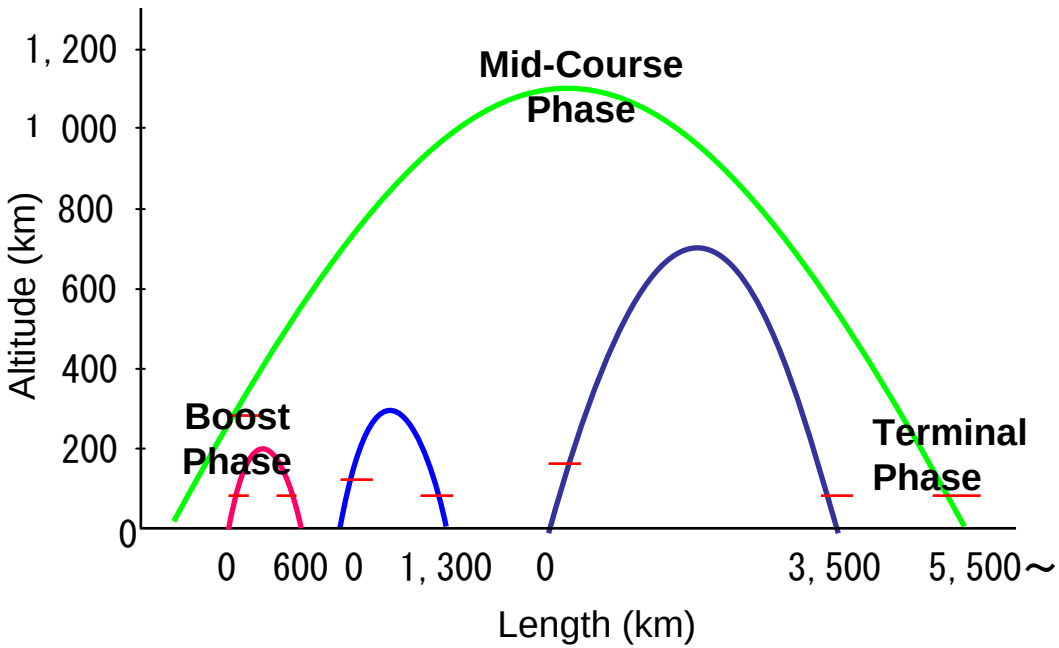
Japan's BMD

February, 2009
Ministry of Defense, Japan

Characteristics of Ballistic Missiles

Ballistic Missile	Cruise Missile
○High trajectory flight; propelled by rocket engine ○Capable of attacking targets over long distances ○ High speed	○Aircraft-like guided missile; propelled by jet engine ○Capable of low altitude flight ○Highly accurate with in-flight course adjustment capability
	



Type	Range	Time	Re-entry Speed
Short-range Ballistic Missile	Approx. 1,000km and less	Approx. 5-10 min.	1～3 km/second (Approx. Mach 3-9)
Medium-range Ballistic Missile	Approx. 1,000-5,500km	Approx. 10-20 min.	3～7 km/second (Approx. Mach 9-21)
Long-range Ballistic Missile	Approx. 5,500km-	Approx. 20-30 min.	7～8 km/second (Approx. Mach 21-24)

※1 Medium-range Ballistic Missile can be categorized into intermediate class.

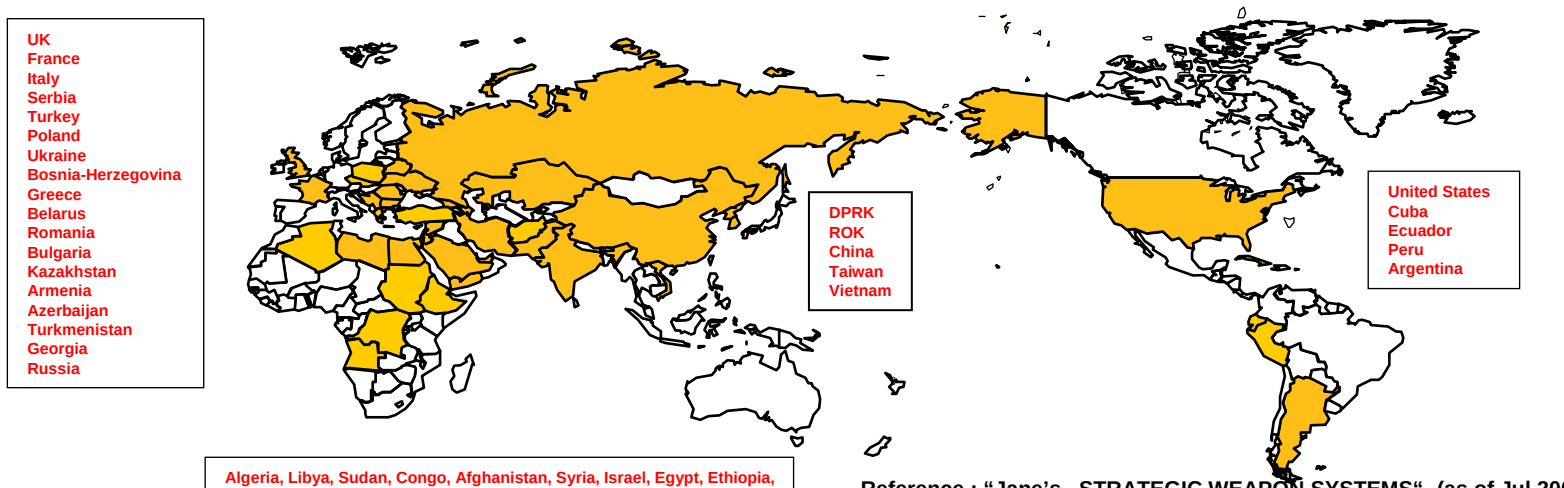
2 (Ref.) The maximum speed of F-15 is Approx. Mach 2.5(Approx. 0.85km/second）.

Challenges to Interception of Ballistic Missiles	
High speed	・Intercept speeds far exceed hitting a bullet with another bullet
Short Response time	・Time available to detect and intercept missiles is very short
High Altitude	・Advanced technology required capable of guiding interceptors accurately at extremely high altitudes
Small target	・Need improved radar capability to detect and track small, high speed target missiles plus capability to destroy them by a hit-to-kill

Requires High Performance Intercept System

Current Situations of Ballistic Missile Proliferation

As of 2008 45 Nations or Areas



Reference : "Jane's STRATEGIC WEAPON SYSTEMS" (as of Jul 2007)

"THE MILITARY BALANCE 2008"

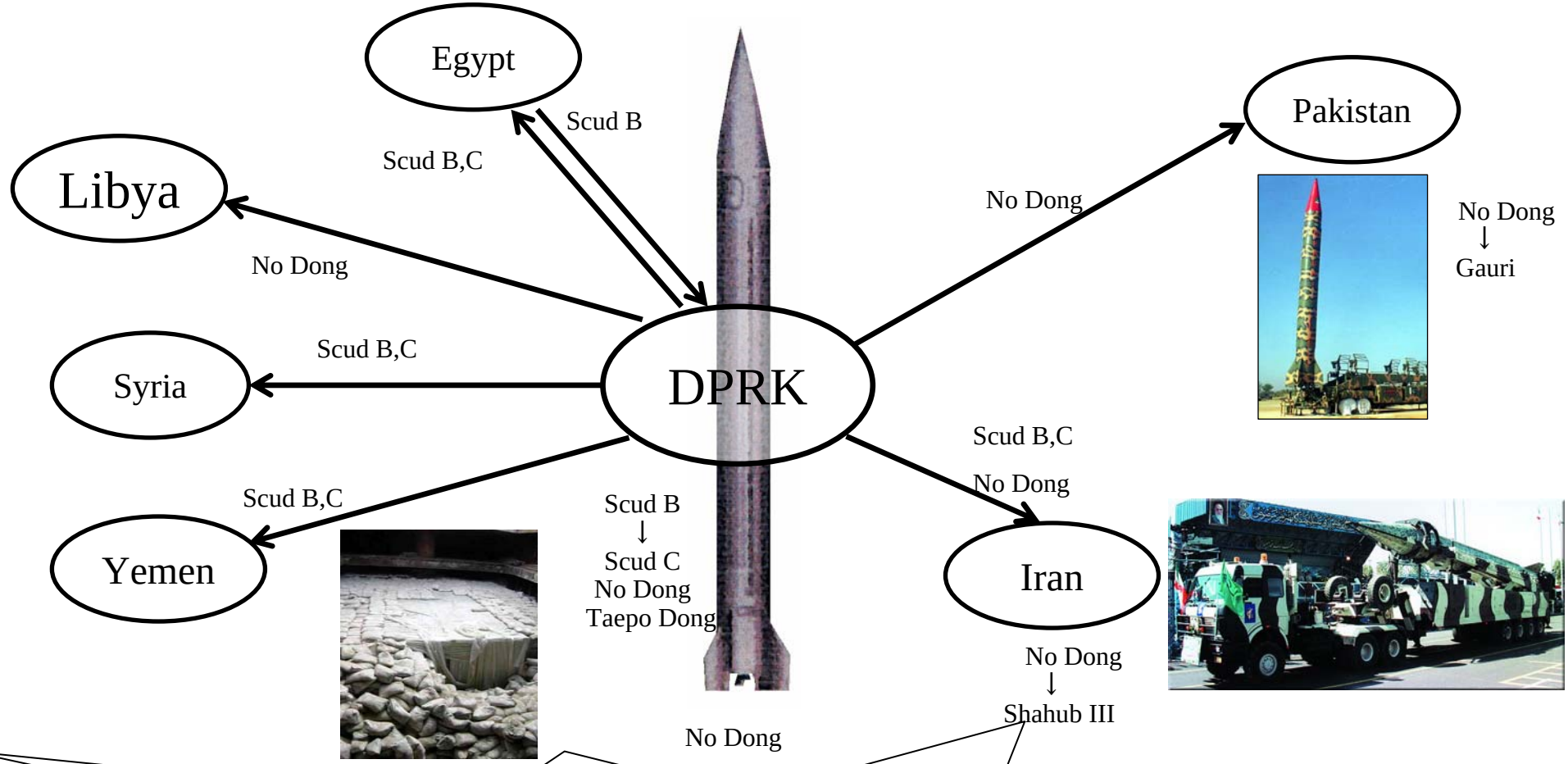
＜Notes＞

- The above chart indicates the nations which have or are suspected to have developed, possessed, and imported in the past "Ballistic Missile" or "Unguided Rocket", as defined in Janes' and/or The Military Balance.
- The missiles include those equipped with multipurpose rocket system developed by the U.S. and short-range FROG-7, etc developed by the Soviet Union in 60's.
- The number of nations above includes the nations which have gained independence from the former Soviet Union. (Missiles of these nations may be under the control of Russia now.)

One of the factors that make long-range ballistic missiles attractive as a delivery vehicle for weapons of mass destruction is that the United States and our allies lack effective defenses against this threat.

"National Policy on Ballistic Missile Defense" The White House 2003.5.20

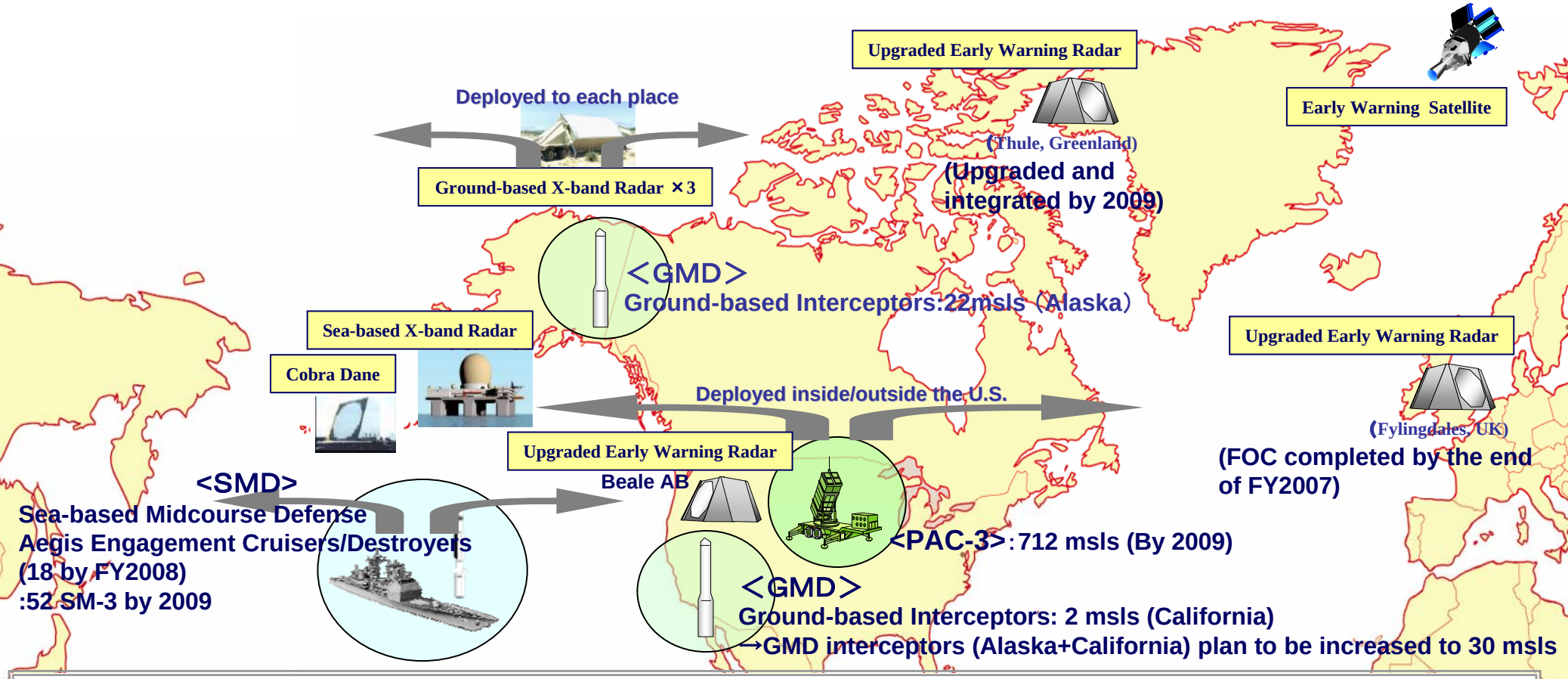
Ballistic Missile Proliferation from DPRK



It has been revealed, by DPRK MOFA spokesman (Dec 2002) that DPRK not only produces missiles but also exports them to gain foreign currency.

The U.S. BMD Deployment Plan

(Reference: MDA FY09 request etc.)



FY09 Budget for Missile Defense

(Ref. 2008.02.04 President Bush's FY2009 Defense Budget)

$10.5B (¥ 1,050B) Total

Up 9% from previous fiscal year

Rate: $1=¥100

※ FY08 Budget: $9.6B (¥960B) Total

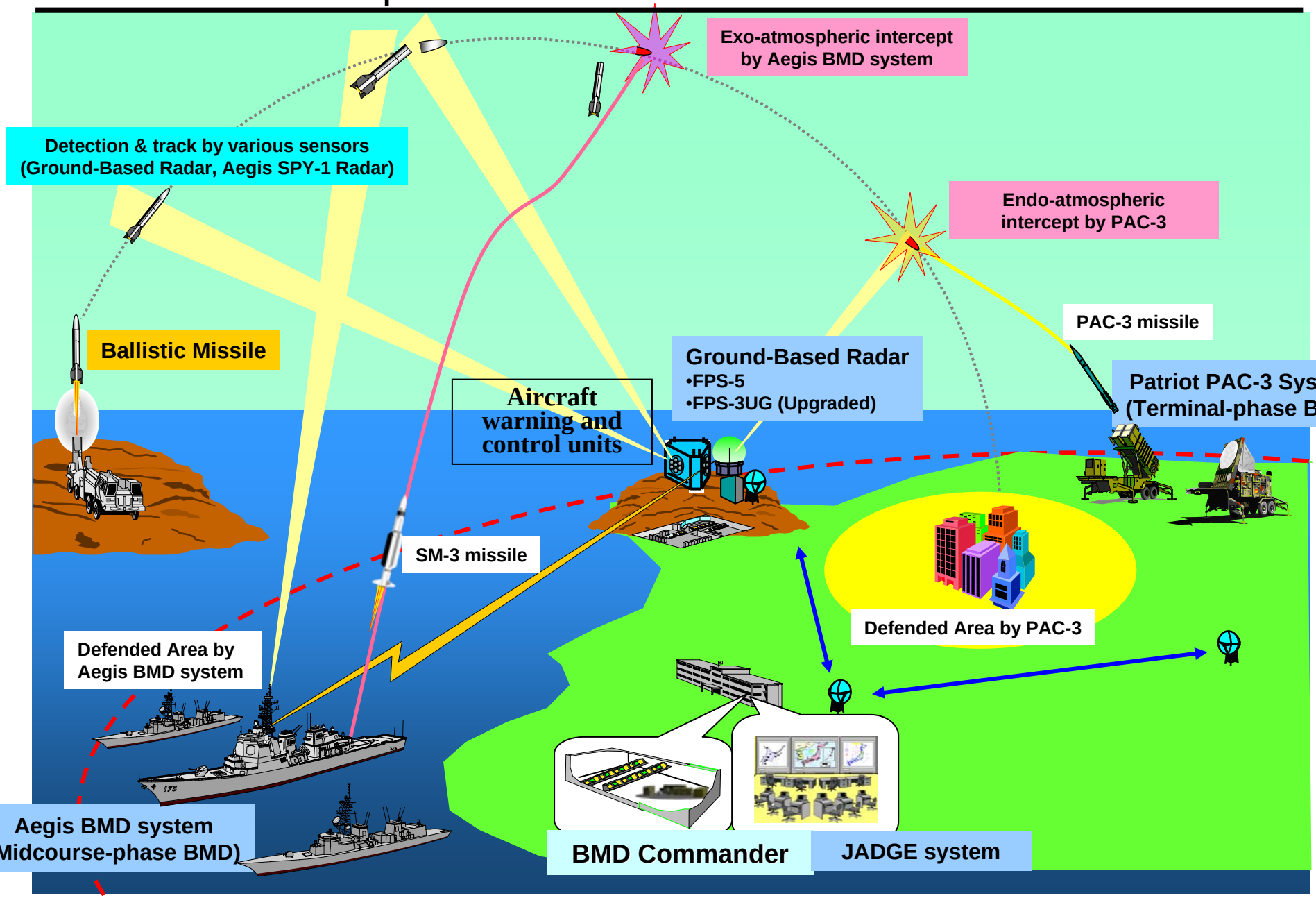
【 RDT&E 】 （Unit : $Million）

	Category	Budget
MDA (Total: 9,336)	Boost Phase	421
	Midcourse Phase	2,076
	Terminal Phase	1,019
	Sensor and others	1,077
	Technology Development & Testing	4,742
Joint Staff/Army (Total: 96)	System Research etc	96

【 Procurement 】 （Unit : $ Million）

Category	Budget
Patriot PAC-3	523
MEADS	462

Japan's BMD Architecture



Recent History of BMD Initiatives in Japan

1993 Dec Started consultations with the U.S. on BMD

1995 Apr JDA commenced BMD study (possible BMD architecture, cost estimation, other issues)

1998 Dec The beginning of Japan-US Cooperative Research Project was approved by the Security Council of Japan and the Cabinet. (Memorandum of Understanding was signed with the US in Aug1999).

2002 Dec Japan-US Defense Summit meeting : Minister Ishiba met US Secretary Rumsfeld
"Japan will conduct study with the perspective of future development and deployment" [Minister Ishiba]

2003 May Japan-US Summit meeting : PM Koizumi met President Bush
"Japan further accelerates its consideration on Missile Defense" [PM Koizumi]

2003 Aug JDA requested BMD related budget for FY 2004 to MOF for the first time

Dec GOJ's decision on introduction of BMD system

2004 Dec New NDPG and MTDP showed GOJ's strong commitment on BMD. Japan and the US signed BMD Framework MOU for broader and deeper cooperation

2005 Jul Japanese Diet concluded legislation for response to ballistic missile.

Oct SCC Documents emphasized the importance of Japan-US BMD cooperation

Dec GOJ's decision on start of SM-3 Joint Cooperative Development

2006 Jun THE STANDARD MISSILE–3 BLOCK IIA COOPERATIVE DEVELOPMENT (SCD) PROJECT(US-Japan) started

2007 Mar PATRIOT PAC-3 deployed at Iruma Air Base (Japan's first interceptor in history)

Dec JS *KONGO* successfully conducted first SM-3 Flight Test. (Japan's first SM-3 Capability)

2008 Sep PATRIOT PAC-3 Firing Test was conducted and the Target was successfully intercepted.

Nov JS *CHOKAI* conducted SM-3 Firing Test. The Target was not intercepted.

Statement of the Chief Cabinet Secretary (Dec 19,2003) (Summary)

- **The Government of Japan decided to introduce the multi-layered defense system composed of Aegis BMD system and Patriot PAC-3.**

- **The technological feasibility of BMD system has been verified through the results of interception tests and various performance evaluations in the United States and also through our own simulation results.**

- **BMD system is the only and purely defensive measure, without alternatives, to protect life and property of the citizens of Japan against ballistic missile attacks, and meets the principle of exclusively defense-oriented national defense policy. Therefore, it is considered that this presents no threat to neighboring countries, and does not affect the regional stability.**

- **The Japan-U.S. Joint Technological Research Project currently undergoing is not for the system being introduced this time, but it aims to improve the capability of future interceptor. It remains important to carry on the Research Project in order to take all possible measures to ensure national defense.**

National Defense Program Guideline and Mid-Term Defense Program

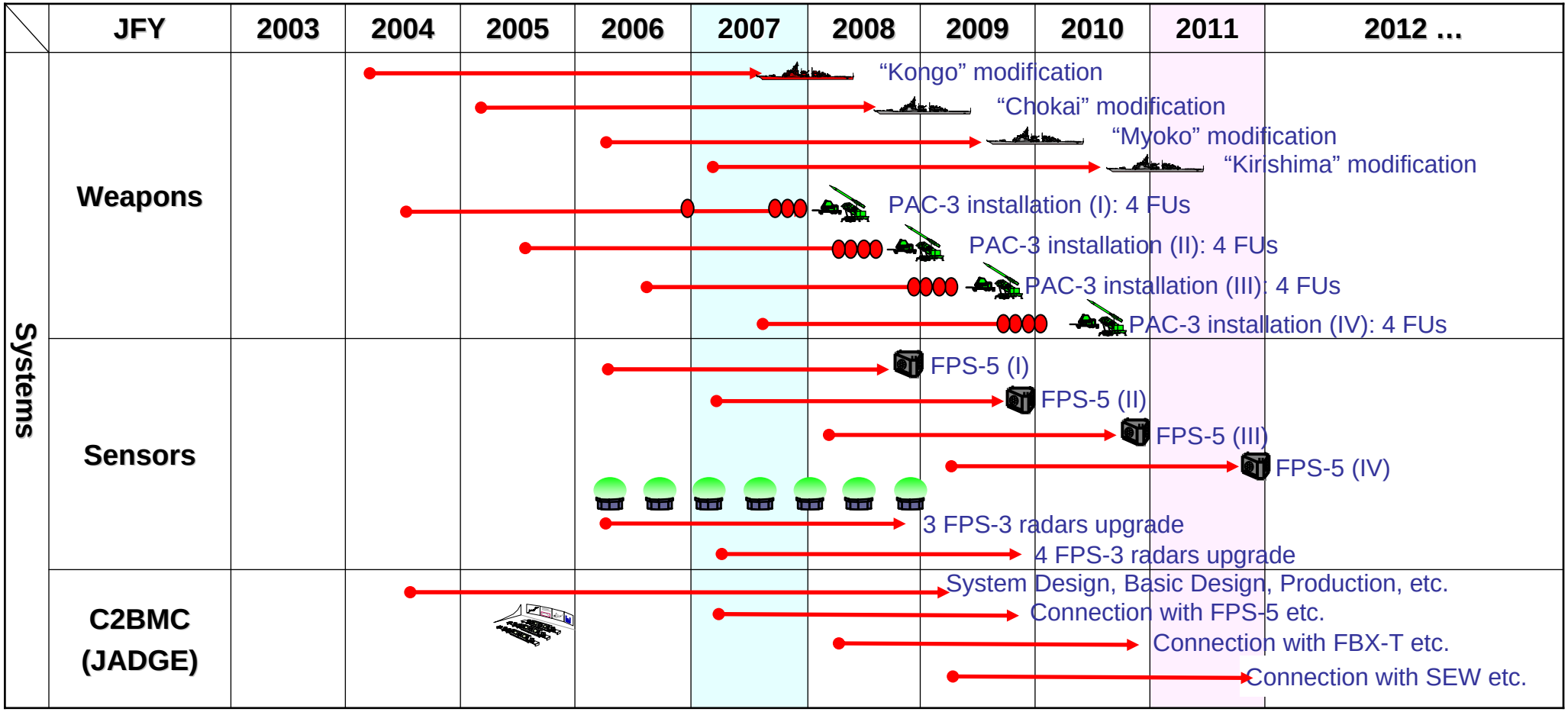
- Japan's NDPG (National Defense Program Guideline) and MTDP (Mid-Term Defense Program) (Dec. 2004) clearly state the importance of establishing BMD capability.

- MTDP states that GOJ will improve AEGIS and PATRIOT system.

- NDPG and MTDP clearly states the importance to enhance US-Japan BMD Cooperation.

- In the Annex of NDPG, GOJ sets an independent category of the main equipment and the major units for BMD as a "fourth category" , following "GSDF", "MSDF" and "ASDF" categories.

Japan's BMD Capability Buildup



- **The acquisition of BMD major weapon systems (16 PAC-3 FU and 4 Aegis BMD) which current NDPG decided to introduce, has already been budgeted by JFY07.**
- **The first Aegis BMD *Kongo* became operational in December 07. Together with the PAC-3 System which was tested successfully in September 08, MOD has established the initial multi-layered BMD defense posture.**
- **4 PAC-3 FUs were deployed in the Metropolitan Area by the end of JFY07. 4 other FUs have been deployed for the training purpose at the Air Missile Defense Training Gr. and the 2nd Technical School (Hamamatsu AB) in JFY08.**

BMD-related Budget

(Unit：100 mil yen)

	Program Title	JFY04 Budget	JFY05 Budget	JFY06 Budget	JFY07 Budget	JFY08 Budget	JFY09 Gov Request
Weapon System	Add BMD Capabilities to AEGIS （Including acquisition of SM-3 missiles and SM-3 firing test）	340	307	309	312	199	125
	Upgrade Patriot System, etc*1	555	572	685	769	404	367
	Acquire PAC-3 missiles	64	75	101	132	31	98
Sensors	Construct FPS-5, etc	--	0	189	185	180	194
	Modify FPS-3UG, etc	--	--	28	27	0	0
C2BMC	Add BMD capabilities for JADGE and others*2	19	205	32	142	112	83
	Install TDS, etc	13	31	17	5	4	7
Sub Total (Buildup of BMD Systems)		991	1188	1361	1572	930	873
R&D etc concerning Future BMD Systems	Japan-U.S. Joint Cooperative Development concerning advanced SM-3 missile for ballistic missile defense and others*3	76	9	37	216	201	238
	Participation to BMD Multinational Conference, etc.	1	1	1	1	1	1
Sub Total (BMD Research and Development)		77	10	38	217	202	239
Sub Total (Supplementary)		--	--	--	37	--	--
Total		1068	1198	1399	1826	1132	1112

We added 76 billion yen for the early procurement of PAC-3missile and 66 billion yen for the improvement of EP-3 in JFY2007 supplementary budget JFY2006.

*1 Includes acquisition and modification costs of maintenance equipment, etc for Patriot system upgrade.

*2 Includes C2BMC related budgets except for installing TDS.

*3Figures of JFY04 and 05 represent the costs required for Japan-U.S Joint Technical Research only.

Aegis BMD System

JMSDF ship *Kongo* was equipped with SM-3 BMD capabilities in Dec 07.

-Radar, software and launcher modified

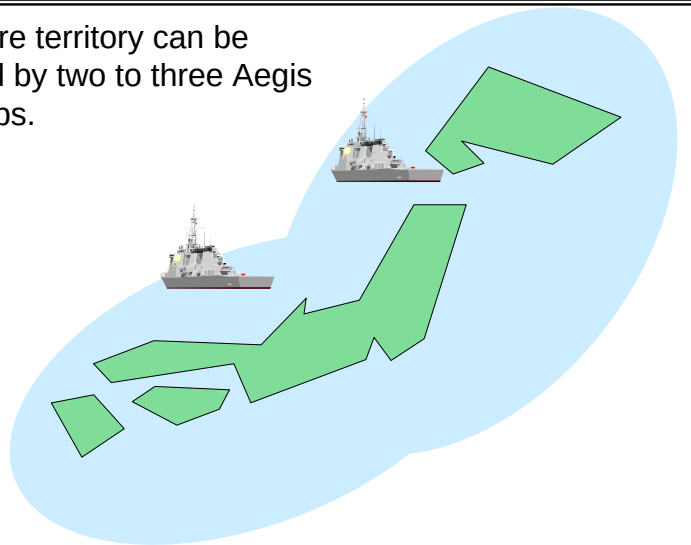
-SM-3 missiles equipped inside VLS (Vertical Launch Systems).

VLS (Vertical Launch Systems)

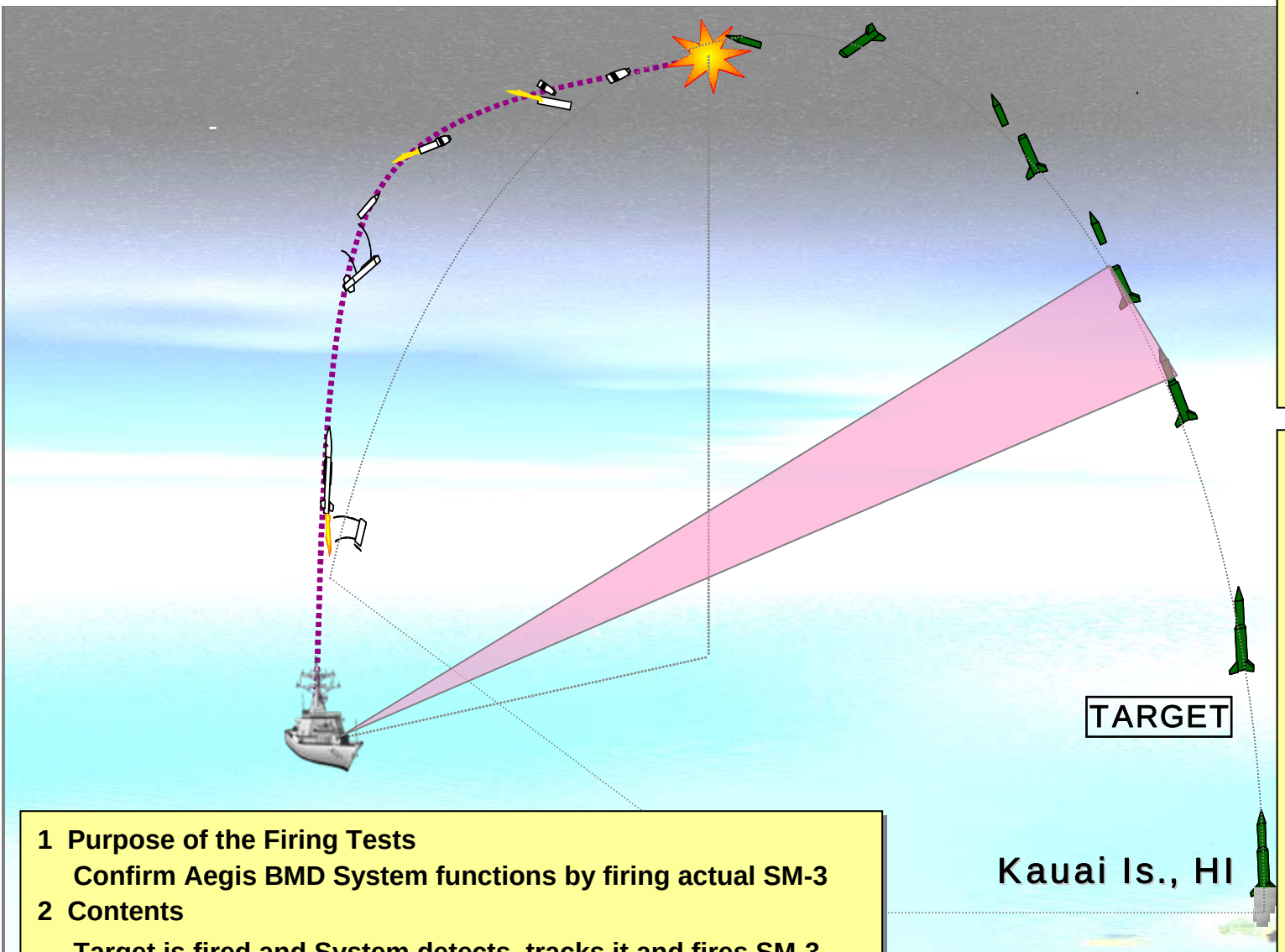
SM-3 missiles

Defended Area (Image) by Aegis BMD System

-The entire territory can be defended by two to three Aegis BMD ships.



SM-3 Firing Tests



JS *Kongo* (Dec 2007)

1 Test Data

– Target Launch

1205PM 17 Dec (AHST)
(0705AM 18th Dec (JT))

– SM-3 Launch

1208PM 17 Dec (AHST)
(0708AM 18th Dec (JT))

2 Results

At 1212PM 17 Dec (AHST) (0712AM 18th Dec (JT)) , **SM-3 successfully intercepted the target** outside the atmosphere.

JS *Chokai* (Nov 2008)

1 Test Data

- Target Launch

1621PM 19 Nov (AHST)
(1121AM 20th Nov (JT**))**

- SM-3 Launch

1624PM 19 Nov (AHST)
(1124AM 20th Nov (JT))

2 Results

The System detected and tracked the launched target, and subsequently launched the SM-3. **The System functioned properly in guiding SM-3 to outside the atmosphere, however, did not succeed in intercepting the target.**

1 Purpose of the Firing Tests

Confirm Aegis BMD System functions by firing actual SM-3

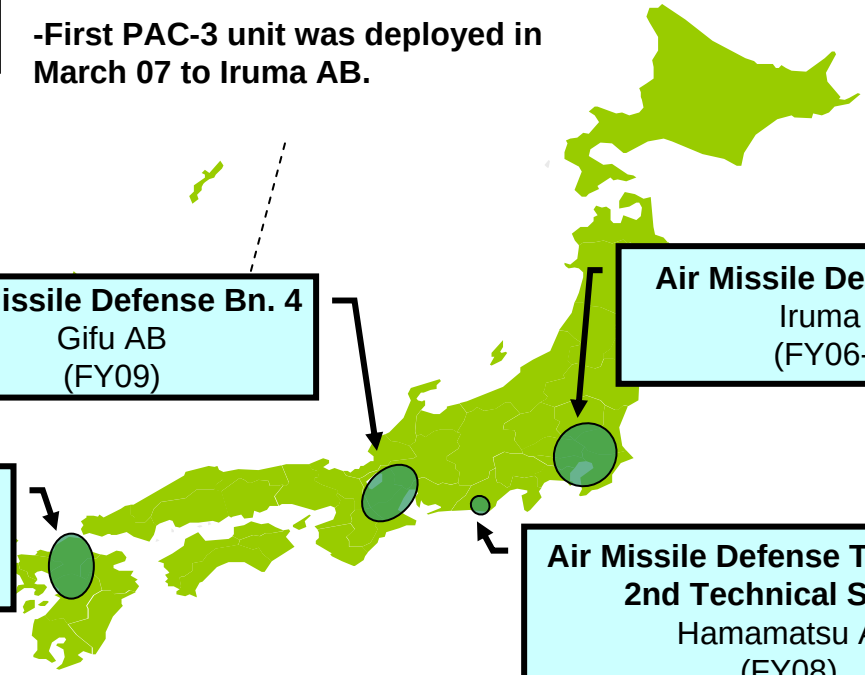
2 Contents

Target is fired and System detects, tracks it and fires SM-3.

Patriot PAC-3 System

Deployment of ＰＡＣ－３

-First PAC-3 unit was deployed in March 07 to Iruma AB.



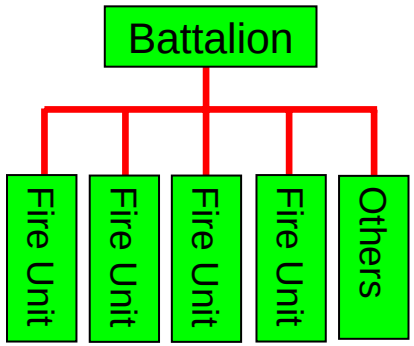
Air Missile Defense Bn. 4
Gifu AB
(FY09)

Air Missile Defense Bn. 1
Iruma AB
(FY06-07)

Air Missile Defense Bn. 2
Kasuga AB
(FY10)

Air Missile Defense Training Gr.
2nd Technical School
Hamamatsu AB
(FY08)

Structure of Battalion



Formation of 1 FU (Fire Unit)

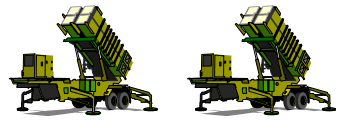
○ Engagement Control Station (ECS)

○Radar Set (RS)

○Antenna Mast Group (AMG)

○Electric Power Plant (EPP)

○ Launcher Stations × 5

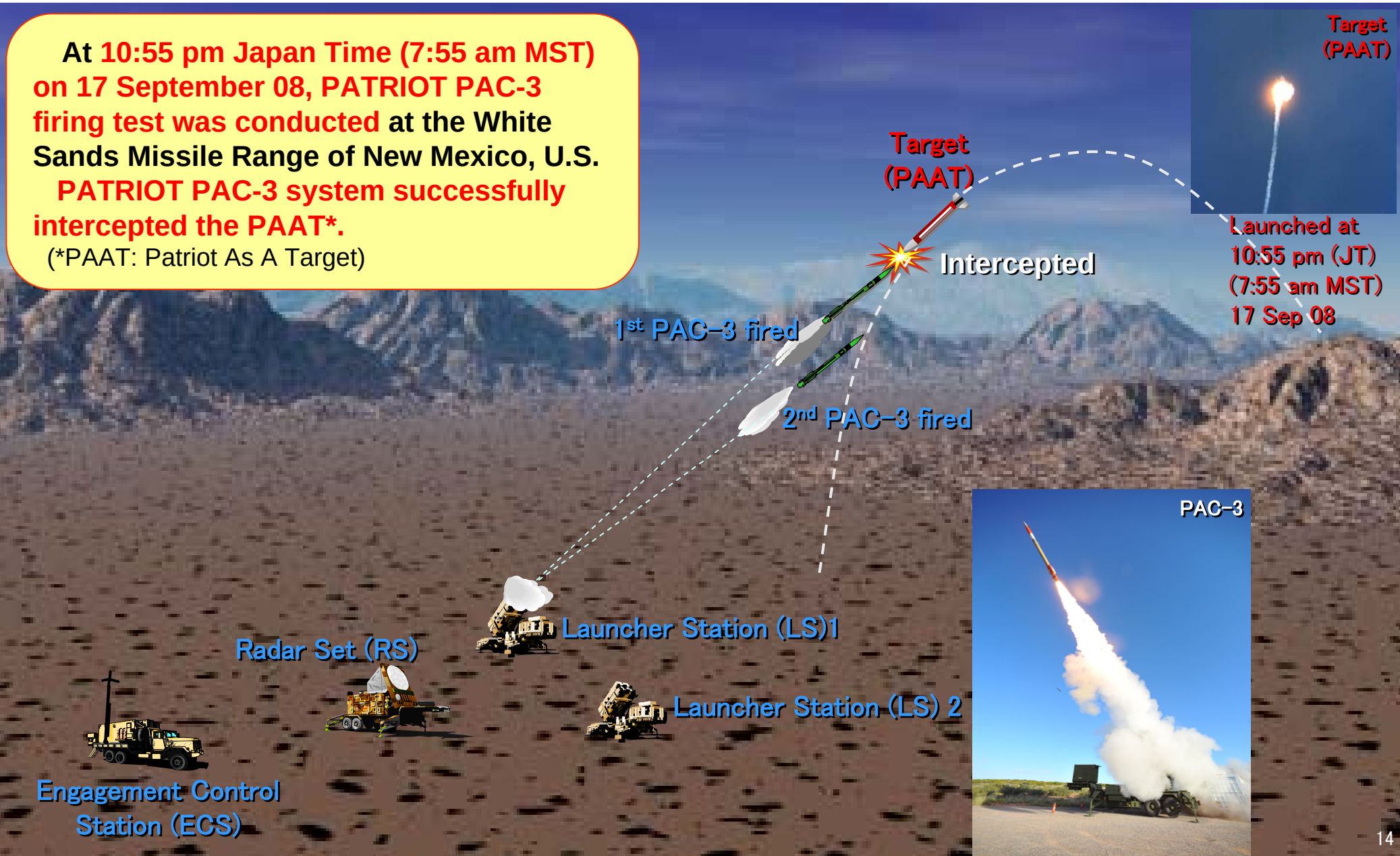


Equipped with PAC-3 missiles

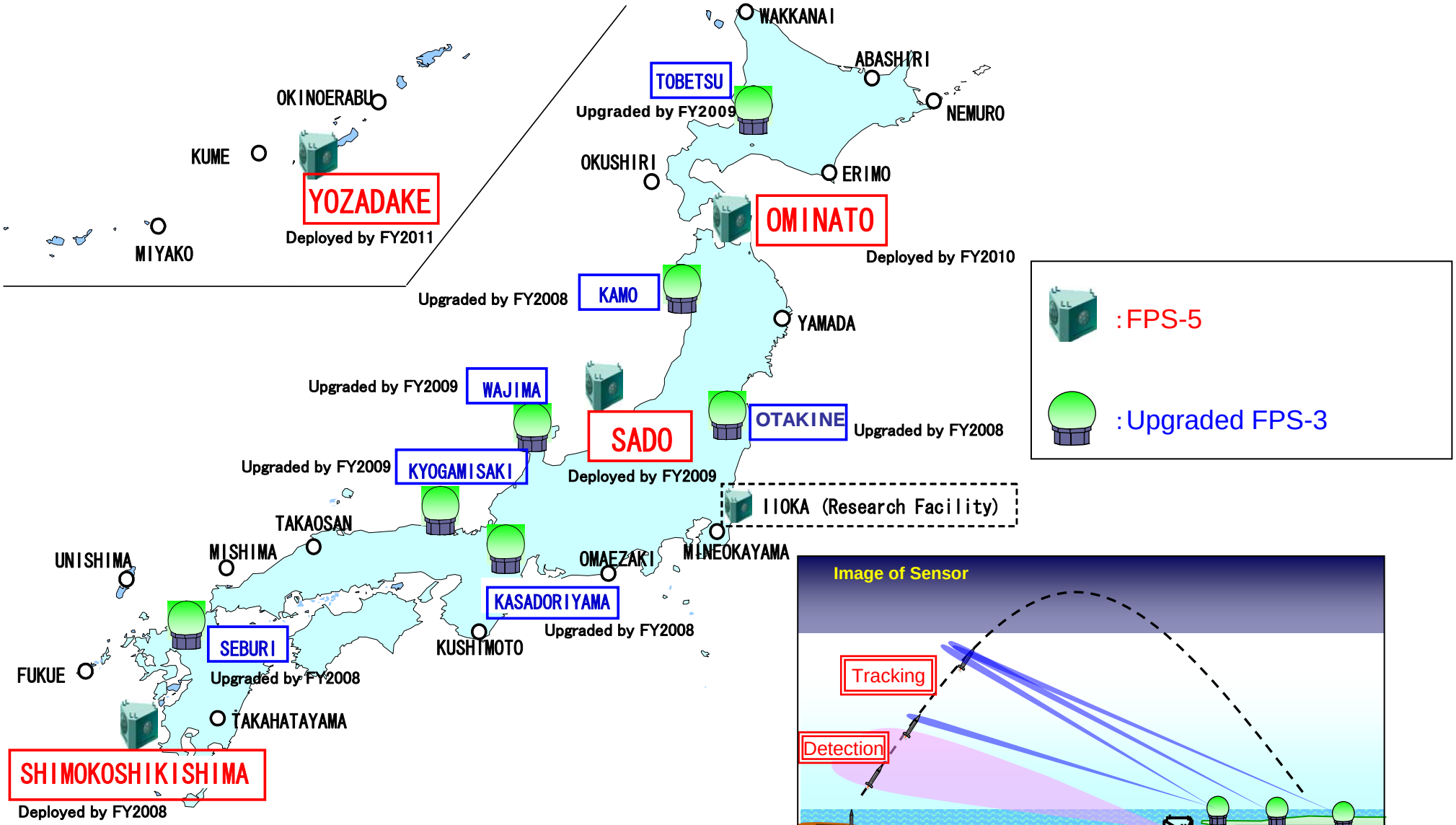
Patriot PAC-3 Firing Test

At 10:55 pm Japan Time (7:55 am MST) on 17 September 08, PATRIOT PAC-3 firing test was conducted at the White Sands Missile Range of New Mexico, U.S. PATRIOT PAC-3 system successfully intercepted the PAAT*.

(*PAAT: Patriot As A Target)



Radar Sites


WAKKANAI
ABASHIRI
NEMURO
TOBETSU
Upgraded by FY2009
OKINOERABU
KUME
YOZADAKE
Deployed by FY2011
MIYAKO
OKUSHIRI
ERIMO
OMINATO
Deployed by FY2010
Upgraded by FY2008
KAMO
YAMADA
Upgraded by FY2009
WAJIMA
SADO
Deployed by FY2009
OTAKINE
Upgraded by FY2008
Upgraded by FY2009
KYOGAMISAKI
IIOKA (Research Facility)
TAKAOSAN
MISHIMA
UNISHIMA
OMAEZAKI
MINEOKAYAMA
KASADORIYAMA
Upgraded by FY2008
SEBURI
Upgraded by FY2008
KUSHIMOTO
FUKUE
TAKAHATAYAMA
SHIMOKOSHIKISHIMA
Deployed by FY2008
:FPS-5
:Upgraded FPS-3
Image of Sensor
Tracking
Detection
FPS－5
FPS－3 Ug

Japan-US BMD cooperation

- **Cooperation in the policy areas**

- U.S. cooperation on earlier deployment of Japan's BMD assets
- Deployment of U.S. BMD assets to Japan
- Information sharing: Ensuring the sharing of BMD-related information collected by Japan and U.S. BMD assets.

· **SM-3 Cooperative Development Project (SCD)**

- Started in June, 2006 (revised MOU signed between Japan and U.S.). The project has been progressing steadily.

· **Cooperation in the operation areas**

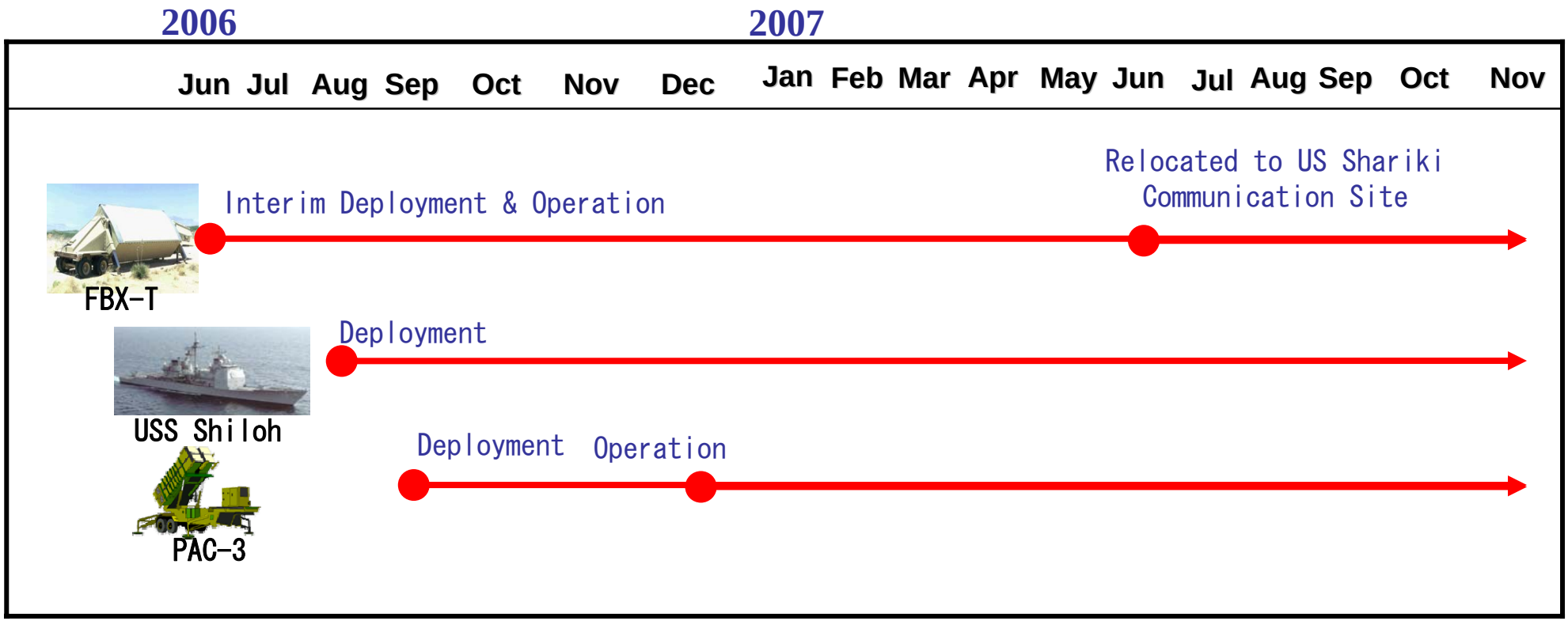
- U.S. BMD assets have been deployed to Japan, and Japan's own BMD assets have been deployed since the end of JFY 2006. The phase of Japan-U.S. cooperation has now shifted to the operation areas.

Deployment of US BMD Assets to Japan

- Japan and the U.S. maintain a close relationship in ballistic missile defense. The U.S. BMD assets have been deployed to Japan step-by-step for the security of Japan and the region.

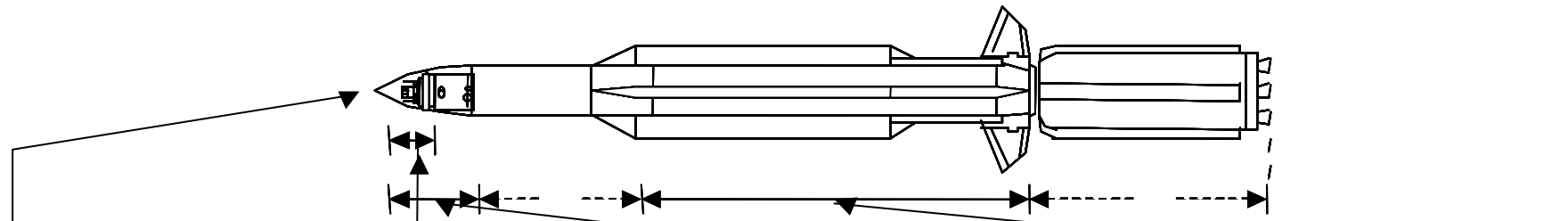
- 2006 Jun: FBX-T was deployed to JASDF Shariki Sub Base (Aomori).
  Aug: USS Shiloh with the BM mid-course interception capabilities arrived at Yokosuka Naval Base.
  Sep: PAC-3 battalion deployed to USFJ Kadena Air Force Base (Okinawa).
  Dec: PAC-3 battalion commenced its operation.

- 2007 Jun: FBX-T relocated to the US Shariki Communication Site.



Joint Cooperative Research on AEGIS BMD Missile

The Joint Cooperative Research on AEGIS BMD Missiles is the research efforts kicked off in 1999 on the four major components of the Future Standard Missiles of AEGIS BMD. which is aimed at higher performance than SM-3Blk 1A currently deployed. Based on the outcome gained from the Research, SM-3blkIIA Cooperative Development Project commenced in the bilateral efforts by Japan and the U.S.



Nosecone

Protect Seeker etc from heat while in flight during inner space flight

Increase the credibility of separation of KW / Improve the response-performance

Seeker

QWIP

MCT

Discriminate and Track targets with IR

Improve the capability to identify targets from decoys

Kinetic Warhead

Hit-to-kill targets with kinetic energy

Improve orbit correction capability and widen its interception area

Second Stage Rocket Motor

Second Stage Rocket Motor

Improve the flight velocityand realie more intercepts in wider interception area

FY	1999	2000	2001	2002	2003	2004	2005	2006
Schedule	←	RESEARCH & PROTOTYPE				→		
			←	TESTS			→	

Overview of SM-3 Cooperative Development Project (SCD)

○ Project Goal

◆ **To develop Advanced SM-3 missile for ballistic missile defense making the most of the cutting edge technologies of US and Japan.**

○ Outline

◆ **Features:**

– Improved kill capability

– Increased battle space and defended area

◆ **Spiral development with incremental capability improvements:**

– The requirements are developed through experimentation and risk reduction activities based on BMD system concept study; not just from the viewpoint of technological feasibility or BMD capability in the future, but of legal constraint, assumed future operational environment, threat, and the other various factors.

◆ **Schedule for about 9 years (JFY06 – JFY14) :**

– Observe the current schedule to complete SCD by JFY 2014.

◆ **Cost:**

– Depends on sharing of work. Each side will bear the necessary costs to complete the development of allocated sections.

(Ref.) Currently the cost of Japan side is estimated $1.0-1.2B, the total is estimated around $2.1- 2.7B. Necessary review will be done as the project progresses.

- **21” Nosecone**
- **Large Diameter KW**
  - **Adv Discrim Seeker**
  - **High Divert DACS**

Improved Kill Capability

- **21” Propulsion**
  - **2nd & 3rd Stage**

Increased Battle space and Defended Area

- **MK 72 Booster**
- **MK 41 VLS Compatible (LW Canister)**

SM-3 BLK IIA

SCD System Engineering Process and Status

Integration And Test

Integrate Sub-Components and Components and Test

Flight Test

MCP: Mission Control Panel

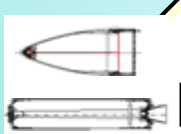
Detailed Design

Develop detailed Design and Fabricate and Test Sub-Components

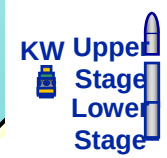
CDR: Critical Design Review

Preliminary Design

Develop preliminary design for the System components and subcomponents



PDR: Preliminary Design Review

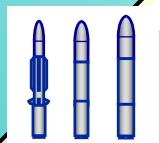


SDR: System Design Review

Current Status: Proceeding to SDR

Concept Definition

Develop System and Component Guidelines



SRR: System Requirements Review (completed)

SCR: System Concept Review (completed)

Legislation for Response to Ballistic Missiles

(Basic Concept of This Legislation)

• Where Defense Order is issued, the Japan Self Defense Forces (JSDF) can take actions against incoming ballistic missiles in accordance with the Order. On the contrary, where the Order is not being issued, JSDF cannot take any actions under the current JSDF law.

• But, there is no other choice than to kill and destroy the incoming ballistic missiles by interceptors in order to prevent the enormous damage regardless of Defense Order is issued or not.

•This legislation covers the lack of the legal authority by adding a new Article to the JSDF law, taking the following into consideration….

1. prompt and appropriate response
2. secure strict civilian control

(Maintain Strict Civilian Control)

• Under the new Law, the approval of the Prime Minister and the order of the Defense Minister are required to destroy the incoming ballistic missiles. And under certain circumstances where the response time is limited, the Defense Minister will be authorized to issue, in accordance with the Emergency Response Procedures made in advance by the Defense Minister with the approval of the Prime Minister, an order to destroy the ballistic missiles for a defined period of time.

Emergency Response Procedure for Ballistic Missiles or Other Objects

Situation identified as having sufficient possibility that BM or other objects will fly toward Japan

Examples:
- Expression of intent to attack Japan by another nation.
- BM launch is imminent.

Identified as Armed Attack Situation

Certified as Armed Attack Situation Minister of Defense issues Defense Operations Order

BM or other objects fly toward Japan

Interception

(Article 76)

(Defense Operations)

Examples:
- Clear sign of BM launch preparation by another nation against Japan, although its intention is unknown.
- Clear indication expressed by another nation of its intention to launch BM.

NOT Identified as Armed Attack Situation

Minister of Defense issues Destruction Order upon approval of Prime Minister

BM or other objects fly toward Japan

Interception

(Article 82-2 (1))

Situation identified as NOT having sufficient possibility that BM or other objects will fly toward Japan

Examples:
- Only partial intelligence is available on possible BM launch.
- A satellite or satellite launch rocket, having lost control due to an accident, has gone off orbit and may fall onto Japanese territory.

Minister of Defense issues Destruction Order in advance in accordance with Emergency Response Procedure*

(*) Drafted by Minister of Defense, Approved by Prime Minister

Examples:
- Intelligence acquired indicates high possibility of BM launch toward Japan within several days.
- High possibility of satellite that has gone off orbit falling onto Japanese territory within several days.

BM or other objects are actually flying toward Japan

Interception

(Article 82-2 (3))

(Destruction Measures against BM or Other Objects)

Emergency Response Procedure for Destruction Measures against Ballistic Missiles or Other Objects (Outline)

Cabinet Decision in March 2007

○ Minister of Defense may order destruction when:

- It is likely that ballistic missiles have been launched or are likely to be launched
- Objects such as satellite launch rockets are likely to fall from the sky due to some accident

○ Method of confirmation

- Japan's ballistic missile defense system confirms that ballistic missiles or other objects are flying toward Japan
  → Destruction

○ Definition of "ballistic missiles or other objects", Methods of destruction

- Ballistic missiles, satellite launch rockets, satellites, etc., flying toward Japan
- Destruction by launch of SM-3 missiles or Patriot PAC-3 missiles

○ Area of Units Operation

- Japanese territory and surrounding high seas as well as air space above those areas
- Minister of Defense specifies the Area of Operation, taking into account the posture of the relevant units and the potential damages caused in case the impact of ballistic missile etc. actually occurs.

○ Cooperation with Relevant Government Ministries and Agencies

- Ministry of Defense will immediately transmit the information below to relevant Government Ministries and Agencies:
  - When it has been confirmed that ballistic missiles or other objects are flying toward Japan
    ⇒ Fact of confirmation as well as estimated point and time of impact
  - When destruction has been executed
    ⇒ State of destruction (Kill or Not Kill)

- Other necessary cooperation will be conducted upon requests by relevant Government Ministries and Agencies.

Relevant Government Ministries and Agencies: Cabinet Secretariat, National Police Agency, Fire and Disaster Management Agency, Ministry of Foreign Affairs, Fisheries Agency, Ministry of Economy, Trade and Industry, Ministry of Land, Infrastructure and Transport, Japan Coast Guard, as well as other agencies deemed necessary by Minister of Defense according to the situation

Alliance Transformation:
Advancing United States-Japan Security and Defense Cooperation

Joint Statement of the Security Consultative Committee (May 1, 2007)

V. Strengthening BMD and Operational Cooperation

Alliance BMD capabilities, which contribute to the Alliance's overall deterrence posture, are strengthened to the extent that U.S. and Japanese systems can operate together effectively. **The SCC members confirmed that, as both countries develop and deploy capabilities, every effort must be made to ensure tactical, operational, and strategic coordination**. In that light, the United States and Japan will take appropriate measures, in close coordination, in response to ballistic missile threats against alliance interests.

In this context, the SCC members highlighted **the following areas of operational cooperation:**

・To strengthen operational cooperation, bilateral planning efforts must take into account missile defense capabilities, today and in the foreseeable future. To that end, **the two sides' forces will clarify concepts, roles, and missions for each side in the conduct of missile defense and related operations in response to ballistic missile threats.** At the same time, a policy-level forum will ensure that policy guidance for BMD operations is unambiguous and current.

・On October 29, 2005, the SCC directed the creation of a bilateral joint operations coordination center (BJOCC). During the North Korean missile provocations of June-July 2006, the Unites States and Japan exchanged information in a timely manner, including through an interim coordination facility at Yokota Air Base with SDF liaisons. The success of this facility in ensuring that both sides had a common awareness of the evolving situation validated the importance of continuous enhancement of bilateral policy/operational coordination including through establishment of the BJOCC at Yokota Air Base.

・Recognizing the importance of improving the situational awareness of U.S. forces and the SDF, **the two sides are committed to the routine sharing of BMD and related operational information directly with each other on a real time, continuous basis.** The two sides will also develop a bilateral common operational picture (COP).

・**The two sides will establish a comprehensive information-sharing roadmap** to identify broader operational information and data to be shared support of alliance roles missions, and Capabilities

VI. Enhancing BMD System Capabilities

The SCC members noted with satisfaction that past alliance decisions about missile defense, coupled with recent accelerated cooperation have strengthened BMD capabilities in the region.

They highlighted **key advances**, including:

・The operational **deployment of a U.S. X-Band radar system to Air SDF Shariki Base, Japan**, with associated U.S. delivery of radar data to Japanese forces.

・**The operational deployment of a U.S. PAC-3 battalion to Kadena Air Base, Japan.**

・The recent and continuing addition of Standard Missile (SM-3) defense capabilities to the forward-deployed naval forces of the U.S. Pacific Fleet.

・Japan's decision to accelerate modification of its Aegis ships with SM-3 capabilities. **Japan will complete modification of DDG Kongo by the end of 2007,** and will expedite modification of DDGs Chokai, Myoko, and Kirishima.

・Japan's decision to expedite the deployment of PAC-3, which resulted in **deployment of the first PAC-3 fire unit in March 2007** and its goal to deploy 16 PAC-3 capable fire units by early 2010.

・**Priority focus on U.S.-Japan cooperative development of the next generation SM-3 interceptor**. The basic agreement on a framework for technology transfer reached by the two sides will facilitate progress on this project as well as in future U.S.-Japan technology cooperation projects.

BMD in "Transformation and Realignment for the future" (Oct. 29th, 2005, SCC Document)

- **Clear commitment on the BMD cooperation**

- Emphasize the importance of the BMD cooperation as one of specific cooperative areas which should be improved

- Specifically, emphasize the importance of

(i) closely coordinating improvements in BMD capabilities

(ii) constant information gathering and sharing

(iii) high readiness and interoperability

(iv) close coordination of bilateral command and control system

- **Deployment US BMD assets in and around Japan**

- Agree to examine optimal site for US X-band radar in Japan

- Commit to deploy US active defenses, such as PATRIOT PAC-3 and SM-3 when appropriate

BMD in “US-J Roadmap for Realignment Implementation”

(May 1, 2006, SCC Document)

:As both sides deploy additional capabilities and improve their respective ballistic missile defense capabilities, close coordination will continue.

:The optimum site for deployment of a new U.S. X-Band radar system has been designated as Air SDF Shariki Base. Necessary arrangements and facility modifications, funded by the USG, will be made before the radar becomes operational in summer 2006.

:The USG will share X-Band radar data with the GOJ.

:U.S. Patriot PAC-3 capabilities will be deployed to Japan within existing U.S. facilities and areas, becoming operational at the earliest possible time.