For Future Defense Technology
-TRDI OVERVIEW-

防衛技術のフロントランナー

防衛省 技術研究本部

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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

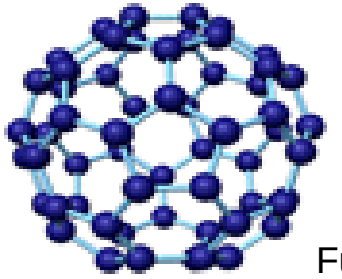
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
- Key Points in the Capability Derivation (Examples)-

Trends in Science & Technology

Advance technologies to contribute defense capabilities

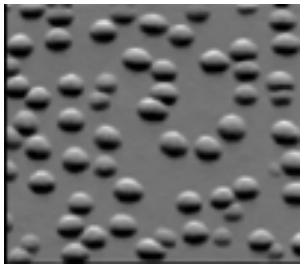
ASIMO

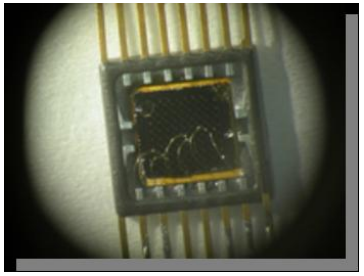
Robot/ Unmanned Technology



Fullerene

Nanotechnology/Bi otechnology





QDIP

Sensor/Device Technology

Software Radio

Information Technology

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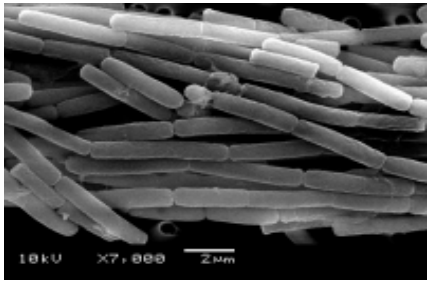
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Key Points in the Capability Derivation (Examples)-

Changes in Security Environment

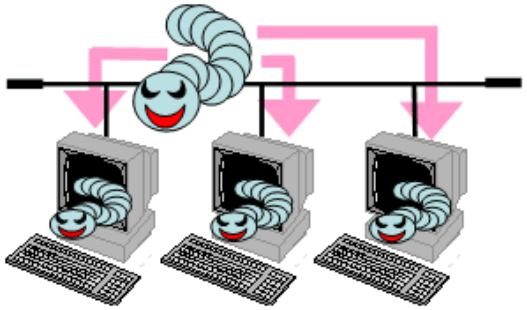
Response to new threads and diverse contingencies

Terrorism

Ballistic Missile



Bacillus Anthrax



Cyber Attack

International Peace Cooperation

Armed special operation vessel

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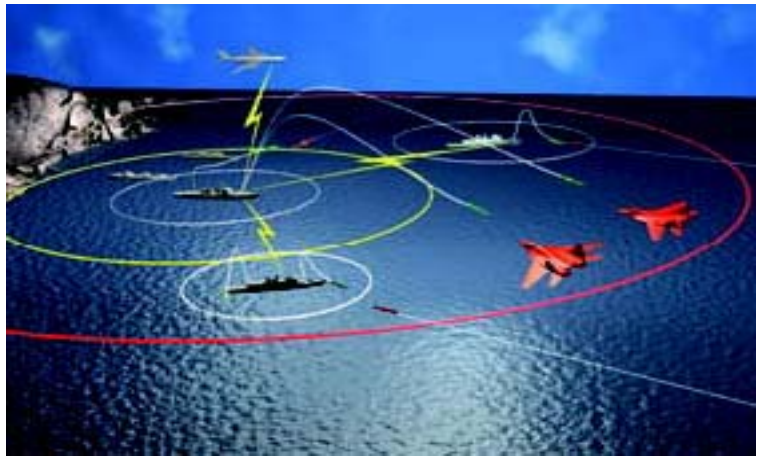
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Key Points in the Capability Derivation (Examples)-

Changes in Operational Environment

Network-Centric Warfare

Joint Operation

The helicopter of JGSDF taking off from DD of JMSDF



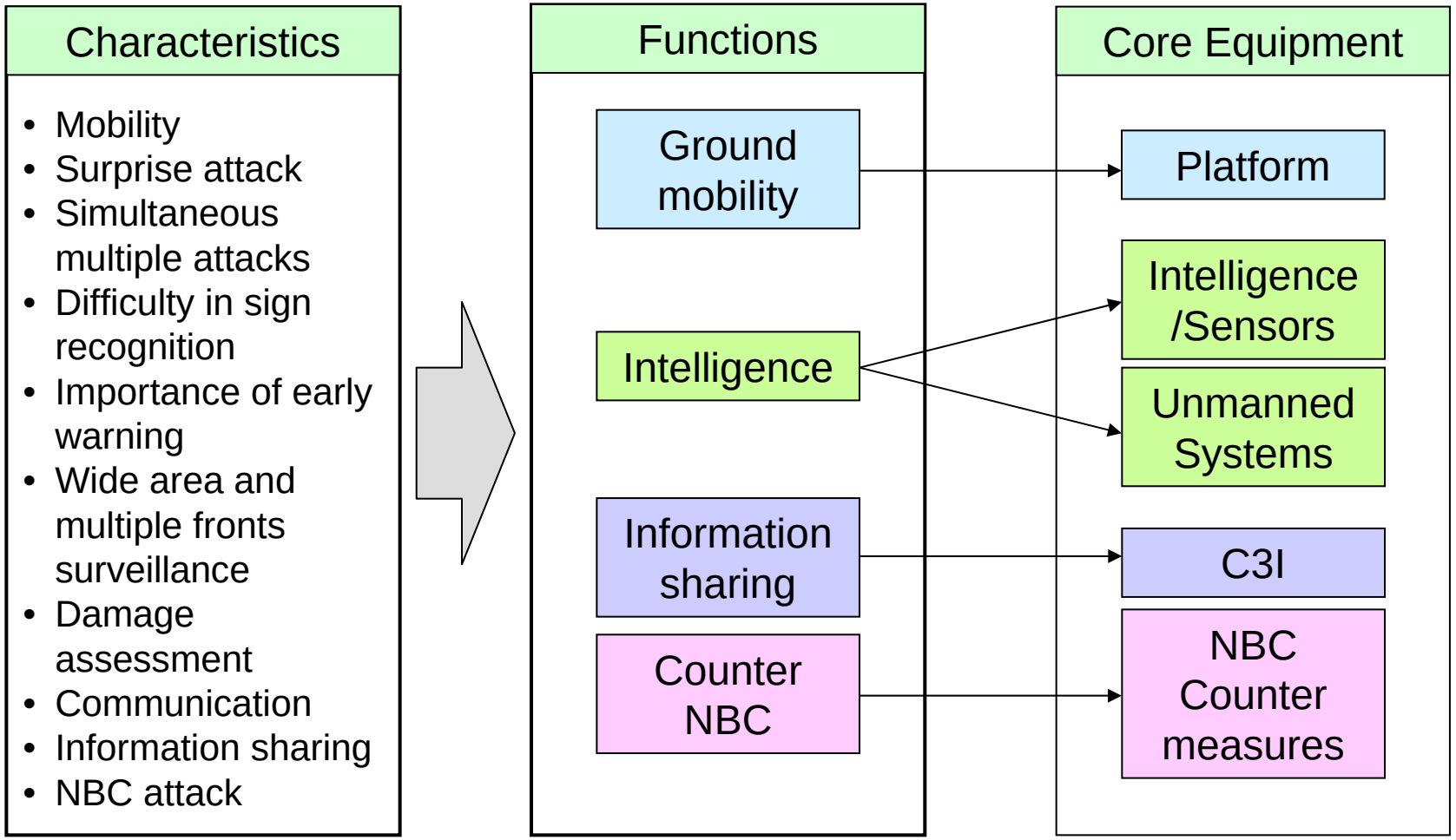
Intelligence/Information Sharing

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

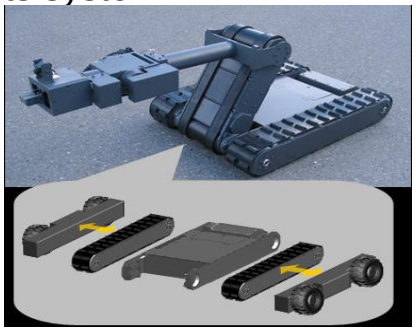
Category	Capability Needed
Response to New Threats and Diverse Contingencies	Defense against Ballistic and Cruise Missiles
	Defense Against Guerrillas and Special Operation Forces
	Counter-terrorism
	Defense against Cyber Attacks
	Counters to Armed special operation Vessels
	Defense against aggression 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-

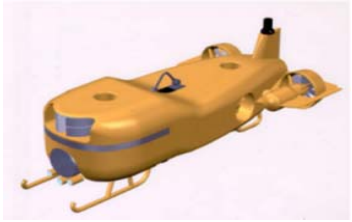
Counter-terrorism



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	

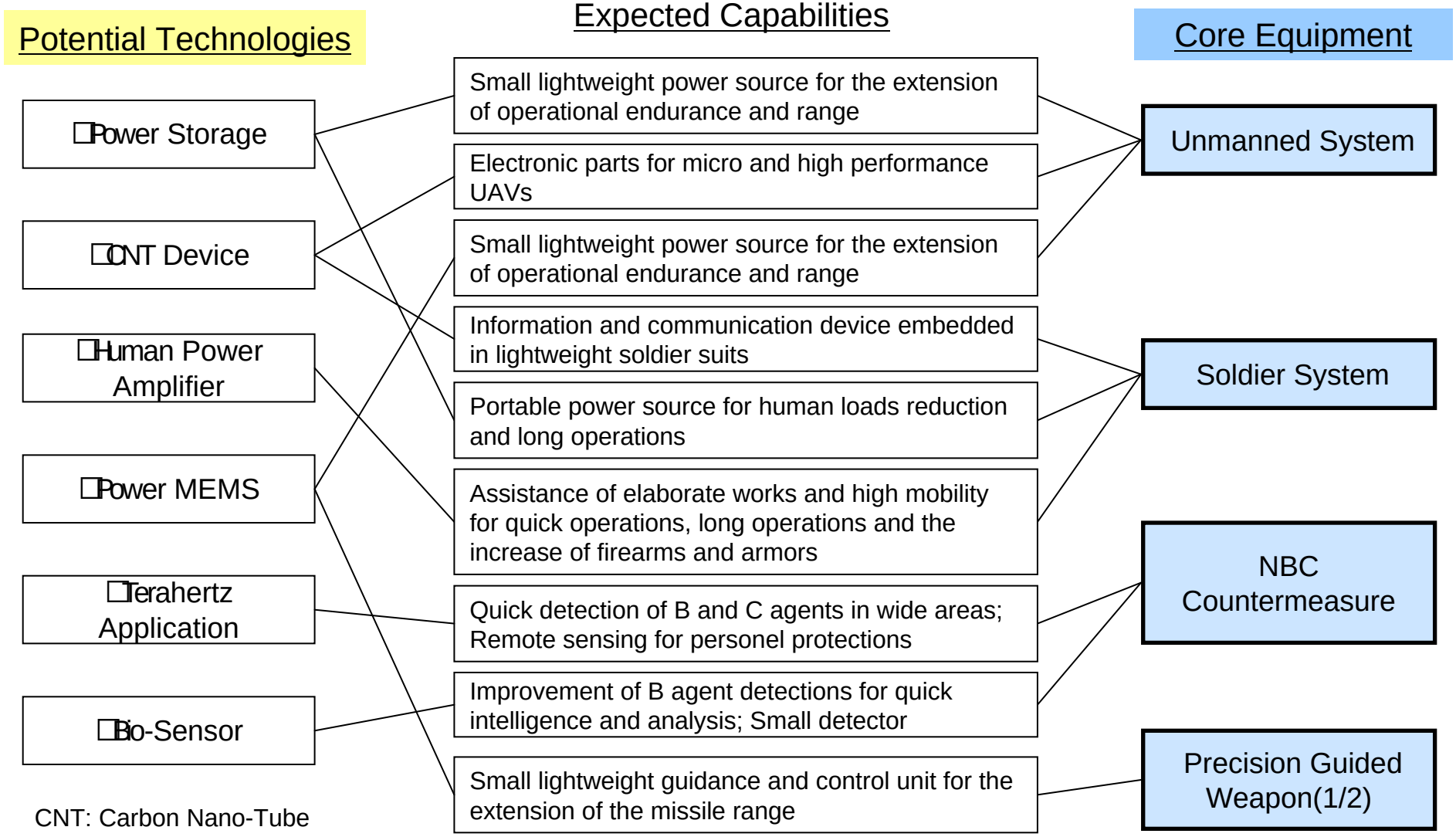
MEDIUM-TO-LONG TERM DEFENSE TECHNOLOGY OUTLOOK
-Future Weapon System Technologies 3/4-

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-

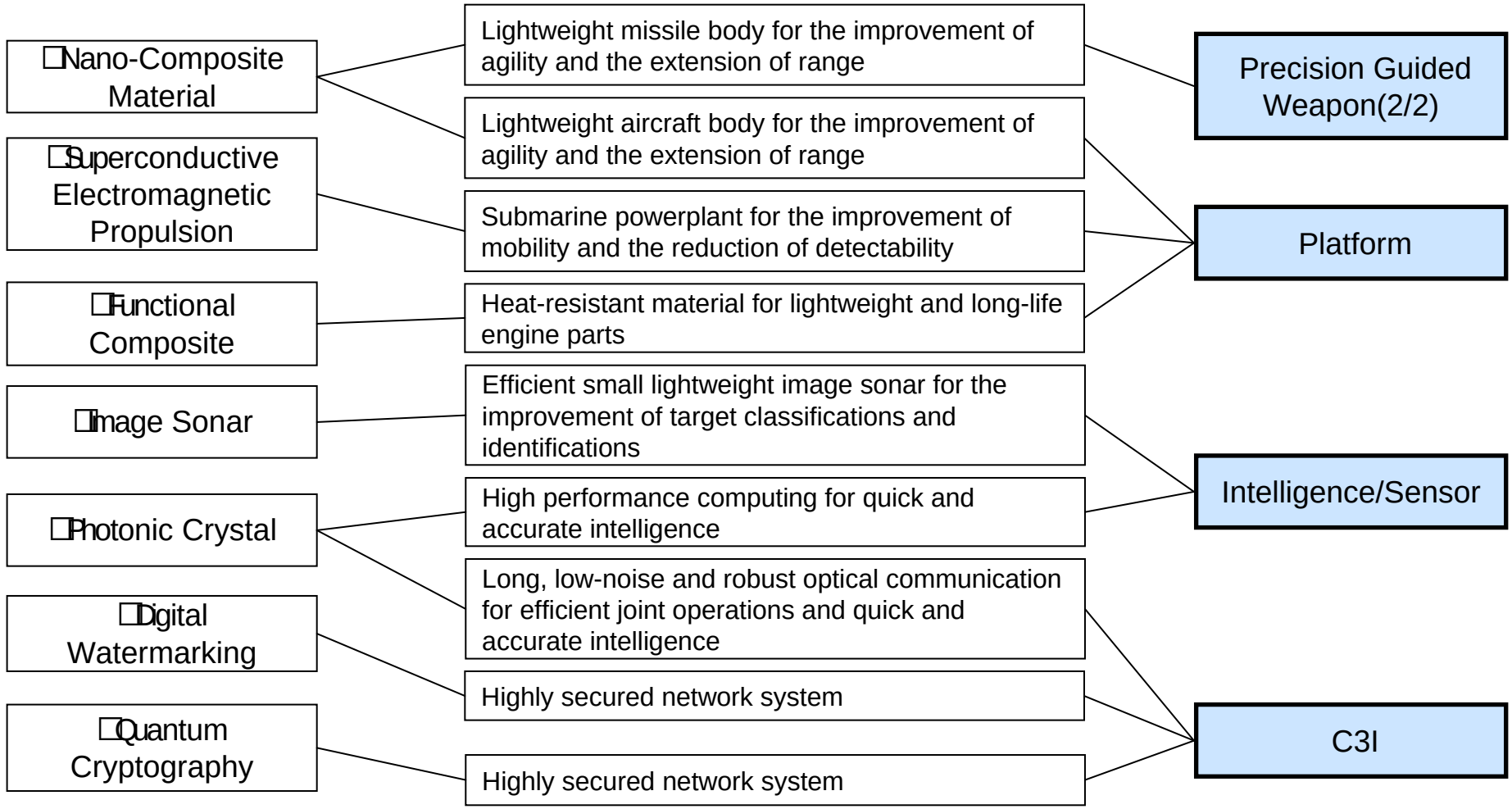
Core Equipment	Future Weapon System Technologies		
	Technology Area		Direction of Efforts
Platform	**15**	**Ground Vehicle**	Remote control; Following drive; Lightweight armor; Stealth; Electrical drive; Generator; Electromagnetic suspension; Long cruising range
	16	**Helicopter**	Load handling capacity; 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 -

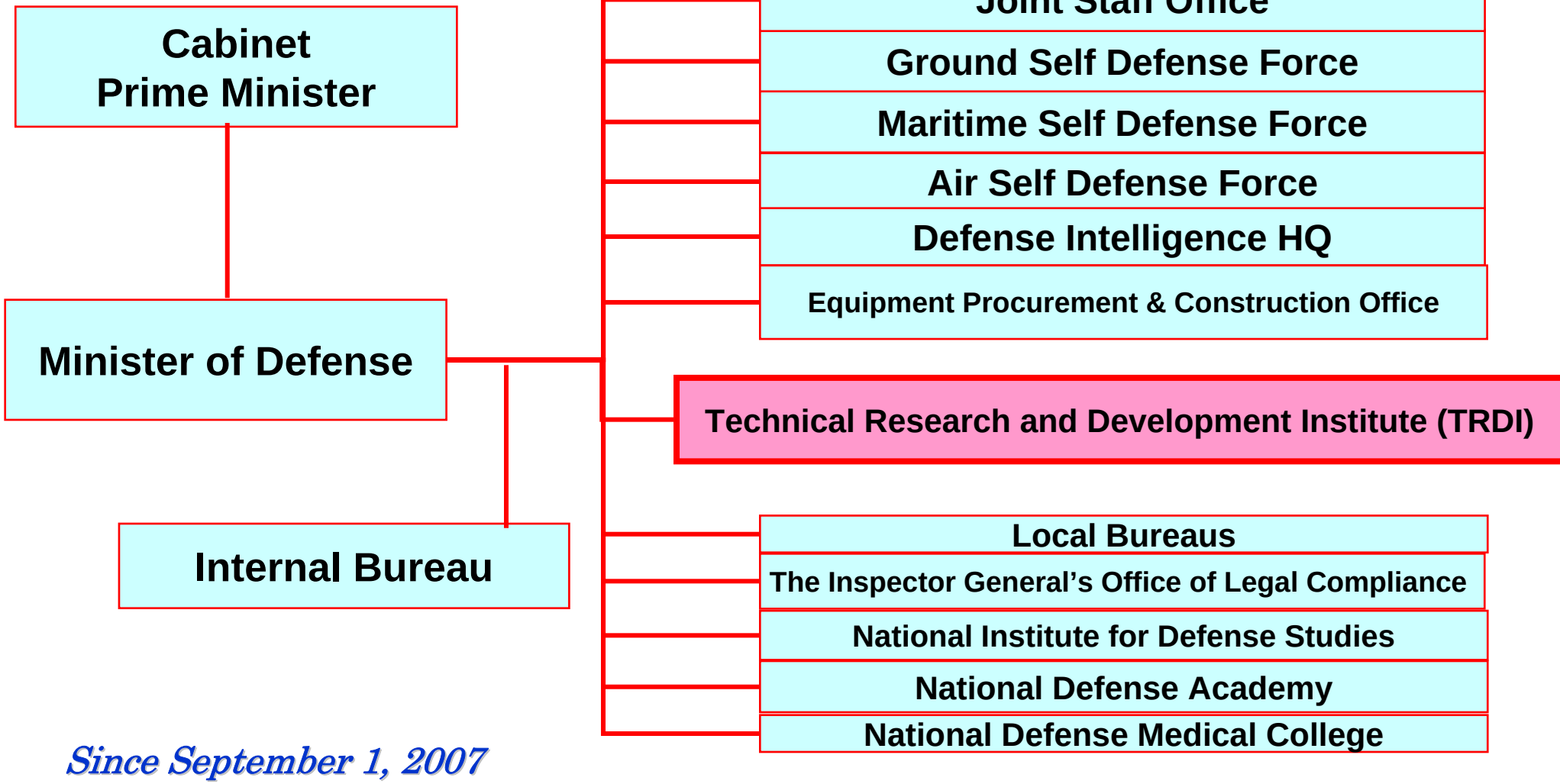


CNT: Carbon Nano-Tube

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

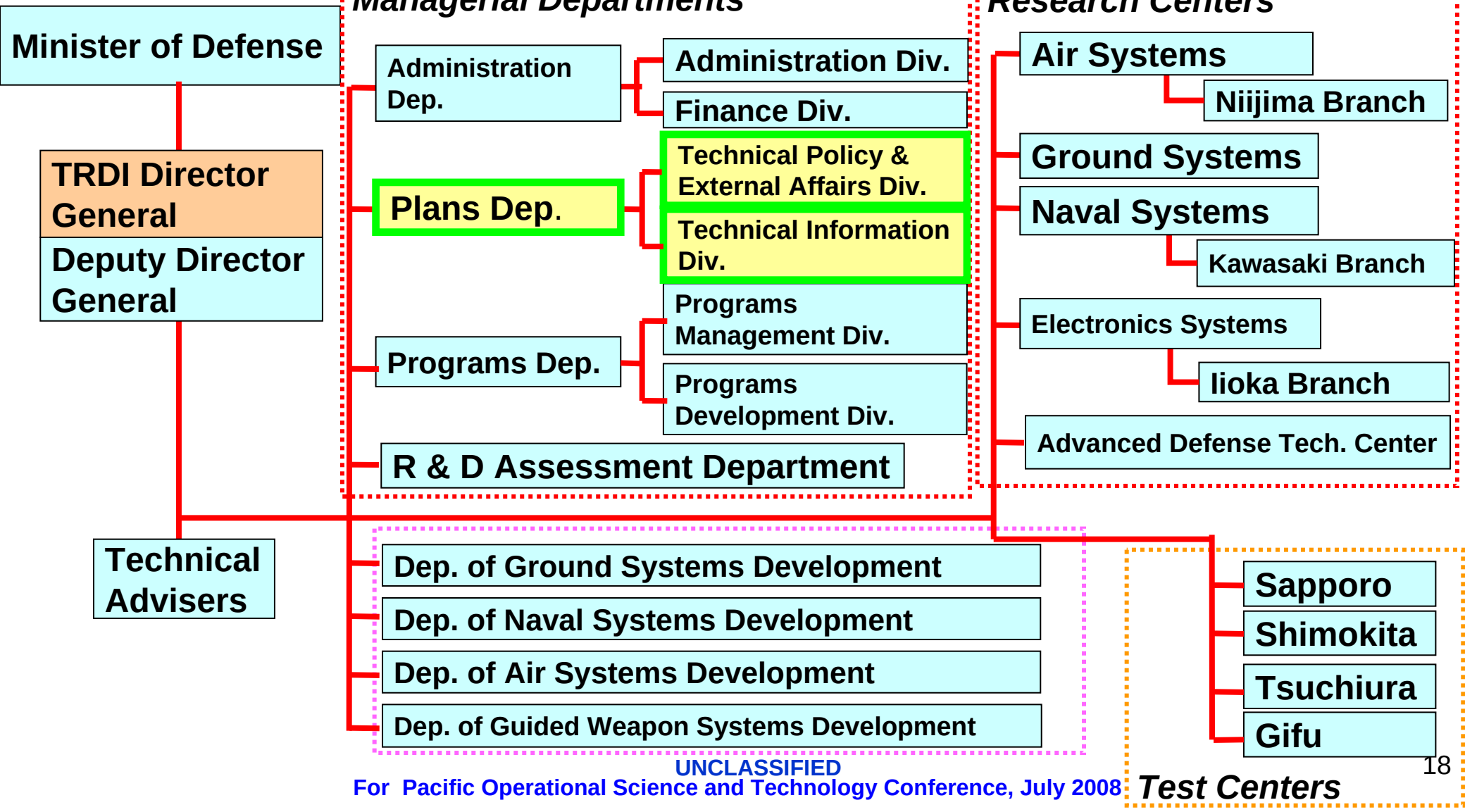


TRDI ORGANIZATION AND FEATURES
-Organization of □OD-



Since September 1, 2007

TRDI ORGANIZATION AND FEATURES
-TRDI Organization-



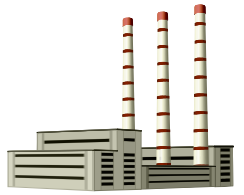
TRDI ORGANIZATION AND FEATURES
-TRDI Features-

- 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

Contract



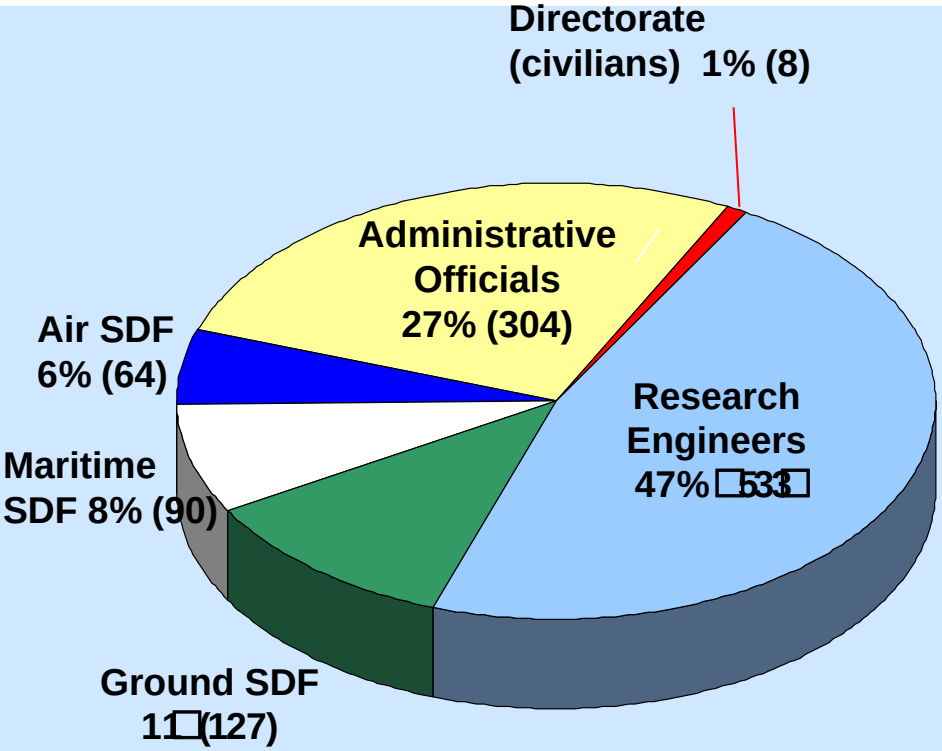
Private Industries

- **Basic Research**
- **Prototype T & E**

Eng. Model & Prototype Manufacturing

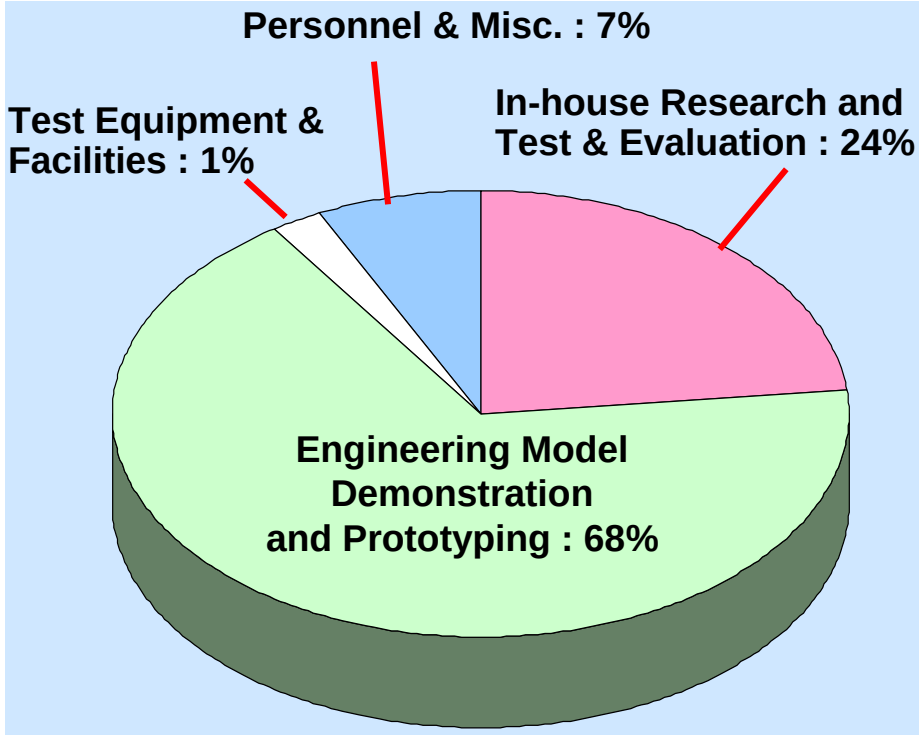
TRDI ORGANIZATION AND FEATURES

-Authorized strength and Budget Classification (JFY08)-



Total : 1,126 (JFY2008)

Civilian 75%
Uniform 25%



Total Budget : \ 183 Billions

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.

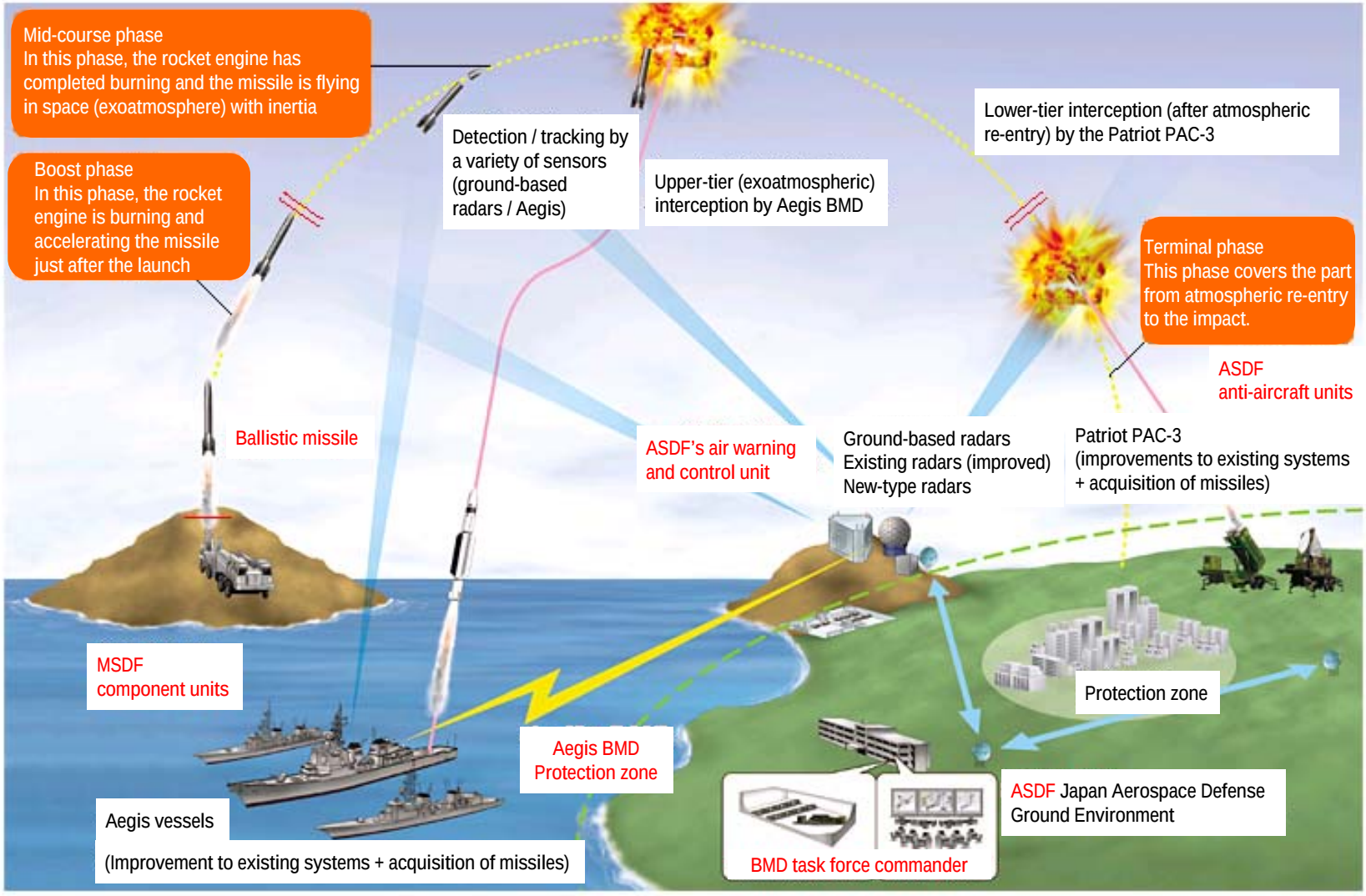
Next-Generation Cargo Aircraft (C-X)

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 -

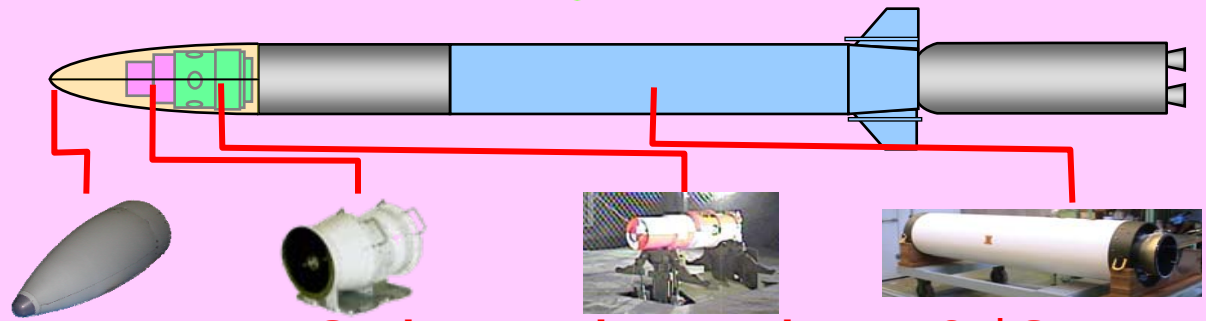
TRDI CURRENT MAJOR R&D ACTIVITIES
- BMD Related Project Activities -

JFY	□	1999	2000	01	02	03	04	05	06	07	08	09

Bilateral Study

JAPAN/U.S. Cooperative BMD Research Project

SM-3 Cooperative Development Project



Nosecone

IR Seeker

Divert and Attitude Control System

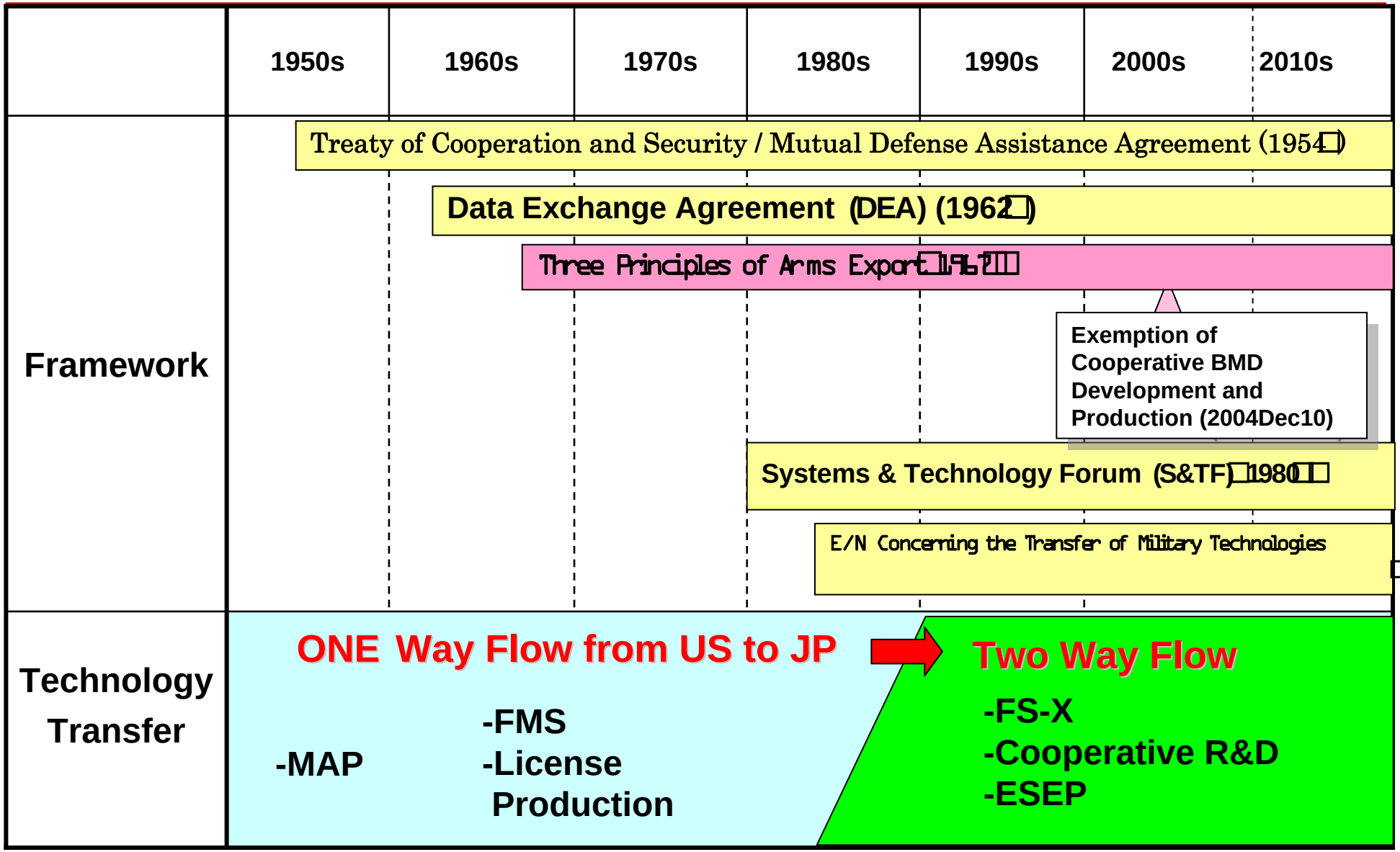
2nd Stage Rocket Motor

JAPAN/U.S. Radar Research Project

BMD Open Architecture Research Project

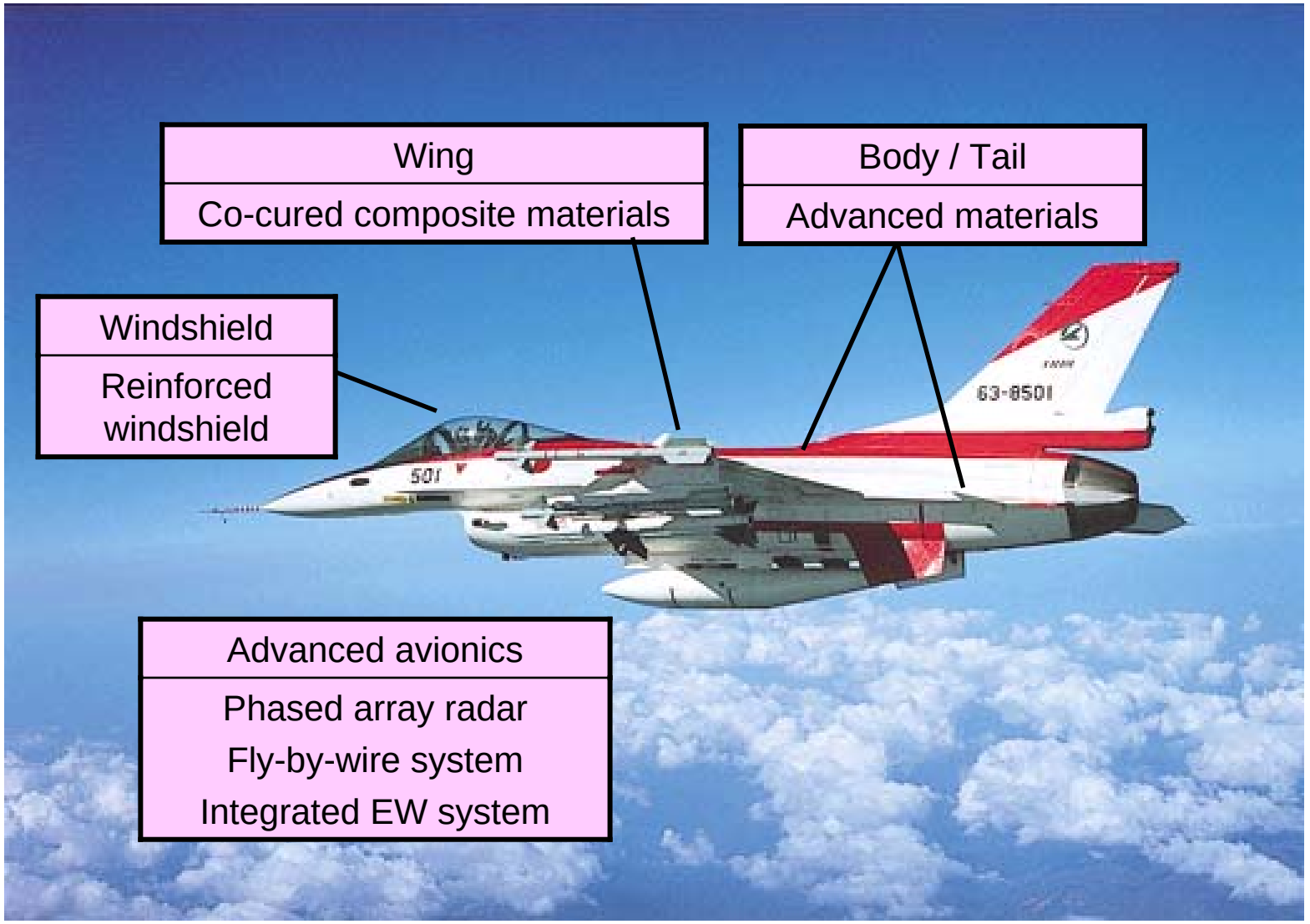
TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Transition of US-JP Technology Cooperation-



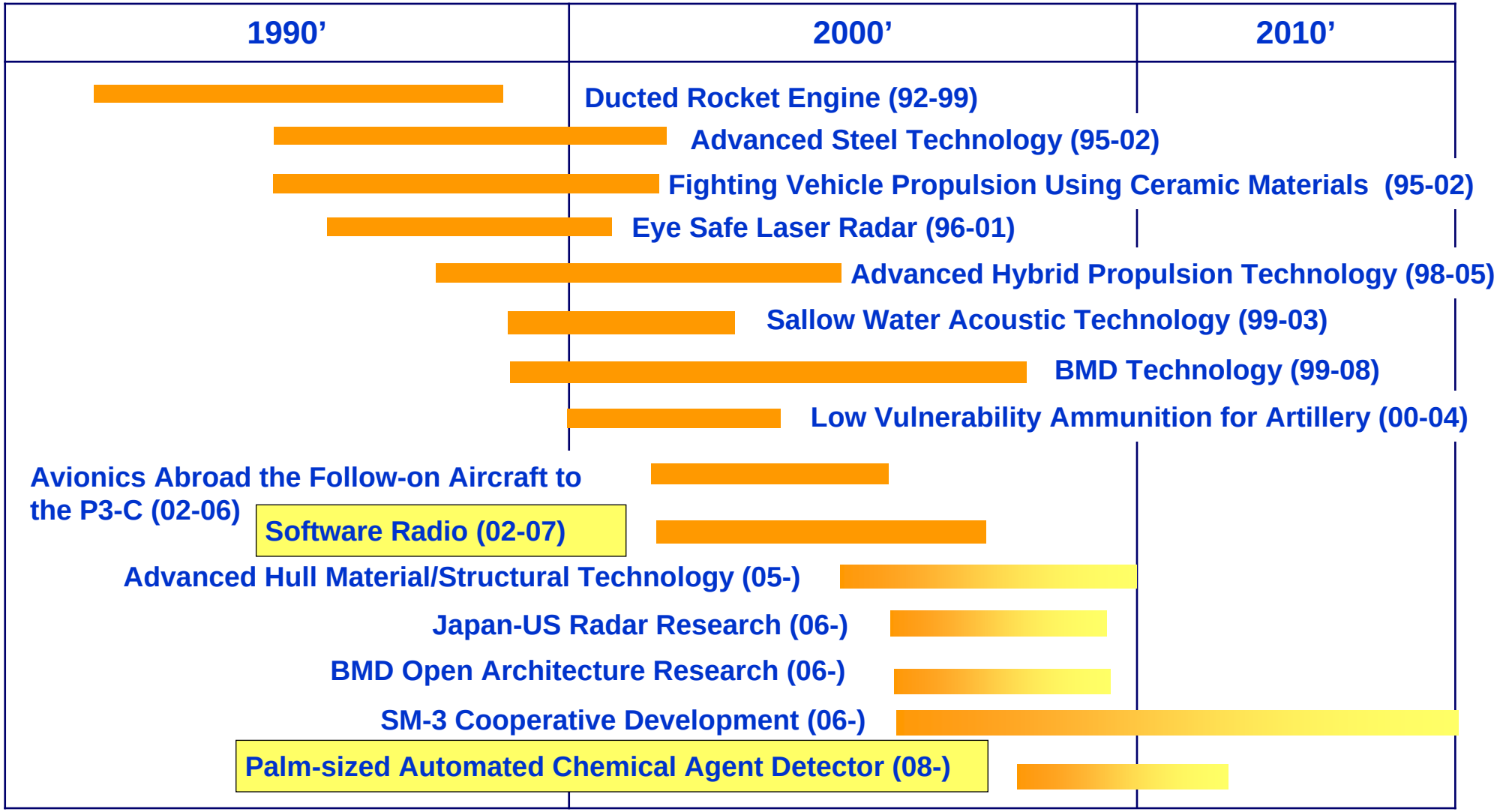
TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Advanced Technologies adapted in F2 Cooperative Development-



TRDI INTERNATIONAL COOPERATION ACTIVITIES

-Overview of Cooperative Projects between US DOD And TRDI-



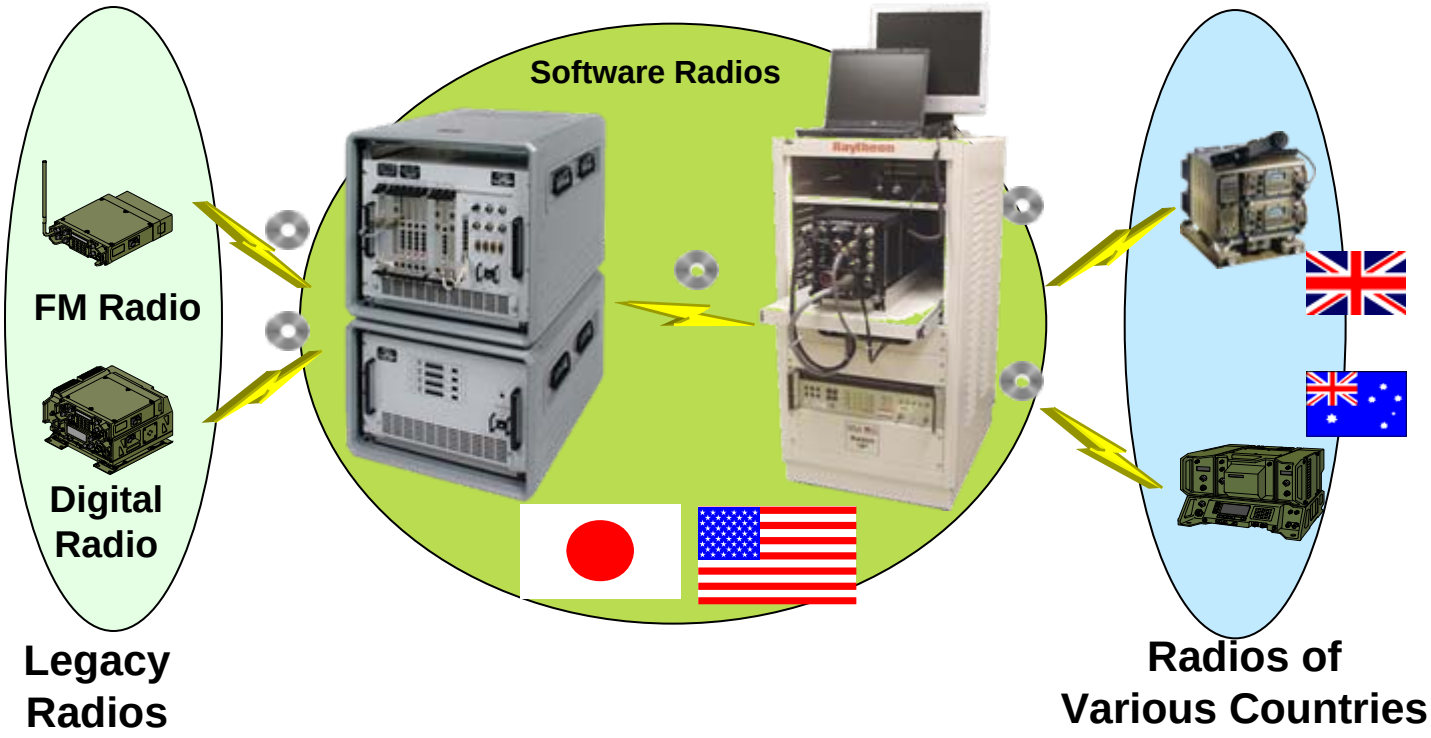
TRDI INTERNATIONAL COOPERATION ACTIVITIES

-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:

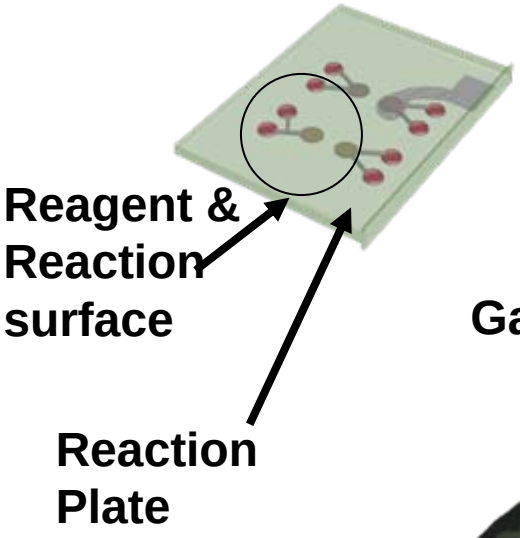
- **Software Communication Architecture**
- **Wideband Antenna & RF module**
- **Ensure interoperability and invulnerability**

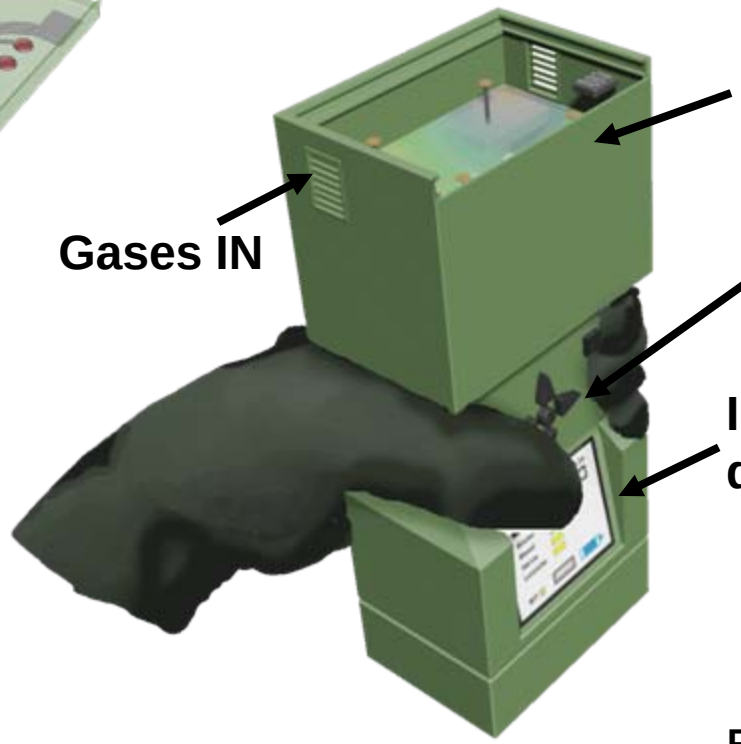
TRDI INTERNATIONAL COOPERATION ACTIVITIES

-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***





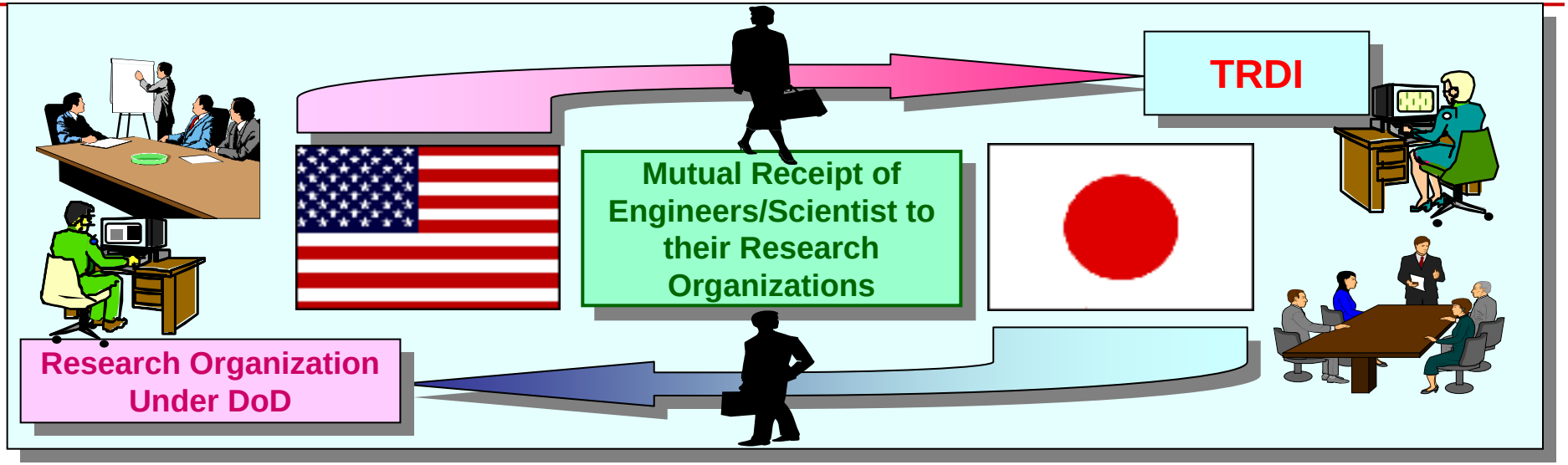
Features:

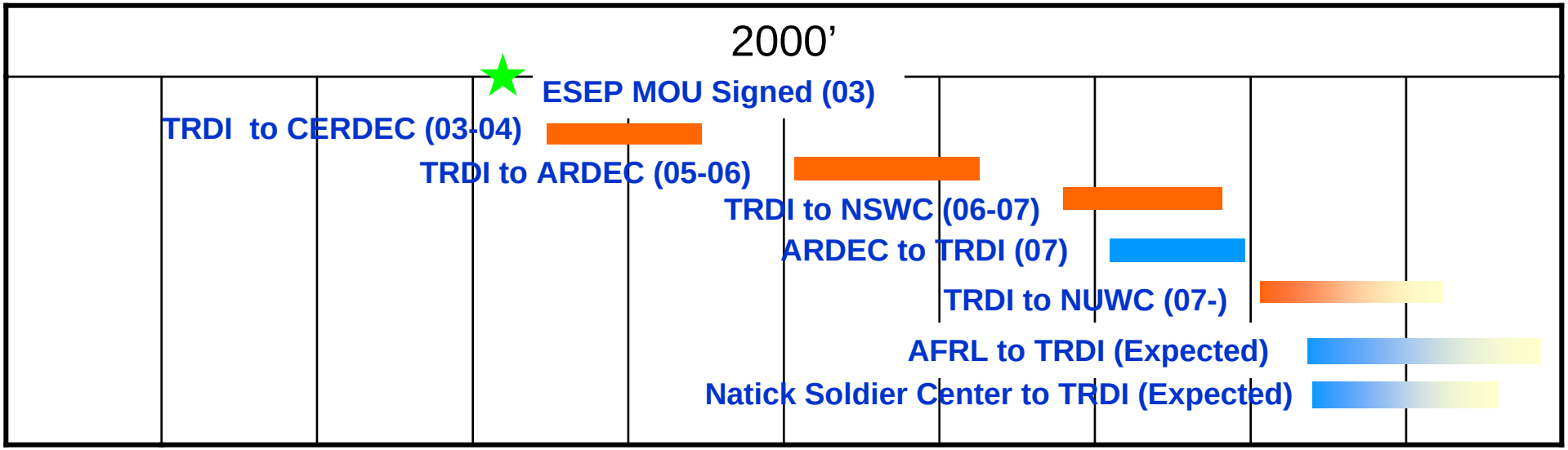
- **-High sensitivity and low false detection by the chemistry of M256A1**
- **-Automated Detection by using EO device**
- **-Small and lightweight**
- **-One-man Operation**
- **-Enable Day/Night Operation**

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