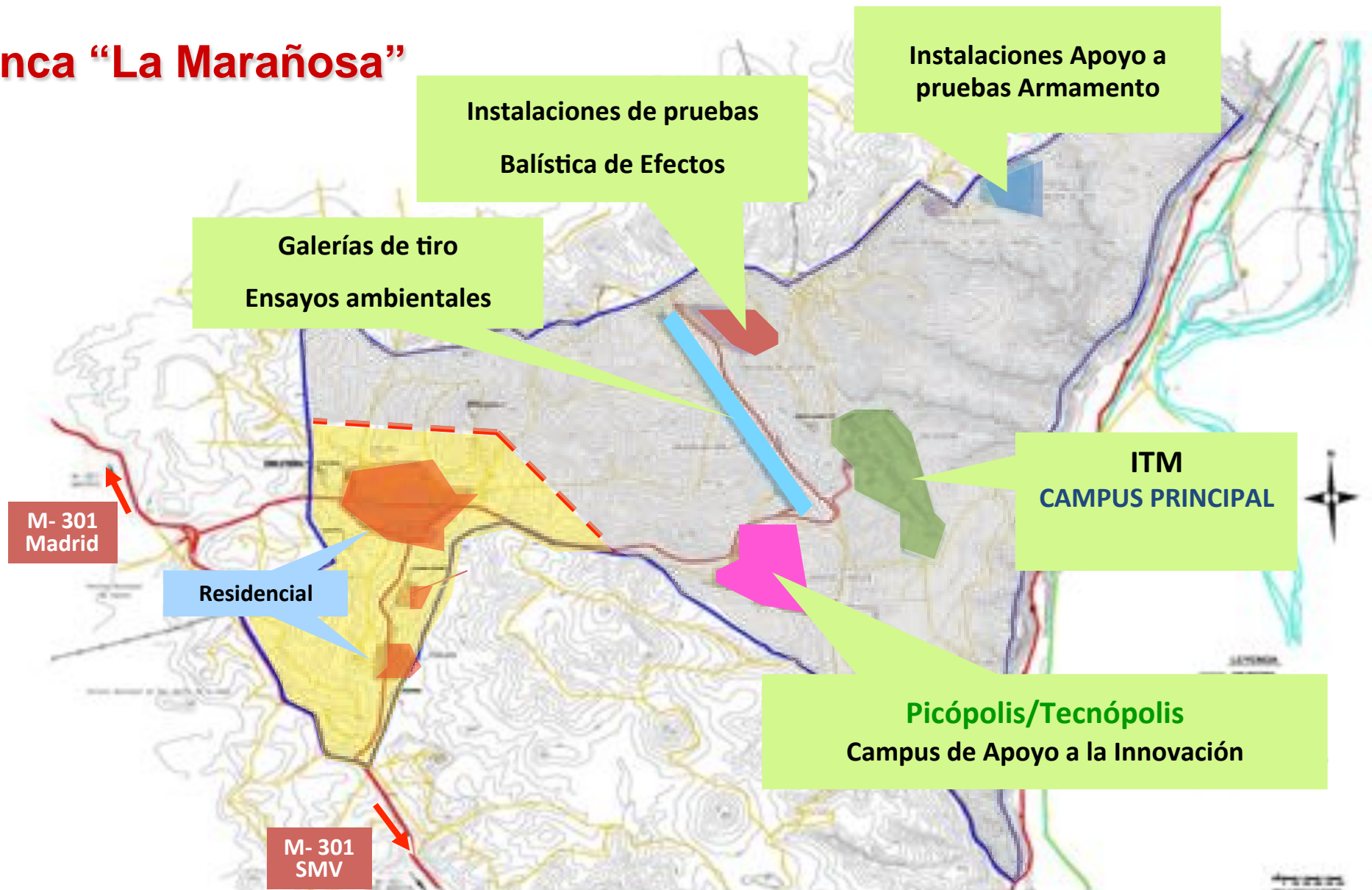
- **Campus central**, San Martín de la Vega (Madrid).
- Centro de Ensayos de Torregorda (**CET**), Cádiz.
- Centro de Evaluación y Ensayos Radioeléctricos (**CEAR**), Guadalajara.

Ubicación

Situación geográfica



Finca "La Marañosá"



Recursos Humanos

PLANTILLA 2007:
880 personas

206 Militares (23,41%)

125 Funcionarios (14,20%)

549 Laborales (62,38%)

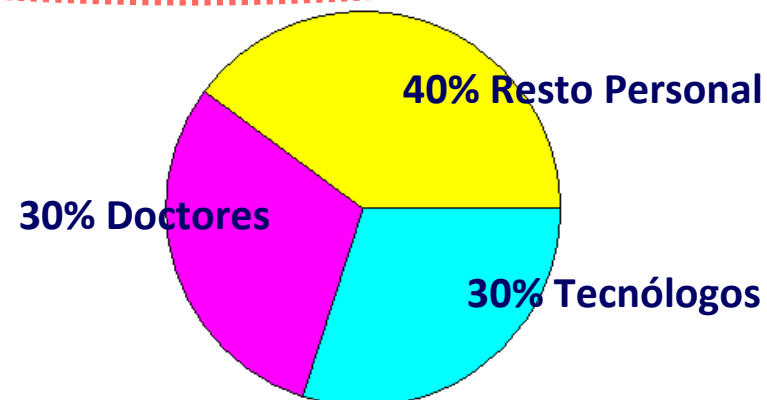
PLANTILLA PREVISTA:
843 personas

206 Militares (24,44%)

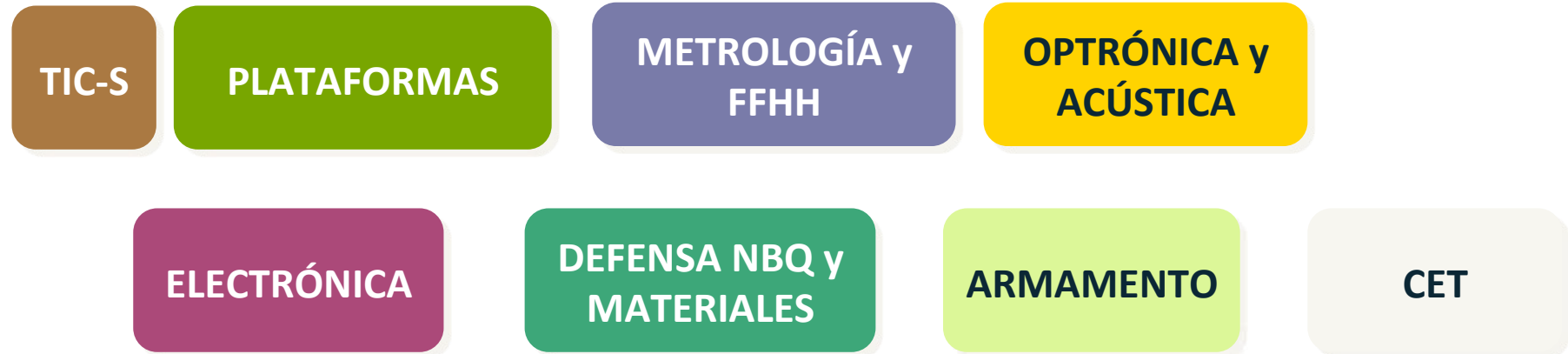
298 Funcionarios (35,35%)

339 Laborales (40,21%)

+60 Personal
Apoyo Técnico



Áreas Tecnológicas



$ITM = \sum 7 \text{ Áreas Tecnológicas} + CET$

- *Área Defensa NBQ y Materiales*
- *Área TIC-S*
- *Área de Electrónica*
- *Área de Optrónica y Acústica*
- *Área de Armamento*
- *Área de Metrología y Factores Humanos*
- *Área de Plataformas*

Centro de Ensayos de Torregorda (CET)



Radar de trayectografía



Cañón 155 mm

ACTIVIDADES

- Recepción de armamento y munición (>40mm)
- Pruebas/ensayos de homologación
- Pruebas de vigilancia
- Pruebas de análisis forenses
- Pruebas I+D
- Apoyos diversos (verificación tablas de tiro)
- Asesoramiento técnico



Blanco aéreo Chuckar

ACTIVIDADES

- Centro Nacional de Ensayos OTAN para calibres pequeños y medios
- Laboratorio de ensayo para procesos de homologación
- Estudios de accidentes
- Proyectos de I+D de armamento, municiones, cohetes, misiles, ANL, C-IED
- Balística de efectos (pruebas y modelización)
- Tablas de tiro (ensayos y modelización)
- Pruebas de fuego y ensayos mecánicos, ambientales, térmicos de armamento y munición
- Control y guiado, Propulsión

PLAZA BALÍSTICA



GALERIAS DE TIRO



MODELOS DE VULNERABILIDAD

ACTIVIDADES

- Ejecución de pruebas de GE, Radares DT, Data-Link, Robótica, Generación de energía
- Mantenimiento SW de equipos de GE, radares, DT, Data-link
- Generación de escenarios radioeléctricos
- Proyectos de I+D de Contramedidas radar, seekers de misiles, inhibidores
- Proyectos de I+D en radares y DT
- Proyectos de I+D en enlaces de datos
- Proyectos de I+D en Robótica
- Proyectos de I+D en Generación de Energía

SISTEMAS INHIBIDORES



ENLACES DE DATOS



CENTRO DE EVALUACIÓN Y ENSAYOS RADIOELÉCTRICOS (CEAR)

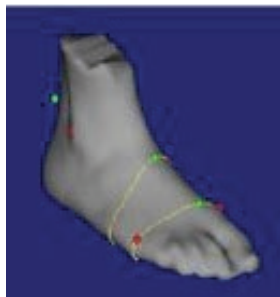


Área de Metrología y Factores Humanos

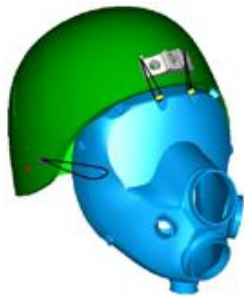
ACTIVIDADES

- Mantenimiento de patrones de referencia (dimensional, térmico, mecánico, acústico, eléctrico, tiempo/frecuencia, radiofrecuencia, radiometría)
- Calibración de patrones de la cadena de calibración del MINISDEF
- Evaluación de ergonomía de equipos operativos y del combatiente en escenarios potenciales
- Mantenimiento de los parámetros antropométricos de la población militar
- Proyectos de I+D en metrología
- Proyectos de I+D en factores humanos
- Modelización del combatiente

Antropometría



Interfaces



Biometría



METROLOGIA (Magnitudes físicas)

Área de Defensa NBQ y Materiales

ACTIVIDADES

- Evaluaciones de riesgos radiológicos
- Calibración de sensores radiológicos, químicos y biológicos
- Detección, identificación y profilaxis de AQ y AB
- Mantenimiento de base de datos de agentes biológicos y químicos
- Proyectos de I+D en nuevos materiales, en materiales energéticos, en defensa frente a AQ, en defensa frente a AB, en defensa sadiológica
- Apoyo a organismos internacionales en el control de ADM
- Asesoramiento en protección radiológica, química y biológica

DEFENSA QUÍMICA



DEFENSA BIOLÓGICA



MATERIALES (Energéticos y no energéticos)



Área de Optrónica y Acústica

ACTIVIDADES

- Asesoramiento sobre sistemas optrónicos y acústicos
- Evaluación de Sistemas Optrónicos (Vis, IR, UV) y Acústicos
- Análisis de atmosfera en Vis e IR
- Procesado de imágenes para mejora de detección y medida
- Proyectos de I+D en Sistemas Optrónicos (vis, IR)
- Proyectos de I+D de sensores, materiales, dispositivos optoelectrónica
- Proyectos de I+D en Micro/nanotecnologías
- Proyectos de I+D en Acústica atmosférica/ submarina
- Obtención y reducción de firmas IR, acústicas, etc.
- Protección láser, acústica, IR, etc
- Modelado de firmas y base de datos de firmas



SEGUIMIENTO OPTRONICO



SALA LIMPIA



Área de Plataformas

ACTIVIDADES

- Asesoramiento y evaluación de sistemas de plataformas
- Proyectos de I+D sobre plataformas (combate, transporte, especiales)
- Integración óptima de elementos en plataformas
- Monitorización estructural de la plataformas (dinámica, protección,...)
- Propulsión y movilidad de plataformas
- Vetrónica
- Plataformas no tripuladas marino-terrestres
- Ergonomía de sistemas embarcados
- Pruebas de verificación/validación de plataformas e interfaces
- Modelización de plataformas
- Apoyo logístico integrado (análisis de fiabilidad, mantenibilidad, gestión de configuración, etc)



Integración en Plataformas



Prototipado



Ergonomía vehicular



UAV

ACTIVIDADES

- Asesoramiento y evaluación de sistemas TIC-S
- Proyectos de I+D en TIC-S
- Desarrollo de demostradores tecnológicos y prototipos TIC-S
- Certificación de sistemas TIC-S
- Desarrollos en Ingeniería de Sistemas (SW, Procesos, calidad SW)
- Pruebas de verificación/validación de sistemas TIC-S
- Interoperabilidad en comunicaciones, Simulación, C2
- Modelado de sistemas TIC-S.
- Desarrollo de entornos de operación para tecnologías y procesos NEC y CD&E



Integración de simuladores y de C2



Modelos y escenarios

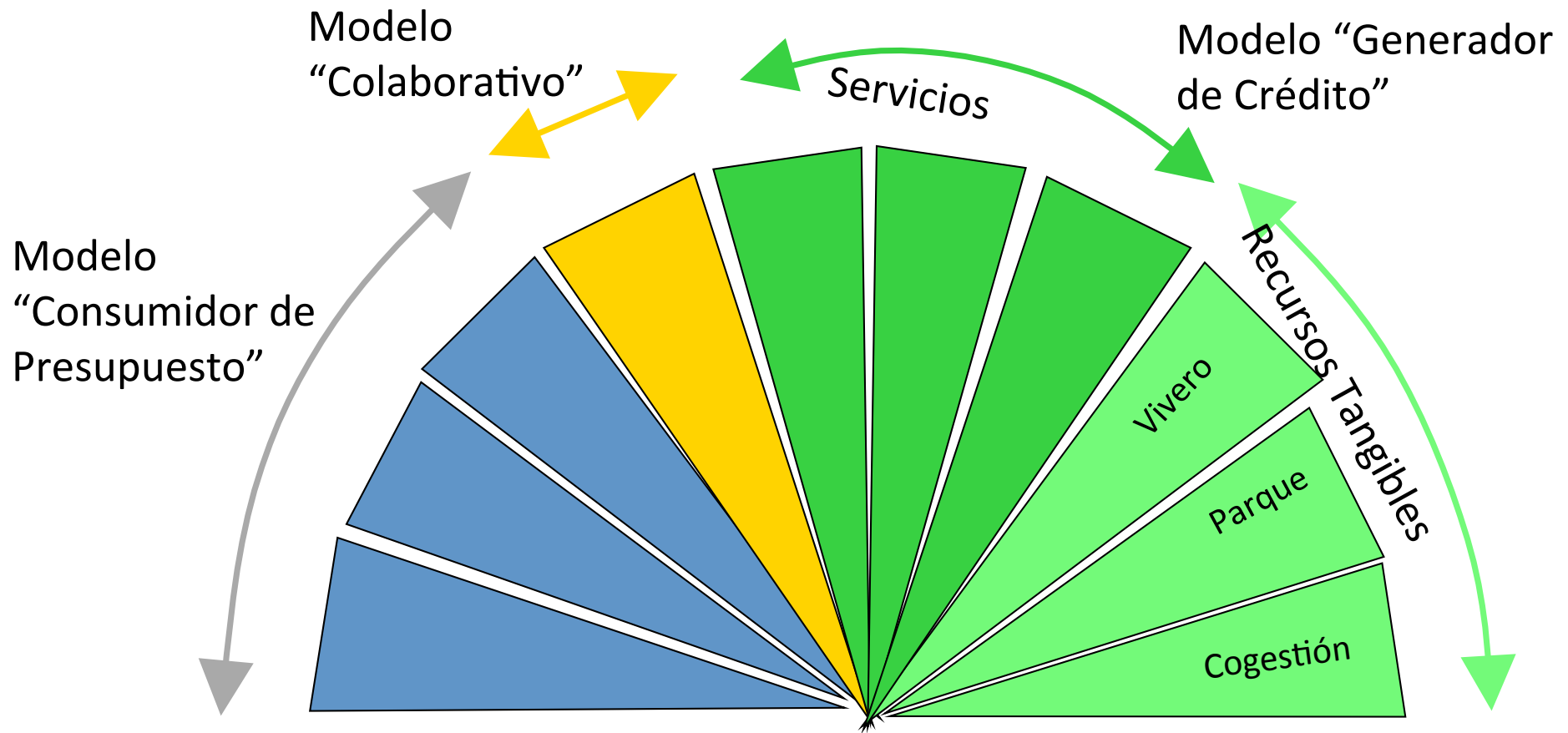


El futuro del ITM

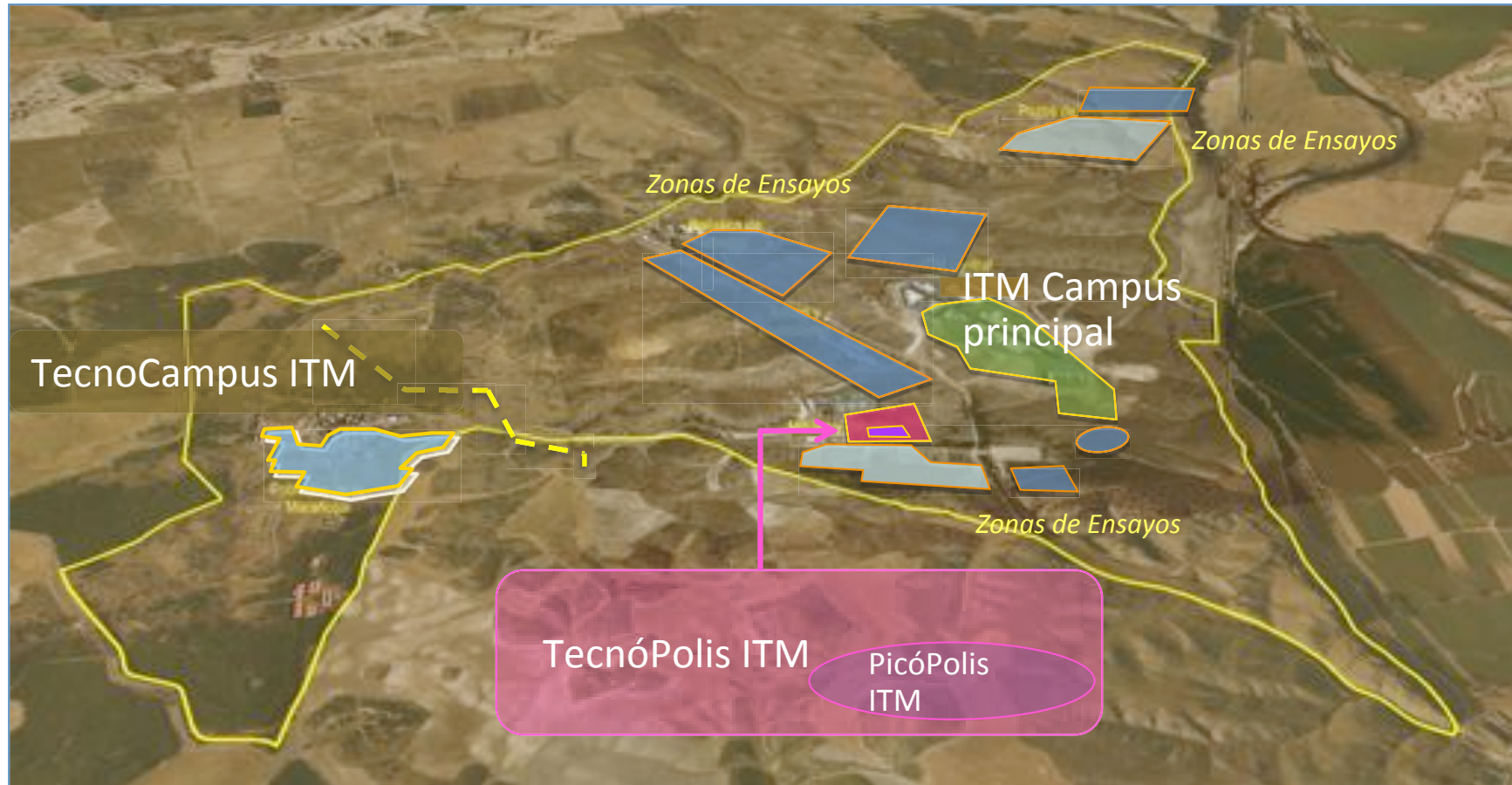


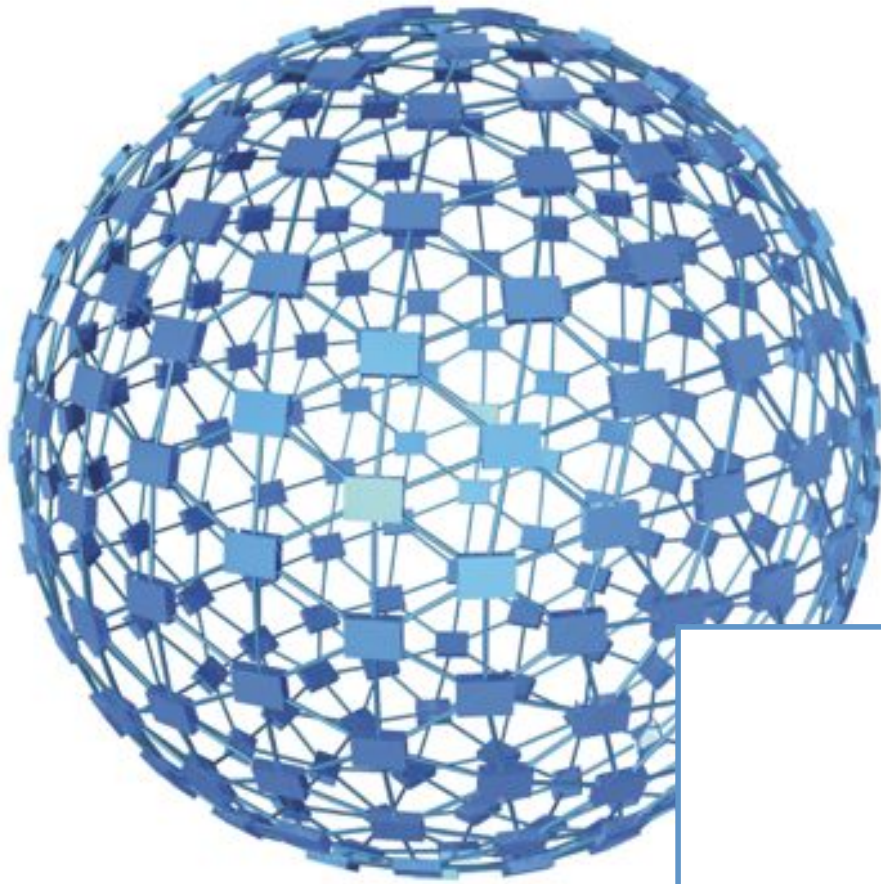
- Proyecto de Gran Complejidad
- Interés Estatal y Político
- Necesidad de un esfuerzo intensivo
- Sinergias entre las Áreas Tecnológicas
- Necesidad de un enfoque sistémico
- Proyecto necesario y rentable

Tipificación de la relación ITM Industria



El ITM en el 2015





Gracias por su atención
ealvarez@in-nova.org

madrid quito toledo albacete bogotá

Ciencia, Tecnología e Innovación en Defensa. El caso de Canadá.

Eric Fresque, Director del Departamento de Ciencia y Tecnología de Relaciones Exteriores, del Departamento de Investigación y Desarrollo de la Defensa de Canadá. Ministerio de Defensa de Canadá.

Colombia Ministry of National Defence
Conference on Science, Technology and
Innovation for Prosperity:
A Canadian Perspective

Eric Fresque

Director S&T External Relations

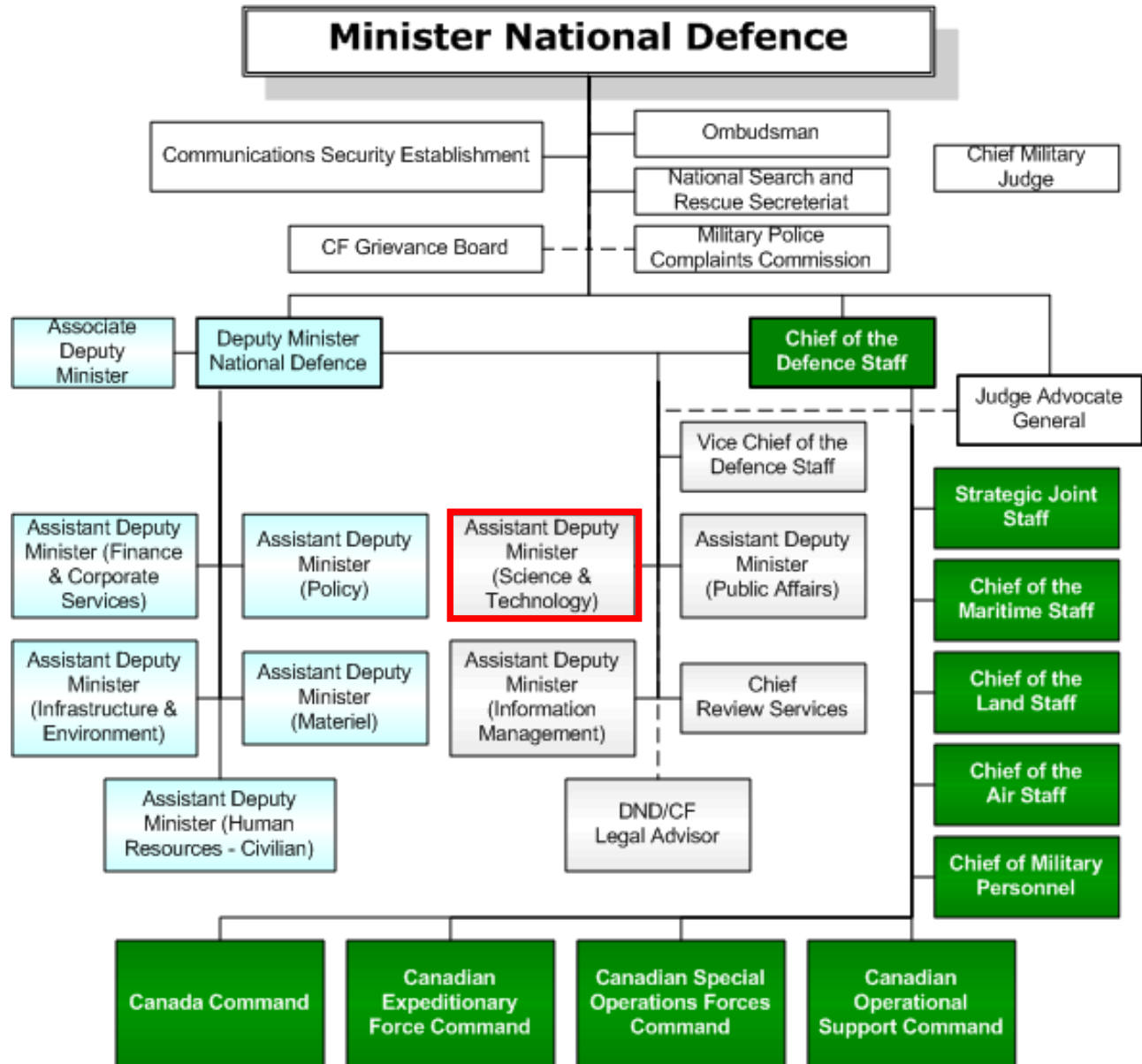
Defence R&D Canada

October 4, 2011

Presentation Outline

- An Introduction to Defence R&D Canada
- Setting the Scene - The Canadian Context
- Establishing the Right Conditions
- Defining the Long Term Objectives
- Final Thoughts

An Introduction to Defence R&D Canada



Defence R&D Canada Mission



DRDC Centres

DRDC Suffield
Weapons Effects
Vehicles
Autonomous Systems
Military Engineering
Chemical & Biological
Defence

DRDC Ottawa
Radar, EW
Space Systems
Information Operations
Communications
Synthetic Environment

DRDC Valcartier
Electro-optics
Combat Systems
Command & Control
Information Management
Systems of Systems

**Centre for Operational
Research and Analysis**
Operational Research
Scientific and Technical
Intelligence

DRDC Atlantic
Underwater Sensing
Materials
Air Vehicles
Marine Vehicles
Signature Management

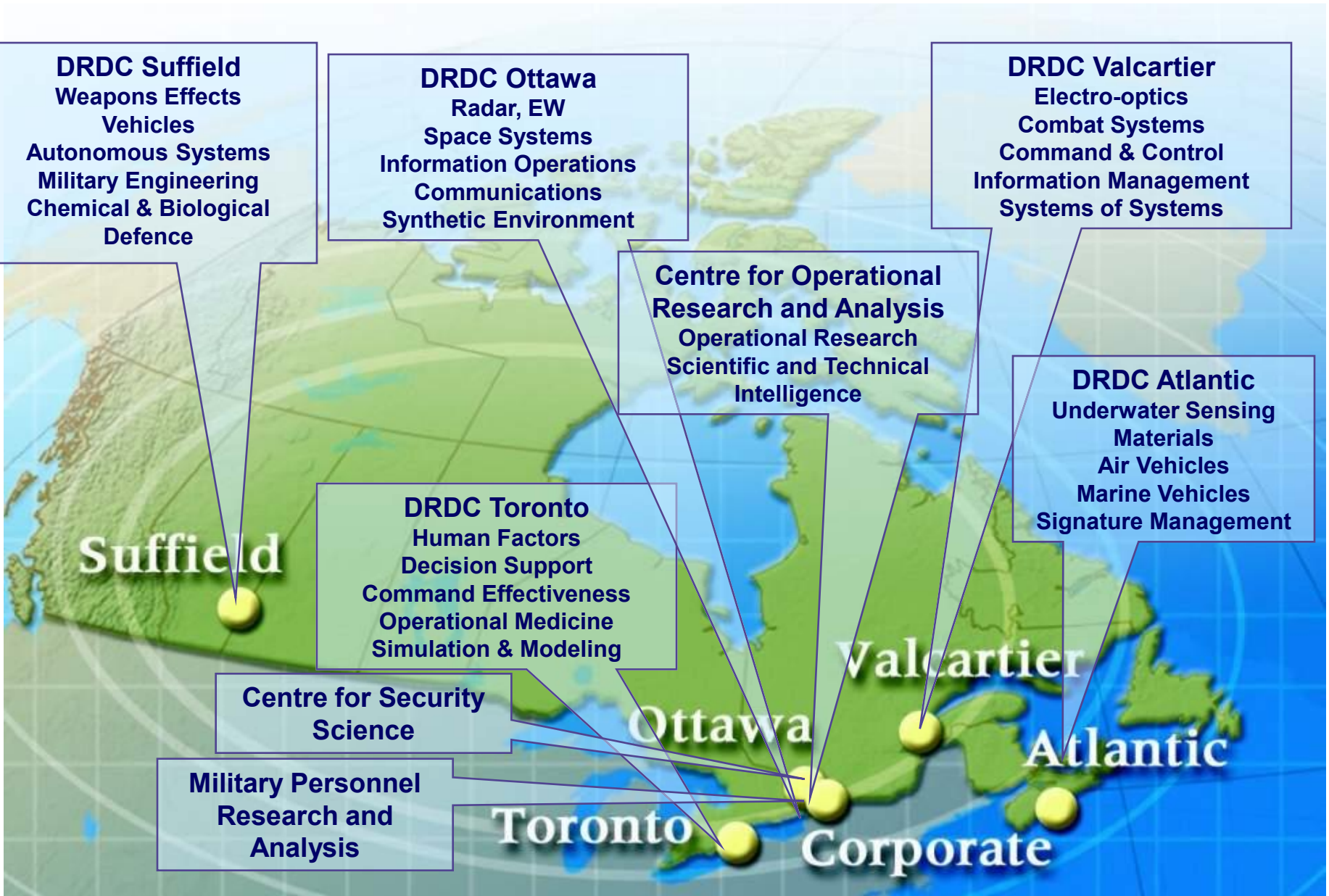
DRDC Toronto
Human Factors
Decision Support
Command Effectiveness
Operational Medicine
Simulation & Modeling

**Centre for Security
Science**

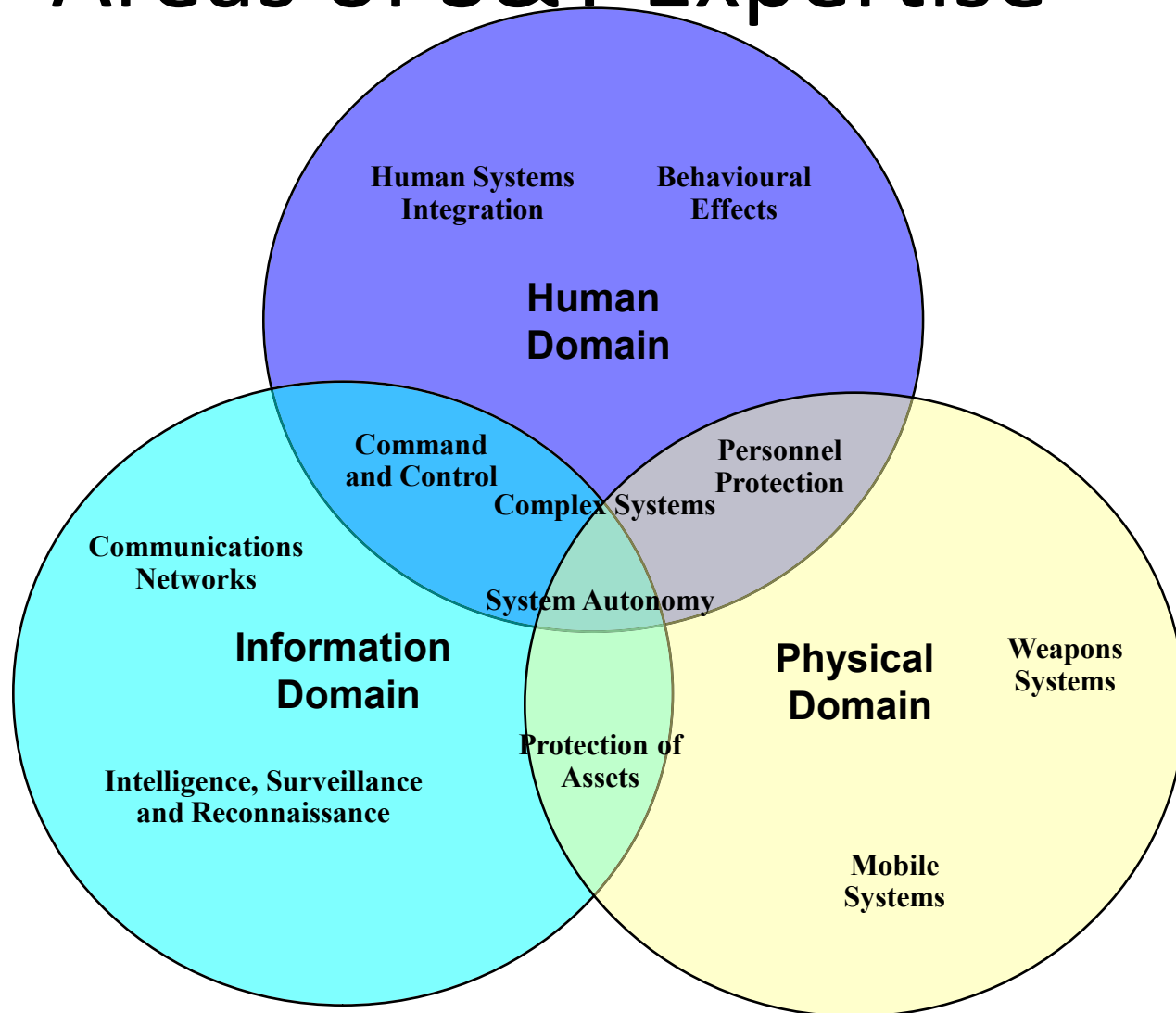
**Military Personnel
Research and
Analysis**

Toronto

Corporate



Areas of S&T Expertise



Assistant Deputy Minister (Science & Technology)

- DND Chief Scientist: Ensures provision of Science and Technology advice to Department of National Defence and the Canadian Forces
- DND ADM(S&T): Functional Authority for the Defence S&T Enterprise. Leads Canada's Defence Research, Technology and Analysis Program. Oversees S&T relations with other government departments and agencies, allied governments and national and international organizations
- Public Security S&T Lead: In partnership with Public Safety Canada, leads the federal effort in bringing S&T to bear on enabling national public security capabilities
- CEO of Defence R&D Canada

S&T Program Capacity

Support to CF current operations: S&T and Afghanistan

- Counter – IED: “Defeat the System” Initiative
- Combat Vehicle Survivability Program
 - Vulnerability assessment of all in-mission land vehicles and solution recommendation
- Leopard II main battle tank heat management
 - Combat crew cooling system
 - External heat management blanket
- Effects Based “dashboard” for assessing mission effectiveness
- Design of Forward Operating Base blast protection
- Introduction of Special Forces capabilities
- Non Lethal Weapons assessments
- CC-177 Strategic Airlift self-defence validation
- Casualty assessment of Personnel Protective Equipment performance



The Canadian Context

The 21st Century world presents us with a rapidly evolving Defence and Security context ...

Complex Conflict Spectrum



Asymmetric Threats



Global Economic Crisis



Common Security and Defence Agenda



Globalization of Science and Technology

Canadian Government Priorities

- Economic priorities – Canada’s Economic Action Plan
 - 2 years of stimulus funding ended March 31, 2011 then return to fiscal balance over the subsequent 3 years
 - Prudent management of Government spending
 - Strategic Review & Strategic Operating Review
- Northern priorities – Canada’s Northern Strategy
 - continue to vigorously defend Canada’s Arctic sovereignty
 - create a world-class High Arctic Research Station
 - support for advanced research, development and prototyping of new space-based technologies, especially in support of Arctic sovereignty.
 - Northern environmental stewardship – marine safety and reduce pollution from shipping and other maritime traffic.
- National Security/Safety Initiatives
 - National Cyber Security Strategy
 - National Critical Infrastructure Strategy
 - National CBRNE Strategy

The Evolving Canadian Landscape

- Increased emphasis put on ‘whole of government” approaches
- Increased synergies between federal laboratories and with non-government partners
- An evolving budgetary context
 - Implications of Strategic & Strategic Operational Review
- The convergence of the defence and security agendas
- Better definition of the role of government and of government science
- Increased engagement of and investment by industry in R&D – greater impact of Federal expenditures on the Canadian economy

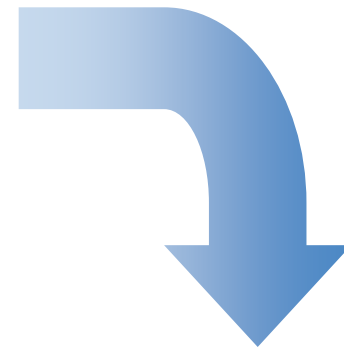
The Department of National Defence Landscape

- Canada First Defence Strategy 2008 (*Update underway*)
 - Long-term objectives and commitment of support for the Canadian Forces
 - A stable, predictable and long-term investment program
 - A stronger, more flexible and high-tech military
 - New and innovative approach to rebuilding the military
 - Strengthen Canada's industrial and technological advantages
 - Opportunity for Canadian industry to position as high-tech leaders, invest proactively in R&D
- Canadian Forces Transformation Report ("Leslie Report")
 - Invest in front lines, reduce bureaucracy
 - Restructure the force
 - Rethink procurement
 - Realize savings



Defence and Security S&T – Setting the Canadian Government’s policy context

- *Canada First Defence Strategy*
- Change of CF’s Afghanistan mission in 2011 from combat to training (July 2011)
- National Security Statement
- Northern Strategy
- *Advantage Canada – Federal Government’s Economic Strategy*
- Budget 2011 - *The Next Phase of Canada’s Economic Action Plan – return to balance by 2014*
- Strategic Review and Strategic Operating Review



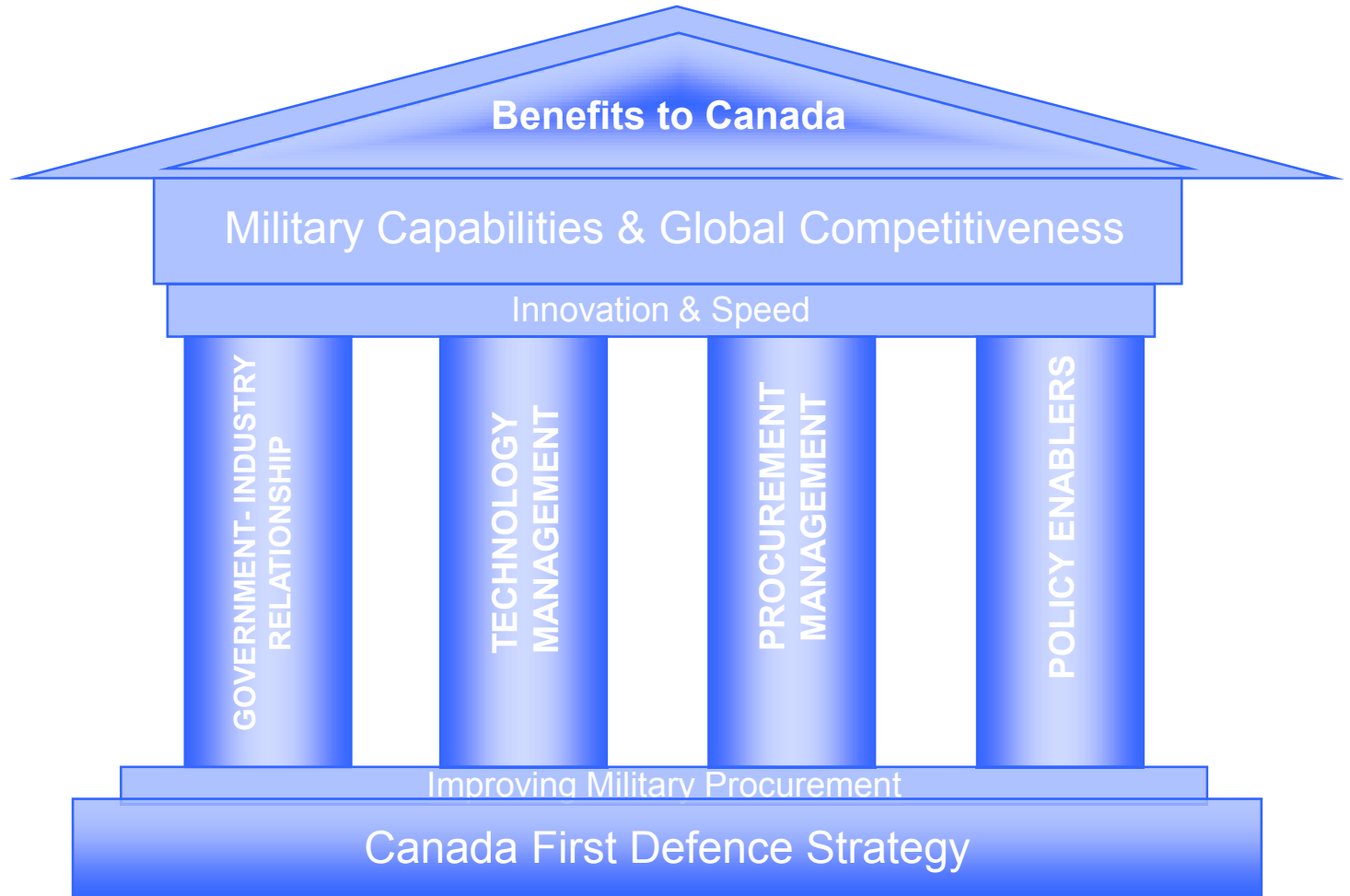
Defence and Security S&T Strategy: *Maximize the impact of S&T on Canadian defence and security capabilities and on the nation’s innovation capacity*

The Department of National Defence S&T Landscape

- Defence S&T Strategy – 2006 (*Update underway*)
 - First ever pan Departmental strategy for S&T
 - Implementing an institution-wide governance construct - *the Defence S&T Enterprise*
 - Evolving the role/focus for the internal S&T capability
 - Establishing purpose-built internal and external partnerships - *leverage effort and increase exploitation of results*
- Key parameters for the updated Defence and Security S&T Strategy
 - Better focused priorities
 - Increased engagement of the private sector
 - Enhanced networks with conventional/non-conventional partners to create new solutions
 - Enhance national security emphasis

Establishing the Right Conditions

BETTER ALIGNMENT BETWEEN CANADA'S DEFENCE INDUSTRIAL CAPABILITIES AND CANADA'S MILITARY REQUIREMENTS WHILE MAXIMIZING THE ECONOMIC BENEFITS TO CANADA



Pillars for Action

- Government – Industry Relationship
 - Set the conditions for a trusted strategic relationship between government and industry throughout all stages of the Investment Plan life-cycle
- Procurement Management
 - Get the fundamentals right for effective and efficient procurement
- Technology Management
 - Proactively position DND and industry with the knowledge and technology to deliver innovative solutions
- Policy Enablers
 - Ensure the government's policies and practices are suitably aligned to enable CFDS objectives

Alignment Across the Whole-of-Government

- Public Works & Government Services Canada - Improving Military Procurement and Streamlining contracting
- Industry Canada – Refining Industrial and Regional Benefits (Offsets) policy
- Department of National Defence – Getting the fundamentals right
- Treasury Board – Streamlining approvals and oversight based on

Defining the Long Term Objectives

What Would Success Look Like?

- Best possible equipment delivered to our troops, as per the Canada First Defence Strategy
- Streamlined processes & timelines for major military/other procurements
- An informed and engaged industry, guided by a detailed roadmap/timelines for planned major military/other procurements
- Maximized benefits to Canada from major procurements on behalf of DND planned over next 20 to 25 years (approximately \$141B)
- Ensure that we acquire the ships, aircraft, vehicles and other equipment our Forces need in a manner that ensures our troops have the best possible equipment and that taxpayers' dollars are prudently spent
- Leverage the investment through Defence procurement to ensure that new high technology jobs are created in Canada through a combination of buying Canadian-made defence equipment and securing high-value industrial benefits when equipment is purchased abroad

Objectives in Engaging the Canadian Innovation System

1. To increase S&T capacity to support departmental core processes

- Augment internal capabilities
- Provide surge capacity when needed
- Strengthen the Canadian innovation system

2. To shorten fielding times for technology solutions

- Avoid duplication of effort and

Objectives in Engaging the Canadian Innovation System (2)

3. To improve access to global leading edge S&T advancements

- Sustain and enhance the quality and impact of R&D within industry, academic and OGD partners
- Increase exposure to international developments

4. To align with and support the priorities of the Government of Canada and related strategies

Key S&T Objectives – FY 2011-2012

- Invest in S&T to create affordable CF – invest to save
 - Address affordability of CF capabilities in the search for new or evolved solutions
 - Provide knowledge and technology that impacts all DND core processes
- Open S&T window into tomorrow
 - Amplify significant weak signals to avoid strategic surprise
 - Emphasize improved policy dialogue with S&T partners
 - Educate and engage CF in the art of the technological possible
- Position industry as valued member of Defence Team
 - Connect DND/CF with industry through interface of S&T program & activities
 - Build stronger ties with industry to help move S&T outputs more quickly into CF capabilities
- Achieve operational excellence at home
 - Enhance focus on CF capabilities for security and defence of Canada and North America
 - Support defence and security priorities in Canada's North
 - Support and develop cyber defence and security capabilities
 - Address space, power and energy capabilities
 - Collaborate with allied nations to contribute to departmental underwater surveillance capabilities

Understanding your National Landscape

- *Canada's* defence industry is small, niche-oriented and integrated into the North American defence industrial base
- Largest firms are primarily foreign subsidiaries
- Limited systems capability – Strength lies at 2nd and 3rd tier level
- Defence Statistics
 - Employs over 70,000 Canadians
 - Generates approx \$10B in sales/year
 - Over 50% of revenues are from exports
 - Over \$4B in DND contracts to Cdn companies in FY 09/10
- Defence R&D Canada Statistics
 - Approx. \$150 M in contracts in FY 09/10
 - 70 % of companies have less than 200 people
 - Currently deal with over 500 R&D companies
 - The Small Medium Size enterprise is seeking a different relationship than the tier 1 companies

Final Thoughts

Some Principles to Shape the Way Ahead

- Conditions matter – Ensure the right policies are in place and aligned/linked across government to maximize impact
- Trust matters - Favor coalitions of trusted partners, from warfighters/first responders to scientists
- Knowledge matters – Balance the S&T cooperation spectrum from knowledge co-development to technology co-development
- Speed matters – Synchronize S&T cooperation to the operational need for solutions
- People are crucial: smart, informed scientists and engineers enable stronger coalitions (engage the best and the brightest)

..... and government-industry defence and security

S&T cooperation is an essential enabler