FOI 92-0855

**APBI AGENDA EXTRACT**

**Program Status**--Major General Malcolm O'Neill, Deputy Director, Strategic Defense Initiative Organization

**Ballistic Missile Defense and Systems Architecture**--Dr. Edward Gerry, SDIO Systems Architect

**Global Protection Against Limited Strikes (GPALS)**--Dr. James Carlson, Deputy for Strategic Defense

**System Integration & Command and Control**--Colonel William Hecker, Director, System Integration and Command and Control Directorate

**Global Missile Defense**--Lieutenant Colonel Rohlman, Assistant Director, Program Operations Global Defense Segment Directorate

**National Missile Defense**--Colonel Carl Drewes, Director, National Defense Segment Directorate

**Theater Missile Defense/Patriot**--Mr. David Israel, Assistant Deputy, Theater Missile Defense

**National Test Bed**--Commander Lenio, Deputy Director, National Test Bed Directorate

**Test and Evaluation**--Colonel Michael Toole, Director, Test and Evaluation Directorate

**Technology Overview**--Colonel Simon Worden, Deputy for Technology

**Innovative Science and Technology**--Dr. Leonard Caveny, Assistant Director, Technology, Innovative Science and Technology Directorate

**International and External Programs**--Dr. J. David Martin, Director, SDIO International and External Programs Directorate

**Program Budget Considerations**--Lieutenant Colonel Steven Mullen, Assistant Director, Program Execution

**SDIO Technical Information Center**--Ms. Jeanette Clay, Assistant Director, System Development, Information Systems Directorate

#425

FOI92-0855F

# STRATEGIC DEFENSE INITIATIVE

## Advance Planning Briefing For Industry

STRATEGIC DEFENSE INITIATIVE
DEPARTMENT OF DEFENSE

**2 MAR 92**

**MG Malcolm O'Neill, USA**
**Deputy Director**
**Strategic Defense Initiative Organization**

jm-24660a / 022892

27

# AGENDA

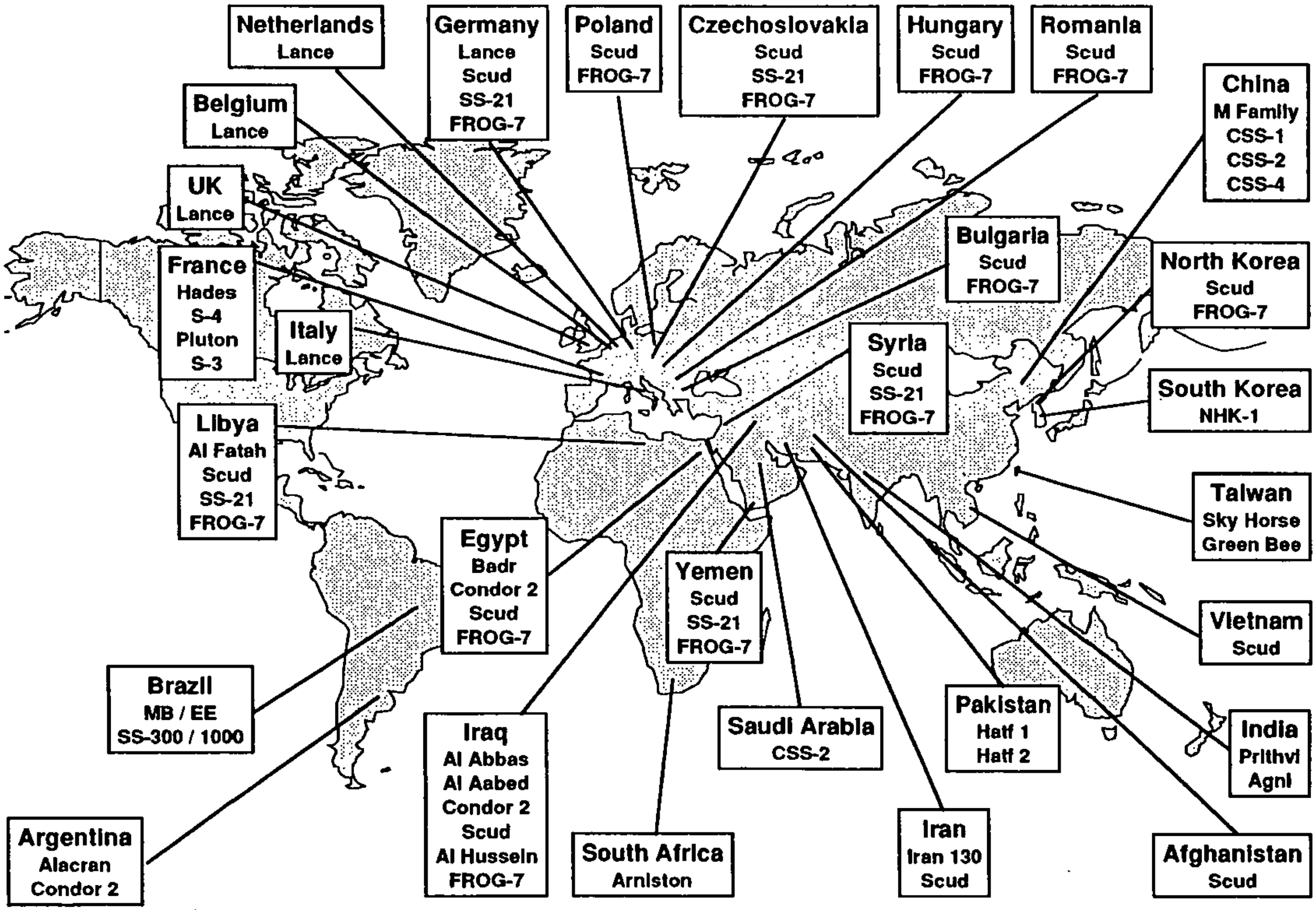
- Situation
- Mission
- Execution
- Resources

# Situation

# THREAT SITUATION

- Evolving East - West Relations Changes Calculus
  - Soviet Union No Longer Exists
  - Republics Of The Former Soviet Union Still Retain Large, Modern Strategic Forces
  - Political Instabilities Increase Concern About Use Of Ballistic Missiles
- Ballistic Missile Proliferation A Growing Threat To U.S.
  - Directly Threatens The Republics Of The Former Soviet Union
- Threat Of Third Country Attacks Increasing

# EVOLVING BALLISTIC MISSILE CAPABILITY




jm-13168C / 020392

# Friendly Situation

# FRIENDLY SITUATION

| | |
|---|---|
| • JCS Ballistic Missile Defense (BMD) Requirements In Place | Phase I Operational Requirements Document (ORD) And Theater Missile Defense (TMD) Mission Needs Statement (MNS) |
| • The President's 1991 State Of The Union Address | Refocus |
| • Missile Defense Act Of 1991 | Early Ballistic Missile Defense Deployment |
| • Soviet / U.S. Treaty Negotiations | ABM & START |

# PRESIDENTIAL REFOCUS

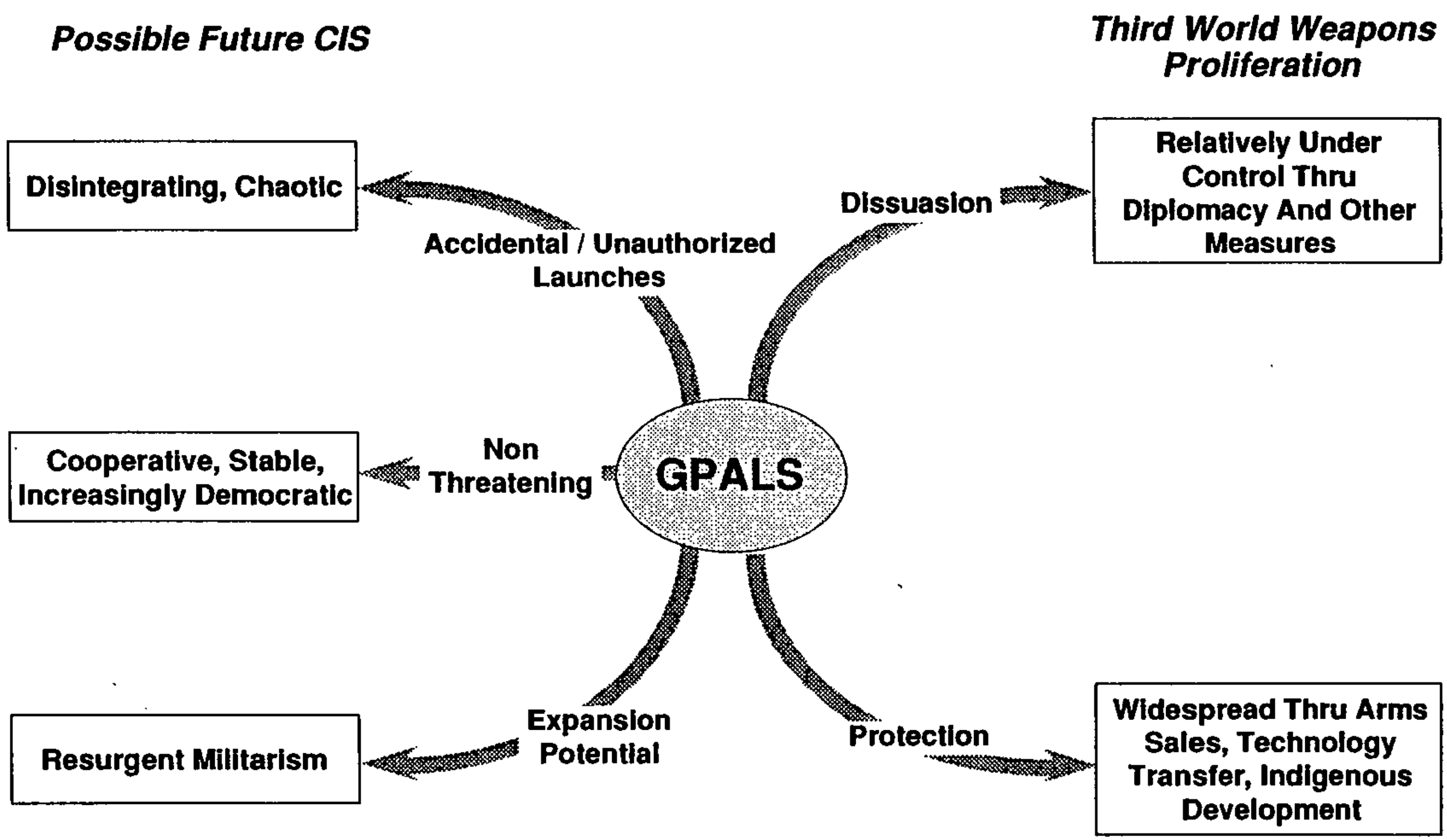
- Deterrence vs Protection
- Massive Attack vs Limited Strikes
- United States vs Global Focus
- Large Scale Deployment vs Limited Space And Ground Based Deployment

Phase I SDS → Changing Threat Environment → GPALS

(Phase I Requirements Remain Valid)

jm-14291G / 112191

# DEALING WITH UNCERTAIN FUTURES




jm-23519b / 012592

# MISSILE DEFENSE ACT OF 1991

*Missile Defense Goal Of The United States*

- **It Is The Goal Of The United States To**
  - **Deploy An Antiballistic Missile System, Including One Or An Adequate Additional Number Of Antiballistic Missile Sites And Space Based Sensors, That Is Capable Of Providing A Highly Effective Defense Of The United States Against Limited Attacks Of Ballistic Missiles**
  - **Maintain Strategic Stability**
  - **Provide Highly Effective Theater Missile Defenses (TMDs) To Forward Deployed And Expeditionary Elements Of The Armed Forces Of The United States And To Friends And Allies Of The United States**

# Mission

# PRESIDENTIAL DIRECTION

***"... Looking Forward, I Have Directed That The SDI Program Be Refocused On Providing Protection From Limited Ballistic Missile Strikes, Whatever Their Source. Let Us Pursue An SDI Program That Can Deal With Any Future Threat To The United States, To Our Forces Overseas And To Our Friends And Allies."***

**President George Bush**
**State Of The Union Address**
**29 JAN 91**

# MISSION

- Respond To Missile Defense Act For
  - Downselect / Deployment Of Advanced TMD Systems By Mid-90s
  - Develop For Deployment First Site Of ABM System As Early As Practical Or By 1996
- Retain President's Vision For Final Architecture
- Include Robust Technology For Space Based Interceptor
- Support Research For
  - Technology Insertion
  - Other Follow-on Systems

# Execution

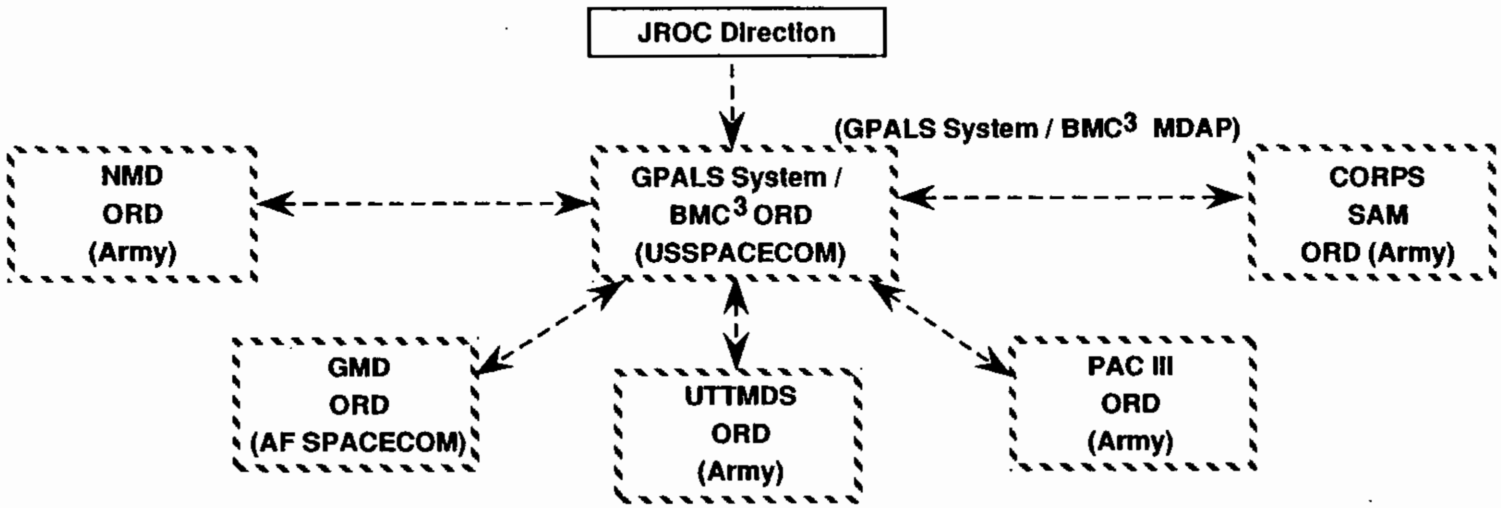
# PROGRAM ORGANIZATION

| System | GPALS System | | | | | |
|---|---|---|---|---|---|---|
| Segments | | NMD | GMD | TMD | | |
| MDAPS | GPALS System $BMC^3$ | NMD System | GMD System | PATRIOT | CORPS SAM | Upper Tier System |
| Elements | Architectural Integration<br><br>System Engineering And Integration<br><br>Command Center Element | Ground Based Interceptor<br><br>Ground Based Radar<br><br>Space Based Sensor (BE) | Space Based Interceptor (BP) | PATRIOT | CORPS SAM | THAAD & TMD-GBR |

**Agreed Structure Based On OSD White Paper**

jm-19046.B / 022892

# GPALS SYSTEM / BMC$^3$ REQUIREMENTS FLOW




## *JROC - Approved Schedule*

| Event | Date |
|---|---|
| GPALS / BMC$^3$ ORD Submitted | 3rd Qtr 1992 |
| GPALS / BMC$^3$ ORD Validated | 3rd Qtr 1992 |
| NMD ORD And GMD ORD Submitted | 3rd Qtr 1992 |
| NMD ORD And GMD ORD Validated | 4rd Qtr 1992 |
| UTTMDS ORD Submitted | 1st Qtr 1993 |
| UTTMDS ORD Validated | 2nd Qtr 1993 |

# DAB ACTIVITIES / HIGHLIGHTS

| *Activity* | *(Timing)* |
|---|---|
| • Review RFPs And Contracts For Dem / Val | (Continuing) |
| • Coordinate NMD / TMD Report To Congress | (Now - MAY 92) |
| • Establish Acquisition Planning Baseline For Each MDAP | (AUG 92)* |
| • Review COEA For GPALS | (JUL 92) |
| • Obtain CAIG Position On Cost Estimates | (MAY 92) |
| • Formal DAB Review / Approval Of Progress | (AUG 92) |

* Does Not Include CORPS SAM

jm-24837 / 022892

# SDIO EVALUATING PROGRAMMATIC IMPACT OF MISSILE DEFENSE ACT ON FY 94-99 POM AND 180-DAY REPORT

- Two Intense Architectural Efforts Examining Implications Of Congressional Call For Early Deployment
  - Theater Missile Defense - Led By MG O'Neill / DD SDIO
  - U.S. Homeland Defense (Ground Based Interceptors And Ground And Space Based Sensors) - Led By Dr. Gerry / System Architect

- Studies
  - Involve Users, Operators, Service Representatives, Other SDIO Agents, System Engineer And Integration Contractor, Key SETA Support And Nationally Recognized Technical Experts
  - Addressing Programmatic / Technical Choices And Costs Of Various Options

- Assessing
  - Impact Upon Support, Tech Base And Follow-on Systems

- Delivery Dates
  - Finalize Approach By April 1992 POM Submission
  - Submit Draft Of 180-day Report To SECDEF By May 1992 As Per 6 December 1991 Guidance From DEPSECDEF (Due To Congress By June 1992)

# SDIO INTERACTIONS

OSD

Policy / Guidance

Users

Requirements

SDIO

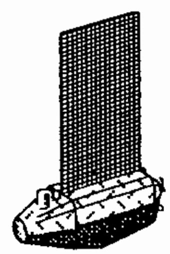
Executing Agreements

- Services
- Other Executing Agencies

- JCS
- CINCS
- Services

Acquisition Management

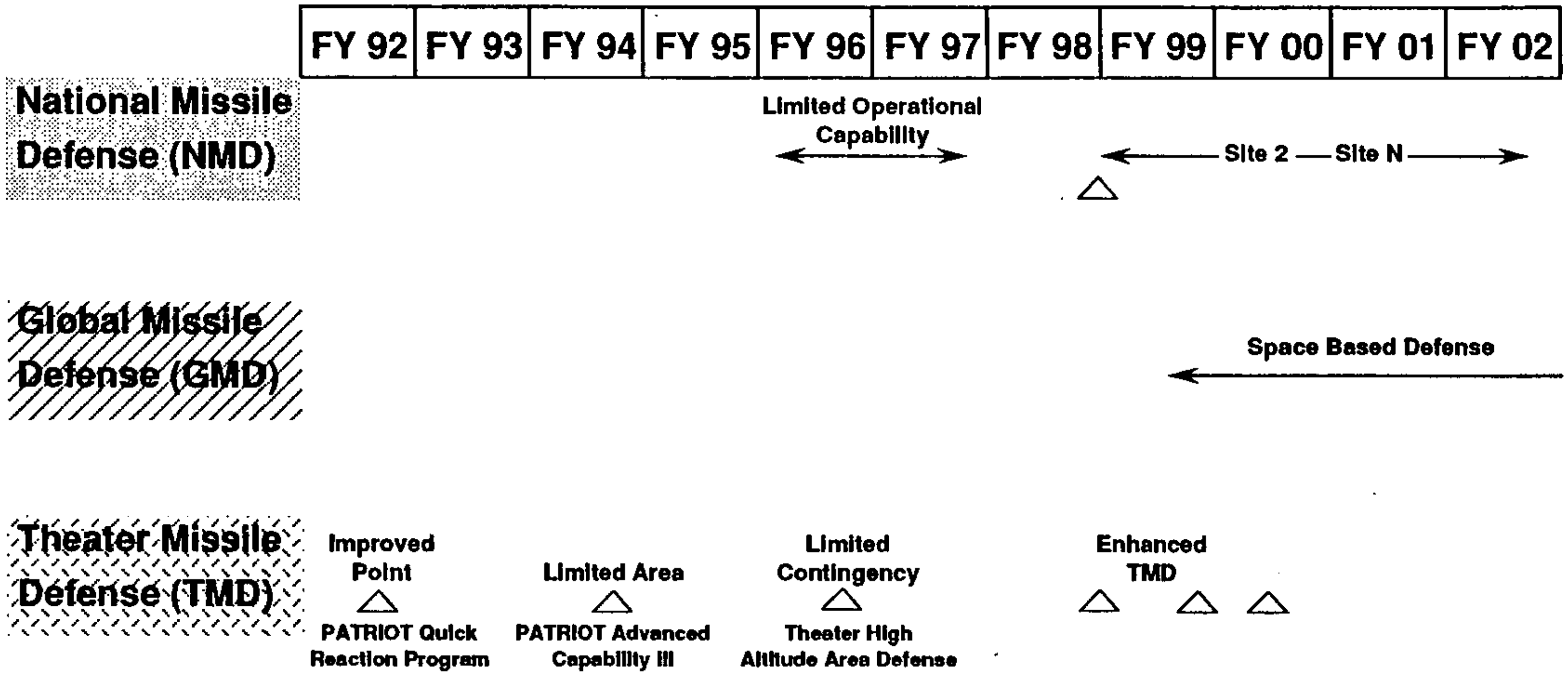
BMD Systems



**Function:**

- Oversight And Interface With Agent
- Direct And Manage Acquisition Processes

# BALLISTIC MISSILE DEFENSE CAPABILITY




- NMD LOC Circa FY 96 At Grand Forks, Expanded Later To Full NMD
- GMD Space Based Defense Capability Complements NMD / TMD
- Initial TMD Improvements In Lethality And Range Through PATRIOT Upgrades
- Limited Contingency In FY 96; UTTMDS Beyond FY 00
- CORPS SAM Matures After THAAD

jm-22164a / 030292

# Resources

# FY 92 RDT&E BUDGET

*$s In Millions*

| Program Elements | President's Budget | Appropriation |
|---|---|---|
| Limited Defense System | 1,459.530 | 1,411.412 |
| Theater | 857.460 | 868.710 |
| Space Based Interceptor | 827.177 | 465.000 |
| Other Follow-on | 925.149 | 674.852 |
| Research - Support | 1,081.258 | 721.627 |
| Total | $5,150.574 | $4,141.601 |

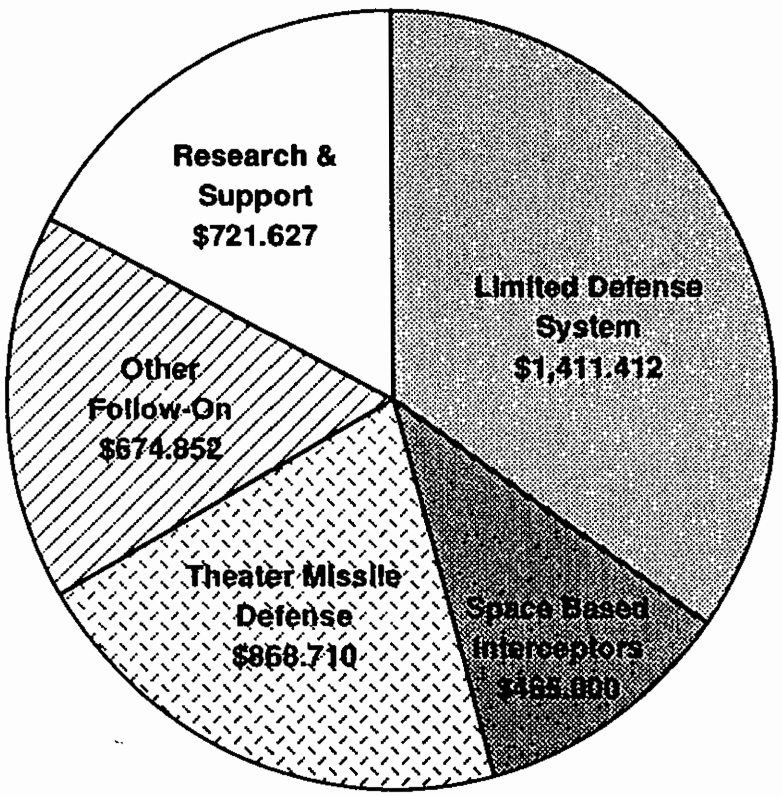
△ - $1,008.973 M

jm-22114 / 030292

# SDI ALLOCATION BY PROGRAM ELEMENT

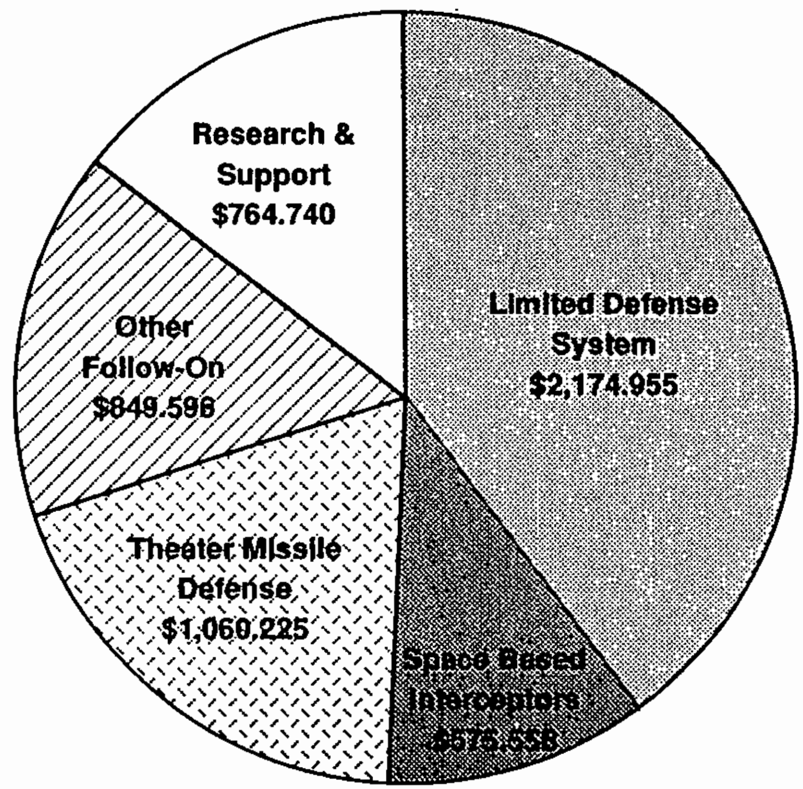
## *$s In Millions*

### FY 92 Appropriation




**Total FY 92 $4,141.601**

### FY 93 Budget Request

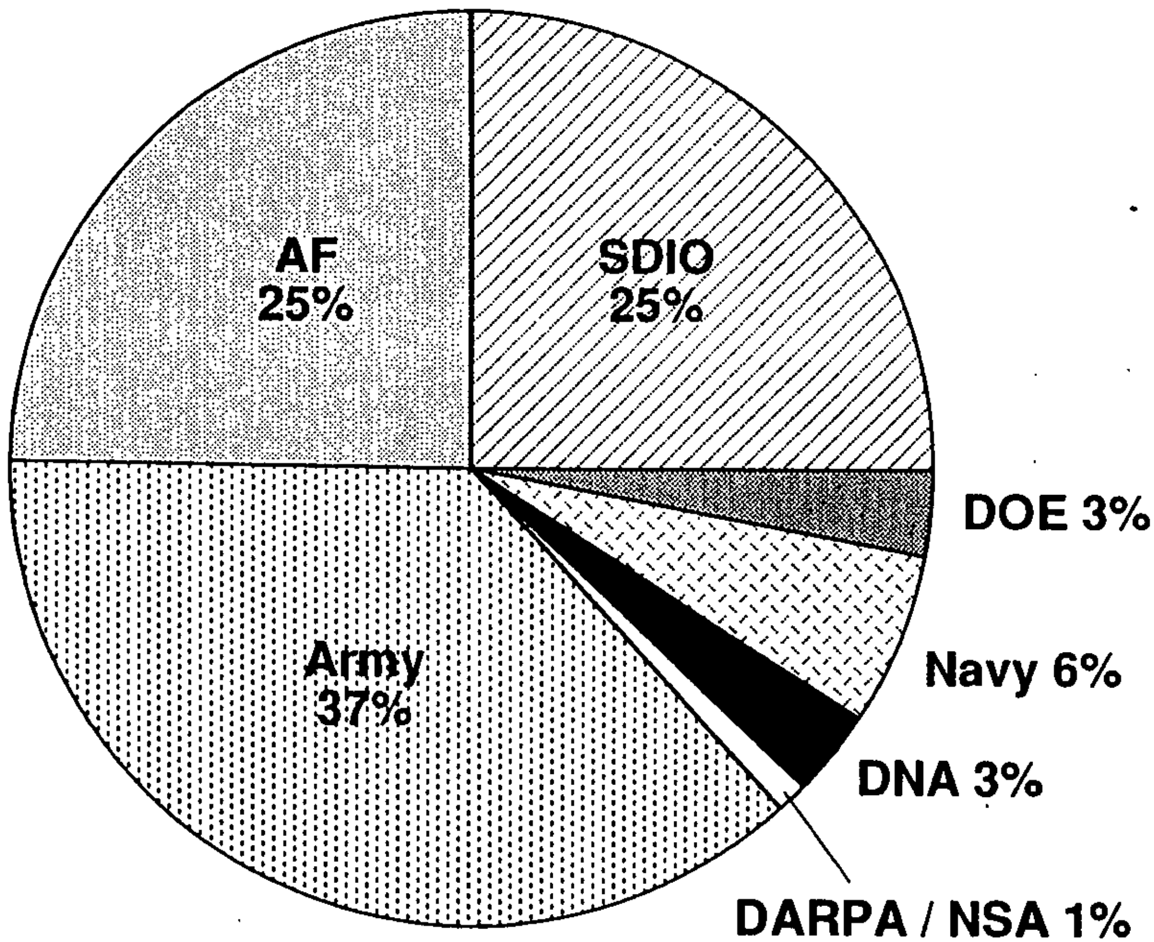



**Total FY 93 Request $5,425.074**

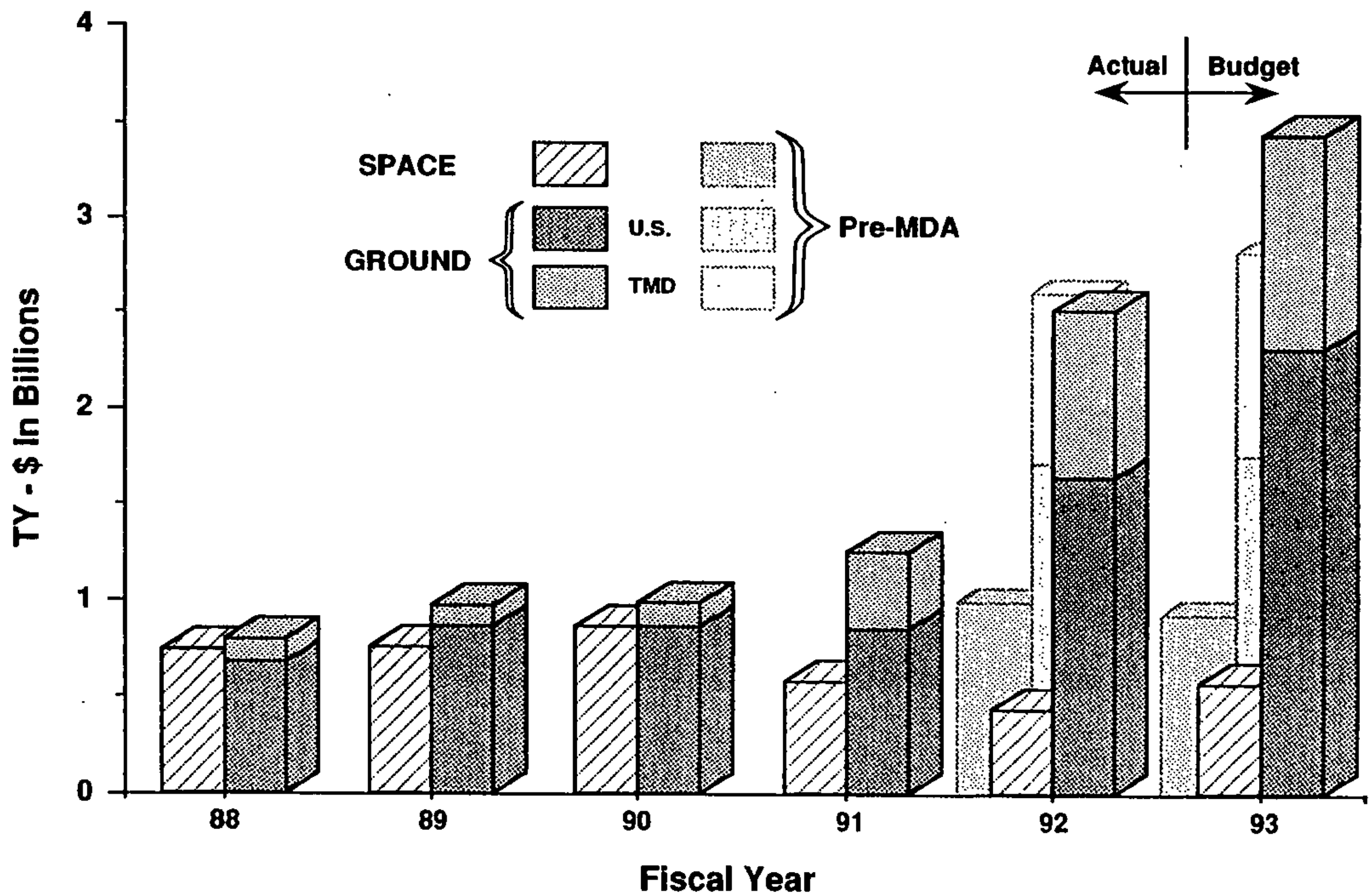
jm-24068a/ 030292

# STRATEGIC DEFENSE INITIATIVE BY EXECUTING AGENT FY 85 - 93

*Percentage*

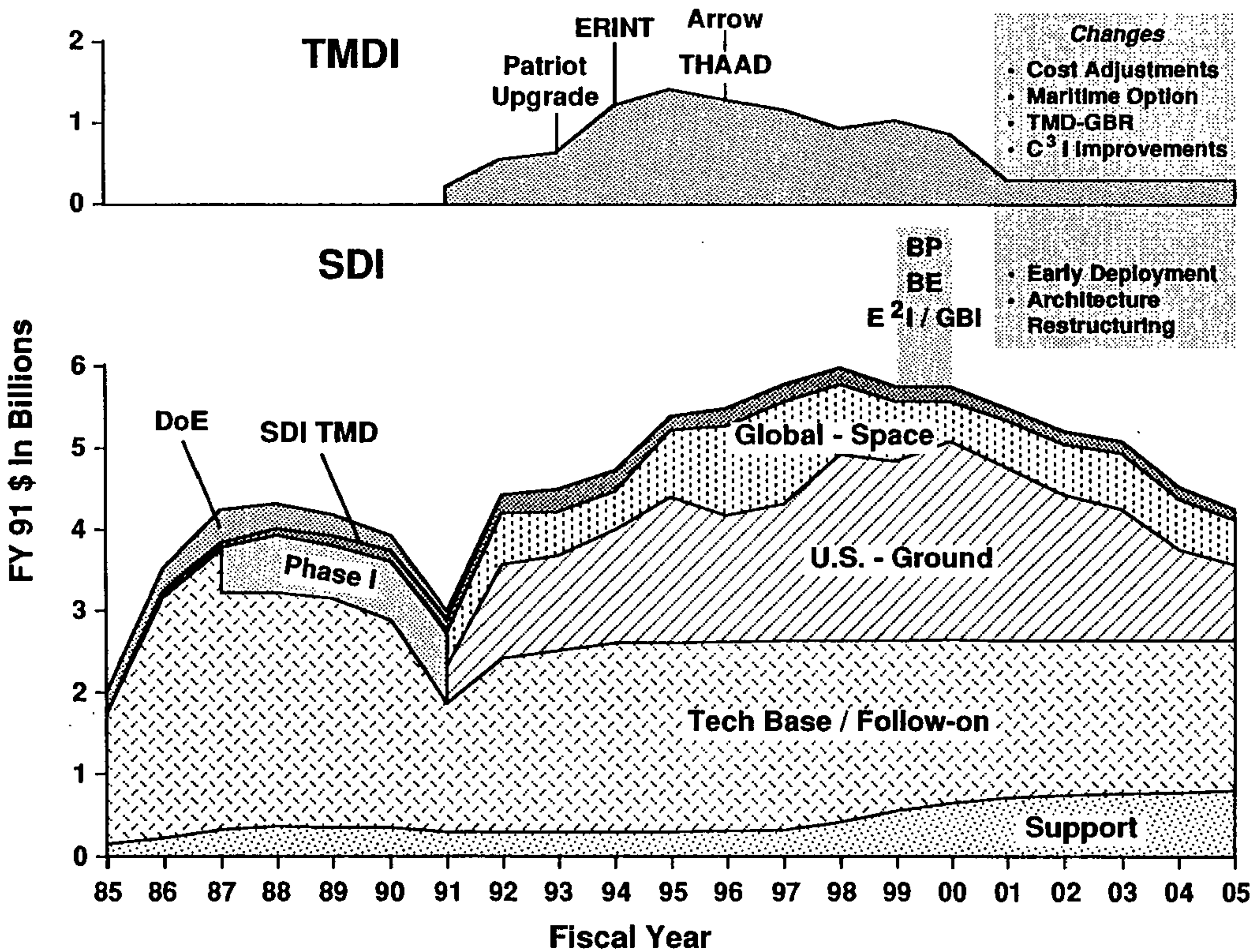


# SPACE - GROUND R&D INVESTMENTS




jm-13194.k / 022591

# BMD BUDGET EVOLUTION




jm-14322I / 022492

# SUMMARY

- **Threat** - Evolving, Increasingly Uncertain And Dangerous
- **Mission** - Consistent With Presidential Refocus, Missile Defense Act, And Existing JCS Requirements
- **Execution**
  - Users, Agents, SDIO Postured For Acquisition
  - Consensus On Early Deployment Of NMD And TMD
  - Continuing GMD Research / Focus Upon GPALS
- **Resources**
  - Near Term Capability Is Top Budget Priority
  - Congressional Direction Requires Out Year Budget Adjustments

jm-22162A / 030292

F

FoI92-0855

# STRATEGIC DEFENSE INITIATIVE

## Advance Planning Briefing For Industry On Ballistic Missile Defense And Systems Architecture

**2 MAR 92**

**Dr. Edward Gerry**
**Systems Architect**
**Strategic Defense Initiative Organization**

19

jm-24833 / 022892

# PROGRAM FOCUS

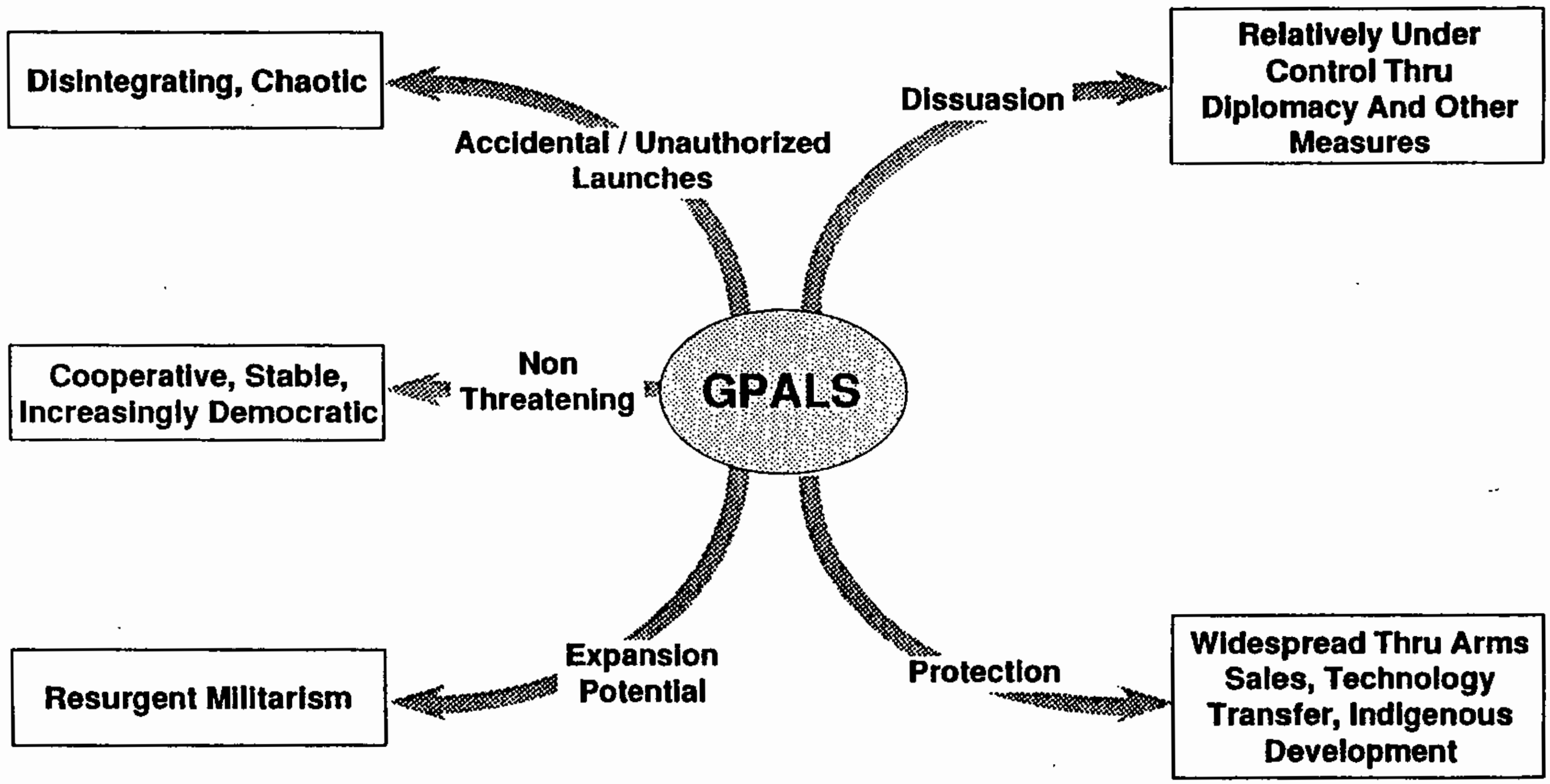
## Objective

- Protect Against
  - Ballistic Missile Attacks On U.S. Forces Overseas And U.S. Friends / Allies
  - Accidental, Unauthorized And / Or Limited Ballistic Missile Attacks On The United States

# DEALING WITH UNCERTAIN FUTURES

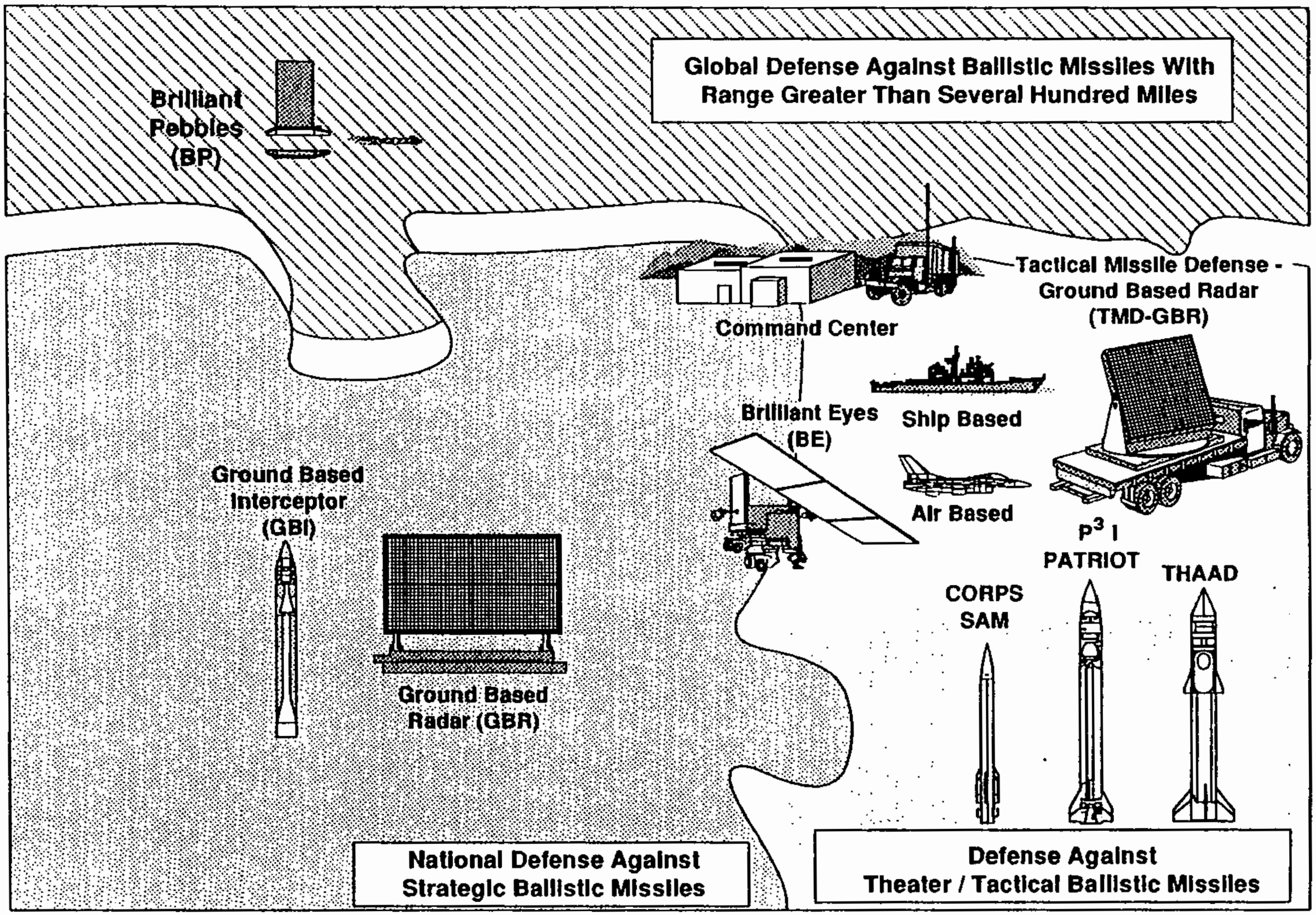
*Possible Future SU*

*Third World Weapons Proliferation*




jm-23519 / 012292

# GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)



# MISSILE DEFENSE ACT OF 1991

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- It Is The Goal Of The United States To

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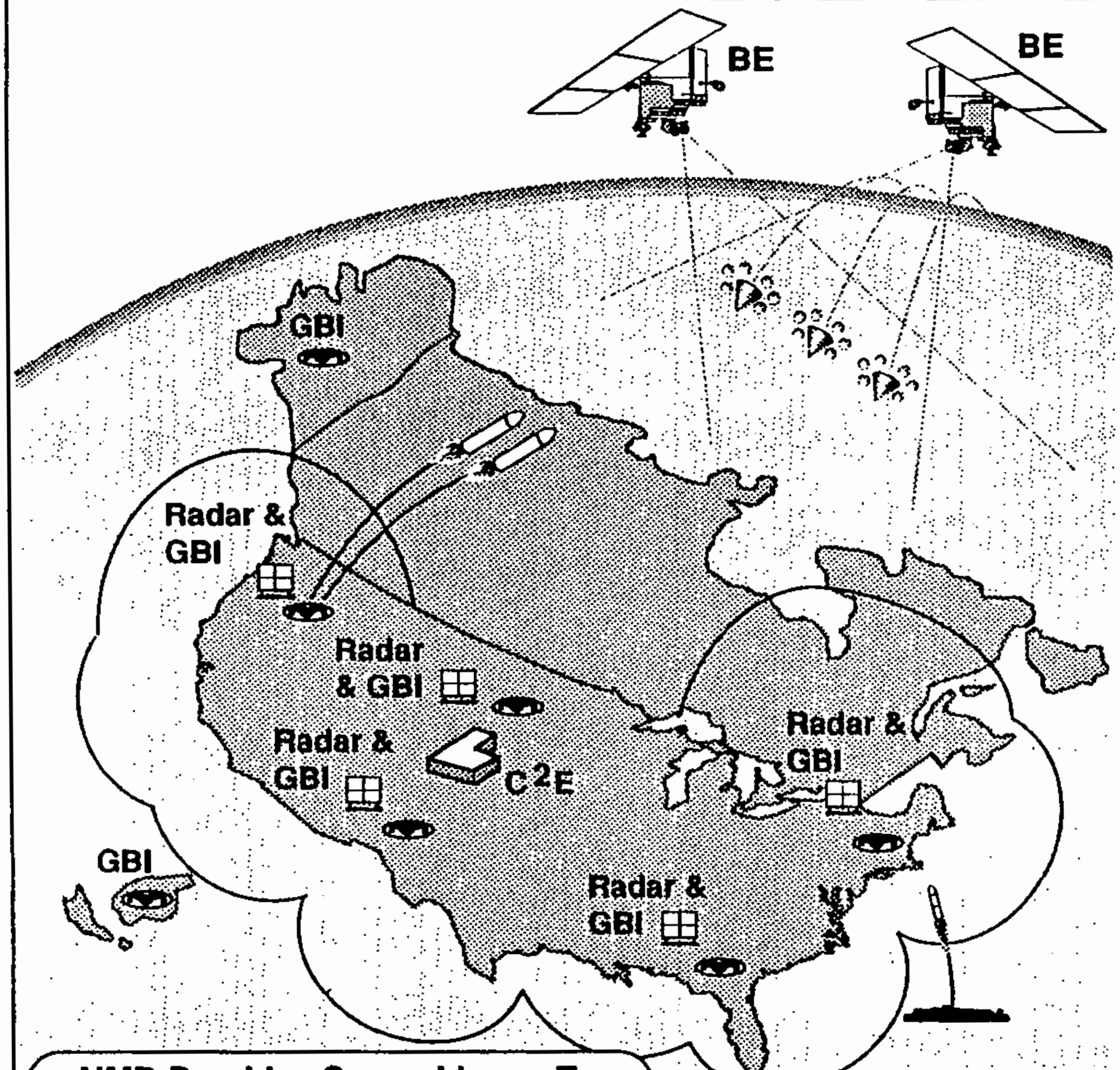
  - Maintain Strategic Stability

  - Provide Highly Effective Theater Missile Defenses (TMDs) To Forward Deployed And Expeditionary Elements Of The Armed Forces Of The United States And To Friends And Allies Of The United States

# NATIONAL MISSILE DEFENSE




- **High System Effectiveness Requires Multilayered Defense**
  - **BE Provides Tracking And Discrimination Of PBVs And RVs**
  - **GBR Provides Tracking And Discrimination Of PBVs And RVs Launched From Coastal SLBMs**
  - **Multiple GBI Sites Provide Multiple Shot Opportunities Against**
    - **RVs**
    - **PBVs Launched From Coastal Submarines**
  - **BE And GBR Provide Distributed Battle Planning And Execution**
  - **BE And GBR Provide IFTU / TOM**

**NMD Provides Second Layer To Achieve High System Effectiveness**

jm-21699 / 021292

# 1991 MISSILE DEFENSE ACT
# LIMITED DEFENSE SYSTEM

- Design To Protect The United States Against Limited Ballistic Missile Threats
  - Accidental Or Unauthorized Launches
  - Third World Attacks

- Develop For Deployment, A Cost Effective, Operationally Effective, ABM Treaty Compliant, Antiballistic Missile System At A Single Site As The Initial Step Toward Deployment Of A Highly Effective Antiballistic Missile System

- By The Earliest Date Allowed By The Availability Of Appropriate Technology Or By FY 96

# TOP LEVEL STRATEGY

- Deploy Initial Site As Soon As Possible As Called For In The MDA91 And Build On It
  - On The Path To Full Multisite NMD
- Maintain Options To Respond To Uncertain Futures With A Robust Technology Base Program
- Maintain Consistency With Evolving National And International Policies And Constraints

# BASELINE PROGRAM

- CCE / BMC$^3$ Open Architecture Design For Full GPALS With First Site Components Operational To Support Initial Capability

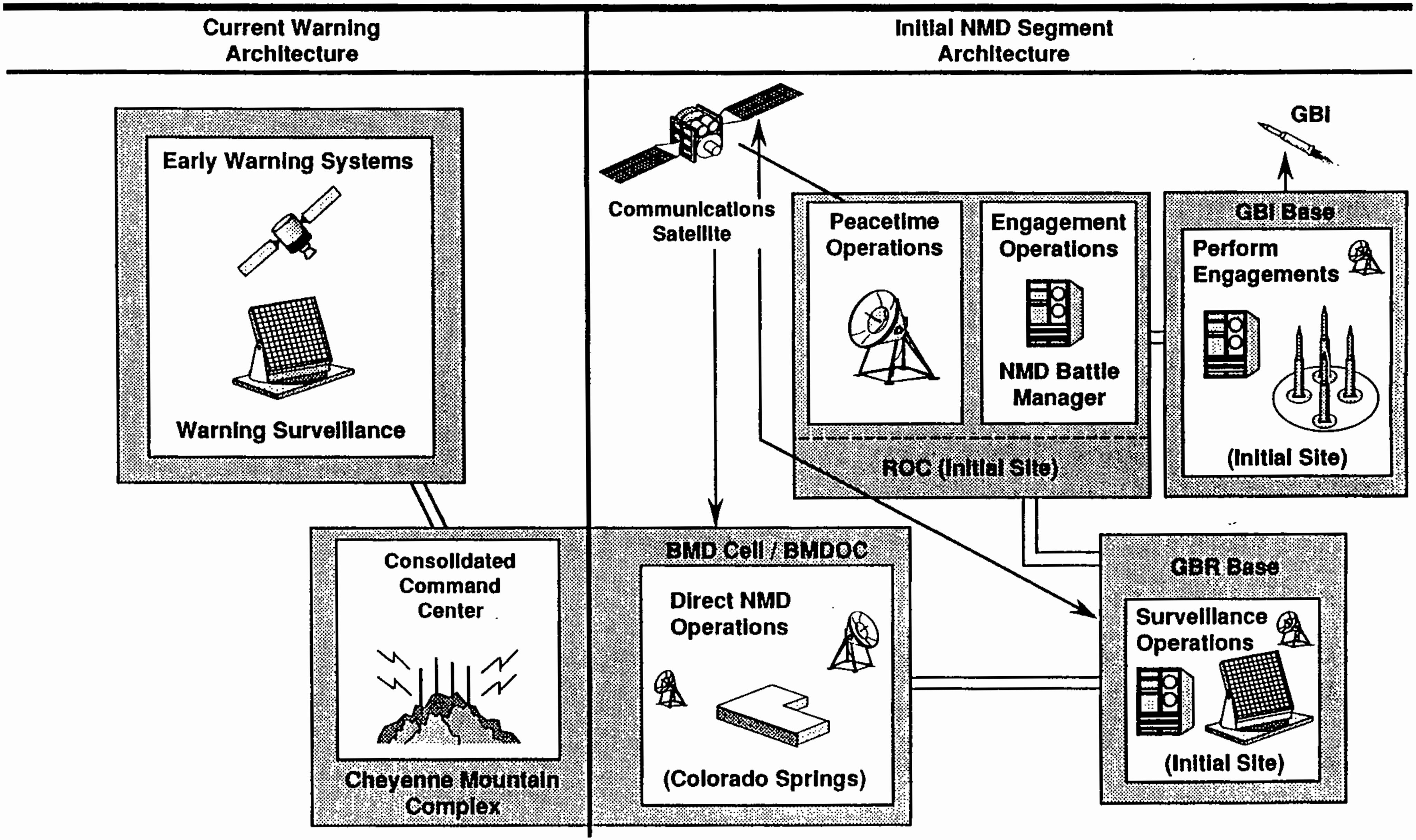
- GBR And GBI Operational At First Site To Support Initial Capability

- Accelerated Deployments Of BE As Primary Midcourse Optical Sensor To Augment Initial Capability

  - Maximum Kinematic Footprint For GBI As Early As Possible

- GSTS Maintained As Backup Optical System As Hedge Against Failure Of Critical BE Technology Demonstrations

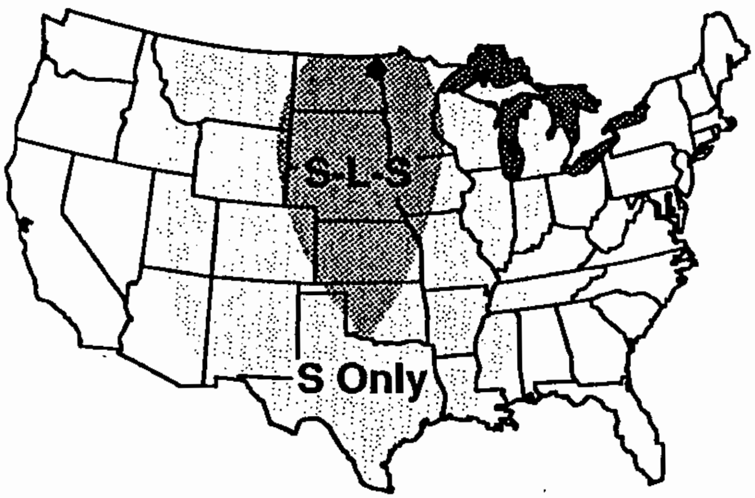
# INITIAL NMD BMC3




jm-19765g / 022492

# COMPOSITE MULTI-THREAT DEFENSE COVERAGE

- Composite Threat
  - CSS-4 From China And Middle East
  - SS-18, SS-N-20 In Bastion, SS-24 From CIS
- Single Site At Grand Forks, ND For GBI And GBR
- GBI Fly Out 6.5 km / sec

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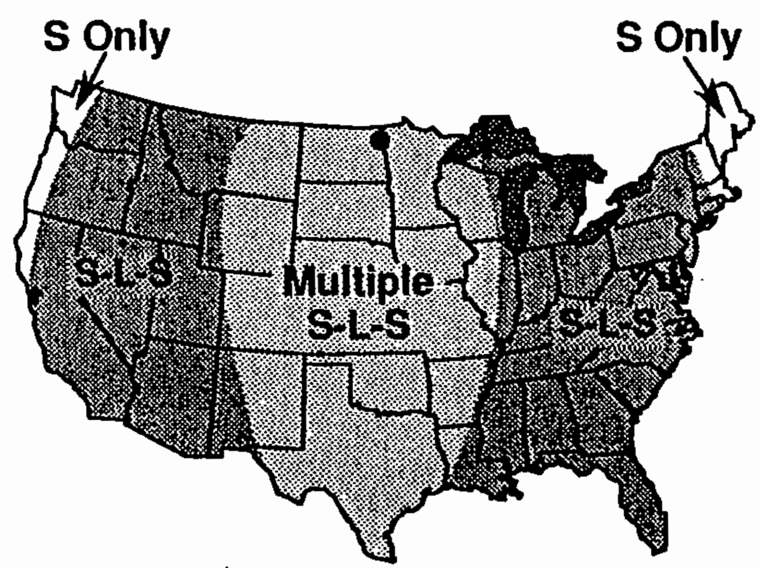
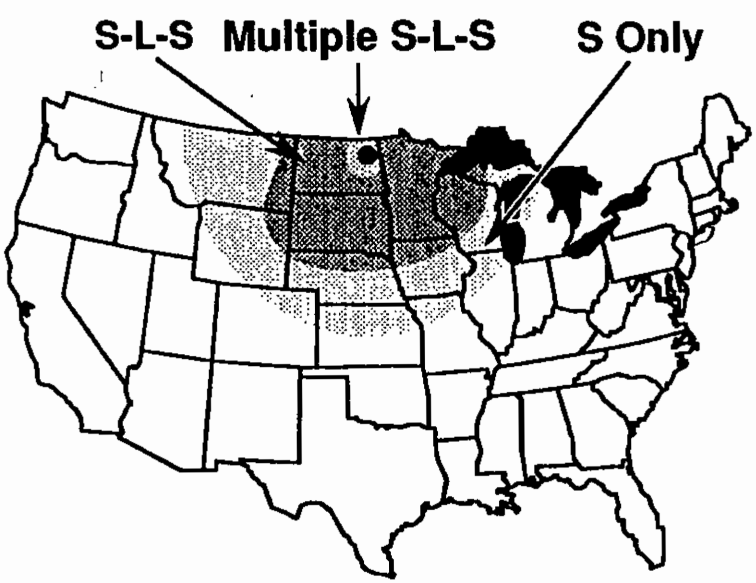



BE And GBR

jm-23800 / 020592

# DEFENSE COVERAGE

- SS-N-23 Out Of Bastion
  - 2,000 km From Coast
  - 24° Reentry Angle
- Single Site At Grand Forks, ND For GBR And GBI
- GBI Fly Out 6.5 km / sec

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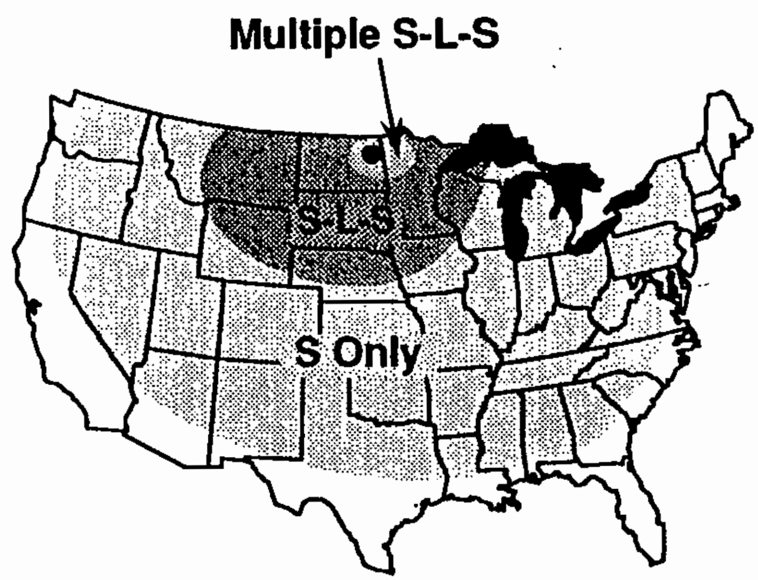
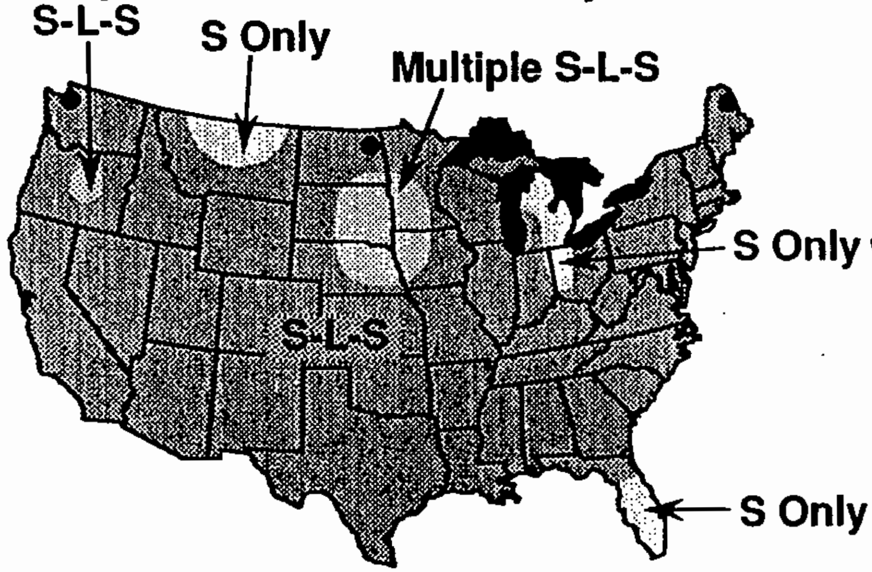



BE And GBR

jm-23969 / 020692

# COMPOSITE MULTI-THREAT DEFENSE COVERAGE

- Composite Threat
  - CSS-4 From China And Middle East
  - SS-18, SS-N-20 In Bastion, SS-24 From CIS
- Three Sites For GBR And GBI
  - NE
  - Grand Forks, ND
  - NW
- GBI Fly Out 6.5 km / sec

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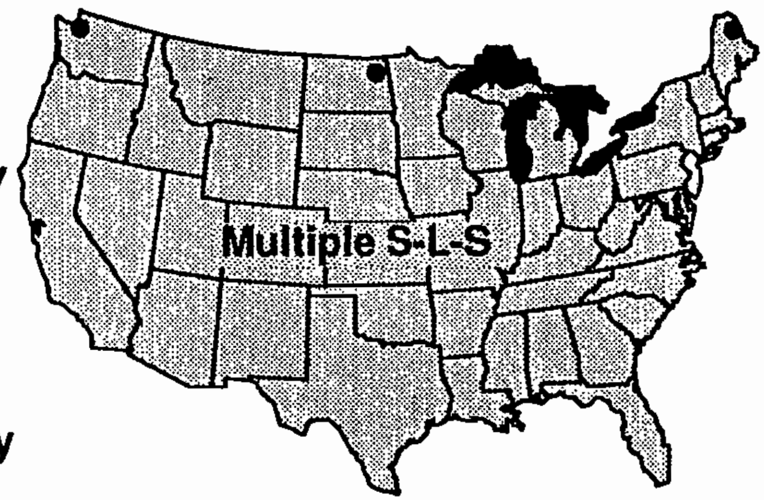
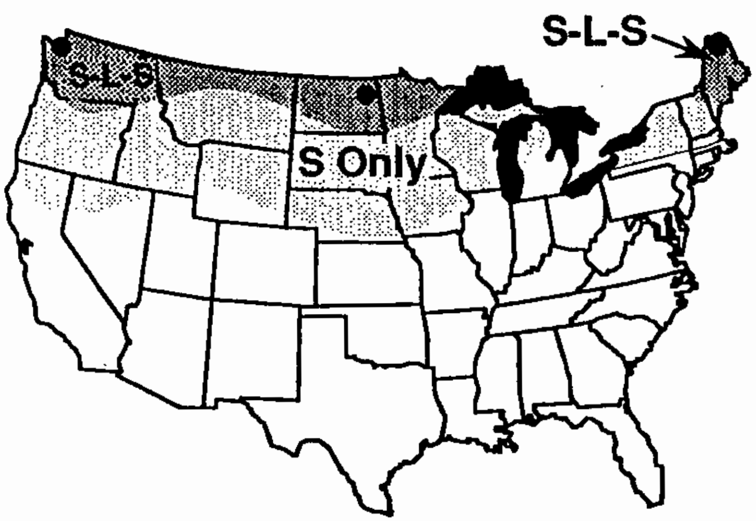



BE And GBR

jm-23974a / 022692

# COMPOSITE MULTI-THREAT DEFENSE COVERAGE

- SS-N-23 Out Of Bastion
  - 2,000 km From Coast
  - 24° Reentry Angle
- Three Sites For GBR And GBI
  - NE
  - Grand Forks, ND
  - NW
- GBI Fly Out 6.5 km / sec

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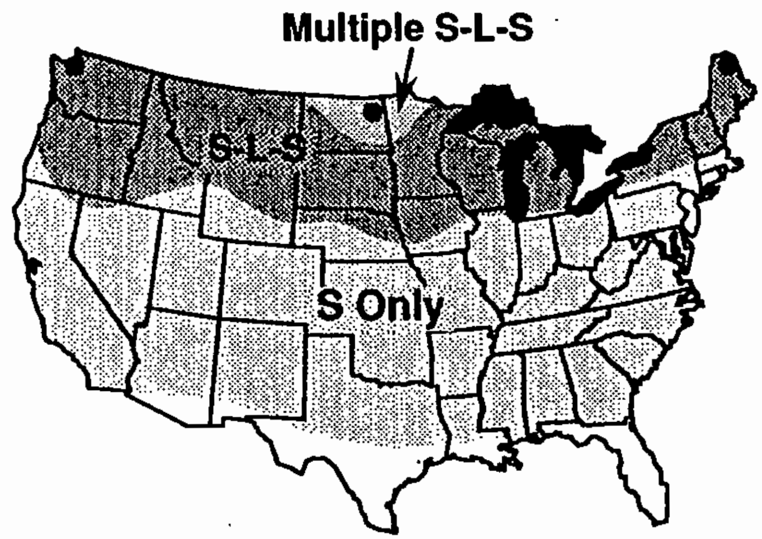


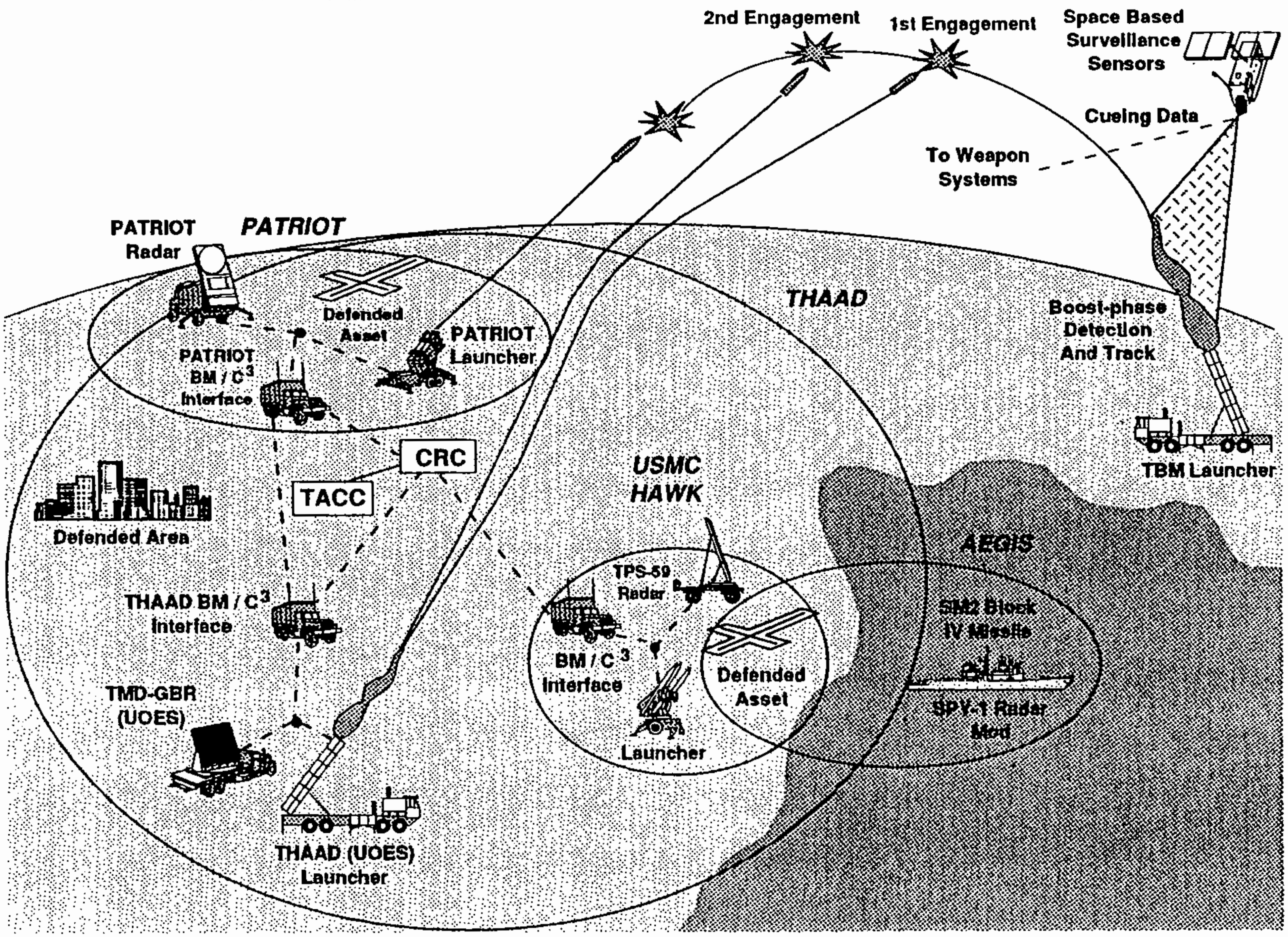

BE And GBR

jm-23973a/ 022892

# JCS MISSION AREA NEEDS STATEMENT

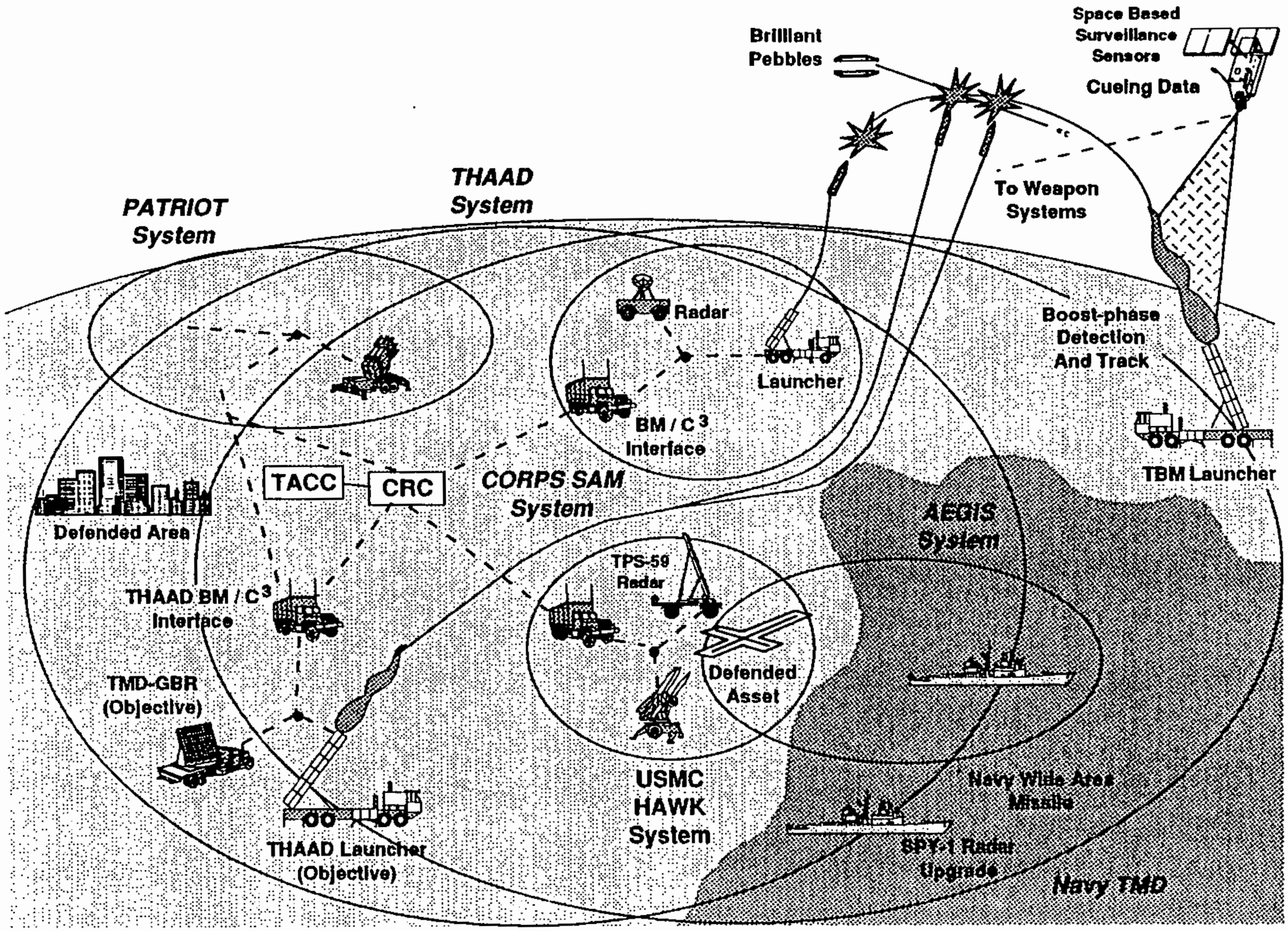
- "Theater Missile" Includes Ballistic, Cruise, And Air-To-Surface Types
- Protect U.S. Forces, U.S. Allies And Other Important Countries Including Areas Of Vital Interest To The U.S., From Theater Missile Attack
- Conventional, Chemical, Biological And Nuclear Warheads
- Four Mission Areas
- Mix Of Land, Air, Sea, And Space Capabilities
- $C^3$I Should Be Incorporated Into Existing Structures
- "Defense In Depth" With Multiple Shot Opportunities
- C-130 Deployable

# NEAR TERM TBMD ACTIVE DEFENSE BASELINE ARCHITECTURE



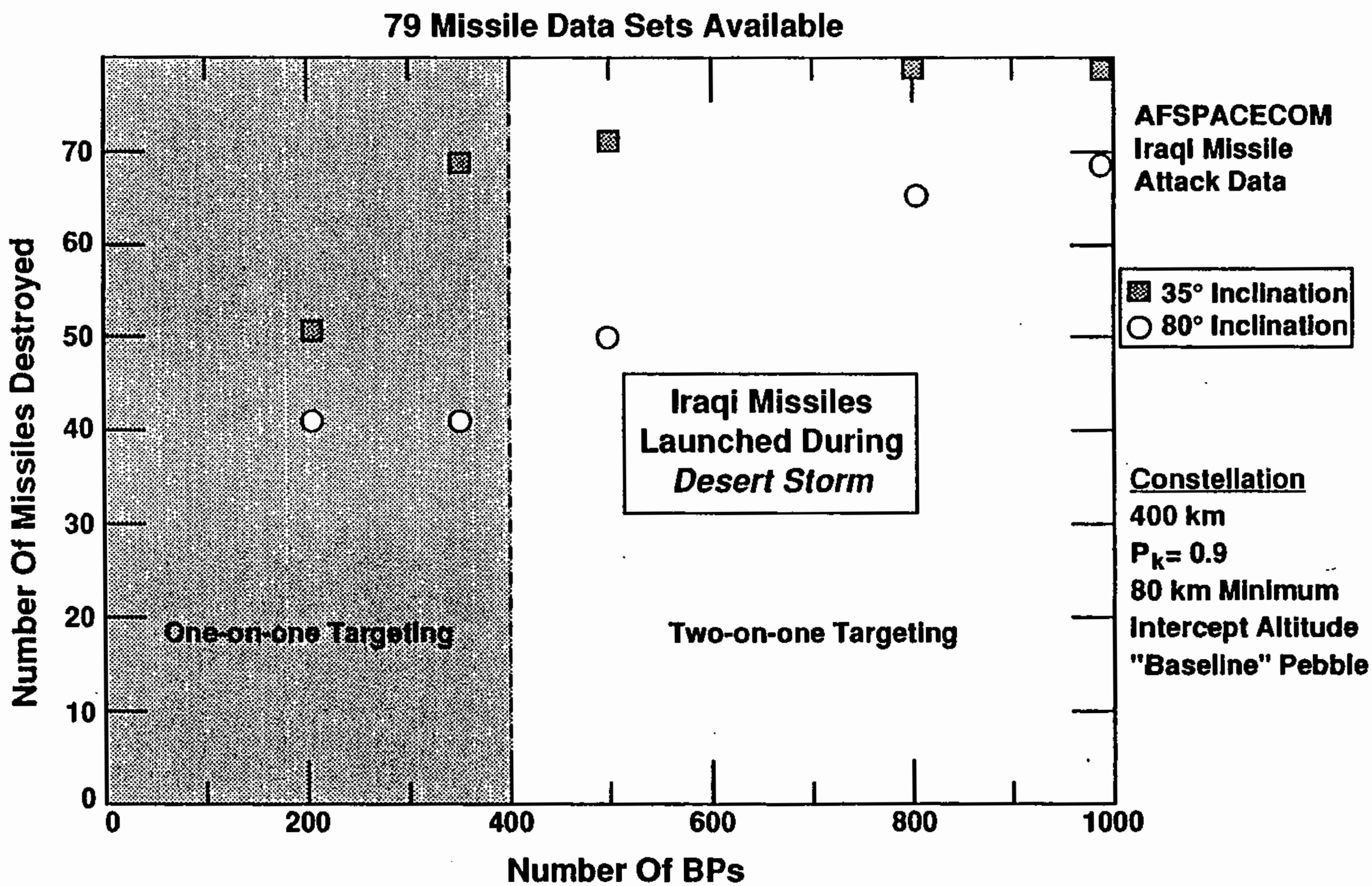

jm-13186.c / 021192

# FAR TERM TBMD ACTIVE DEFENSE BASELINE ARCHITECTURE



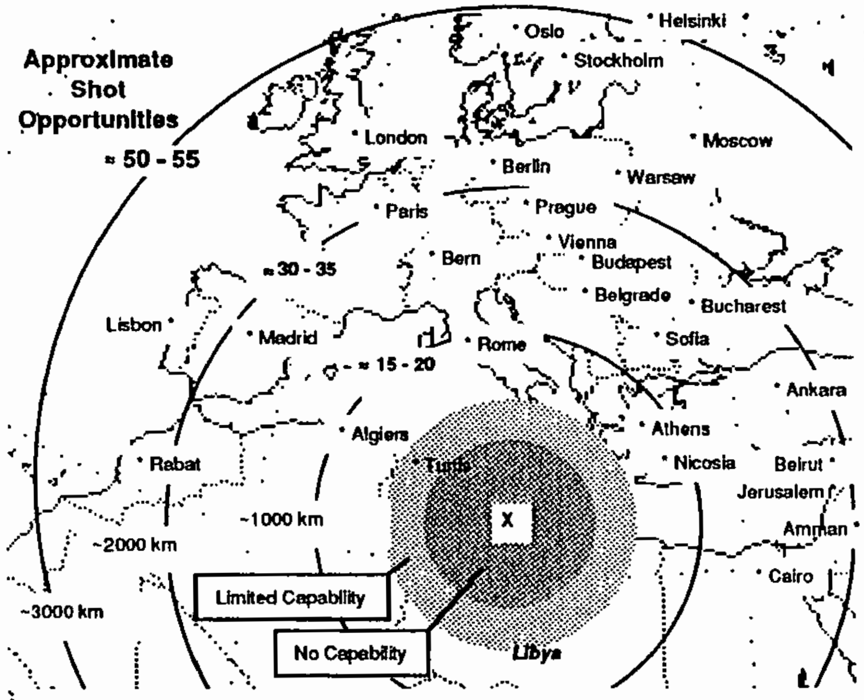

jm-13186.D / 021192

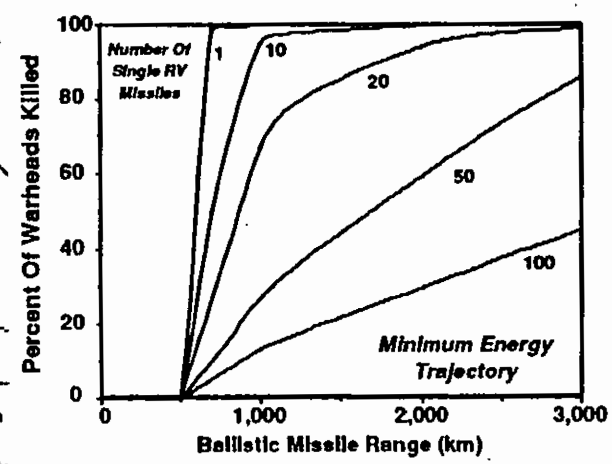
# HOW WOULD BRILLIANT PEBBLES HAVE PERFORMED AS THE SPACE-BASED SEGMENT IN GPALS AGAINST IRAQI MISSILES LAUNCHED DURING *DESERT STORM* ?

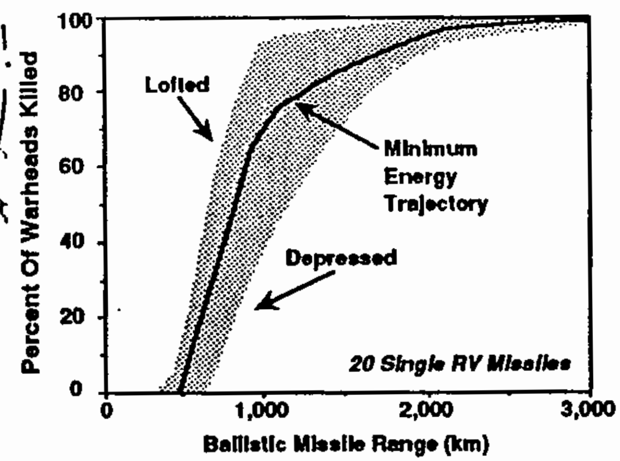



jm-16285a / 051091

# 1,000 BP CAPABILITY AGAINST HYPOTHETICAL ATTACK FROM LIBYA




- **1,000 BPs At Low Earth Orbit In A Typical Constellation**
- **Multiple Shots Available Against Simultaneous Launches**
- **Similar Capability vs ICBM / SLBM Attack**

jm-23504a / 021892

FOI92-0855

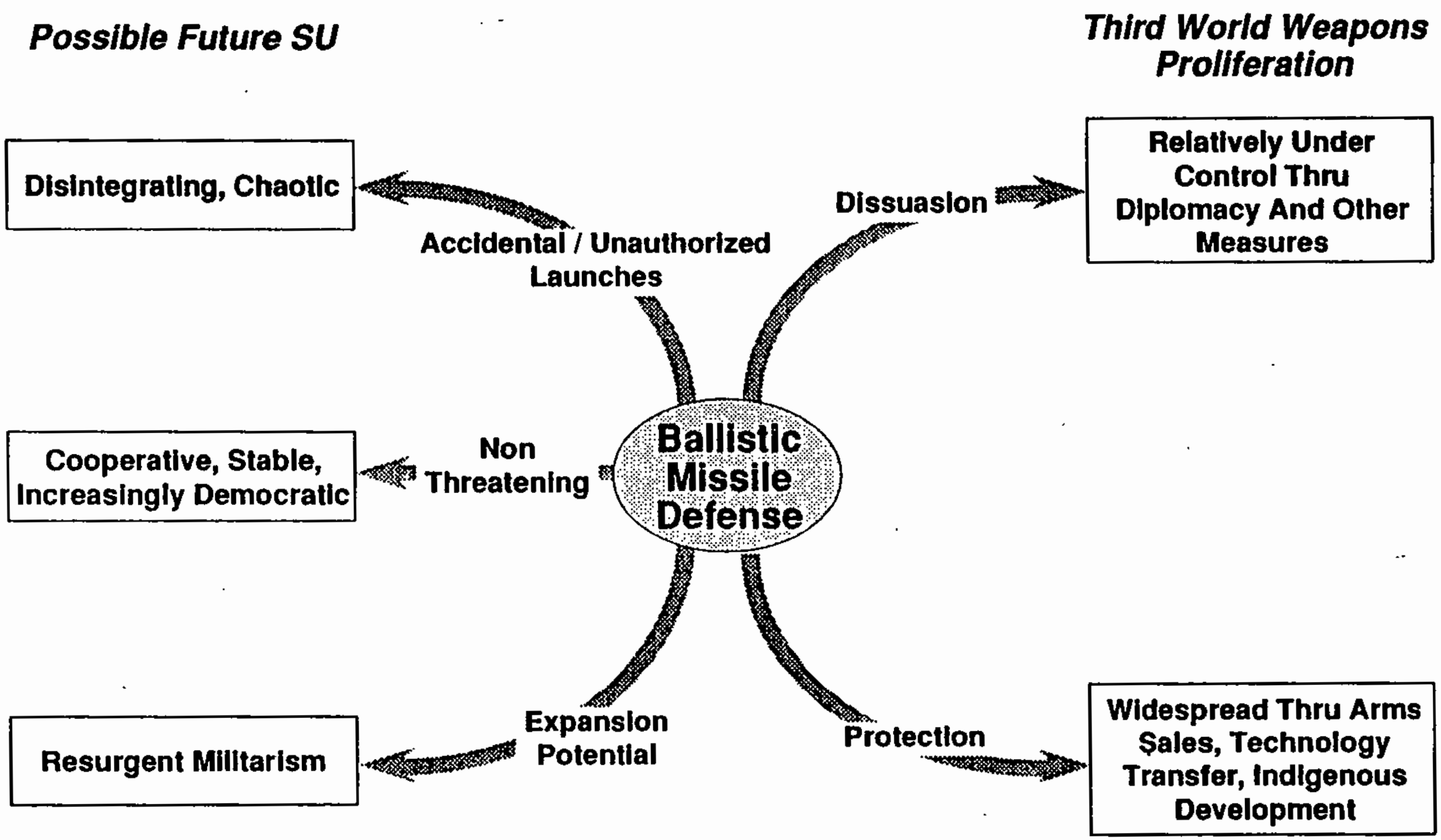
# STRATEGIC DEFENSE INITIATIVE

## Advance Planning Briefing For Industry On Global Protection Against Limited Strikes (GPALS)

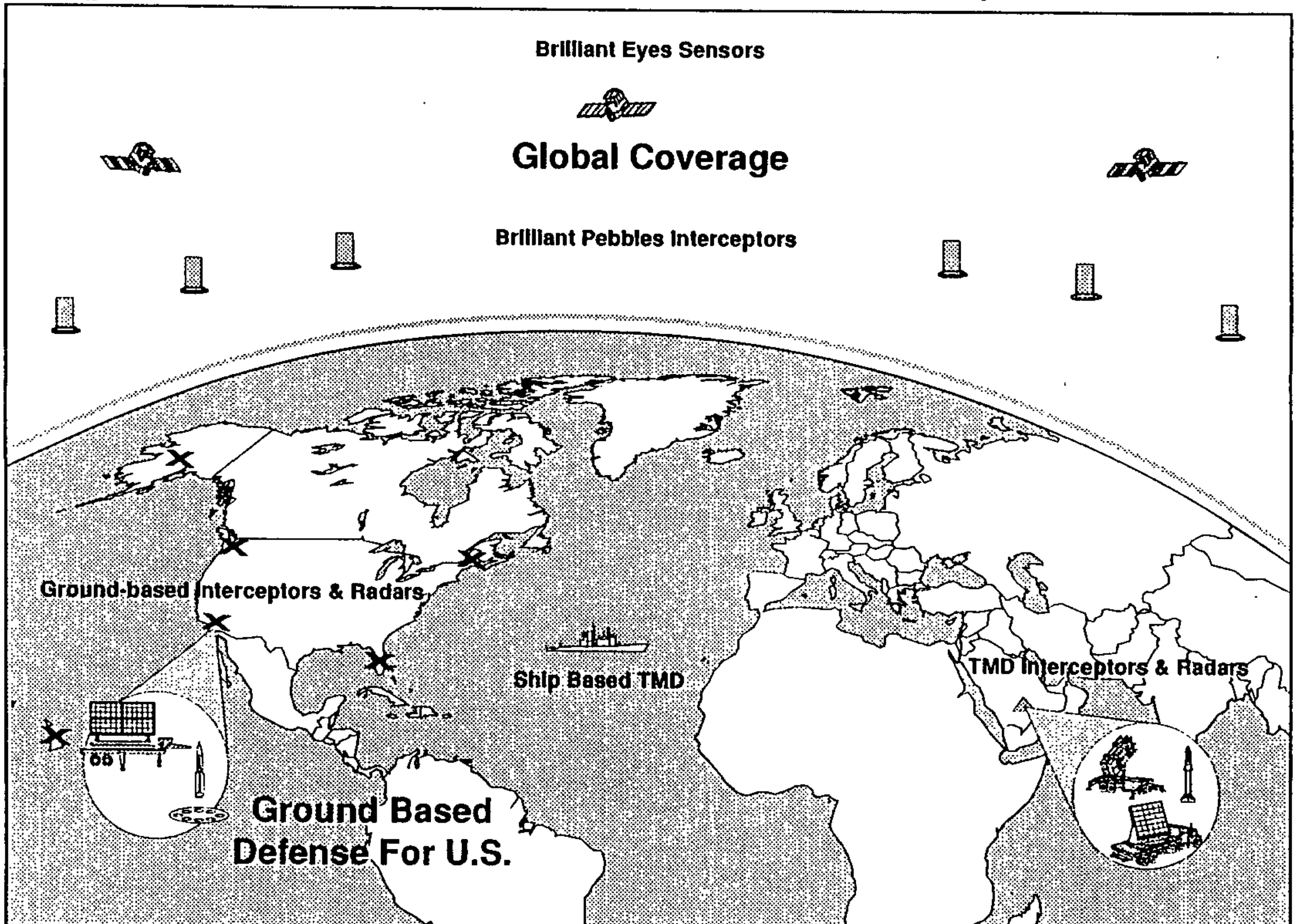
2 MAR 92


Dr. James Carlson
Deputy For Strategic Defense
Strategic Defense Initiative Organization

# DEALING WITH UNCERTAIN FUTURES



# GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)




jm-16366.f / 020492

# 1991 MISSILE DEFENSE ACT
# LIMITED DEFENSE SYSTEM

*(National System)*

- Design To *Protect* The United States Against *Limited* Ballistic Missile Threats
  - *Accidental Or Unauthorized Launches*
  - *Third World Attacks*

- Develop For *Deployment* A
  - *Cost Effective*
  - *Operationally Effective*
  - *ABM Treaty Compliant*

- Antiballistic Missile System At A *Single* Site As The *Initial Step* Toward *Deployment* Of A Highly Effective Antiballistic Missile System

- By The Earliest Date Allowed By The Availability Of Appropriate Technology Or By FY 96

# MISSILE DEFENSE ACT OF 1991

### Goal
- Deploy An ABM System, Including One Or An Adequate Additional Number Of ABM Sites And Space-based Sensors, That Is Capable Of Providing A Highly Effective Defense Of The U.S. Against Limited Attacks Of Ballistic Missiles
- Maintain Strategic Stability
- Provide Highly Effective Theater Missile Defenses To Forward Deployed And Expeditionary Elements Of U.S. Forces And To U.S. Friends And Allies

### ABM Treaty Negotiations
- Congress Recognizes The President's Call For "Immediate" Concrete Steps To Permit The Deployment Of Defenses Against Limited Ballistic Missile Strikes And The President Of The Soviet Union Undertaking To Consider Such Proposals From The U.S. On Nonnuclear ABM Systems
- Congress Urges The President To Pursue Immediate Discussions With The Soviets On The Feasibility And Mutual Interests Of Amendments To The ABM Treaty To Permit
  - More Ground Sites And Interceptors
  - Increase Use Of Space Sensors For BM / $C^3$
  - Clarification Of Development And Testing
  - Flexibility For Advanced ABM Technology
  - Clarification Between TMD And ABM Defenses

GMD

### Spaced-based Interceptors
- Conduct Research On Space-based Kinetic-kill Interceptors And Associated Sensors That Could Provide An Overlay To Ground-based ABM Interceptors
- Robust Funding For Research And Development . . . Including Brilliant Pebbles, Is Required
- Deployment Of Brilliant Pebbles Is Not Included In The Initial Plan For The Limited Defense System Architecture
- Report On Conceptual And Burden Sharing Issues Associated With Deploying Space-based Interceptors (Including Brilliant Pebbles) For Purpose Of Providing Global Defenses Against Ballistic Missile Attacks

NMD

### Limited Defense System
Development Of Systems, Components And Architectures For A Deployable ABM System Capable Of Providing A Highly Effective Defense Of The U. S. Against Limited Strikes, But Below A Threshold That Would Bring Into Question Strategic Stability

Includes Activities Necessary To Develop And Test Systems, Components, And Architectures Capable Of Deployment By FY 96 As Part Of An ABM Treaty Compliant Initial Site Defense System

For Purposes Of Planning, Evaluation, Design, And Effectiveness Studies, Such Programs, Projects, And Activities May Take Into Consideration Both The Current Limitations Of The ABM Treaty And Modest Changes To Its Numerical Limitations And Its Limitations On The Use Of Space-based Sensors

### Initial Deployment
Develop For Deployment By The Earliest Date Allowed By The Availability Of Appropriate Technology, Or By FY 96, A Cost Effective, Operationally Effective, And ABM Treaty Compliant ABM System At A Single Site As The Initial Step Toward Deployment Of The ABM System Described [In The Act's Goal]
- 100 Ground-based Interceptors (The Design Of Which Determined By Competition And Down Selection)
- Fixed, Ground-based ABM Battle Management Radars
- Optimum Utilization Of Space Sensors Including Sensors Capable Of Cueing Ground-based ABM Interceptors And Providing Initial Targeting Vectors

TMD

### Theater Missile Defenses
- Aggressively Pursue The Development Of Advanced Theater Missile Defense Systems With The Objective Of Down Selecting And Deploying Such Systems By The Mid-1990s
- Capable Of Defending Forward-deployed And Expeditionary Elements Of The Armed Forces Of The United States
- Cooperation With Friendly And Allied Nations In the Development Of Theater Defenses Against Tactical Or Theater Ballistic Missiles

### Review Of Deployment Options
- Interim Report Due MAY 94 On Progress Of Negotiations
- Assess Progress And Consider Options To The U.S. As Now Exist Under ABM Treaty

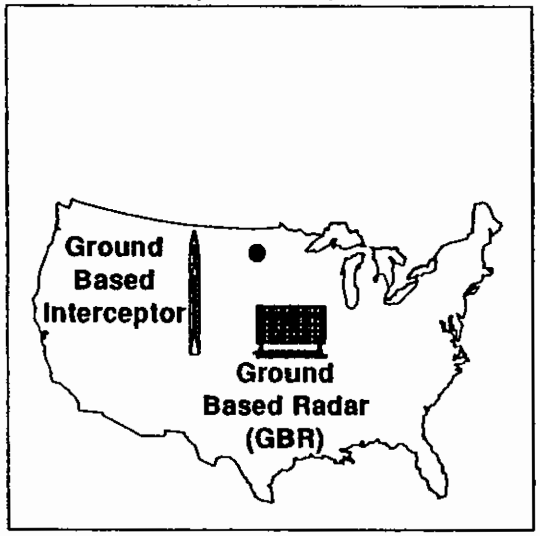
### Deployment Plan
- Within 180 Days, Submit Deployment Plan For TMD Systems And The ABM System Established By The Act's Goal

jm-22230J / 012992

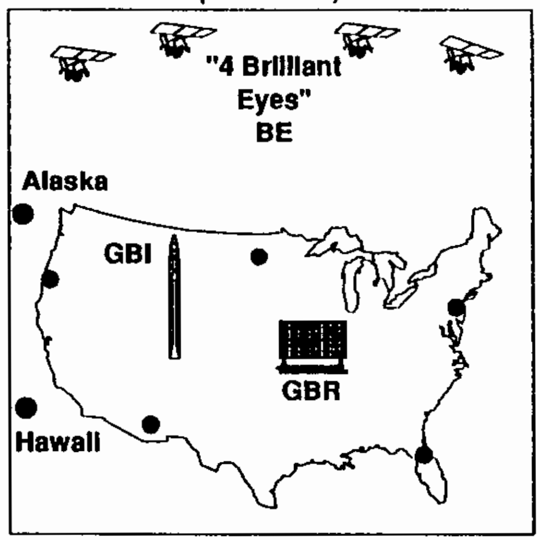
# DEFENSE ARCHITECTURE

Goals:
- Highly Effective Defenses Of The U.S. Against Limited Attacks Of Ballistic Missiles — Consistent With Strategic Stability
- Highly Effective Theater Missile Defenses For Forward Deployed And Expeditionary U.S. Forces, Friends And Allies

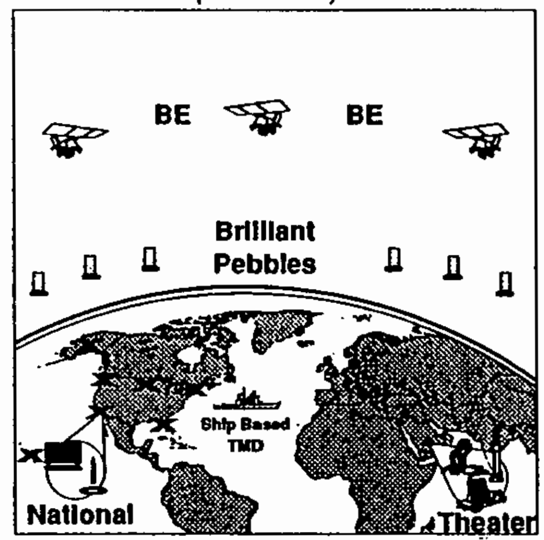
***Initial Site Defense System (FY 96 - 97)***



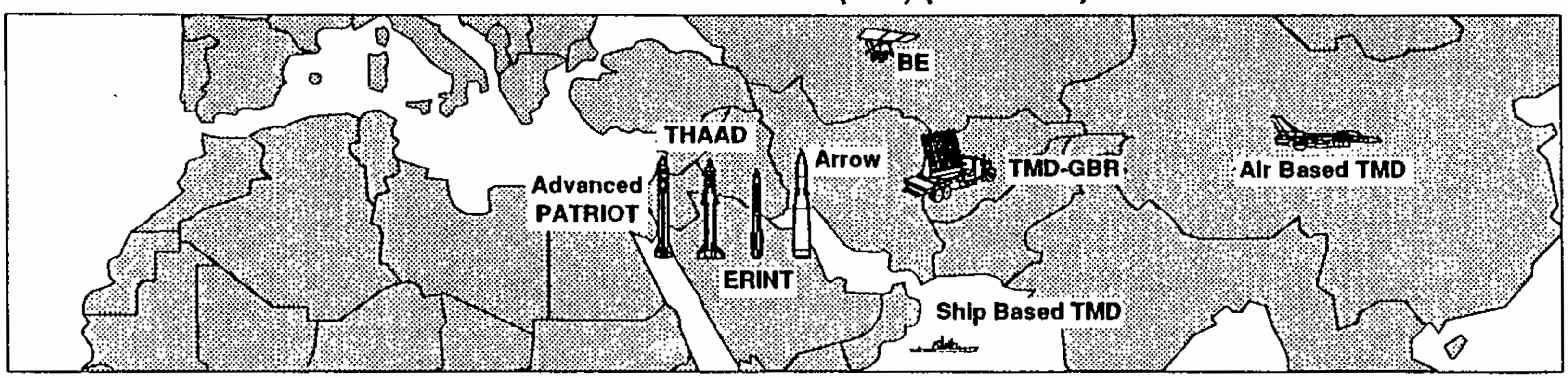

***Limited Defense System (FY 98 - 02)***




***With Space Based Interceptors (FY 00 - 03)***




***Theater Missile Defense (IMD) (FY 92 - 05)***




jm-22219B / 020392

# 180-DAY REPORT PLAN

- Two Teams Performing Up Front Studies

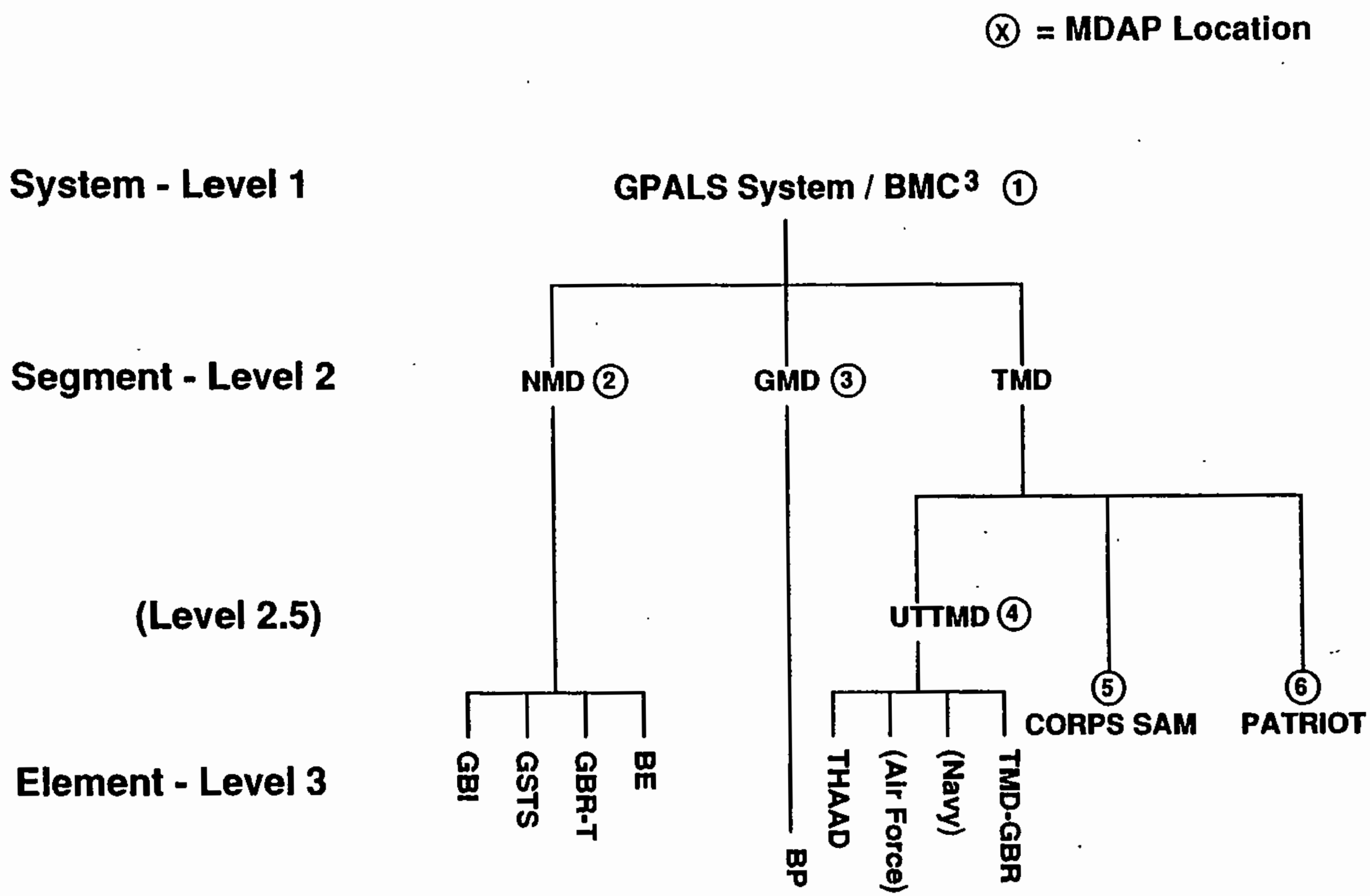
  - TMD, Led By MG O'Neill
  - U.S. Homeland Defense, Led By Dr. Gerry

- Results To Be Reviewed By SDI System Design Board Prior To SDIO Recommendations For FY 94-99 POM

- Schedule

  - Finalize Approach By April 1992 POM Submission
  - Submit Draft Of 180-Day Report To SECDEF By May 1992
  - Due To Congress June 1992

# GPALS HIERARCHY




**GPALS System / BMC$^3$ MDAP Tells The Whole GPALS Story**

jm-21732 / 110491

# SDIO SSC / DAB STRATEGY

| GPALS Management DAB | SSC [illegible]OC Review (Postponed) | GPALS Program DAB (Postponed) | AO Meeting | SSC Meeting | SSC Chairman's Review | JCS / OSD Coordination Meeting | 180 Day Report To Congress | GPALS Program DAB |
|---|---|---|---|---|---|---|---|---|
| SEP 91 | DEC 91 | DEC 91 | 11 FEB | 20 FEB | | ? | JUN 92 | |

**Pre-Missile Defense Act** (SEP 91 – 20 FEB)

**Post-Missile Defense Act** (20 FEB – GPALS Program DAB)

## *Objectives*
## *February 1992 SSC*

- **Based On "Previous World"**
  **(Process Initiated February 1991 With Element CARD Tasking)**

  - **Approve Baseline Approach**
  - **Discuss Plan To Get To "Spring DAB"**
  - **Conclude Baseline Documentation Process**
  - **Close Out 10 DEC 91 SSC Issues**

## *Objectives*
## *Summer GPALS DAB*

- **Based On Missile Defense Act Of 1991**

  - **Review GPALS Architectural And Acquisition Strategy**
  - **Approve GPALS MDAP Baselines And Initial Element PPCs**
  - **Approve MDAP Cost Estimates**
  - **Approve DAB Documentation Required By White Paper**

# FY 92 MAJOR CONTRACTING ACTIVITIES

- Upper Tier Theater Missile Defense Concept Exploration
- Ground Based Radar
- Brilliant Eyes
- Ground Based Interceptor
- Numerous Supporting Technology Programs

# OPTIONS ASSESSMENT FOR GBI

- GBI Must Meet NMD Segment Effectivity Performance Requirements
- Deployable Exo Interceptor At GF, Upgradable To Full Operational Capability Later
- GBI / NMD Options Development
  - Describe Options For Exo GBI In FY 97
    - Development
    - Fabrication
    - Test
    - Integration
    - Production
    - Deployment
  - Options That Improve NMD Requirements Documents
    - Industry Perspective On Critical Requirements
    - Allocations Between GBI And NMD Segment
  - Options For GBI Performance Enhancement
    - Risk Reduction
    - Approach For Tech Infusion To Meet Full Operational Capability
    - Militarization

# GBI OPTIONS ASSESSMENT

| Activity | FY 92 | | | | | | | | FY 93 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN |
| Release CBD Notice | △ 19 | | | | | | | | | | | |
| Release Options RFP | | △ 6 | | | | | | | | | | |
| Industry Proposal Prep | | △ 6 | △ 3 | | | | | | | | | |
| Evaluate / Negotiate | | | △ 3 △ 17 | | | | | | | | | |
| Award Options Contract | | | △ 21 | | | | | | | | | |
| Options Assessment Phase | | | △ 21 | IPR | IPR | — | △ 21 | | | | | |
| Release Draft GBI RFP | | | | △ | | | | | | | | |
| OSD Review | | | | | | △ 20 | △ 21 | | | | | |
| Release GBI RFP | | | | | | | | △ 4 | | | | |
| Industry Proposal Prep | | | | | | | | △ 4 | △ 20 | | | |
| Evaluate Proposal | | | | | | | | | △ 20 | — | △ 31 | |
| Negotiate | | | | | | | | | | | △ 31 | △ 23 |
| Award GBI Contract | | | | | | | | | | | | △ 23 |

# GLOBAL PROTECTION AGAINST LIMITED STRIKES SYSTEM

- GPALS Represents A New Capability
  - No Existing System
  - Must Be Viewed As An Entity

- GPALS Architecture Must Be Capable Of Evolving Over Time
  - To Accommodate Changing Geopolitical Context
  - Acquisition Strategy Will Evolve With Architecture

- Importance Of Urgency Has Been Made Clear By Secretary Of Defense And The Congress
  - Will Not Occur With A "Business As Usual" Approach

**End Points Of A New Capability Should Not Be Predetermined Up Front**

jm-21722 / 021092

FoI 92-0855

# STRATEGIC DEFENSE INITIATIVE

## System Engineering

2 MAR 92

COL W. Hecker, USA
Strategic Defense Initiative Organization

jm-24718 / 022892

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# OUTLINE

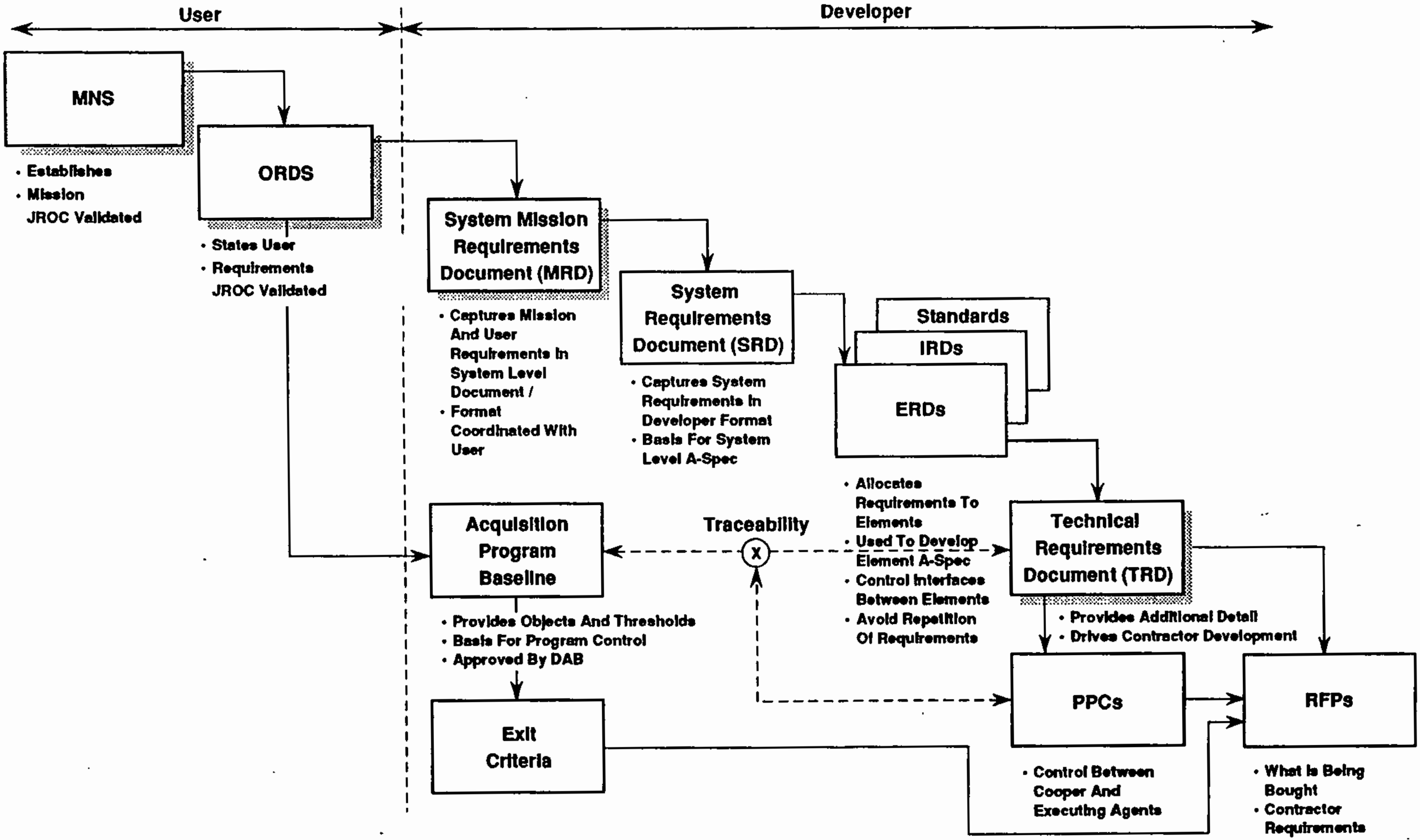
- System Engineering Approach
- User Interface
- Requirements Traceability
- Performance Assessment
- System Risk Management
- GPALS Integration

# SYSTEMS ENGINEERING APPROACH

- Strong, Centralized SE&I Activity
  - Single Contractor
  - Central Operating Facility And Multiple Field Sites Enable Close Coupling With User / Service Activities
  - Focused Support To Segment / MDAP Managers
  - GPALS System, BMC$^3$, NMD, GMD, TMD

- Key Responsibilities
  - Engineering Interface With User (USSPACECOM)
  - GPALS System Definition / Requirements Allocation
  - End-To-End Performance Assessment
  - GPALS Integration

# USER INTERFACE (REQUIREMENTS FLOW DOWN)

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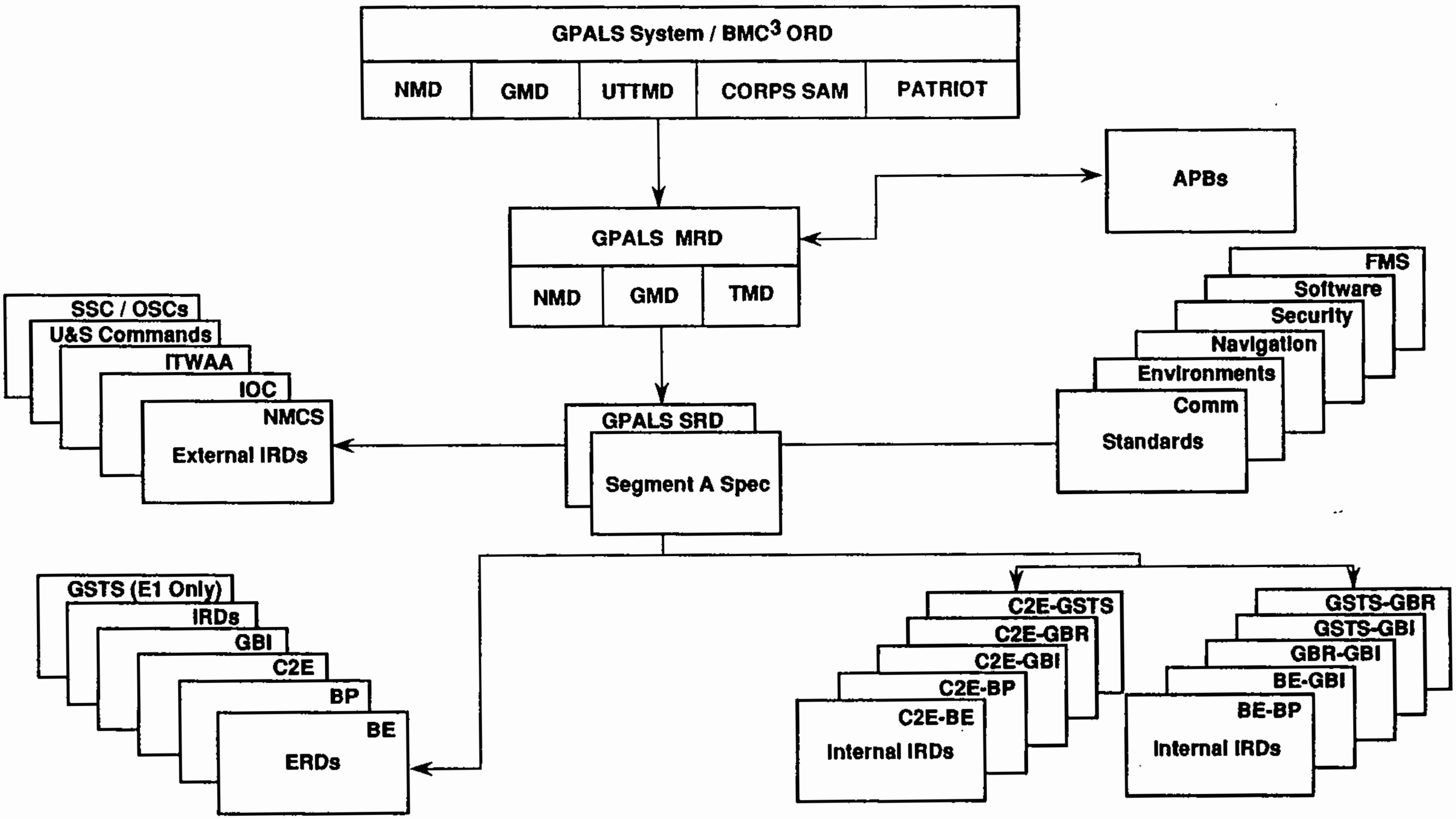
# GPALS REQUIREMENTS DOCUMENT TRACEABILITY




jm-24722 / 022892

# END-TO-END PERFORMANCE ASSESSMENT

- System Effectiveness Is Iterated Using A Series Of Performance / Cost Trade-offs
  - At Each Succeeding Level Of Decomposition, Until
    - The Mission Requirements Are Met
    - System Objectives Are Satisfied
    - Most Cost Effective System Design Has Been Achieved

- Effectiveness Trades Include Balancing
  - Tier - Tier Performance
  - Sensor vs Weapon Performance
  - Individual Platform Performance vs Inventory
  - Inventories vs Location (Basing)

- Multiple Tier Concept Provides Flexibility To Balance The System To Meet The Mission Requirement

# SYSTEM RISK MANAGEMENT

- GPALS Risk Management Program Constitutes
  - Competitive Acquisition Strategies
  - Technology Back-up Programs
  - Test, Evaluation And Validation Activities
- System Test Plan Focuses And Integrates Test Beds, Simulators, Elements And Technology Programs To Resolve Critical Performance Issues
- Interactive Cycle Of Test Bed Confidence Building Establishes The Basis For Integrated System Level Test And Demonstration
- The Hierarchy Of Test Beds Provides For Rigorous Validation Of Test Results Under Controlled Test Conditions

# GPALS RISK ABATEMENT PROCESS

**GPALS System Risks**

H/W & S/W

Requirement

***Resolve Via***

- **Technology Development**
- **Hardware Alternatives / Trades**
- **Software / Hardware Trades**
- **Product And Process Development Test**

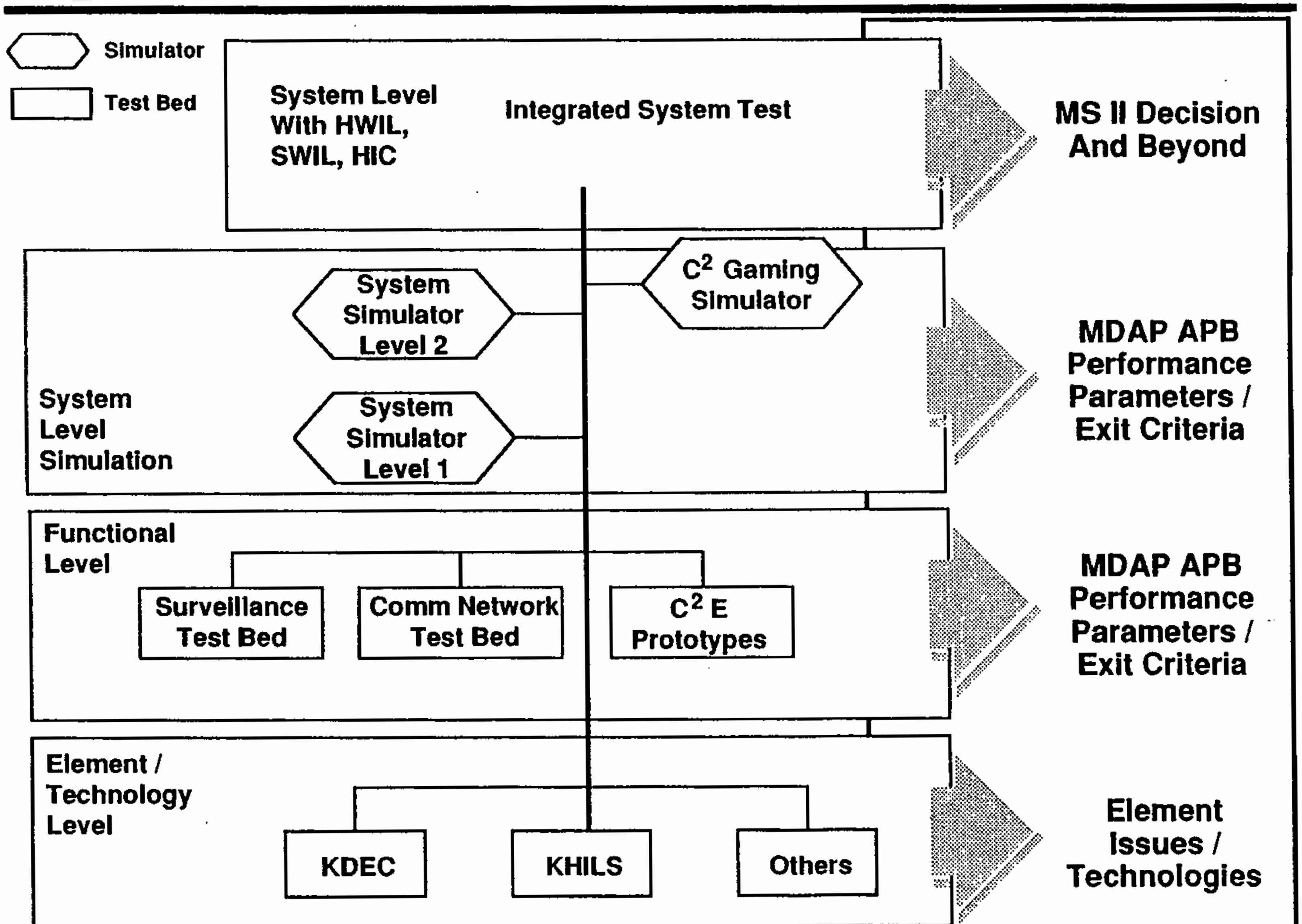
***Resolve Via***

- **Change System / Element Performance Requirement**
- **Architecture Trades**
- **Test Bed**

**GPALS Risk Management Process Resolves Risk Issues In Systematic Fashion**

jm-24725 / 022892

# TOOLS AVAILABLE TO SUPPORT GPALS SYSTEM




Note: This Chart Does Not Represent All Resources

jm-18045 /121891

F

FOI92-0855

# STRATEGIC DEFENSE INITIATIVE

## Brilliant Pebbles Advance Planning Briefing For Industry

**2-3 MAR 92**


**Lt Col Bill Rohlman, USAF**
**Deputy Director, Global Defense Segment Directorate**
**Strategic Defense Initiative Organization**


jm-24082 / 021292

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# AGENDA

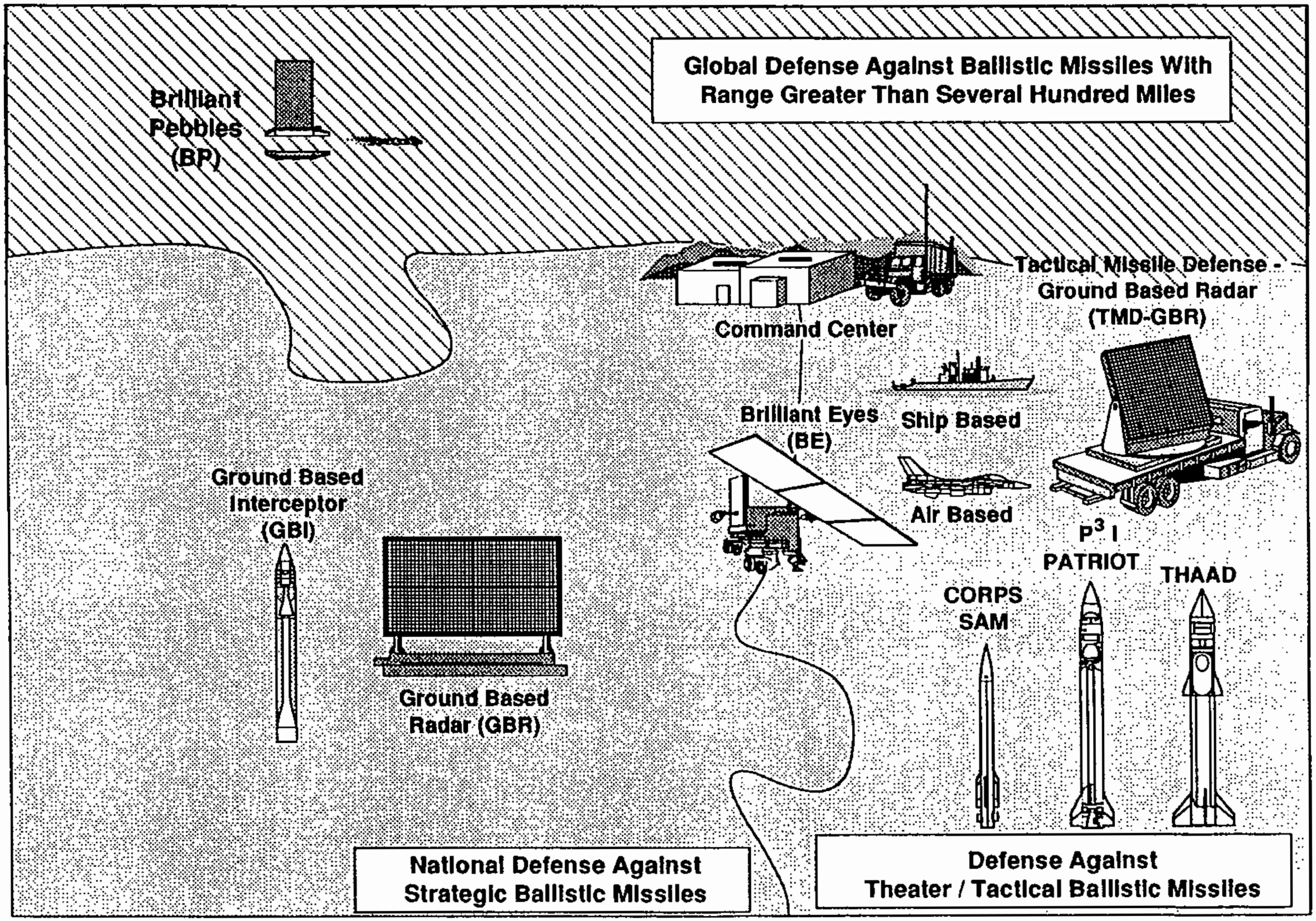
- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# BRILLIANT PEBBLES

- Space Based Weapon System
  - Distributed
  - Autonomous
  - Reduced Dependence On Other System Elements

- Continues Revolutionary Design Process
  - Exploratory
  - Emphasis On Cost And Weight
  - Emphasis On Near Term Technology

# GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)




jm-22119P / 021092

# PARADIGMS

- Space Weapon
  - Militarization Of Space
  - Ops Requirement
  - Space Debris

- Autonomous Operation
  - Current Satellite Operations
  - Impact On Current Systems
  - Collision Avoidance

- Mass Produced Satellite
  - Affordability
  - Reliability

# BRILLIANT PEBBLES FUNCTIONALITY

**Detect:** Detect And Track Booster / PBV / RV

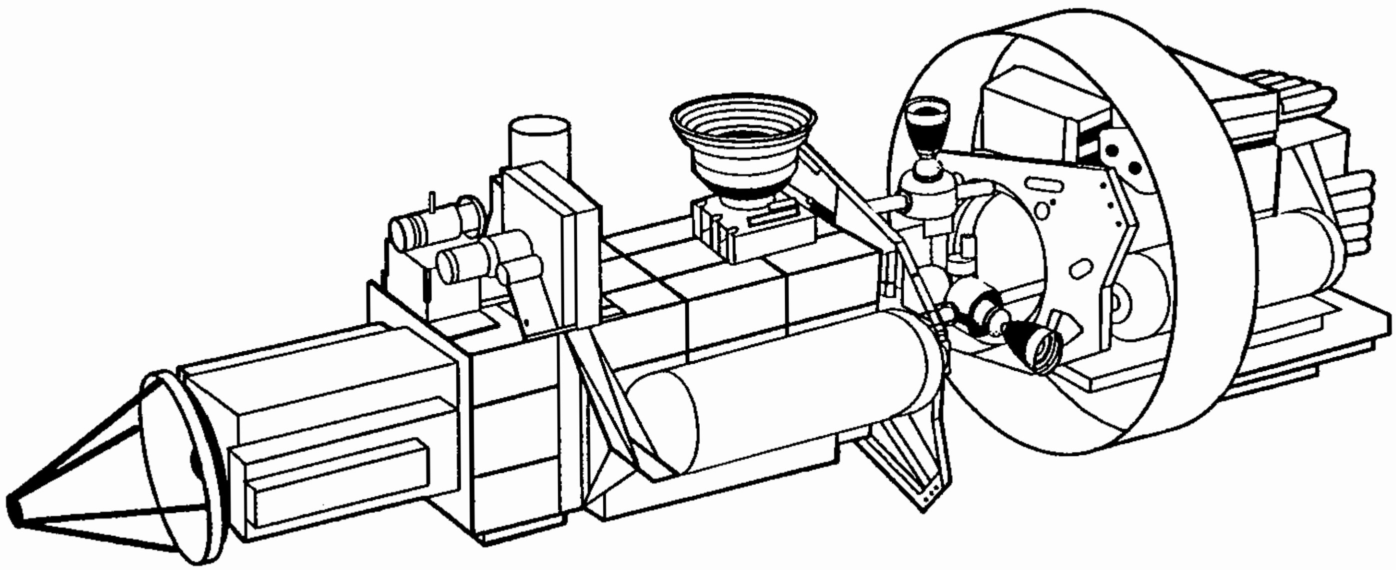
**Control:** Upon Release Authority (From Man-In-The-Loop), Guides Itself To Target

**Engage:** Hit-To-Kill Interceptor

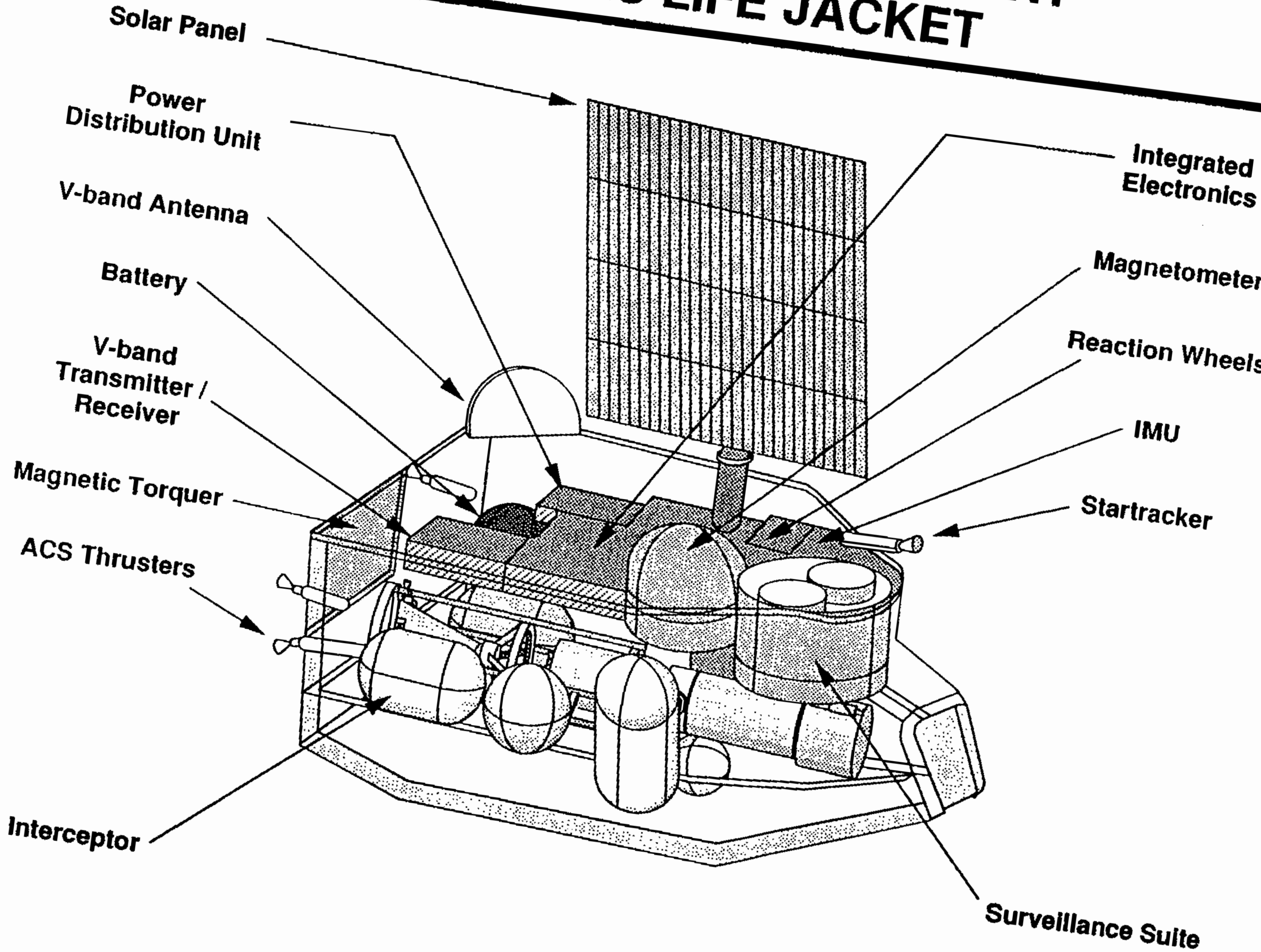
**Support:** Built In Support System (Power, Cooling, Navigation, Computing, etc.)

**Perform Many Functions On a Single (But Proliferated) Platform**

# LLNL (AIT) CDV INTERCEPTOR

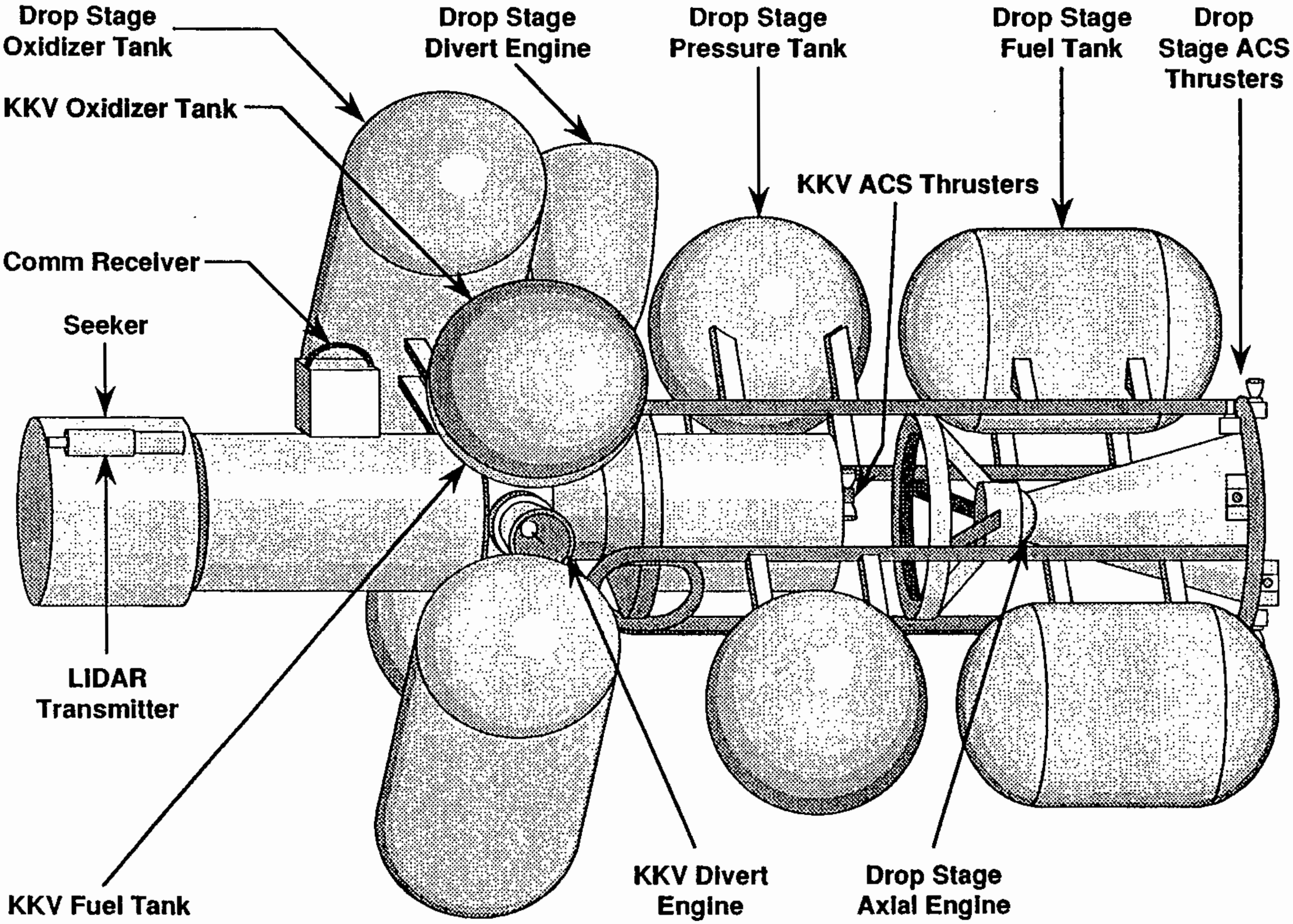


# MARTIN MARIETTA BRILLIANT PEBBLES LIFE JACKET



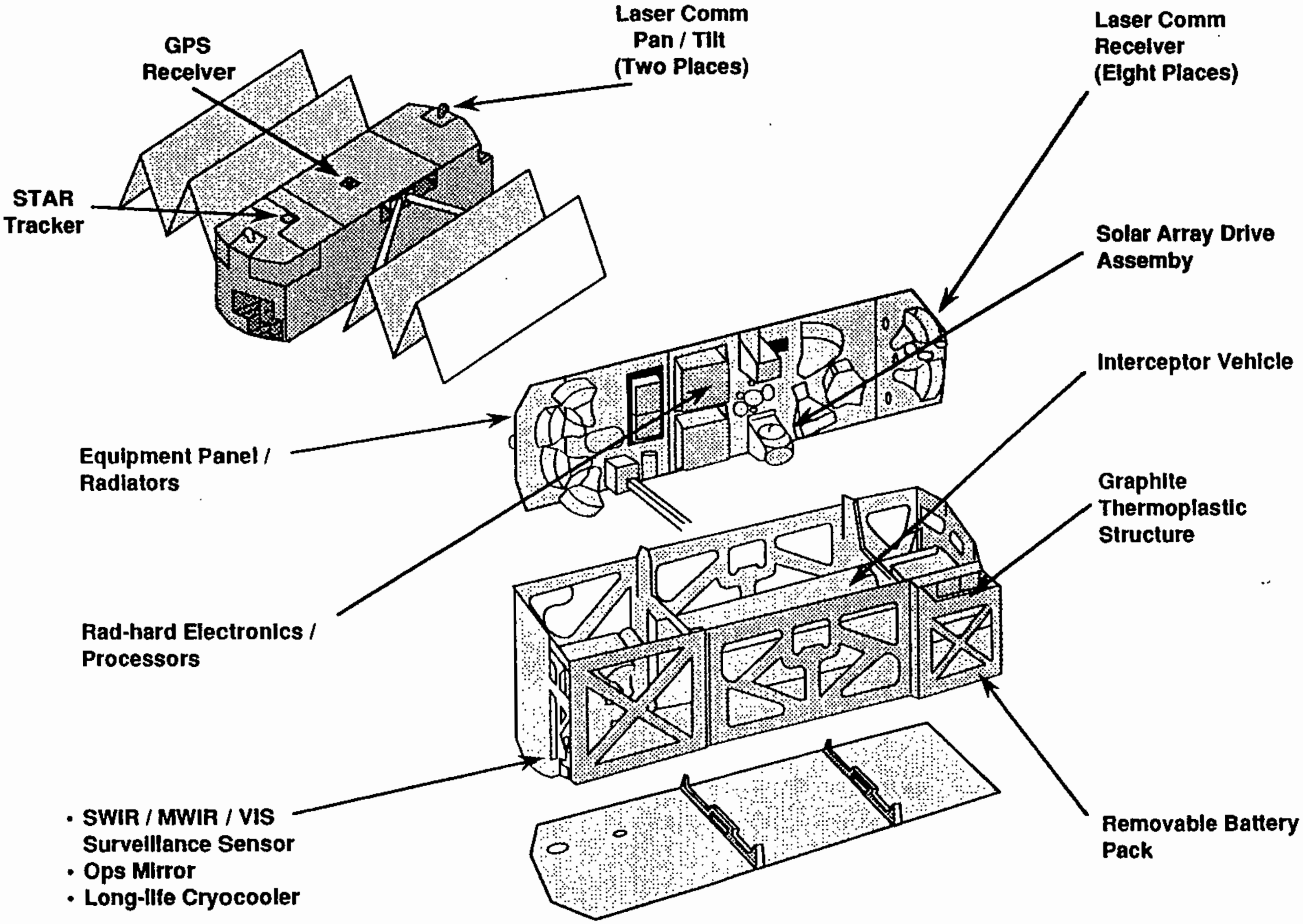

jm-19456 / 122091

# MARTIN MARIETTA BRILLIANT PEBBLES INTERCEPTOR



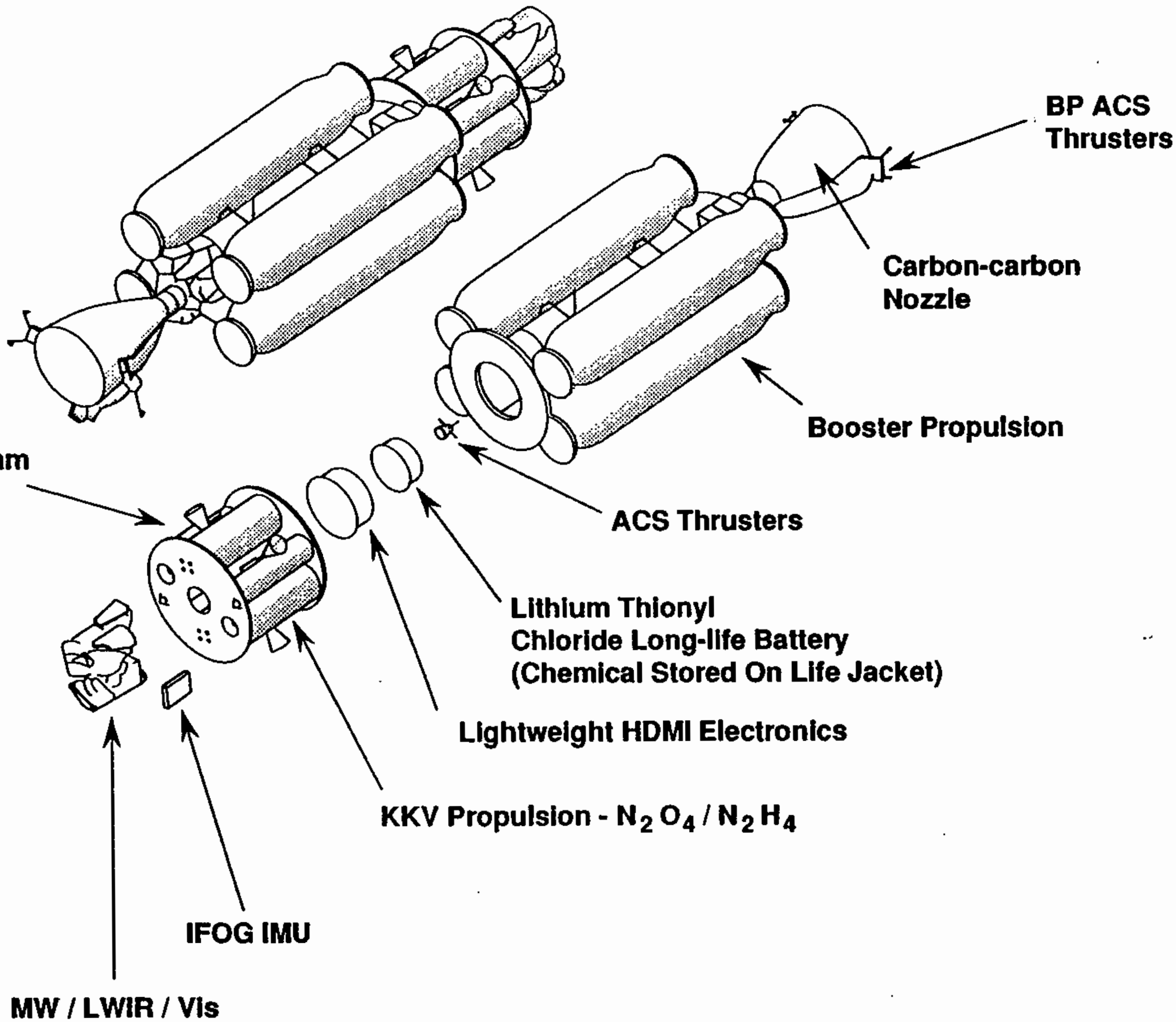

jm-19457 / 122091

# TRW BRILLIANT PEBBLES LIFE JACKET




jm-19463 / 112191

# TRW BRILLIANT PEBBLES INTERCEPTOR




jm-19464 / 112191

# AGENDA

- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# ACQUISITION OBJECTIVES

- Streamlined Acquisition
- "Fly Before Buy" Through Test Vehicles
- Encourage Industrial Innovation
- No Specifications Until EMD, Then Carefully Tailored

**Develop, Demonstrate And Produce
1 - 10K Brilliant Pebbles**

# ACQUISITION STRATEGY

- Concept Definition
- Pre-EMD Program Features
- EMD / Production

# AGENDA

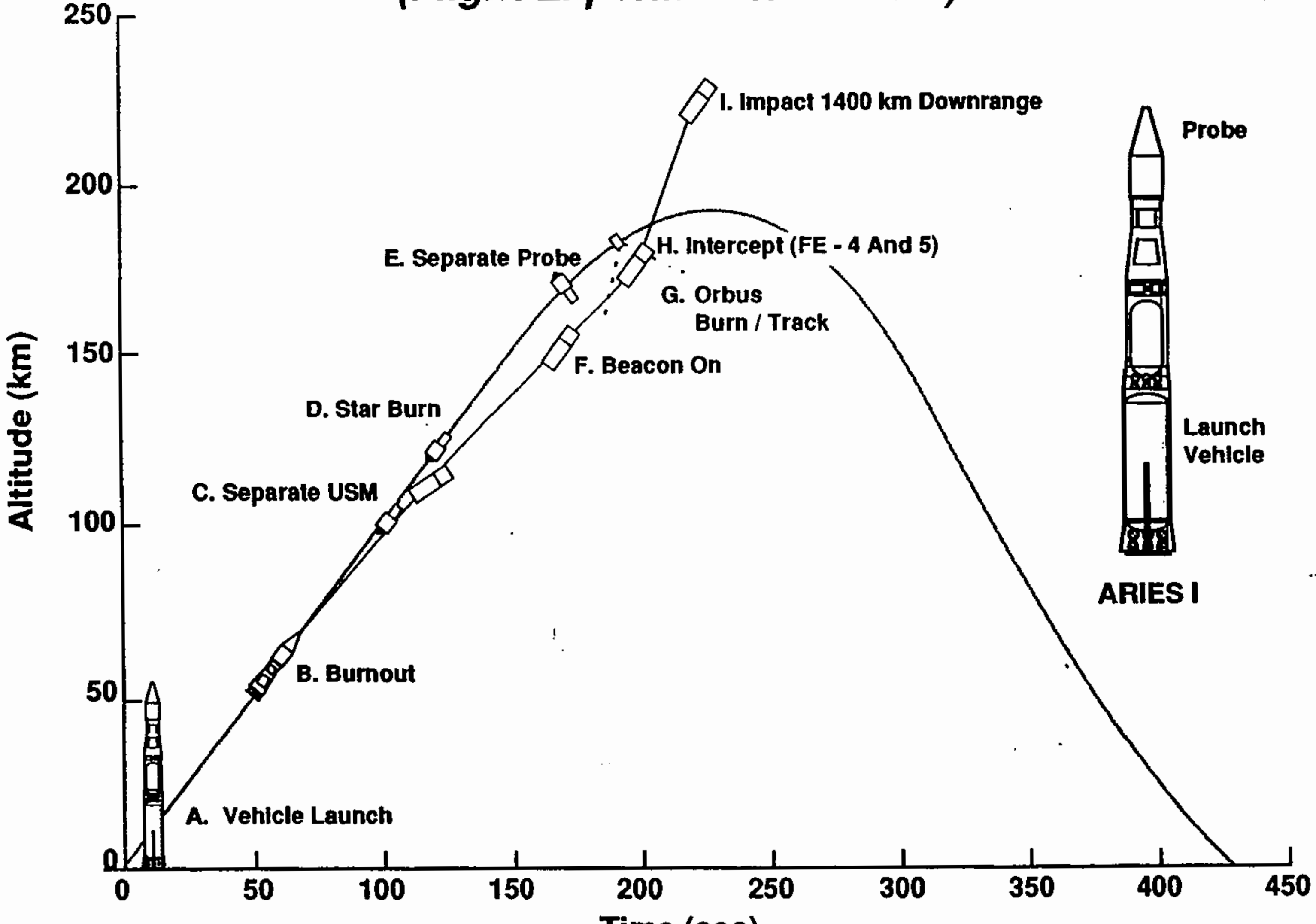
- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# FLIGHT TEST PROGRAM

- LLNL Leads For Flight Experiments 1-4 (Through 1992)
  - Pre-EMD Contractors Become Observers On These Experiments
- TRW And Martin Marietta Lead Beginning With BP-1T And BP-1M
  - LLNL Advises Industry
  - LLNL Continues Critical Technical Development

# LLNL PHASE II EXPERIMENT CONFIGURATION

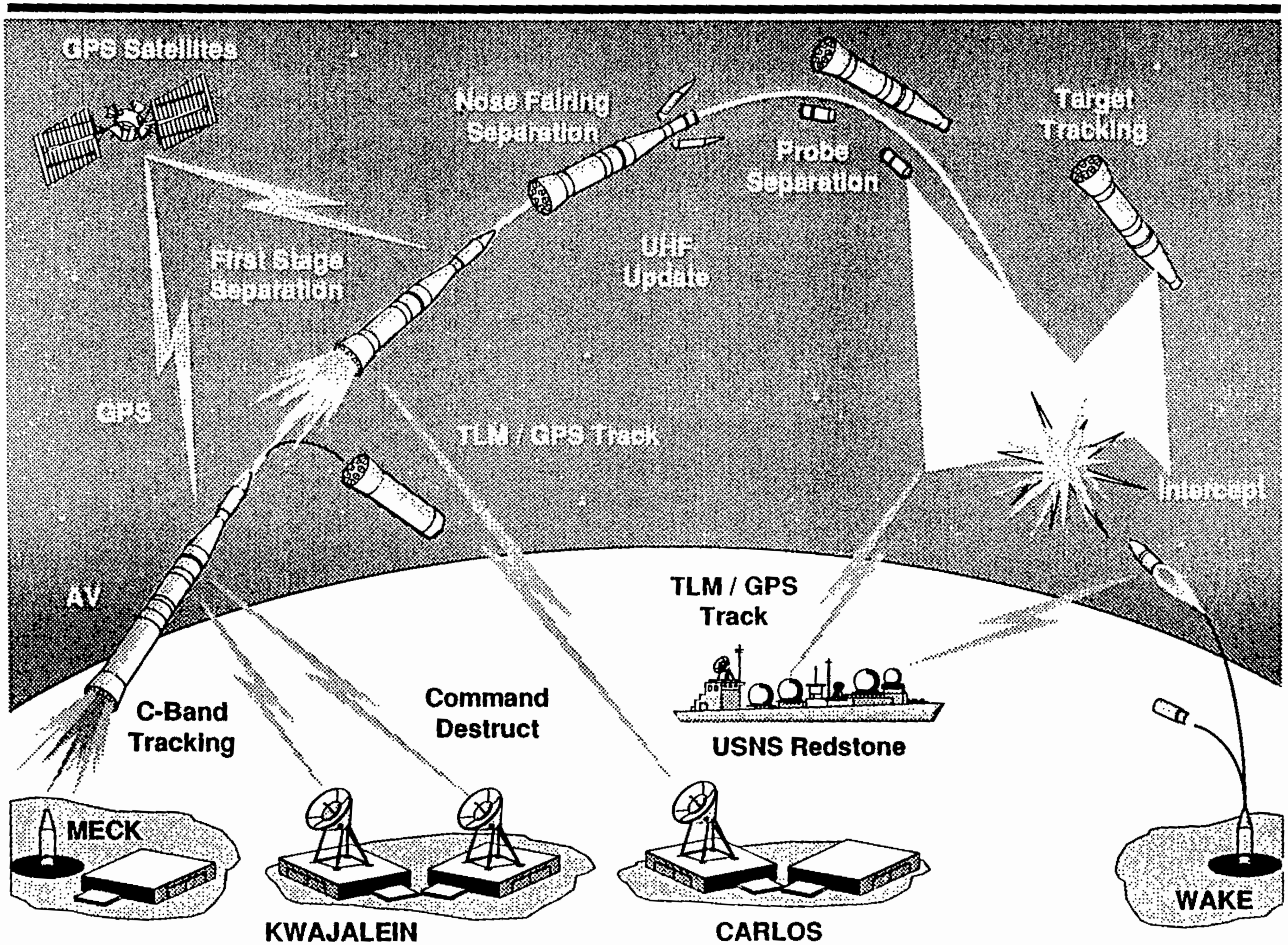
*(Flight Experiments 3 And 4)*




* Optional

jm-7422b / 011392

# BP - 1M MISSION

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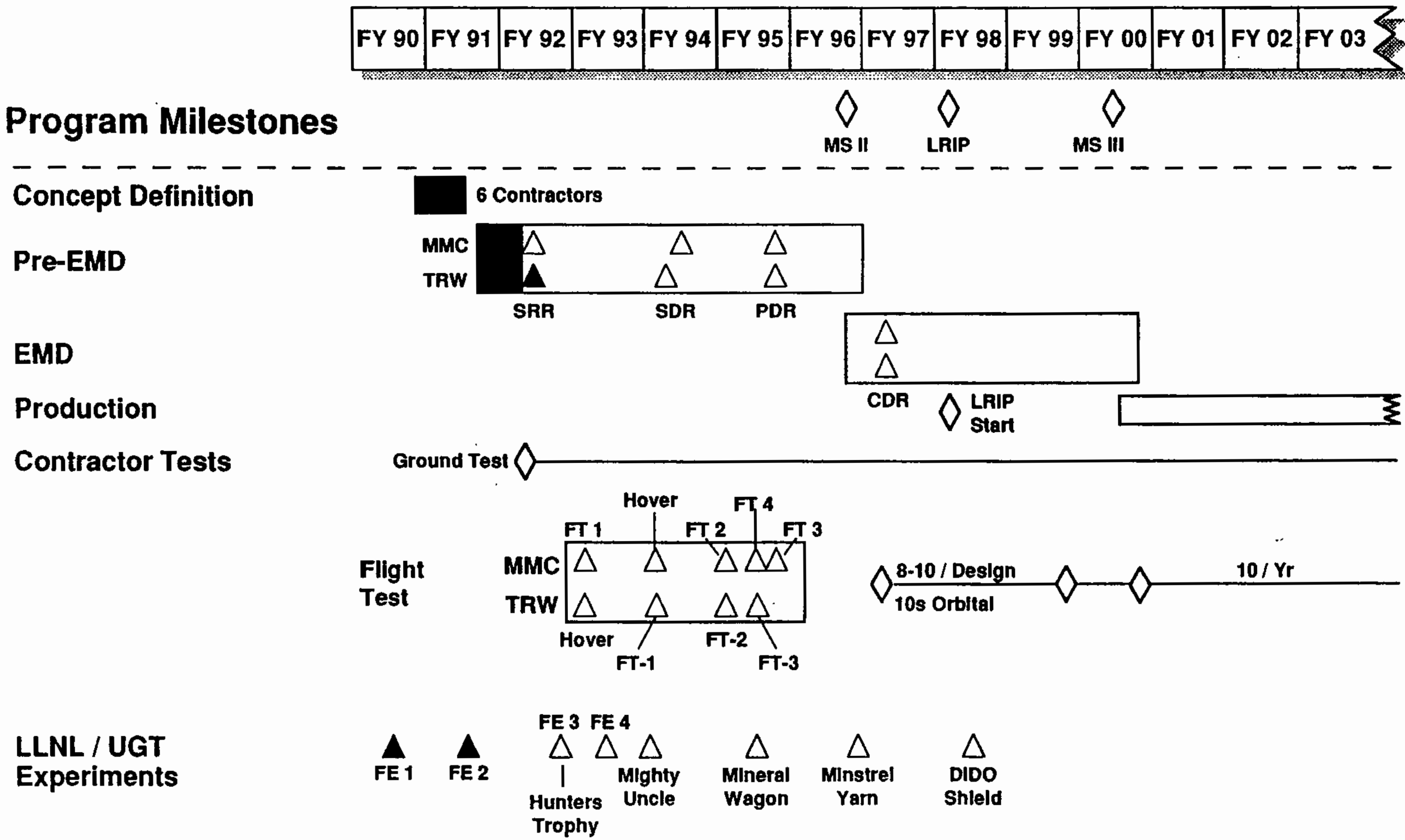
# AGENDA

- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# BP PROGRAM SCHEDULE

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# PROGRAM MILESTONES

## FY 91

- LLNL Flight Tests 1, 2
- Concept Development Phase Ended, Down Selection For Pre-EMD
- Pre-EMD Contracts Initiated
- GPALS DAB-GPALS Management Strategy

## FY 92

- GPALS DAB-GMD Baseline Approval
- SRR
- LLNL Flight Test 3

## FY 93

- BP Contractor Pre-EMD Flight Experiment BP-1M
- LLNL Flight Test 4
- SDR

# BP PROGRAM PARTNERS - ROLES AND RESPONSIBILITIES

- SDIO
  - Manage
  - Integrate
  - Risk Mitigation

- Services
  - Army Support To Test Program
  - Air Force Operating Locations And Continuous Technical Support

- LLNL
  - Initial Concept
  - Functional Concept Feasibility (Flight Experiments)
  - Selected Component Technology Innovations
  - Technical Advisor

- Industry
  - Complete Detailed Design
  - Ground And Flight Testing Of Detailed Design
  - Producibility / Manufacturing Technology
  - Balance Performance, Producibility, Operability, Supportability, Affordability And Schedule

# PRE-EMD CONTRACTORS

| Contractors | City | State |
|---|---|---|
| Martin Marietta - Prime | Denver | CO |
| IBM | Manassas | VA |
| Mission Research Corporation | Colorado Springs | CO |
| Aerojet Propulsion Division | Sacramento | CA |
| Litton | Woodland Hills | CA |
| Stanford Telecommunications | Reston | VA |
| OCA | Garden Grove | CA |
| LIRIS | Lexington | MA |
| MDESC | St. Louis | MO |
| Eagle Picher | Joplin | MO |
| Babcock | Orange | CA |
| Courtaids | Bennington | VT |
| AOI | Rolling Hills Estate | CA |
| OEA | Aurora | CA |
| Hi-Shear | Torrance | CA |
| Wittaker | Hollister | CA |

| Contractors | City | State |
|---|---|---|
| TRW - Prime | Redondo Beach | CA |
| Hughes Aircraft | El Segundo | CA |
| Defense System, Inc | Vienna | VA |
| Photon Research Association | San Diego | CA |
| Mission Research Corporation | Santa Barbara | CA |
| SPARTA | Laguna Hills | CA |
| Prairie View A&M | Prairie View | TX |
| Alliance Infonet | Costa Mesa | CA |
| Applied Technology Association | Mountain View | CA |
| Sun Computers | Carson | CA |
| Frontier Electronics | Stillwater | OK |
| Romallo Tool & Die | Torrance | CA |
| Sloane Company | Sun Valley | CA |
| Spaceonics Industrial, Inc | Harbor City | CA |
| Webber Cable & Electronics | Cerritos | CA |
| Bob Lewis Machine | Gardena | CA |
| Omega Engineering, Inc | Stanford | CT |
| C.W. Swift & Associates | Van Nuys | CA |
| LSI Logic | Milpitas | CA |
| Ward / Davis | Redondo Beach | CA |
| Lambda Novatronics, Inc | Del Rey Beach | FL |
| Qualcom | San Diego | CA |
| London Engineering | Gardena | CA |
| Precision Bearing Center | West Lebanon | NH |

jm-17043 / 021292

# RISK MITIGATION POSSIBILITIES

- We Are Looking For Technologies To Support Our Risk Mitigation Program That Are
  - Extremely Lightweight
  - Robust
    - Survivable In A Space Environment With High Reliability
  - Requires Low Input Power
  - Readily Available

- Specific Areas Of Interest
  - High Resolution Long Wave Infrared (LWIR)
  - 60 GHz Communications
  - Laser Communications
  - Cryocooler
  - Laser Imaging, Detection, And Ranging (LIDAR)
  - Solar Power
  - Long Life Batteries
  - Inertial Measurement Unit

# RISK MANAGEMENT POINTS OF CONTACT

Martin Marietta Strategic Defense Systems
Attn: Ms. Kathy Tobey Ms: F4066
P.O. Box 179
Denver, CO 80201
Telephone Number (303) 971-3598

TRW Military Space System Divisions
Attn: Mr. Norm Hollinger
One Space Park
Redondo Beach, CA 90278
Telephone Number (213) 814-9169

Lawrence Livermore National Laboratory
Attn: Mr. Nick Collella
P.O. Box 808
Livermore, CA 94550
Telephone Number (510) 423-8452

Department Of Defense
Strategic Defense Initiative Organization
Attn: CPT W. Russell Hall
The Pentagon
Washington, D.C. 20301-7100
Telephone Number (703) 693-1612

jm-24713 / 022792

# AGENDA

- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# 1992 CONGRESSIONAL ISSUES

- Keeping Brilliant Pebbles In Research And Development Phase
- ABM Treaty Compliance For BP Testing
- Cooperative Funding From Allies

**We Are Fully Compliant With The 1991 Missile Defense Act And ABM Treaty. We Are Exploring Allied Participation**

# AGENDA

- Space Based Interceptor Evolution
- Acquisition Strategy
- Test Program
- Programmatics
- Congressional Issues / Treaty Compliance
- Summary

# SUMMARY

*World Of Opportunity - Areas To Solicit*

- MMC, TRW
  - Provide Positive Contributions In The Areas Of Cost And Weight Reduction, Effectiveness And Producibility
- Government
  - Provide Risk Mitigation And Enabling Technology
- TASC, BDM
  - Provide Program Management Support In Areas Of Systems Integration, Resource Management And Test And Evaluation

FOI92-0855

# STRATEGIC DEFENSE INITIATIVE

## Advance Planning Briefing For Industry

**2 MAR 92**

**COL Carl E. Drewes, USA**
**Director, National Missile Defense Segment**
**Strategic Defense Initiative Organization**

jm-23781b / 022892

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# TOPICS

- 1991 Missile Defense Act
  (Limited Defense System)
- National Missile Defense (NMD) Architecture
- Planned Growth Path
- Program Strategy
- Schedules
- Critical Factors For Deployment
- Summary

# MISSILE DEFENSE ACT OF 1991

## *Missile Defense Goal Of The United States*

- **It Is The Goal Of The United States To**
  - **Deploy An Antiballistic Missile System, Including One Or An Adequate Additional Number Of Antiballistic Missile Sites And Space Based Sensors, That Is Capable Of Providing A Highly Effective Defense Of The United States Against Limited Attacks Of Ballistic Missiles**
  - **Maintain Strategic Stability**
  - **Provide Highly Effective Theater Missile Defenses (TMDs) To Forward Deployed And Expeditionary Elements Of The Armed Forces Of The United States And To Friends And Allies Of The United States**

# 1991 MISSILE DEFENSE ACT
# LIMITED DEFENSE SYSTEM

- Design To *Protect* The United States Against *Limited* Ballistic Missile Threats
  - *Accidental Or Unauthorized Launches*
  - *Third World Attacks*

- Develop For *Deployment* a
  - *Cost Effective*
  - *Operationally Effective*
  - *ABM Treaty Compliant*

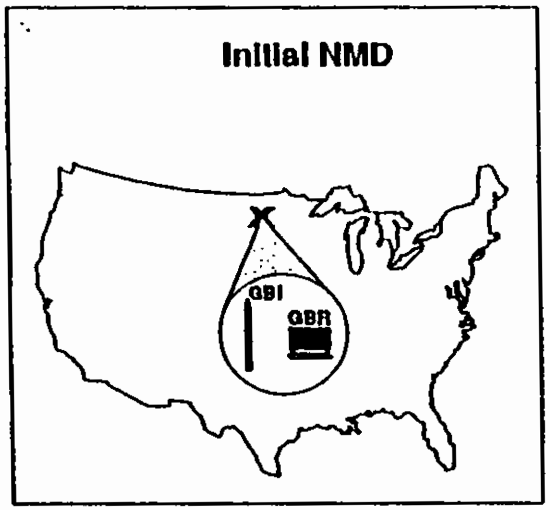
- Antiballistic Missile System At A *Single* Site As The *Initial Step* Toward *Deployment* Of A Highly Effective Antiballistic Missile System

- By The Earliest Date Allowed By The Availability Of Appropriate Technology Or By FY 96

# NATIONAL MISSILE DEFENSE ARCHITECTURE

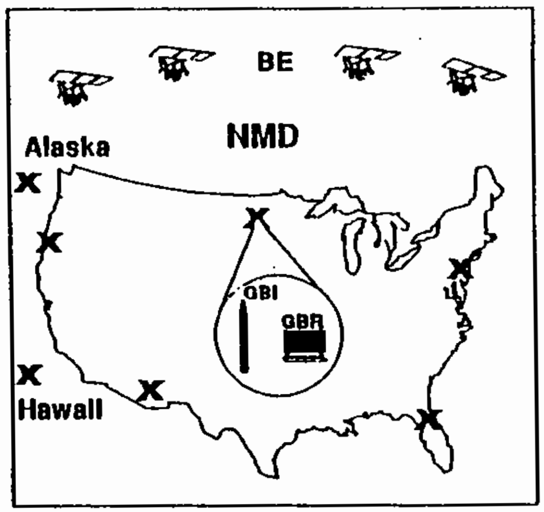
**Goal:** **Highly Effective Defense Of The U.S. Against Limited Attacks Of Ballistic Missiles — Consistent With Strategic Stability**

***Initial Site Defense System***
***(FY 96 - 97)***



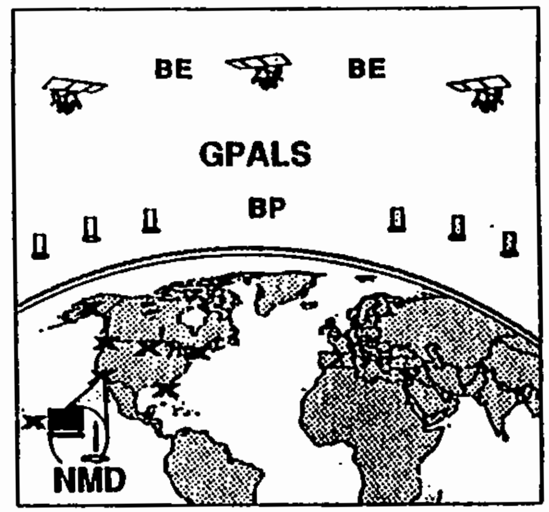

(GBI) Ground Based Interceptor
(GBR) Ground Based Radar

***Limited Defense System***
***(FY 98 - 02)***



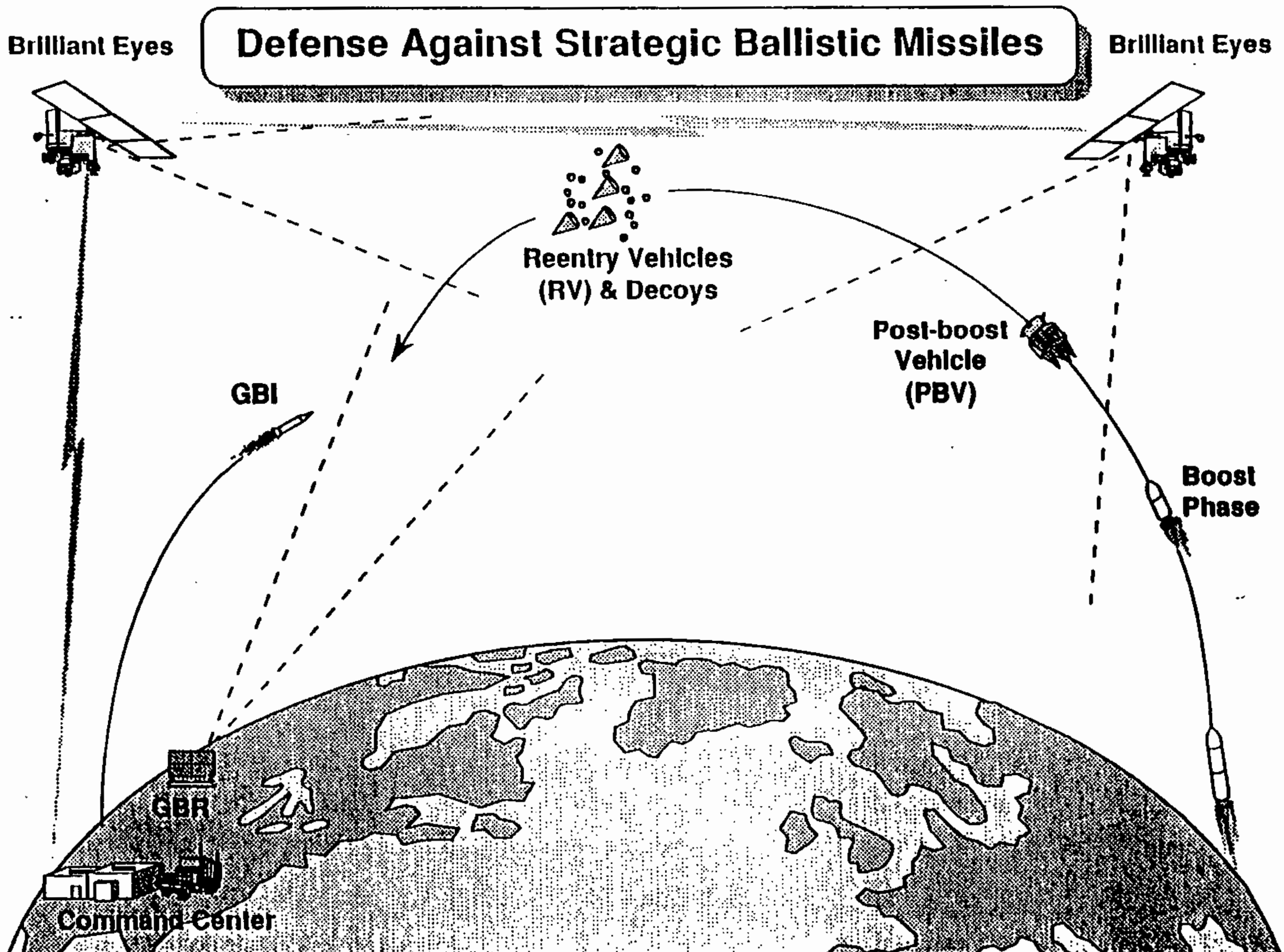

(BE) Brilliant Eyes
( X ) Missile Defense Site

***With Space Based Interceptors***
***(FY 00 - 03)***




(NMD) National Missile Defense
(BP) Brilliant Pebbles

# NMD ARCHITECTURE

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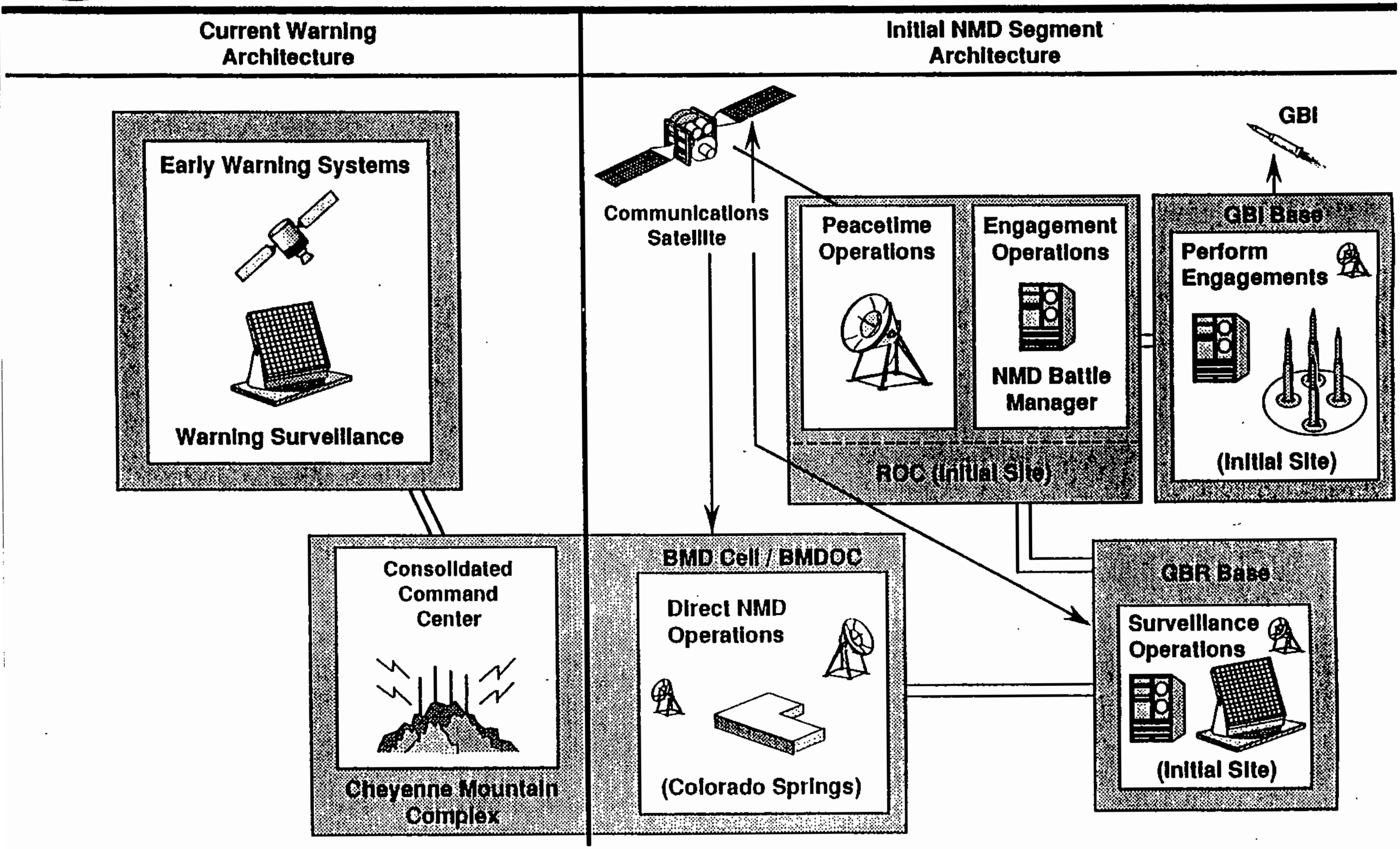


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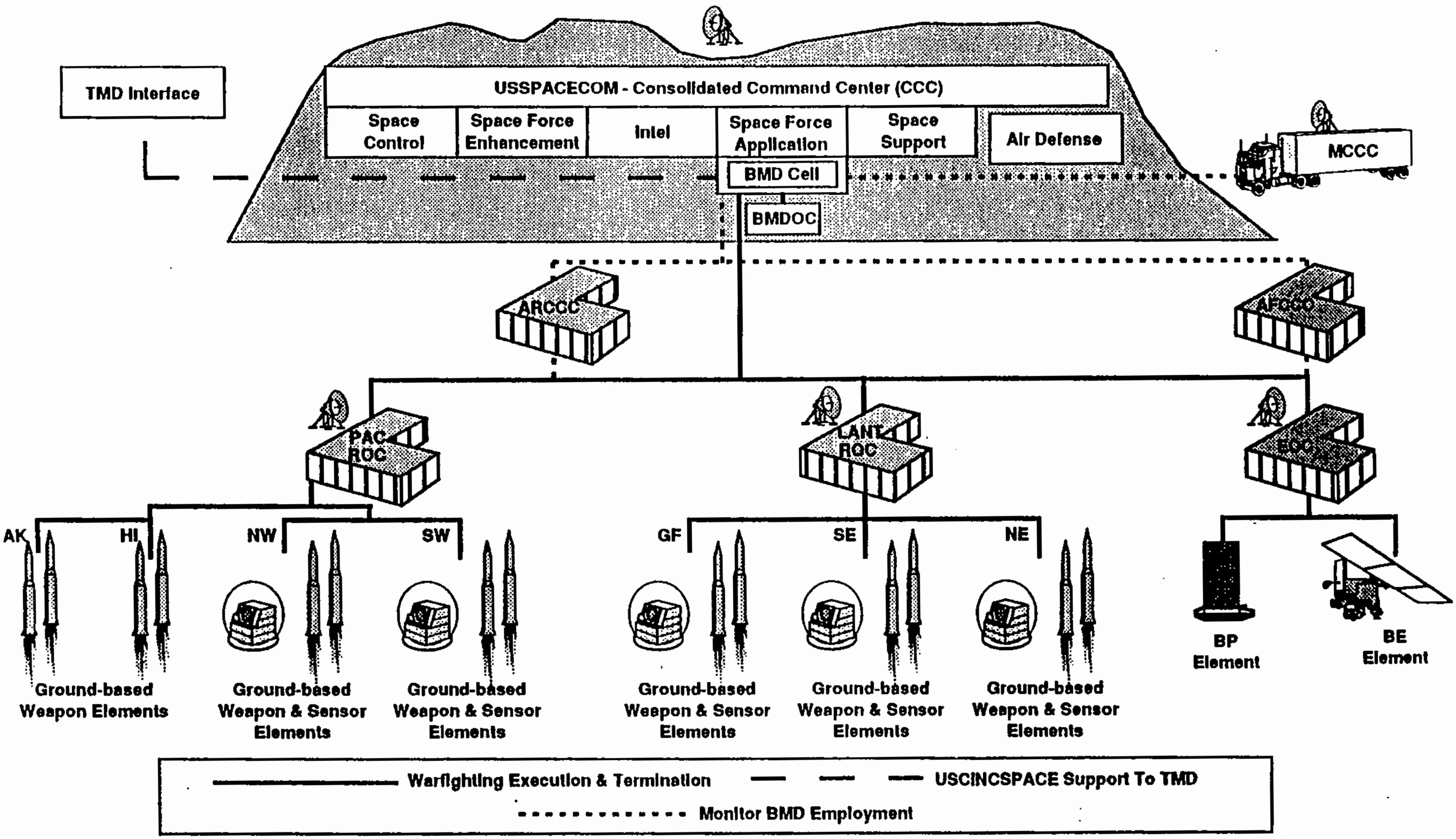
# NMD COMMAND AND CONTROL STRUCTURE

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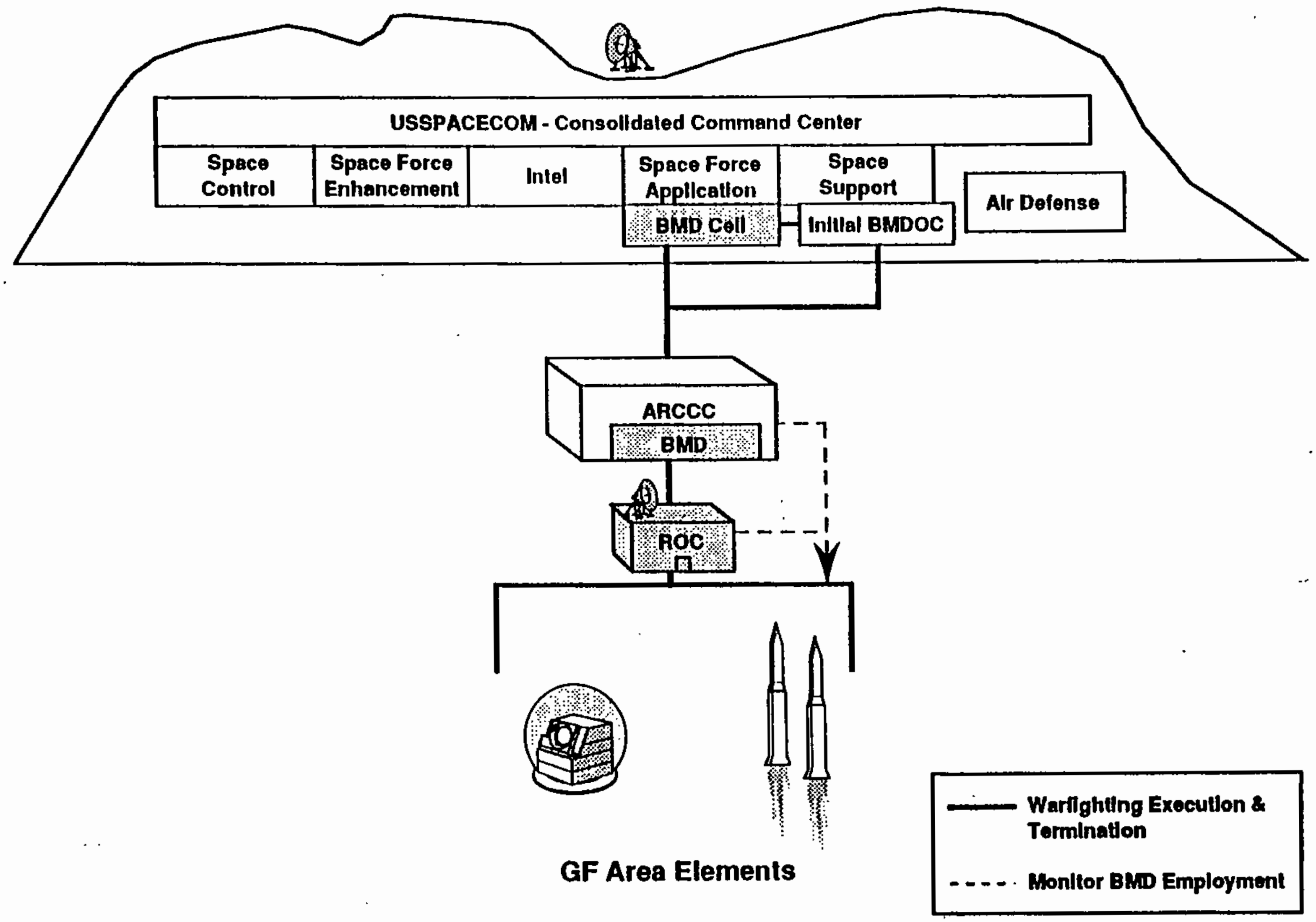
# INITIAL NMD COMMAND AND CONTROL STRUCTURE

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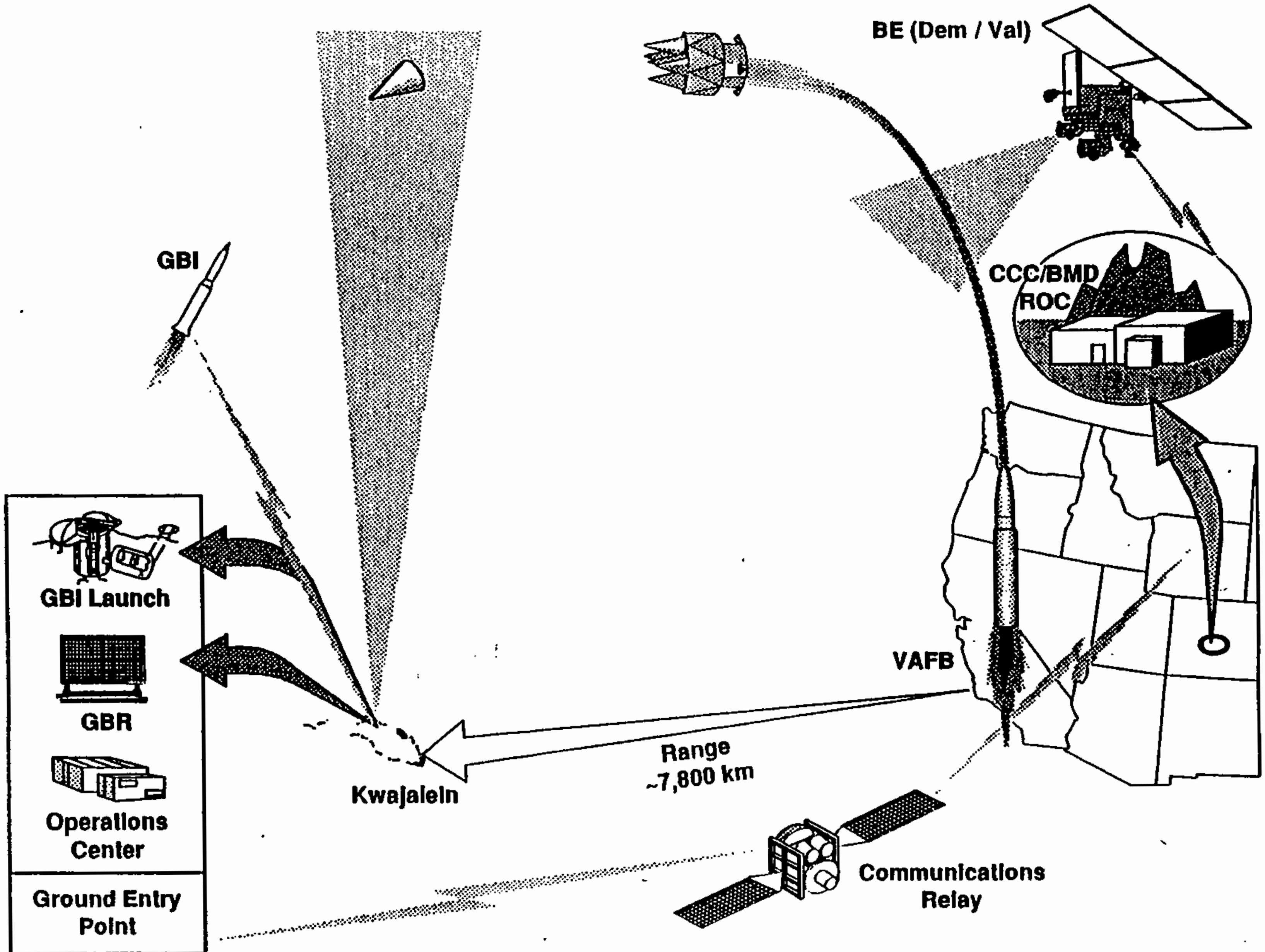
# WHY INITIAL NMD DEPLOYMENT ?

- Responds To The 1991 Missile Defense Act
- Protects Most Of U.S.A. Against Certain Limited, Accidental, And Unauthorized Ballistic Missile Strikes
- Provides USSPACECOM An Operational And A Training Capability
- Provides Evolutionary First Step Toward The Objective GPALS Deployment
- Provides And Maintains Strategic Stability

# INITIAL NMD TEST SCENARIO

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# PLANNED NMD GROWTH PATH TO GPALS

- Open Architecture For GPALS
- Pre-planned Product Improvements
- Interceptor Block Upgrades
  - Advanced Discrimination Capability
  - Endoatmospheric Capability
- Brilliant Eyes
- Brilliant Pebbles
- GPALS Integration (TMD + NMD + GMD)

# NMD PROGRAM STRATEGY

- Core Strategy
  - Deploy Initial Site And Build On It
  - Continue On Full Deployment Path
  - Maintain Options To Respond To Uncertain Future With A Robust Technology Base Program
  - Maintain Consistency With Evolving National And International Policies And Constraints

# PROBLEM ANALYSIS

## *Acquisition Strategy For Initial GPALS / NMD Deployment*

*Issue*

- How Should Acquisition Milestones And Phases Be Structured For The GPALS Elements That Will Be Deployed In FY 97 To Meet The 1991 Missile Defense Act Mandate?

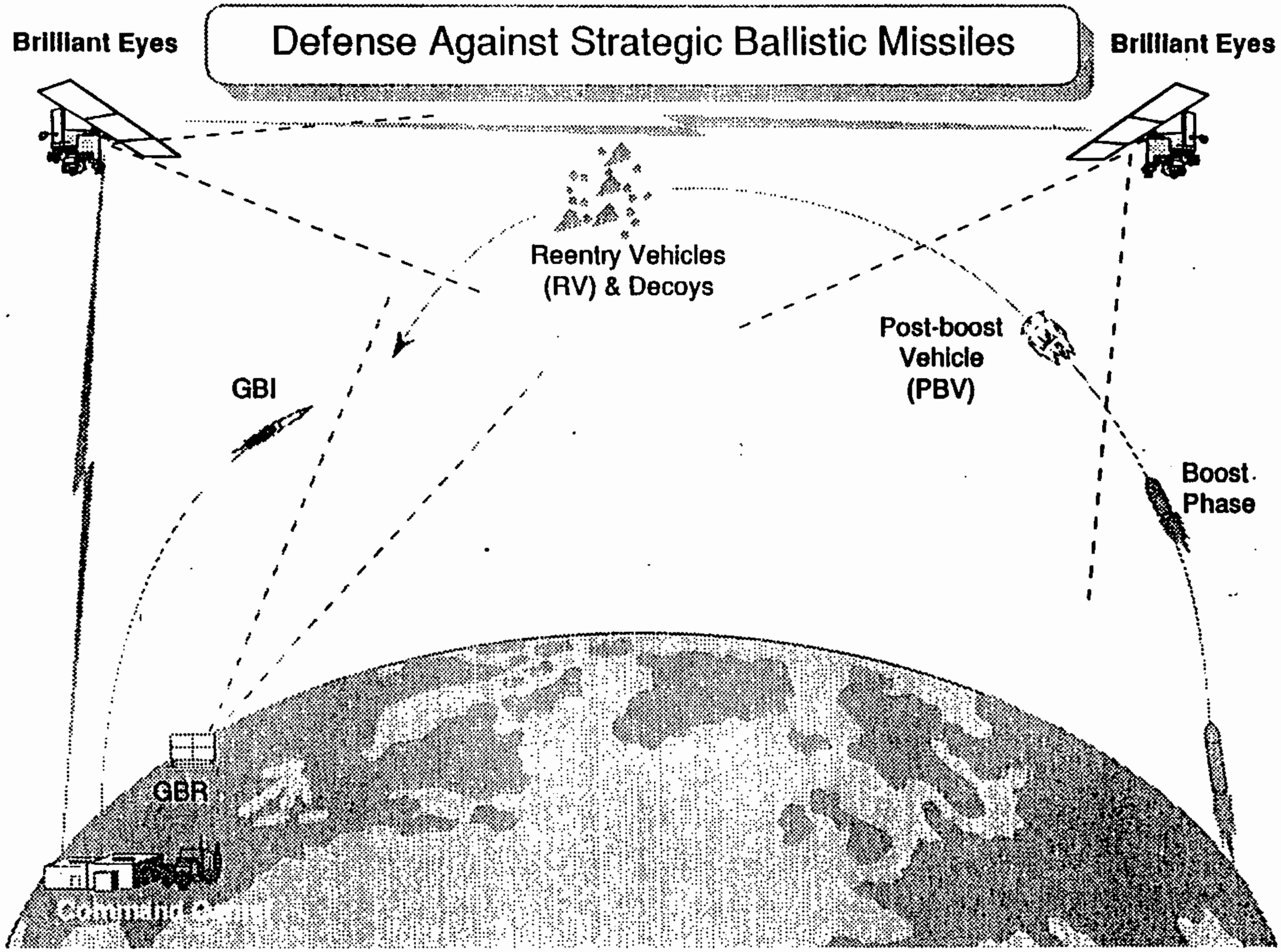
*Impacts*

- Execution Of Defense Acquisition Management Policies And Procedures (DoDI 5000.2)s
- Provisions And Requirements In GBI, GBR, And $C^2E$ Procurement Packages
- FY 94 - 99 POM / Color Of Money

*Solution*

- Focus System Designs On Suitability, Testability, Producibility, And Supportability For Initial Deployment, And Adaptability For Incremental Growth To Meet Objective GPALS And Uncertain Future
- Insist The Most Mature Technology Be Used To Meet GPALS Effectivity #1 (LOC) Requirements
- Conduct Enhancing Technology Developments / Demonstrations In Parallel With System Development For Infusion As Block Changes
- Fund Advanced Development And Initial Deployment Units With 6.3 Dollars. Fund Fixes, Follow-on Testing, And Upgrades Necessary For Initial Deployment Units To Meet GPALS Effectivity #1 With 6.3 Dollars. Fund System Development And Fix Level III Engineering Documentation For GPALS Effectivities #2 Thru N With 6.4 Dollars. Fund Follow-on Deployment (LRIP / Production) With Procurement Dollars

# NMD ARCHITECTURE

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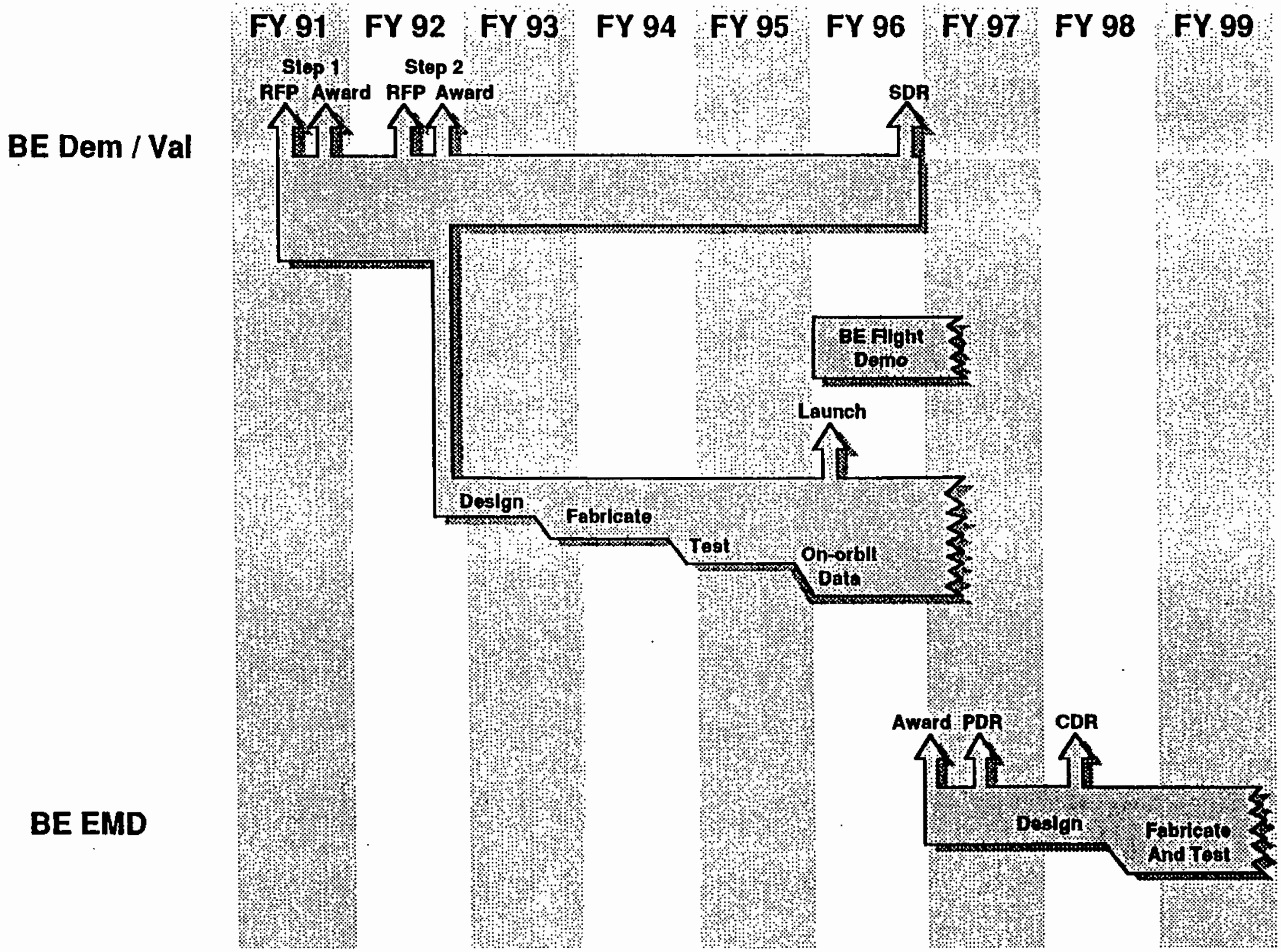
# BRILLIANT EYES PROGRAM SCHEDULE

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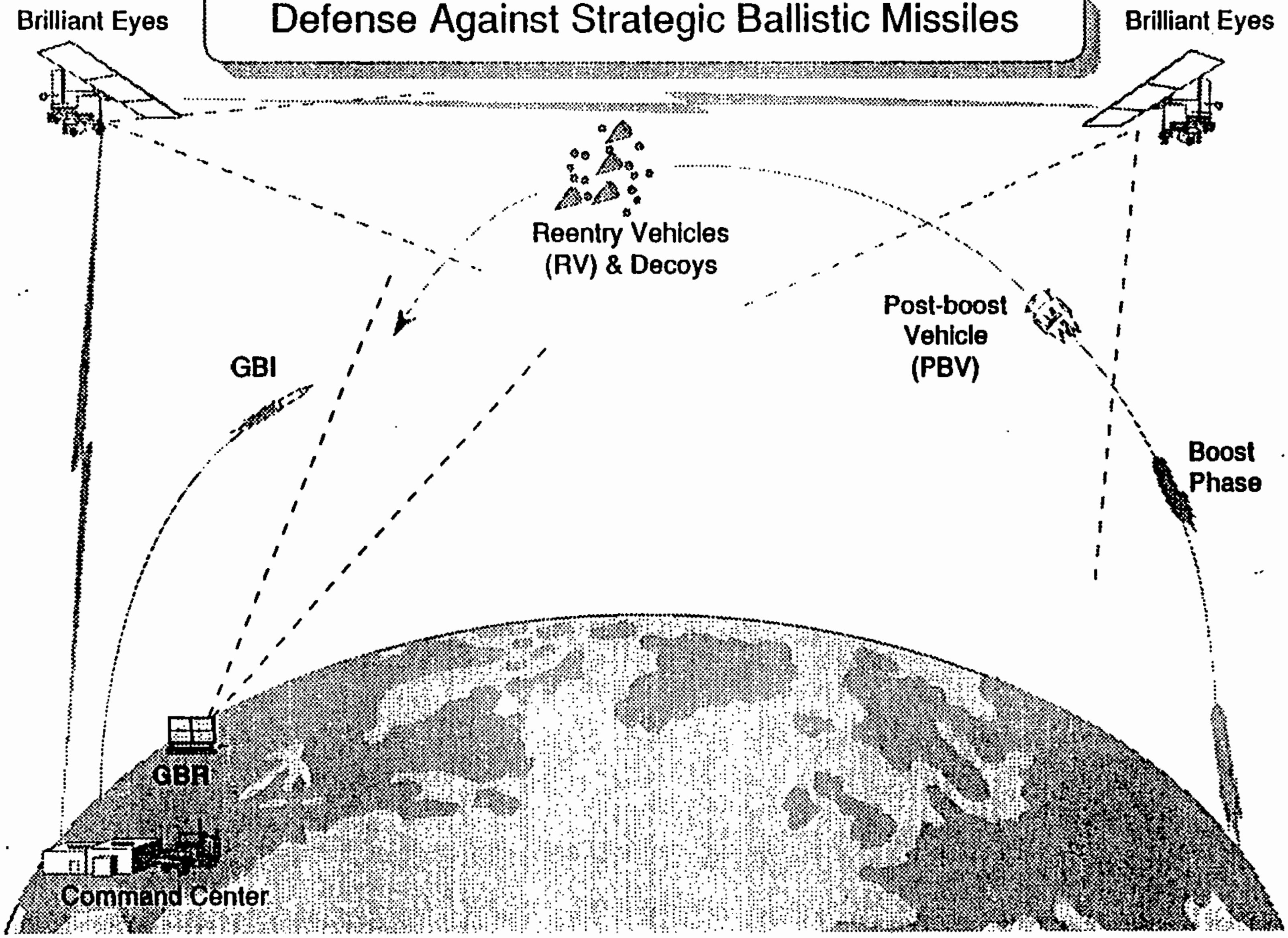
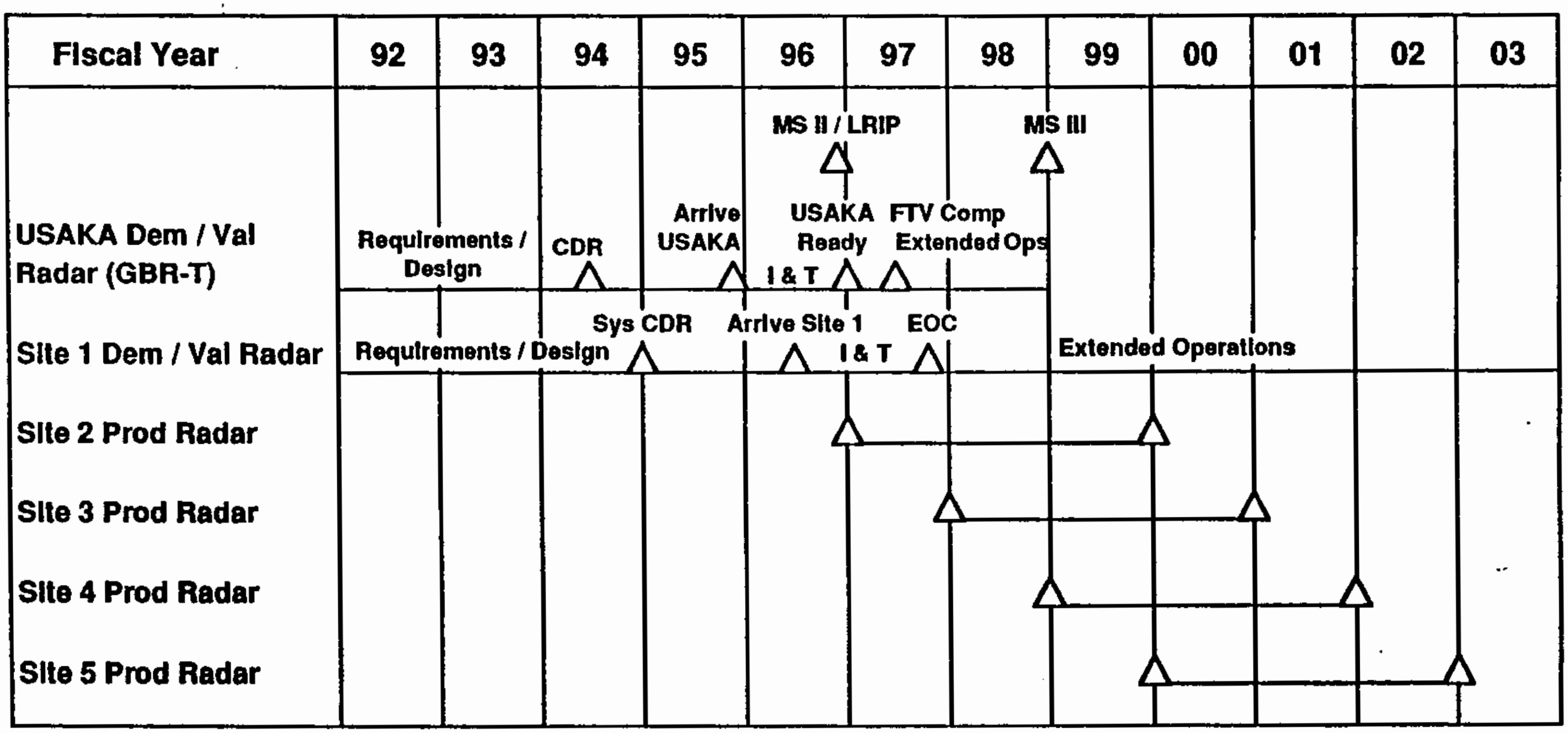
# NMD ARCHITECTURE

## Defense Against Strategic Ballistic Missiles



# NMD-GBR SCHEDULE

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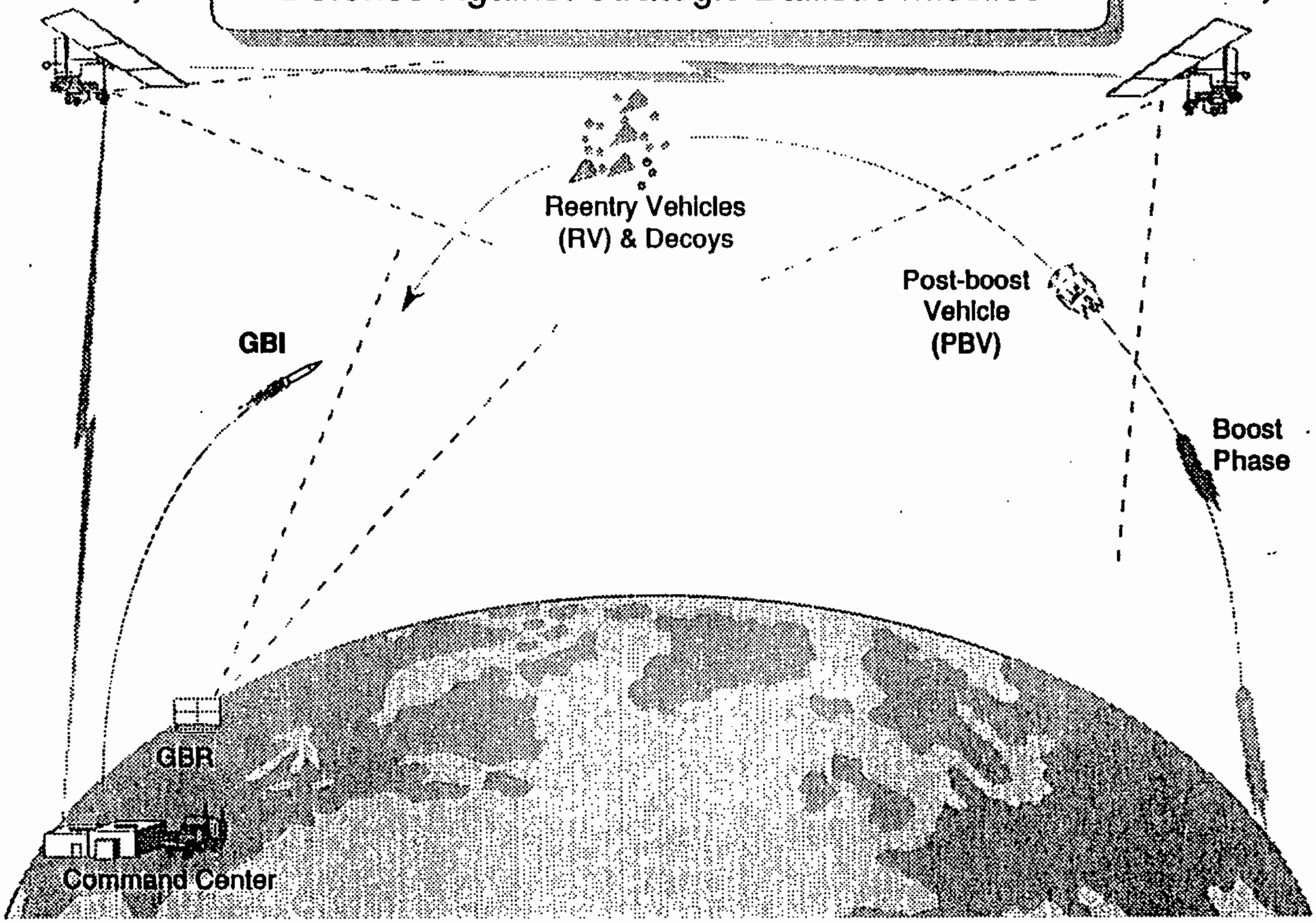
# NMD ARCHITECTURE

## Defense Against Strategic Ballistic Missiles

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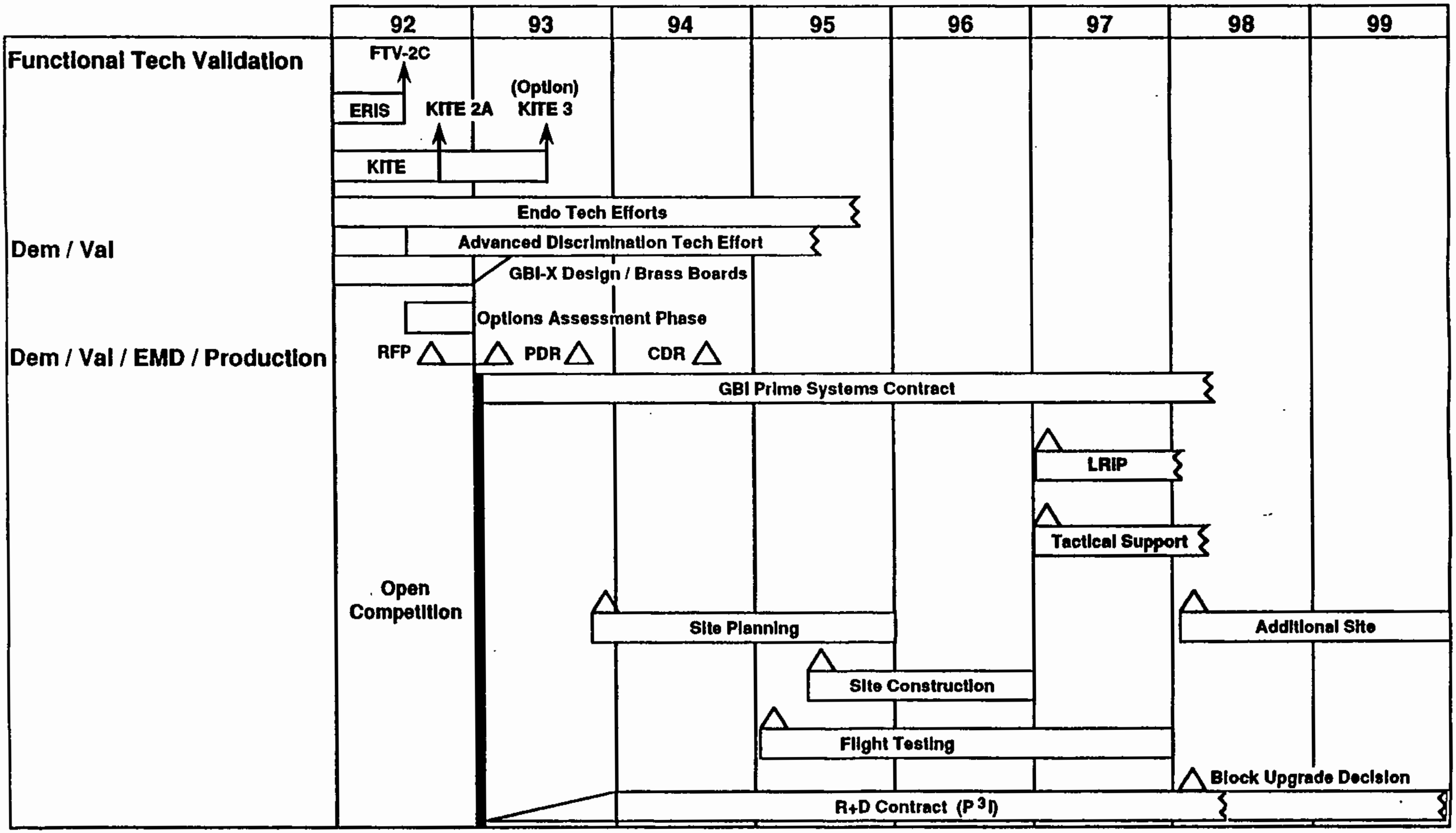
# GROUND BASED INTERCEPTOR PROGRAM SCHEDULE

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# OPTIONS ASSESSMENT FOR GBI

- GBI Must Meet NMD Segment Effectivity Performance Requirements
- Deployable Exo Interceptor At GF, Upgradable To Full Operational Capability Later
- GBI / NMD Options
  - Options For Exo GBI In FY 97
    - Development
    - Fabrication
    - Test
    - Integration
    - Production
    - Deployment
  - Options That Improve NMD Requirements Documents
    - Industry Perspective On Critical Requirements
    - Allocations Between GBI And NMD Segment
  - Options For GBI Performance Enhancement
    - Risk Reduction
    - Approach For Technology Infusion To Meet Full Operational Capability

jm-24737a / 022792

# GBI OPTIONS ASSESSMENT

| Activity | FY 92 | | | | | | | | FY 93 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN |
| Release CBD Notice | 19 | | | | | | | | | | | |
| Release Options RFP | | 6 | | | | | | | | | | |
| Industry Proposal Prep | | 6 | 3 | | | | | | | | | |
| Evaluate / Negotiate | | | 3 17 | | | | | | | | | |
| Award Options Contract | | | 21 | | | | | | | | | |
| Options Assessment Phase | | | 21 | IPR | IPR | | 21 | | | | | |
| Release Draft GBI RFP | | | | | ▲ | | | | | | | |
| OSD Review | | | | | | 20 | 21 | | | | | |
| Release GBI RFP | | | | | | | | 4 | | | | |
| Industry Proposal Prep | | | | | | | | 4 | 20 | | | |
| Evaluate Proposal | | | | | | | | | 20 | | 31 | |
| Negotiate | | | | | | | | | | | 31 | 23 |
| Award GBI Contract | | | | | | | | | | | | 23 |

# NMD FY 92 MASTER SCHEDULE

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| USSPACECOM Reviews (SWAAT) | | | ▲5 | | ▲25 | | △28 | | | | △ | |
| GPALS BM / $C^3$ ORD | | | | | | | | Submit △30 | | Validate △30 | | |
| NMD ORD | | | | | | | | | | | Submit △31 | |
| SDIO GPALS / NMD Reviews | | | SRR ▲18-19 | | | IPR △24-25 | | | | △SDR | | |
| ERIS FTV-2 / KITE 2A | | | | | | △ | | | | △ | | |
| DAB / SSC | | ▲5 | | | ▲20 | | | | △1 | 29△ | | |
| POM | | | | | | | | | | | | |
| - Base CARDs | | | | ▲15 | | | | | | | | |
| - NMD Working Group Changes | | | | | ▲13 | | | | | | | |
| - BCE / ICE | | | | | | △16 | | | | | | |
| - Review (PRB) | | | | | | | △7-9 | | | | | |
| - Submission | | | | | | | | △1 | | | | |
| Congressional Descriptive Summaries | | | | ▲10 | | | △17 | | | | | |
| 180 Day Report To Congress | | | | v 1.0 ▲23 | v 2.0 ▲6 | v 3.0 △10 | NMD / TMD △15 | | Submission △6 | | | |

# CRITICAL FACTORS FOR DEPLOYMENT

- Integration
- Producibility
- Supportability
- Risk Control

# SYSTEM / SEGMENT INTEGRATION RISK REDUCTION MEASURES

- Integrated Management Structure
- Design For Testing
- Iterative Design Analyses
  - Product Design Specifications
  - User's Manuals
- Integrated Test Plans
  - All Contractor Tests
  - All Subcontractor Tests
- Failure Reporting System
- Failure Review Board
- Uniform Test Reporting
- Technical Risk Assessment System Integrated With C / SCSC
- Continuously Test, Analyze, And Fix

# NMD ELEMENT CONTRACTS AND SYSTEM / SEGMENT INTEGRATION CONTRACT

- Specification
- Contract Line Items / Clauses
- Statement Of Work
- Integrated Master Plan / Integrated Master Schedule
- Work Breakdown Structure
- Contract Data Requirements List
- Technical Performance Measures
- Cost / Schedule Control System
- Award Fee Plan

Integrated Management Structure

# INTEGRATED MANAGEMENT STRUCTURE

**Objective:** Contractor Plans / Commits To Executable Program; Contractor Manages To His Plan; Government Evaluates And Rewards Performance

**Requirements**

Functional System Specification

**Work Breakdown Structure (WBS)**

Tailored To Development / Manufacturing Process
Outline Of Entire Program
Single Numbering System (Spec Tree / SOW / IMP / Award Fee Plan)

**Statement Of Work (SOW)**

Guidance Provided In Request For Proposal
Contractor Generated

**Integrated Master Plan (IMP)**

Event Driven Plan
Details Significant
Accomplishments
And Success Criteria

**Award Fee Plan**

Tied To IMP And Accomplishments

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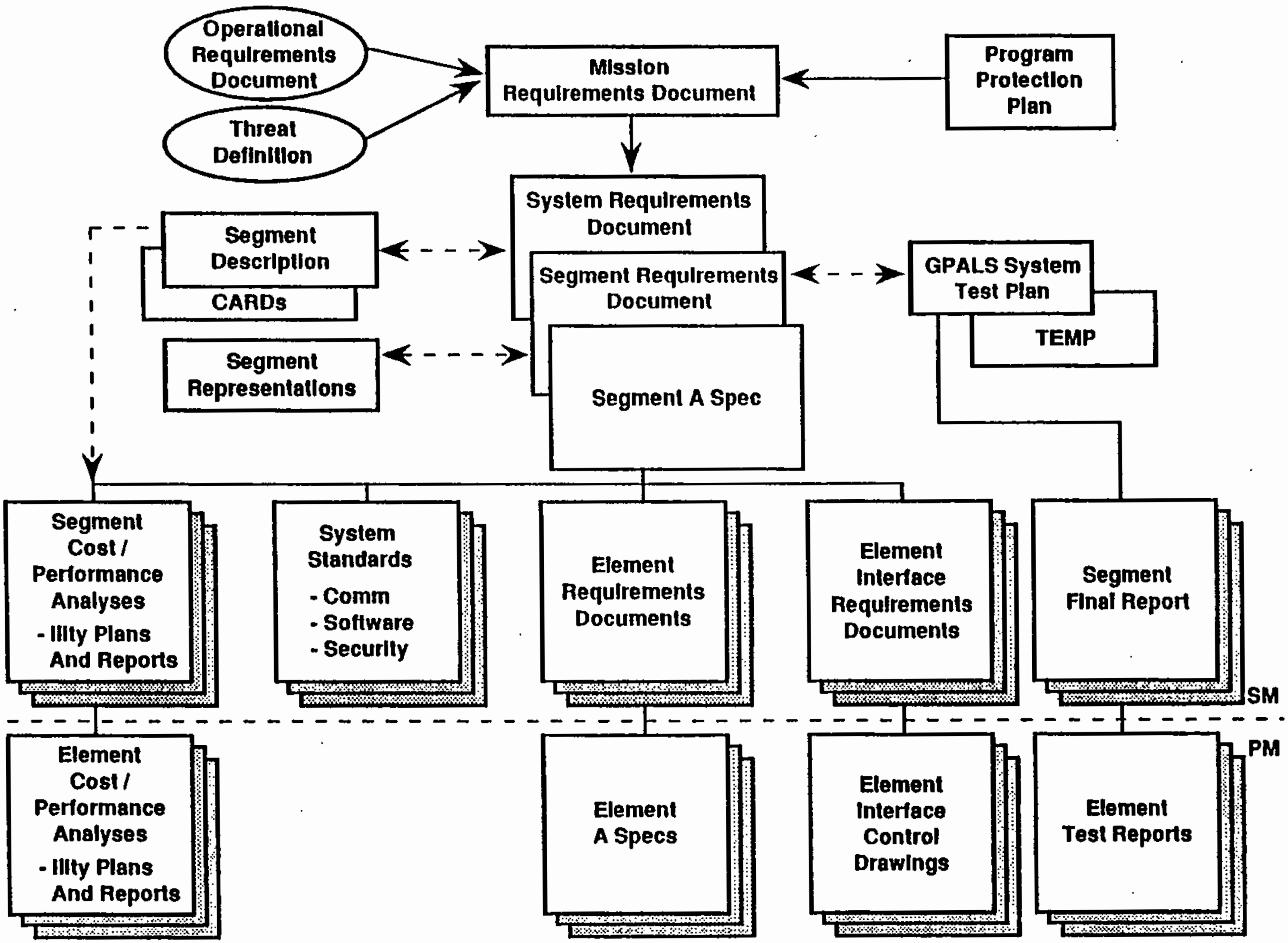
# DEFINITION AND CONTROL OF SEGMENT DESIGN BASELINE

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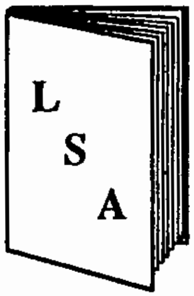
# NMD PRODUCIBILITY

- Integral To The Engineering Process
- Manufacturing Process Qualification = Design Performance Qualification
- Configuration Control Program
  - Product Baseline
  - Production Process Baseline
  - Subcontractors And Vendors
- Formal Piece Part Control Program
- Defect Control Program

# NMD SUPPORTABILITY

## Logistics Support Analysis

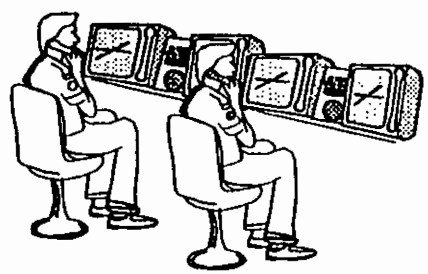



- Integral To The Engineering Process
- Critical For Developing
  - Maintenance Concepts (2 vs 3 vs 4 Levels)
  - Built-In Test Design
    - Reliability Requirements
    - Maintainability Requirements
  - Supply Support To Meet $A_o$

**Supportability Impacts GPALS / NMD Operational Availability And Readiness**

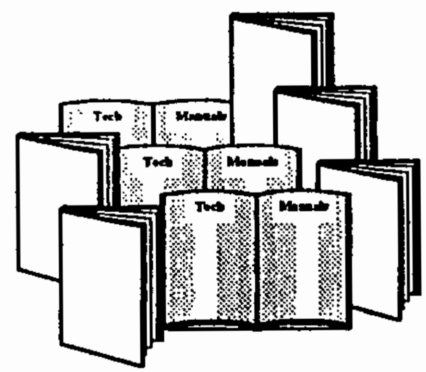
### Manpower And Personnel

- Skill Requirements To Be Identified Early
  - Operational Requirements Documents
  - Development Specifications
- Limitations Factored Into Design



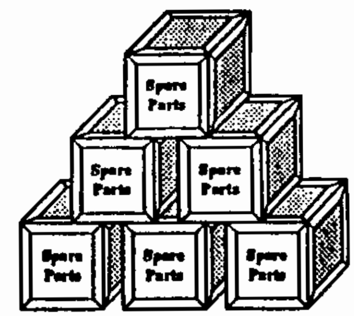
### Training & Training Devices

- Configuration Consistency With
  - As Built Elements
  - Technical Manuals
- Built-In Capability For On The Job Training




### Technical Manuals

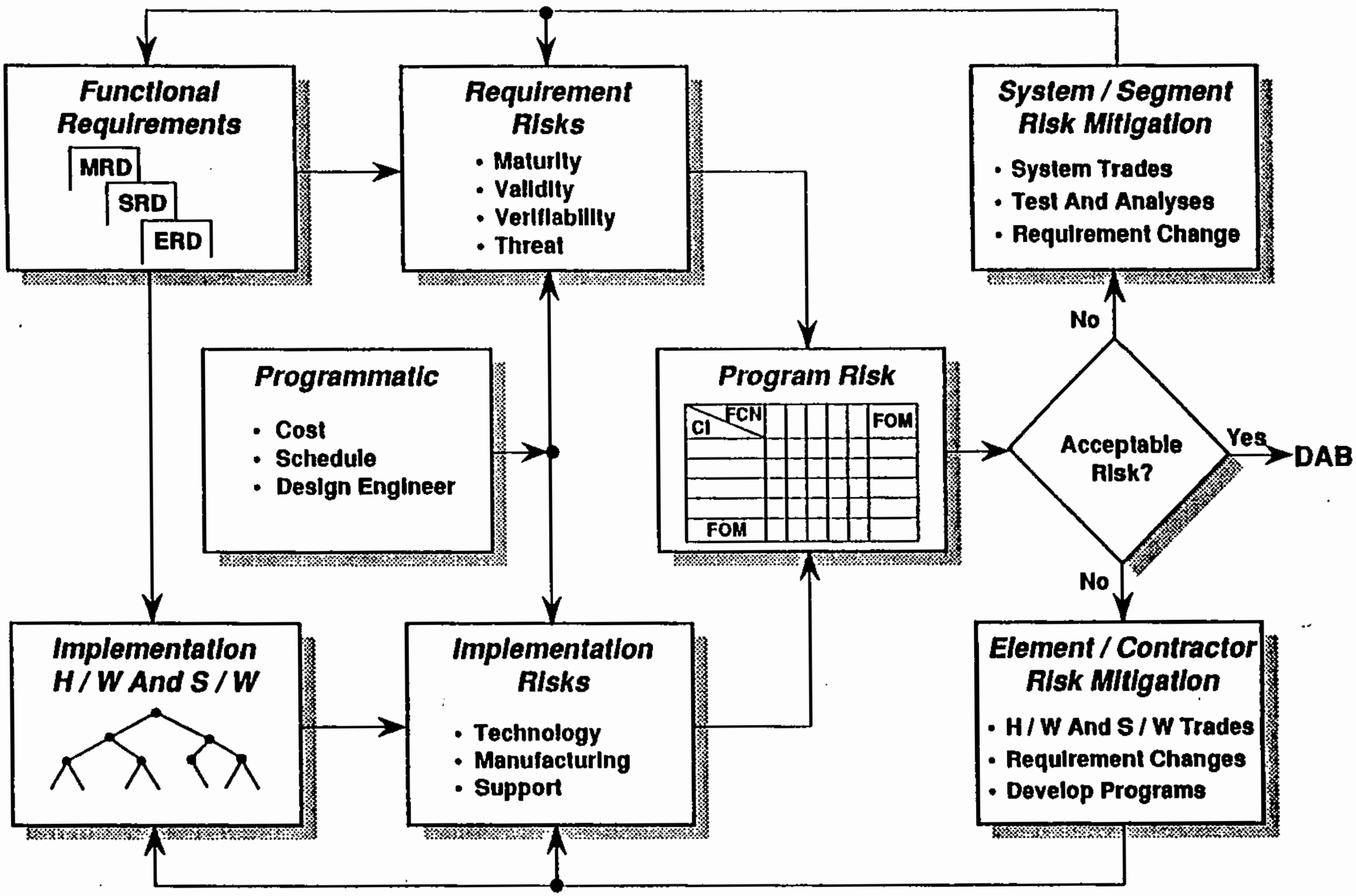
- Configuration Consistent With
  - As Built Elements
  - Training And Training Devices
- Verification Included In Testing




### Spares

- Stockage Allowances Engineered To Optimize Operational Availability
- Production Concurrent With Element To Reduce Unit Cost
- Transition To Government Spares Support

# RISK ASSESSMENT AND MITIGATION PROCESS



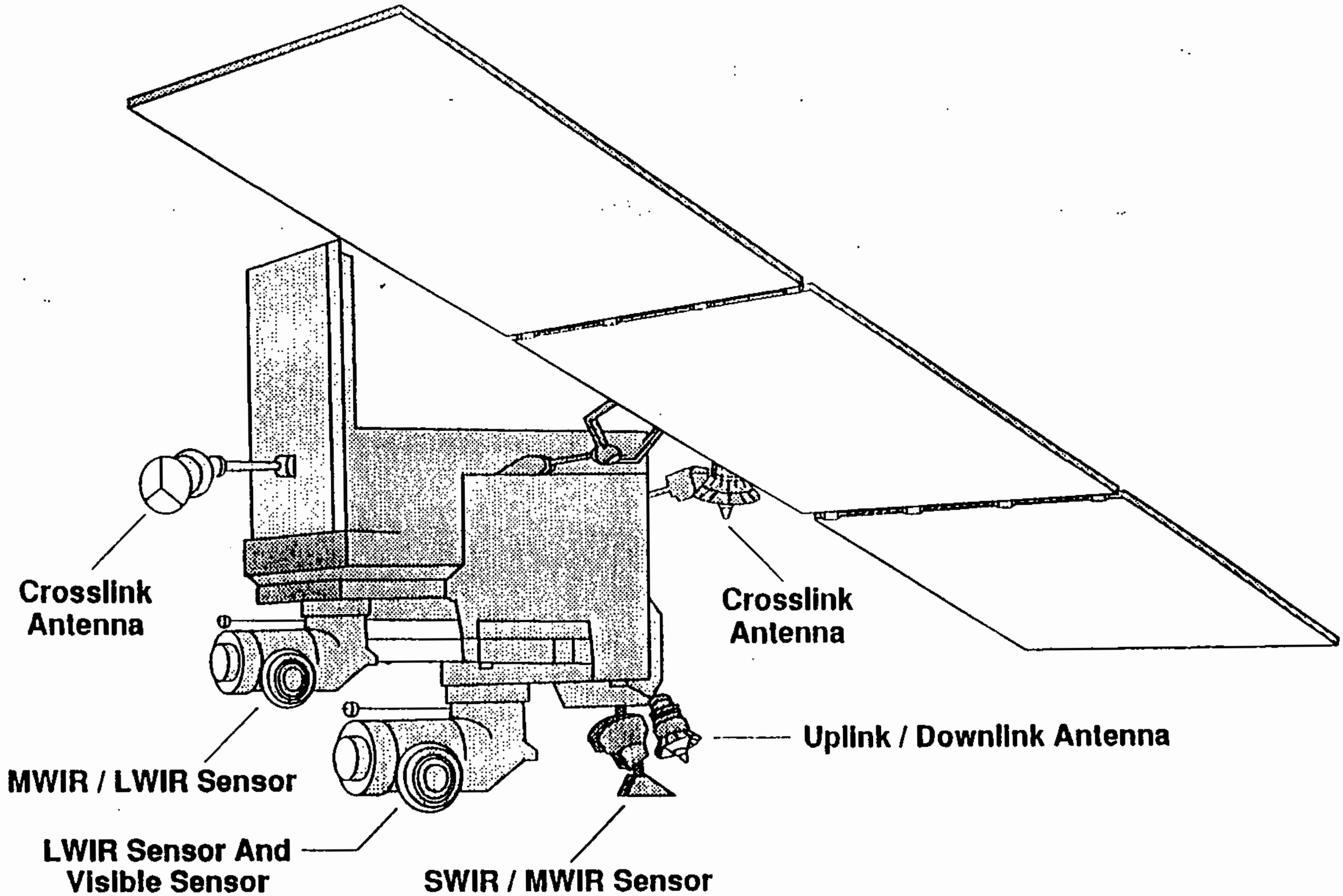

Systematic Process For Assessing, Prioritizing And Resolving All Risks Associated With The Definition (Requirements) And Implementation (H / W And S / W) Of The System

# SUMMARY

- NMD Segment Can Be Deployed Incrementally
- NMD Meets The Initial Deployment Mandate In The 1991 Missile Defense Act
- Producibility And Supportability Are Key Factors For Fielding Equipment That Is Suitable, Supportable, And Sustainable By Military Operators / Maintainers
- NMD Success Depends On User / Developer / Contractor Teamwork

# BACK-UP

# BRILLIANT EYES

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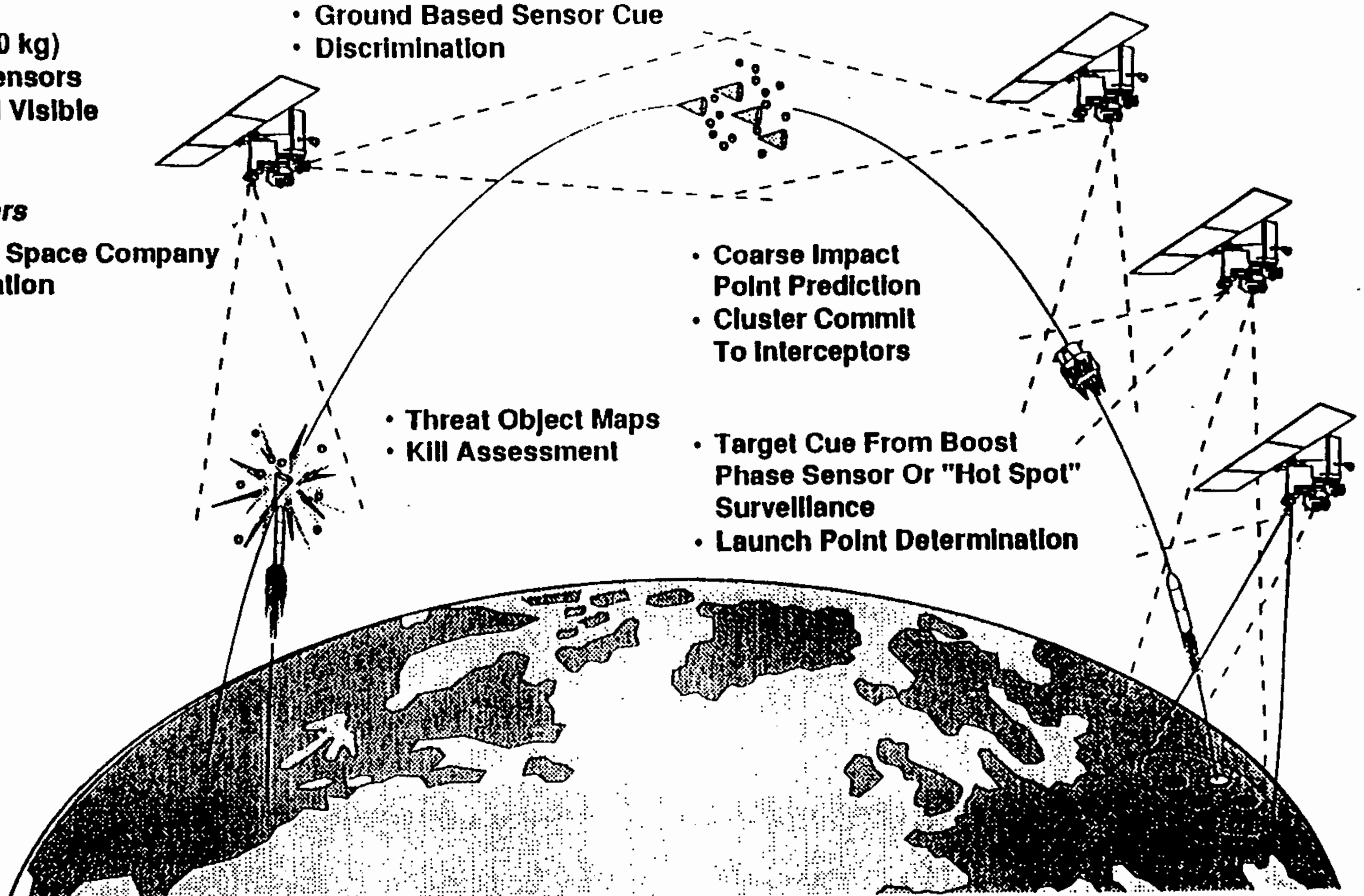
# BRILLIANT EYES
# SPACE BASED SURVEILLANCE SATELLITES

### *Description*

- Highly Distributed
- Low Earth Orbit
- Small, Lightweight (<450 kg)
- Narrow Field Of View Sensors
- SWIR, MWIR, LWIR And Visible Sensors

### *Contractors*

- Lockheed Missiles And Space Company
- Martin Marietta Corporation
- Rockwell International
- TRW, Inc

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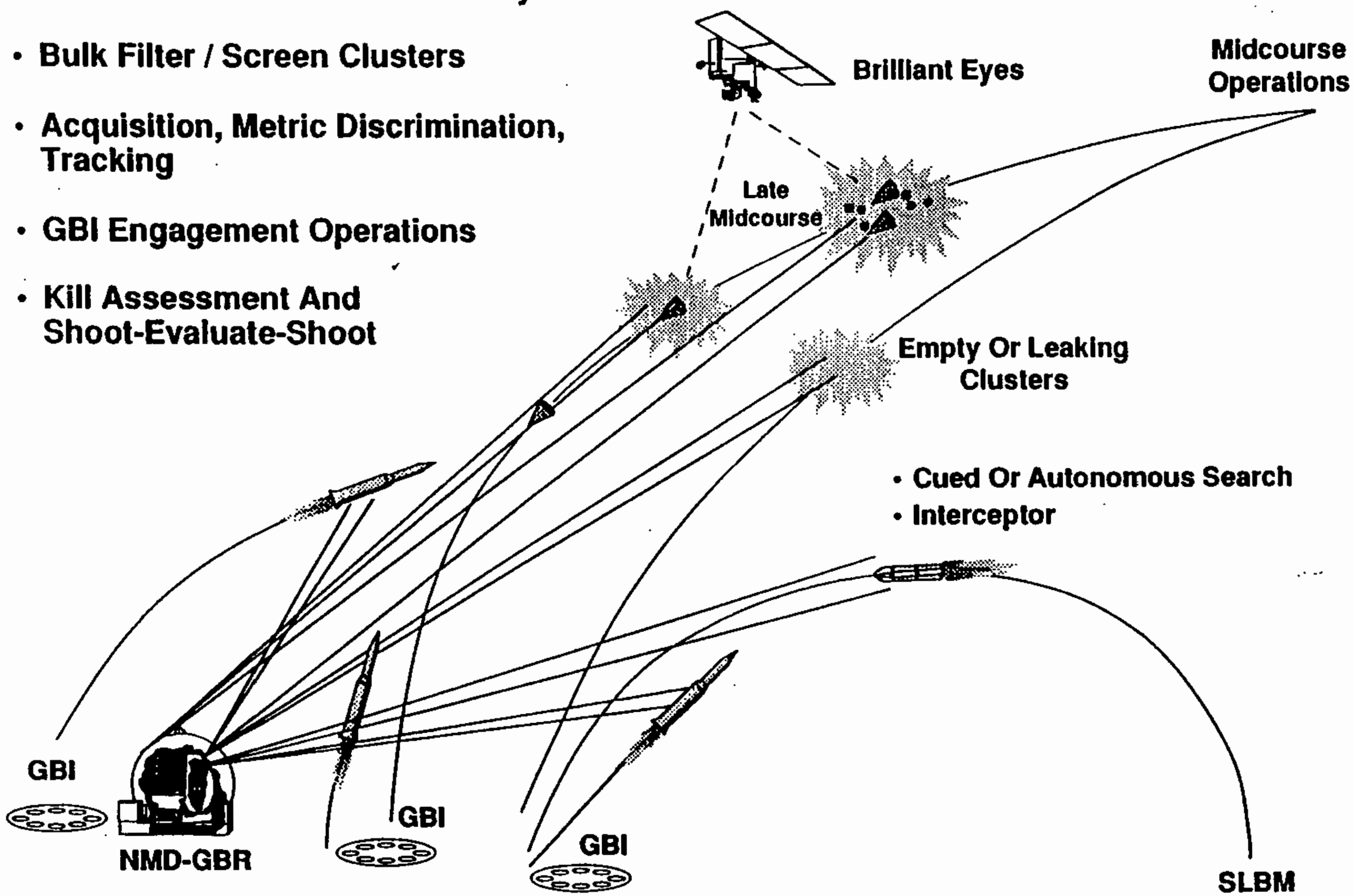
# NMD-GBR CONCEPT OF OPERATIONS

- Autonomous Search Or Cued By Other Sensors
- Bulk Filter / Screen Clusters
- Acquisition, Metric Discrimination, Tracking
- GBI Engagement Operations
- Kill Assessment And Shoot-Evaluate-Shoot

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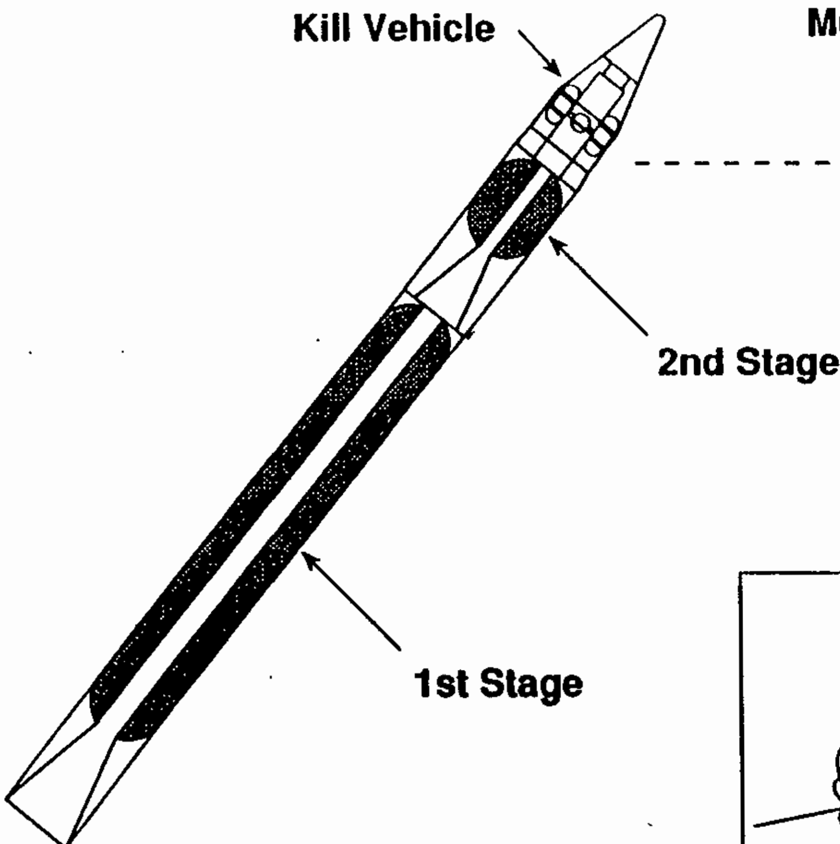
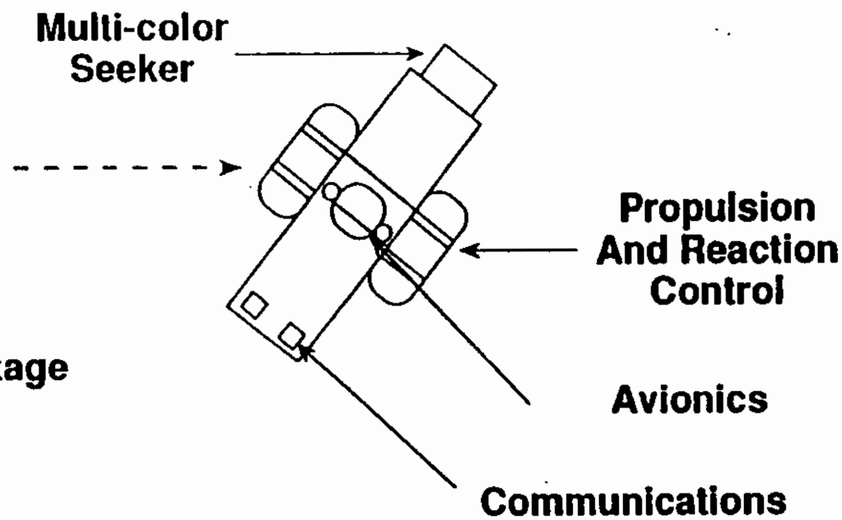
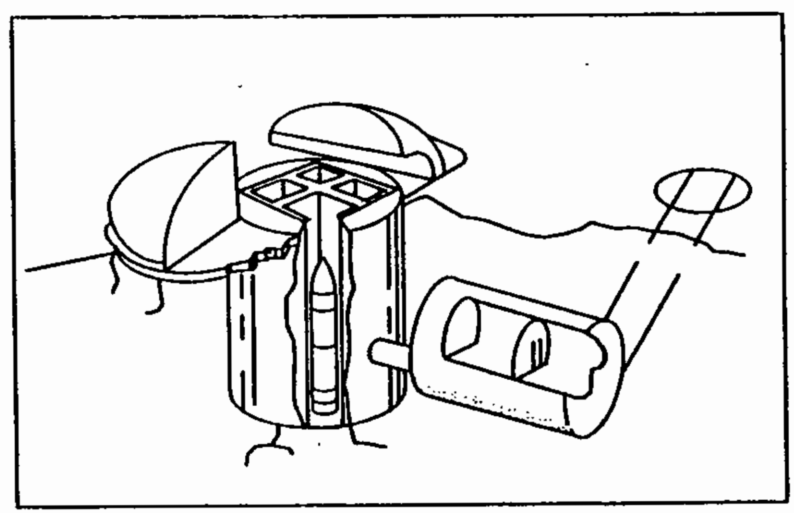
# GBI



Launch Site

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# THEATER MISSILE DEFENSE

Israel

**Theater Missile Defense Deputate**
**Strategic Defense Initiative Organization**

Jm-13637C / 022792 92

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
  - Experimental Support
  - Special Projects
- Programmatics

# TERMINOLOGY

- *Theater* And *Tactical* Are Used Interchangeably
- *Theater Missile* Or *Tactical Missile* Refers Herein To Ballistic Missiles

# THEATER MISSILE DEFENSE HISTORY

- 1984 And Subsequent SDIO Charters Included Authority To Conduct Theater Missile Defense Research
- SECDEF Guidance In 1986 Directed SDIO To Explore Specific Ways (Its) Research Can Support NATO Extended Air Defense Efforts
- Prior To FY 91, SDIO's TMD Efforts Were Directed To Technology Demonstrations And Architecture Studies
- FY 91 Congressional Direction: Centrally Manage And Accelerate TMD Efforts
- SDIO Identified As Central DoD Manager For TMD In November 1990

# CONGRESSIONAL DIRECTION

*Conference Report On FY 91 Appropriations*

". . . A U.S. Tactical Ballistic Missile [Defense] System With The Necessary Capabilities Should Be Fielded As Soon As Technologically And Fiscally Feasible."

"[Include] As Appropriate . . . The Navy And Air Force Requirements For Tactical Ballistic Missile Defense Systems And Programs."

*Authorization Act (Sec. 225) For FY 91*

It Is The Sense Of Congress To "Ensure That The Navy And Marine Corps Are Involved In Development Programs For Future ATBM Systems Suitable For Deployment With Their Projection And Expeditionary Forces."

5

# CONGRESSIONAL DIRECTION

*Conference Report On FY 91 Appropriations*

**". . . A U.S. Tactical Ballistic Missile [Defense] System With The Necessary Capabilities Should Be Fielded As Soon As Technologically And Fiscally Feasible."**

**"[Include] As Appropriate . . . The Navy And Air Force Requirements F...**

# PRESIDENTIAL DIRECTION

"... Looking Forward, I Have Directed That The SDI Program Be Refocused On Providing Protection From Limited Ballistic Missile Strikes, Whatever Their Source. Let Us Pursue An SDI Program That Can Deal With Any Future Threat To The United States, To Our Forces Overseas And To Our Friends And Allies."

*President George Bush*
*State Of The Union Address*
*29 JAN 91*

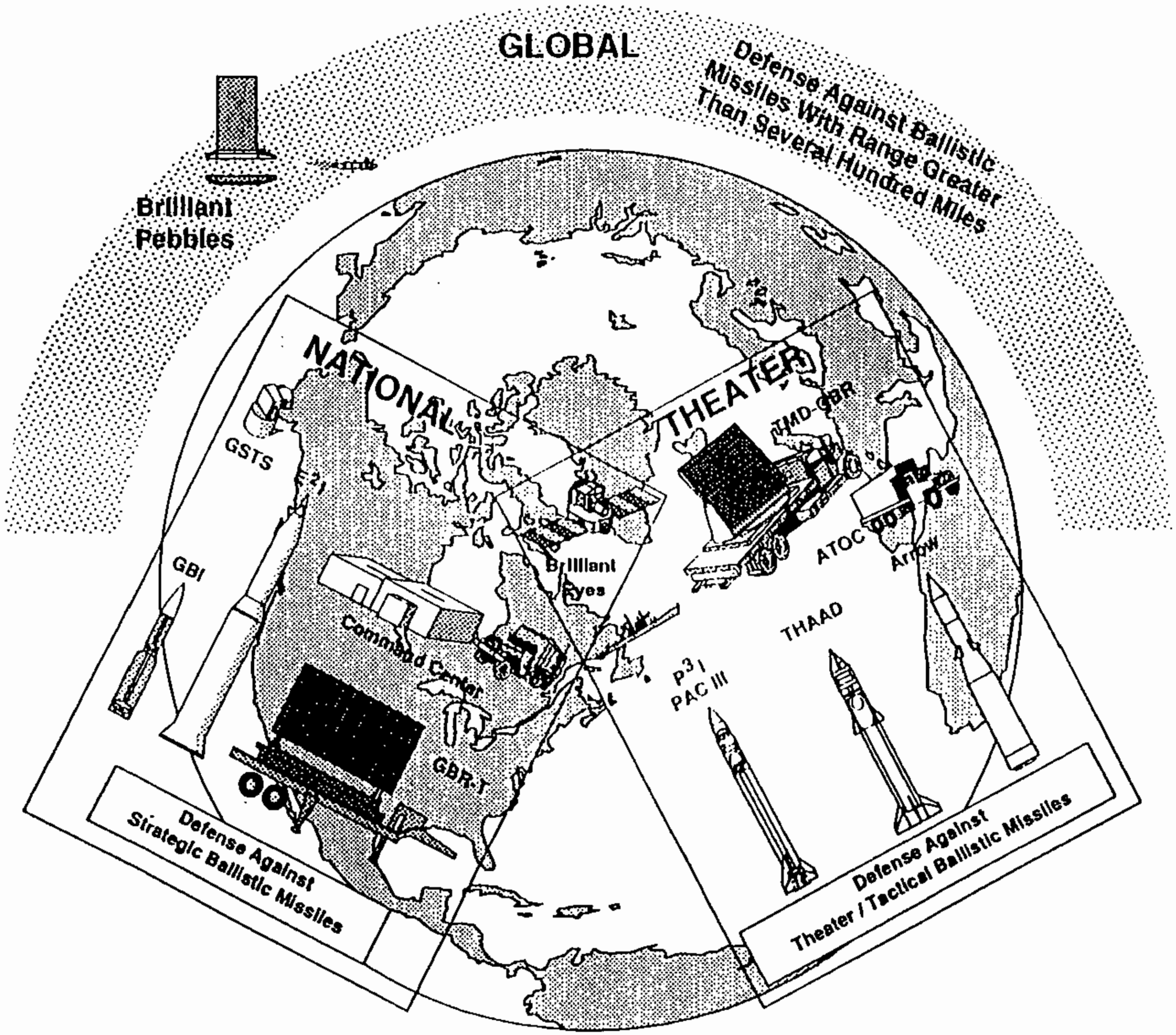
# DIRECTION AND GUIDANCE

- Secretary Cheney Statement Before The Senate Armed Services Committee Feb 21, 1991: ". . . SDIO Has Been Charged With Developing Advanced Defensive Technologies To Deploy Much Improved, Transportable Theater Missile Defenses Within The Next Five Years"

- Missile Defense Act Of 1991
  - "Aggressively Pursue The Development Of A Range Of Advanced TMD Options, With The Objective Of Down Selecting And Deploying Such Systems By The Mid-1990s."

  - "...To Achieve The Mid-1990s Deployment Date For A Theater Missile Defense System, Acceleration Of Normal Acquisition Process And Procedures Is Required In Light Of The Very High Priority Of These Objectives."

# GPALS

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# TMD FUNCTIONS

### Active Defense

- Launch Detection
- Cueing
- Tier Defense
  - Launcher
  - Missiles
  - Radar
  - Fire Control
- Kill Assessment

### $C^3I$

- Integration Of Information
- Integration Of Operations
  - TMD
  - Air Defense
- Attack Assessment
- Battle Management

### Passive Defense

- Concealment
- Dispersion
- Hardening
- Deception
- Mobility
- Civil Defense

### Counterforce Or Attack Operations

- Find Launchers And Associated Support
- Attack Targets

# SDIO's TMD MISSION

- Part Of GPALS, But Early Stand-alone Capability

- Active Defense And Associated $C^3I$
  - Early (Boost Phase) Intercepts
  - High-altitude Midcourse Intercepts
  - Low Leakage
  - Protect Areas (Population) And Assets

- Integrate And Balance Among All Pillars

- Integrate TMD And Air Defense, Including Cruise Missile Defense

# TOPICS

- Background
- Requirements And Threat

# JCS MISSION AREA NEEDS STATEMENT

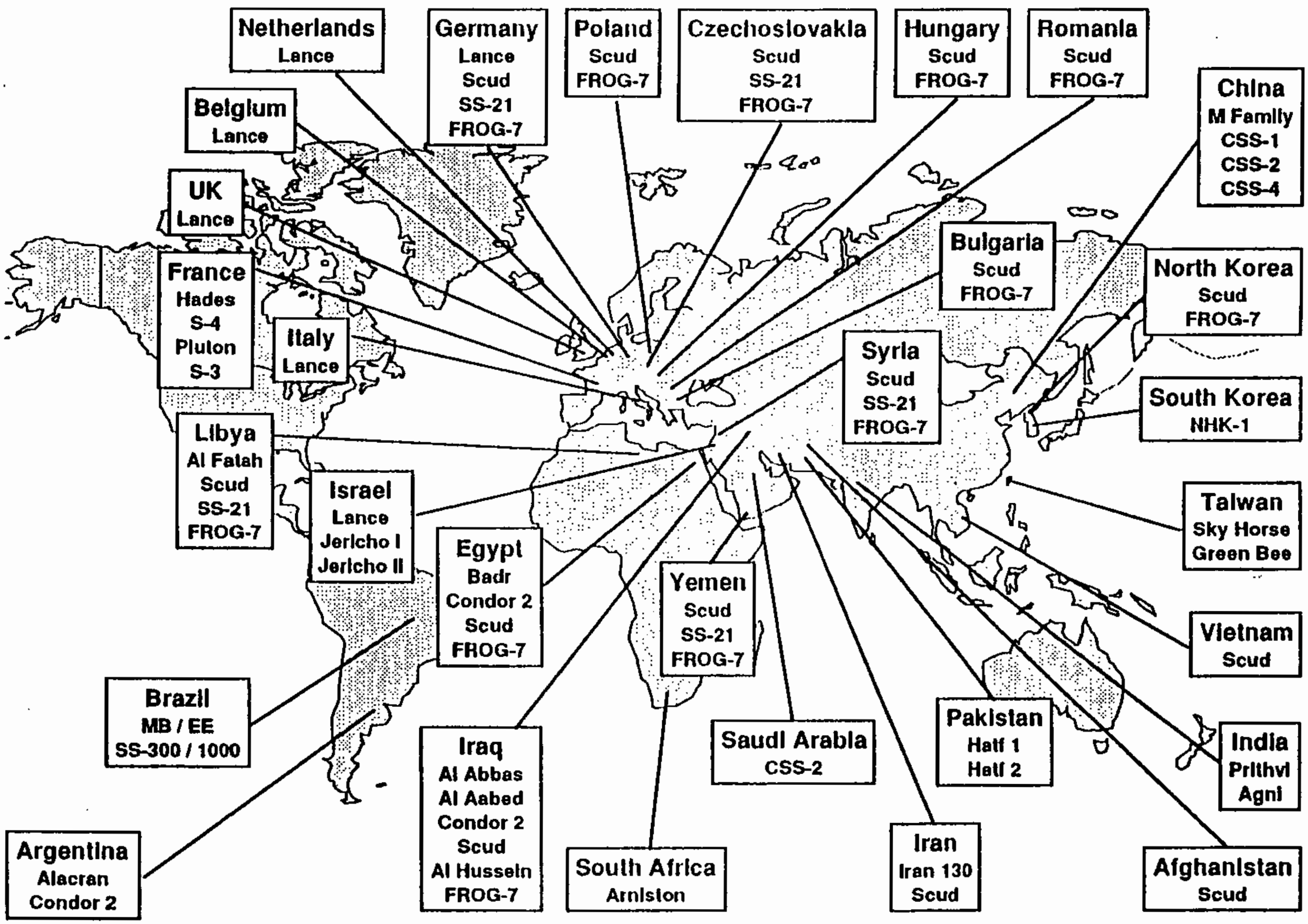
- "Theater Missile" Includes Ballistic, Cruise, And Air-To-Surface Types
- Protect U.S. Forces, U.S. Allies And Other Important Countries Including Areas Of Vital Interest To The U.S., From Theater Missile Attack
- Conventional, Chemical, Biological And Nuclear Warheads
- Four Mission Areas
- Mix Of Land, Air, Sea, And Space Capabilities
- $C^3I$ Should Be Incorporated Into Existing Structures
- "Defense In Depth" With Multiple Shot Opportunities
- C-130 Deployable
- No Quantitative Information

# TMD THREAT

- Extent
  - Countries With TBMs } 10s
  - Different TBM Designs } 10s
  - Existing Launchers 100s
  - Existing Missiles 1000s

- Characteristics
  - Ranges 80 - 3000 km
  - Apogees 20 - 150 km
  - Velocities 1 - 4 km/sec

# EVOLVING BALLISTIC MISSILE CAPABILITY

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# FUTURE DEVELOPMENTS AFFECTING BALLISTIC MISSILE CAPABILITY

- Range
- Accuracy
- Payload
  - Warhead
  - Packaging
- Countermeasures And Decoys
- Indigenous Production

# TMD THREAT WARHEADS CONSIDERED

- Bulk High Explosive
- High Explosive Submunitions
- Bulk Chemical Munition
- Chemical Submunition
- Bulk Agent Of Biological Origin (ABO)
- ABO Submunition
- Soviet Nuclear
- Third World Nuclear

# TMD COUNTERMEASURES

- Separating Warhead
- Fragmenting Booster
- Standoff Jammer
- Escort Jammer (X-band)
- RCS - $\beta$ - Matched Decoys
- Low RCS RV
- IR Decoy / Flares

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope

# APPROACH

- Priority To Near-term Improvement Of Active Defense
- Flexible / Modular Approach For Range Of Deployments
  - Mature Theater
  - Immature Theater
- Multiservice Involvement
- Activities Across Four Pillars Of TMD
- Scope
  - Architecture And Analyses
  - Experimental Support
  - Acquisition
- International Participation

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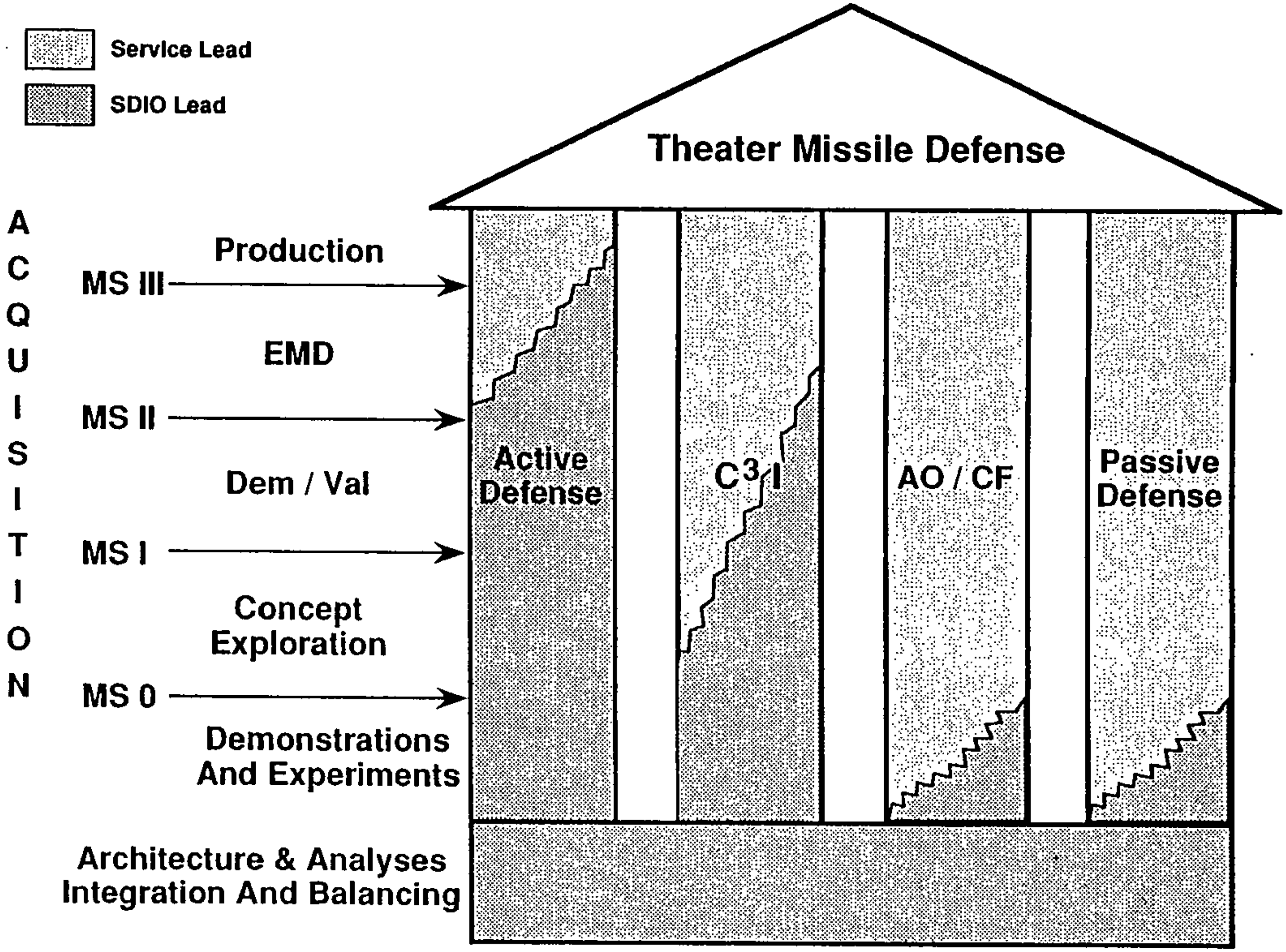
# SDIO ROLES

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# SDIO TMD PROGRAM

| Category \ Pillar | Active Defense | $C^3I$ | AO / CF | Passive Defense |
|---|---|---|---|---|
| Architecture And Analyses | | | | |
| Experimental Support | | | | |
| System Acquisition | | | | |
| Special Projects | | As Required → | | |

jm-23146 / 022792

# ROLES

- SDIO
  - Central TMD Manager For DoD
  - Source Of Funding
  - System Engineering And Program Direction
- Services
  - Combat Development
  - System Acquisition
  - Contracting
  - Technology Development

# STRATEGIC DEFENSE INITIATIVE ORGANIZATION

- Director (D) — Ambassador Cooper
- Deputy Director (DD) — MG O'Neill
- Systems Architect (DA) — Dr. Gerry
  - GC — General Counsel — Mr. Carroll
  - SB — Small And Disadvantaged Business — Mr. Moss
  - AQ — Acquisition & Mission Operations — Col Collins
  - IE — International & External Programs — Dr. Martin
  - CT — Contracts — Col Stewart
  - MO — Management Operations — Col Caddell
  - SI — Security, Intel, & Countermeasures — Dr. Ward
  - PO — Deputy For Program Operations
    - Deputy: Mr. Snyder
    - Asst. Deputy: Mr. Love
    - POF — Financial Management — Mr. Koval
    - POE — Cost Estimating & Analysis — Mr. Dryden
    - POI — Information Systems — Ms. Litman
    - POC — Planning & Control — COL Horn
  - SD — Deputy For Strategic Defenses
    - Deputy: Dr. Carlson
    - Asst. Deputy: Dr. Bleach
    - SDG — Global Defense Segment — Col Worrell
    - SDN — National Defense Segment — COL Drewes
    - SDA — System Integration & Command & Control — COL Hecker
    - SDT — National Test Bed — Col Kouts
  - TN — Deputy For Technology
    - Deputy: Col Worden
    - Asst. Deputy: Col Murphy
    - TNS — Sensor Technology — Col Heitz
    - TNC — Interceptor Technology — COL Powell
    - TNK — Key Technologies — Mr. Verga
    - TND — Directed Energy — Mr. Griff
    - TNE — Test And Evaluation — COL Toole
    - TNI — Innovative Science & Technology — Dr. Duston
  - TD — Deputy For Theater Missile Defense
    - Deputy: COL Ross
    - Asst. Deputy: Mr. Israel
    - TDS — Sensors — Col Payton
    - TDW — Weapons — COL Bubb
    - TDI — System Integration — Col Ritter
    - Program Mgmt & Corporate Strategy — COL Richardson

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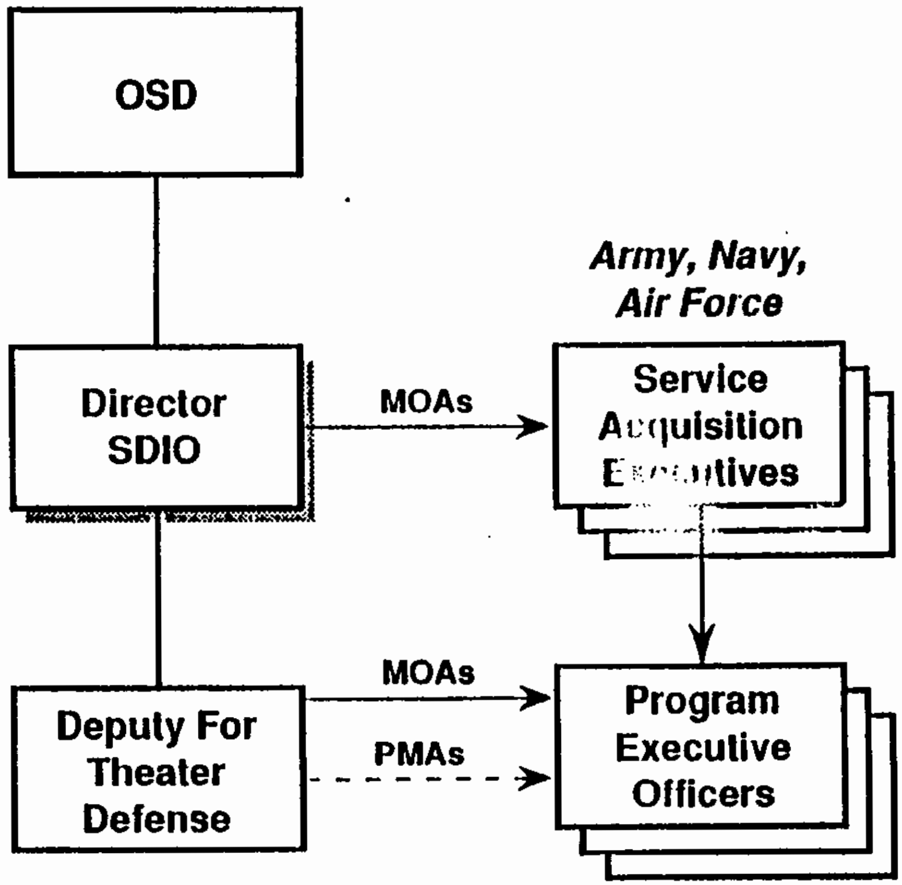
# TD MANAGEMENT



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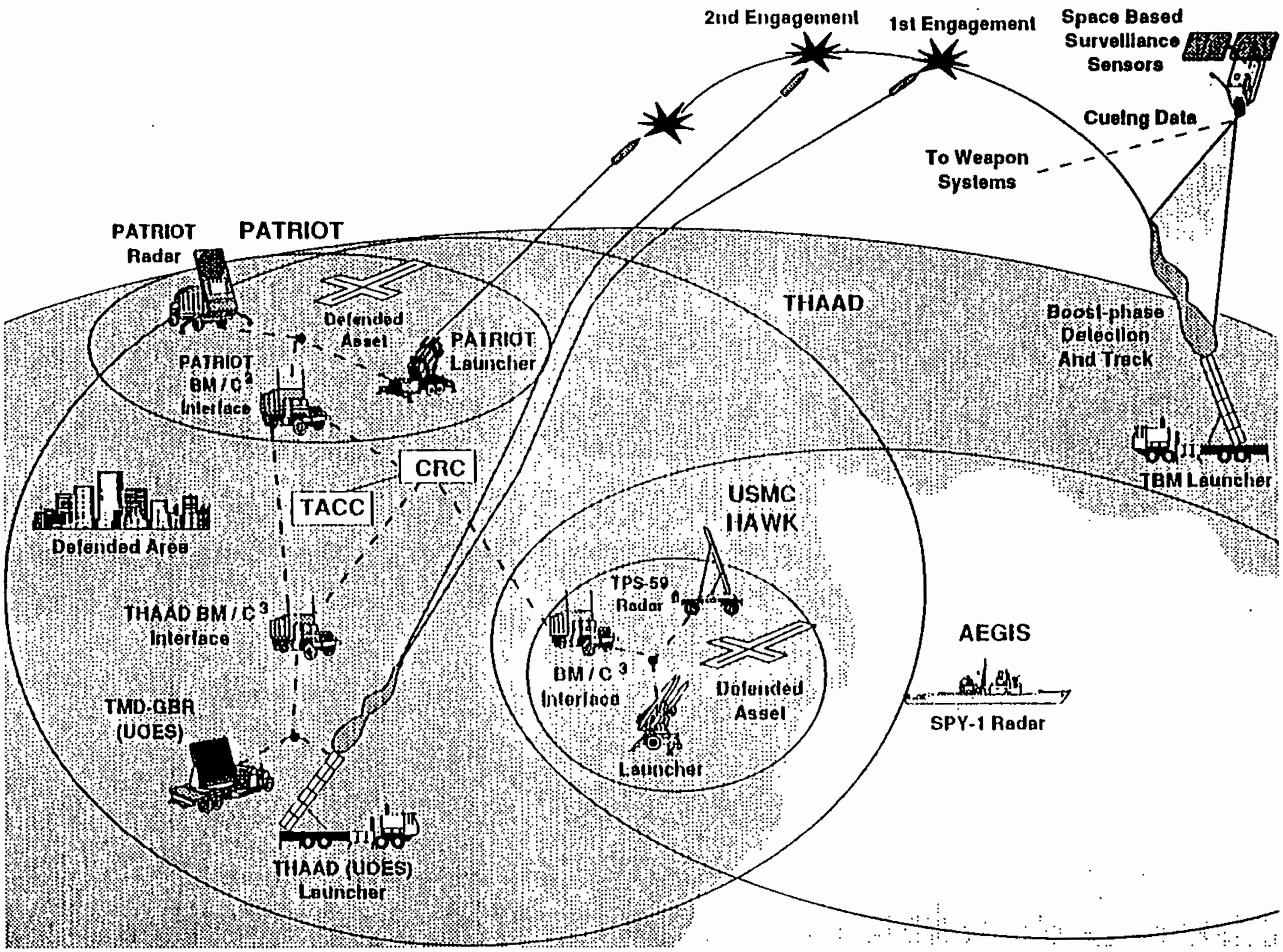
# NEAR TERM TBMD ACTIVE DEFENSE BASELINE ARCHITECTURE



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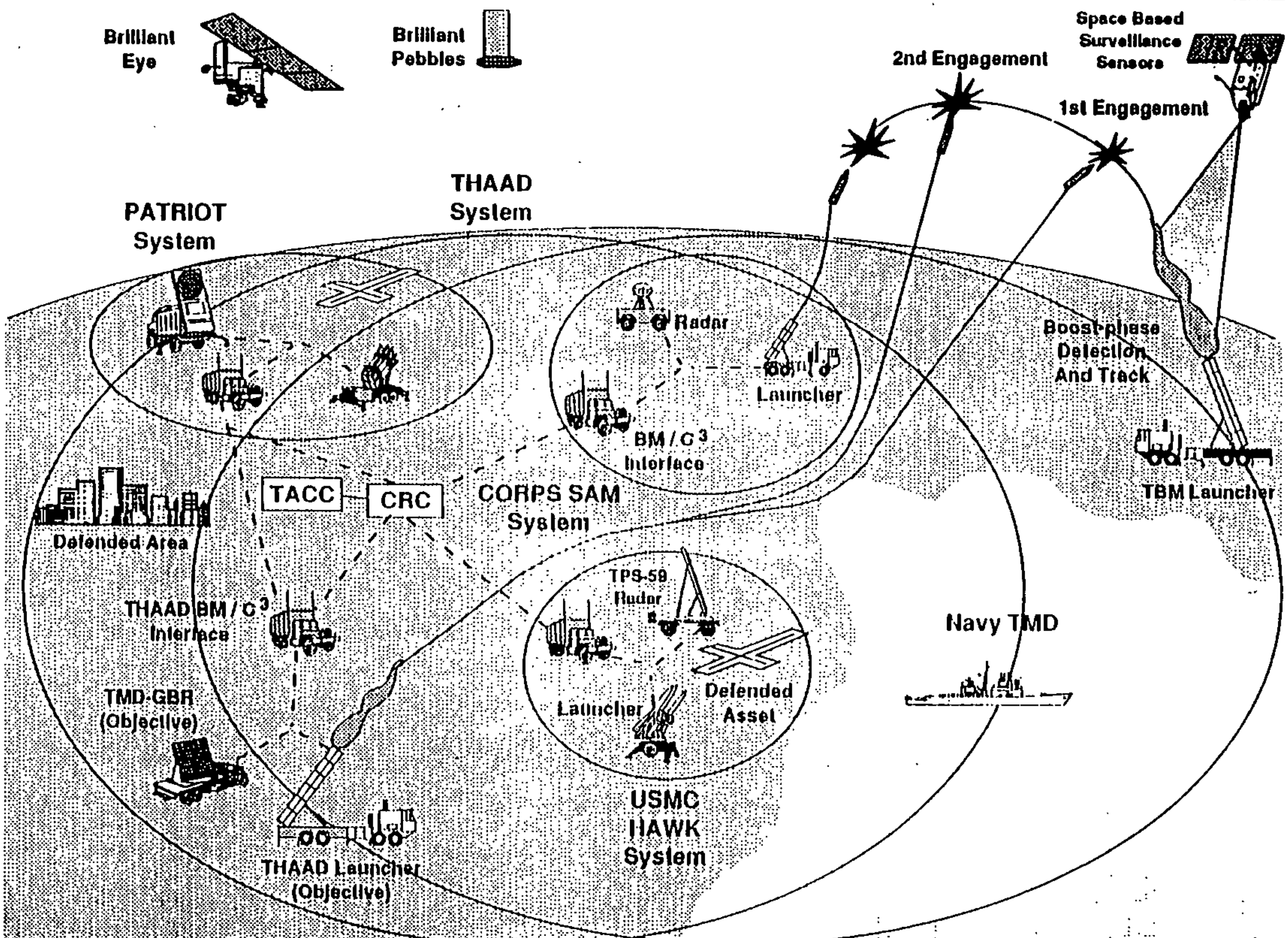
24B

# FAR TERM TBMD ACTIVE DEFENSE BASELINE ARCHITECTURE



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# KEY STUDIES

- Defense Science Board
- JASON
- Navy Studies
- Architecture Integration Study
- POET Summer Studies

# DSB / DPB

- Upgrade PATRIOT Quickly
- Lethality Unknowns Merit Attention
- Pursue Advanced System (THAAD And TMD - GBR)
  - Consider Heavier Warhead
- Consider Important Navy Role
- Space Can Make Contributions
- Management Attention Required

# POET SUMMER STUDIES

- Launch Detection
- Midcourse Sensing (BEAMS)
- Counterforce
- Advanced Technology

# INTERNATIONAL INTEREST

- Israel
  - Mid East Architecture Analysis
  - Arrow / ACES
  - ETG / HVG
  - Test Bed
  - Lethality
- United Kingdom
  - Evaluate Theater Strategic Threat
  - Cooperative Program In KBS / AI / Sensors / Test Beds
  - UK Architecture Study
- Japan
  - Awareness Of Problem (WESTPAC)
  - PATRIOT Improvements
  - MSAM / CHU SAM
  - Test Bed Interest
- Germany
  - Awareness Of Threat
  - PATRIOT Improvements / Dual Mode Seeker
  - MSAM CD Studies
  - Test Bed Interest
  - Lethality / HVG
- France
  - Awareness Of Threat
  - Developing ASTER With Italy
  - Test Bed Interest
- Italy
  - Awareness Of The Threat
  - Test Bed Interest
  - Developing ASTER With France

27b

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
  - Experimental Support
  - Special Projects

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
    - THAAD
    - TMD-GBR
    - PATRIOT
    - ERINT
    - Launch Detection

# BASIC PREMISE FOR ACTIVE DEFENSE

- Improvement Of Active Defense Capability Is An Urgent, High Priority Matter
- Two Tiers Of Active Defense Are Required
  - PATRIOT Upgraded, CORPS SAM
  - THAAD (Including TMD - GBR)
- Improved Launch Detection Is Necessary

# WHY AN UPPER TIER?

- High Altitude
  - Minimize Chemical Damage
- Large Footprint
  - Defense Of Dispersed Assets
  - Flexibility Of Deployment
  - Reduced Inventory / Force Structure
  - Reduced Airlift Requirements
- Long Range
  - Multiple Shots (Shoot-look-shoot)
  - Higher Overall System $P_k$

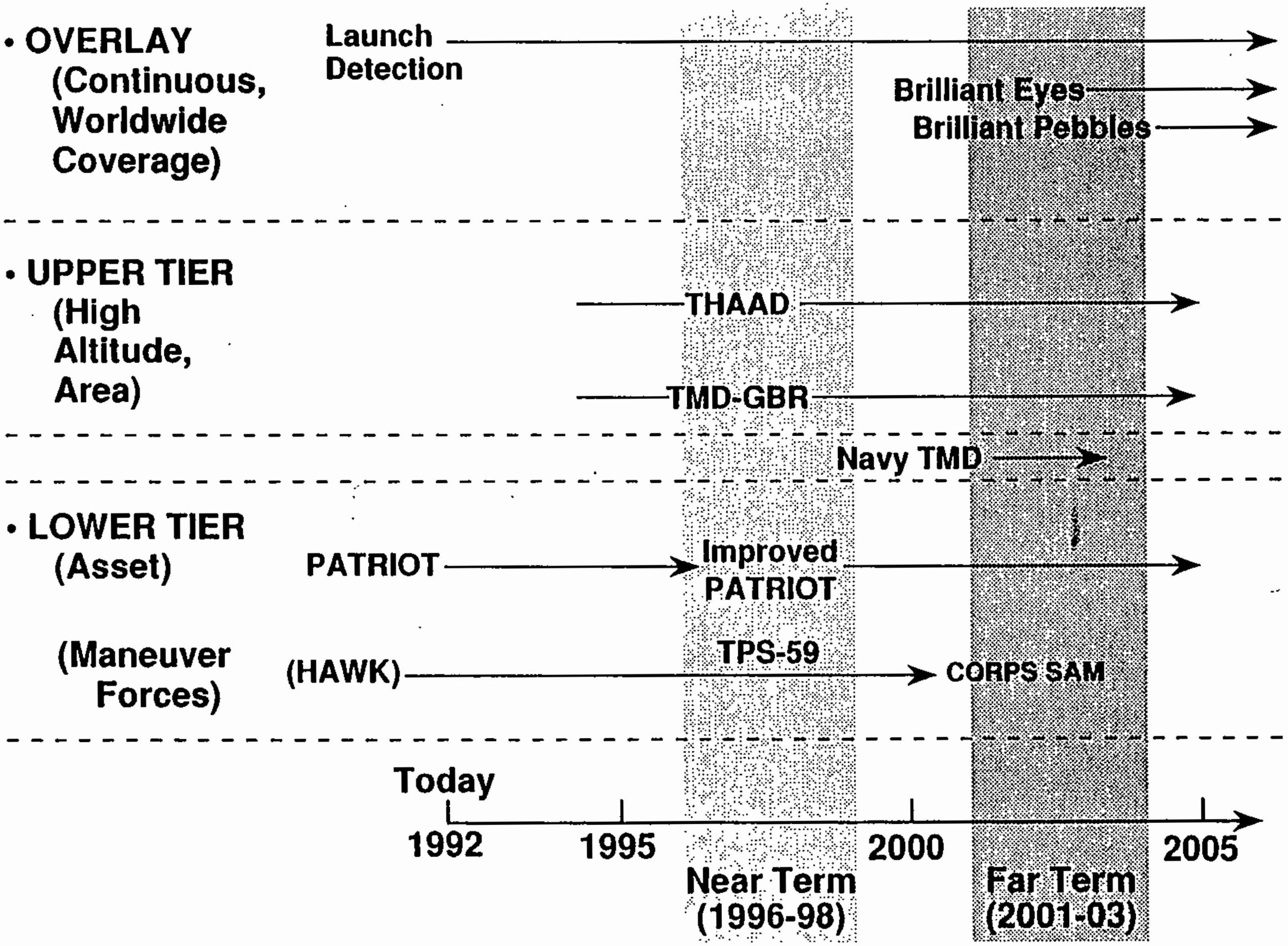
# <u>AVIATION WEEK</u> INTERVIEW OF LT GEN HORNER

*" I Underestimated The Political Impact Of the Scud... A Lousy Weapon, A Terror Weapon"*... A Miscalculation... Defused Only By The Success Of Patriot... Patriot Success Also has Exposed A Hole In The Allied Arsenal, Patriot Is A Point Defense Weapon, Areas To Be Defended In Saudi Arabia Are Concentrated In A Few, Small Clusters. If The Allied Military Targets Had Been Spread Out, There *"Wouldn't Be Enough Patriots In The World To Defend"* Them All.

In 15 To 20 Years, When Very Accurate Missiles With Mass Destruction Warheads Are Available To Third-World Nations, The U.S. Will Need A Regional, Wide Area Air Defense Force To Duplicate On A Grand Scale The Patriot's *"Pivotal Role Of Defanging"* The Scud.

*Lt Gen Charles A. Horner,*
*Commander, U.S. Central Command*
*Tactical Air Forces*
*<u>Aviation Week And Space Technology</u>*
*11 FEB 91*

# TMD ACTIVE DEFENSE

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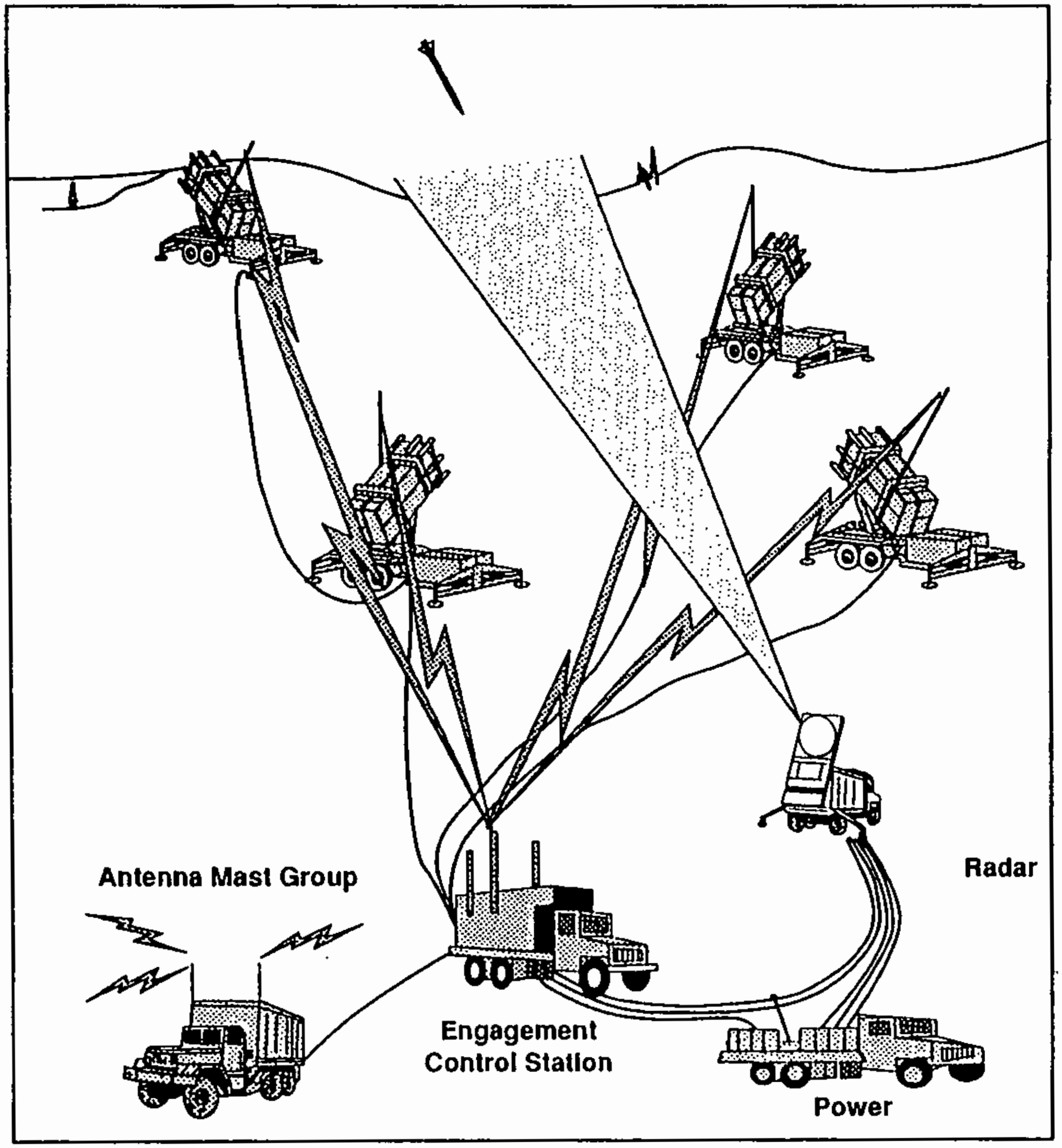
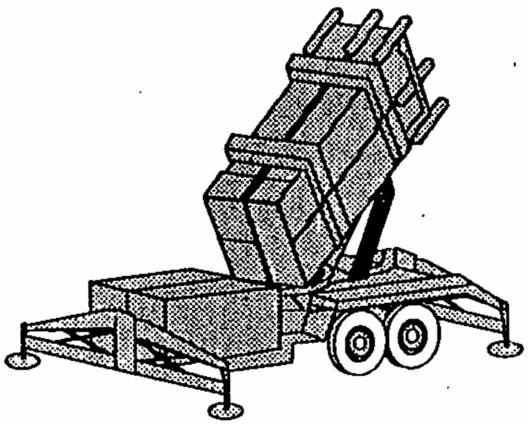
# PATRIOT FIRING BATTERY




- Multifunction Phased Array Radar For Multilaunching Stations
- Multilaunching Stations Mission Dependent (Remote)
- Manned Engagement Control Station (ECS)
- Key Support Equipment
  - Antenna Mast Group
  - Electric Power Plant
  - Fiber Optics Links
  - Cables
  - VHF Radio Data Link

# PATRIOT GROWTH PROGRAMS



### Configuration 3

- *Radar Enhancement Phase III*
- *Multimode Seeker (Full Capability)*
- Positive Identification
- *Remote Launch (Phase III)*
- Out-of-sector Launch
- Battalion Tactical Operations Center (BTOC) / Information Coordination Control (ICC) Integration
- Communication Upgrades
- *Launch Point Detection*
- Maintenance Equipment

### Configuration 2

- *Multimode Seeker*
- *Improved Propulsion*
- *Remote Launch (Phase II)*
- *Improved Launcher*
- Positive Identification (Initial Capability)
- Communication Upgrades
  - Communications Processor
  - JTIDS / MSE (BN And Above)
- Counter-antiradiation Missile
- Battalion Tactical Operations Center (BTOC) / Information Coordination Control (ICC) Integration (Initial)
  - Passive Emplacement
  - Air Control Order (ACO) Transfer
- Radar Enhancement Phase II

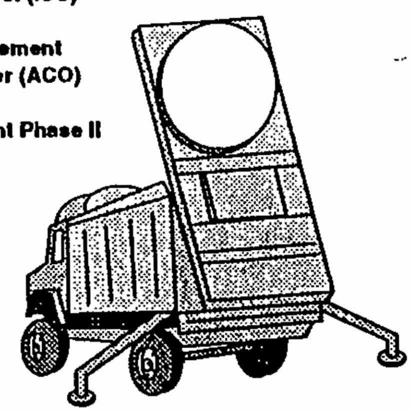
### Configuration 1

- Expanded Weapon Control Computer
- Optical Disk (Embedded Data Recorder)

### QRP Configuration

- Remote Launch (Phase I)
- *Radar Enhancements (QRP)*
- Emplacement Enhancements
- Radar Shroud (Not A QRP Task)
- Missile Guidance Enhancements
- Battalion Tactical Operator Center (BTOC) / Information Coordination Control (ICC) Integration Not QRP Task)

### PAC II



**Legend**

*Red - SDIO Funded*
Green - Army Funded

Today → Future

# ERINT-1

- ERINT-1 Will Demonstrate The Hit-to-kill Capability Of A Small, Low-endoatmospheric Interceptor Concept

- ERINT-1 Will Demonstrate The Integration Of Unique Technologies
  - On-board Active Seeker For Terminal Guidance
  - Composite Solid-rocket Motor And Attitude-control Motor Casing
  - Combination Of Aerodynamic And Impulsive Control To Achieve Hit-to-kill Accuracy

- Achievement Of Program Objectives Will Be Measured In A Series Of Eight Flight Tests

# ERINT-1 CONFIGURATION

- 3:1 VON KARMAN RADOME
- 180 DEG ATTITUDE CONTROL MOTORS, 12.5 LB-SEC
- ONE PIECE RADAR ELECTRONICS ASSEMBLY
- KOROTHERM THERMAL INSULATION
- FIBER OPTIC SIGNAL INTERFACE ACROSS SRM
- AERODYNAMIC MANEUVERING SYSTEM
- LENGTH 4475mm
- DIAMETER 255 mm
- LAUNCH WEIGHT 303.9 Kg
- BURNOUT WEIGHT 135.9 Kg

90U-0028
28 JAN 90

# ERINT-1 FLIGHT TESTS: REVISION B

## FY92

| Q1 | Q2 | Q3 | Q4 |
| --- | --- | --- | --- |
| | **CTF1** Airframe Evaluation, SRM Performance, Autopilot Validation — JAN | | |
| | **CTF2** Missile Control Capabilities, Inertial Flyout — MAR | **GTF1** High RCS TBM Surrogate, Medium Alt / Range, Simulated Bulk Chemical Warhead — MAY | **GTF2** TBM-surrogate, Simulated Chemical Submunitions — JUL |

## FY93

| Q1 | Q2 | Q3 | Q4 |
| --- | --- | --- | --- |
| **GTF3** Airbreather (Drone), High RCS, Low Alt / Range — OCT | | | |
| **GTF4** High RCS TBM Surrogate, High Alt / Range, Simulated Bulk Chemical Warhead — DEC | **GTF5** High RCS, Maneuvering Target, Medium Alt / Range Simulated Chemical Submunitions — FEB | **GTF6** High RCS, Maneuvering Target, High Alt / Range, Simulated Chemical Submunitions — APR | |

# THAAD FEATURES

- Endo And Exo Intercepts
- Long Range Capability
- IR Seeker
- Hit-to-kill
- Deployable By C-130
- Engagement Operations (EO) And Force Operations (FO) Functions In Tactical Operations Center (TOC)
- Theater Missile Defense - Ground Based Radar Provides Surveillance / Fire Control For System
- Modular Design Allows Use Of Space Based Assets

# THAAD ACQUISITION

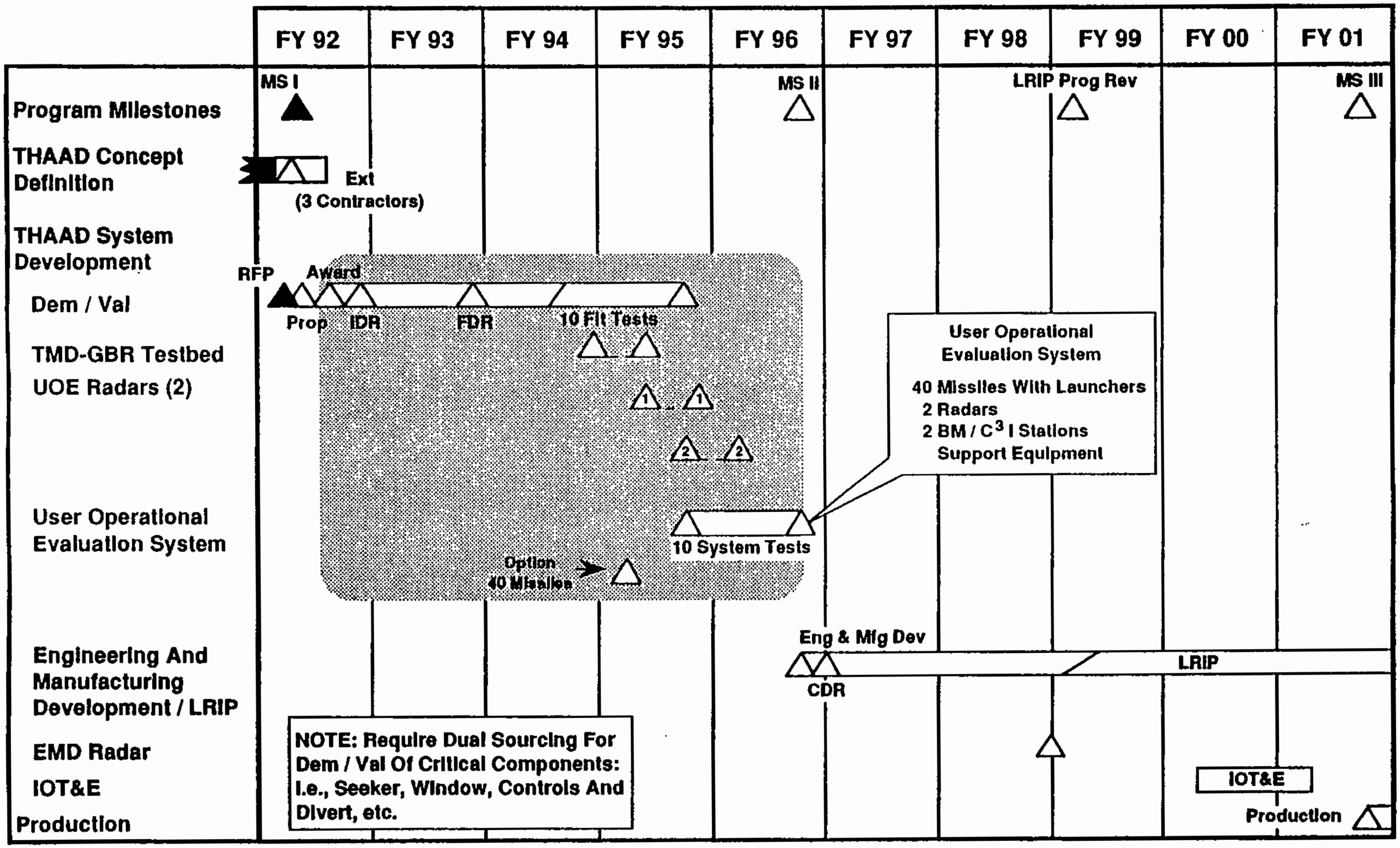
- Concept Definition
  - Contract Awards For Missile Design In August 1990
    - Lockheed Missiles And Space Company
    - McDonnell Douglas Space Systems Company
    - SPARTA
  - Redirected January 1991 To Design THAAD System (Missile, Radar, BM / $C^3$ ) Vice Missile Only
  - Redirected May 1991 To Design THAAD Missile, BM / $C^3$ And Integration With GFE X-Band TMD-GBR
  - Contracts End May 1992

- Demonstration And Validation
  - RFP Released In January 1992
  - Contract Award 4th Quarter FY 92
  - Two-fold Purpose
    - Prove Concept Ready To Proceed To MS II
    - Build Deployable Prototype System For Crisis Deployment If Necessary

# INITIAL THAAD OBJECTIVE

- Build A Dem / Val "Prototype" THAAD Capability By 1996 For Test And Early User Assessment At WSMR
  - 40 Missiles With Launchers
  - 2 TMD-GBRs
  - 2 THAAD TOCs
- With Special Support Provisions, This Capability Could Be Deployed In The Event Of A Crisis Situation

# THAAD SYSTEM PROGRAM SCHEDULE



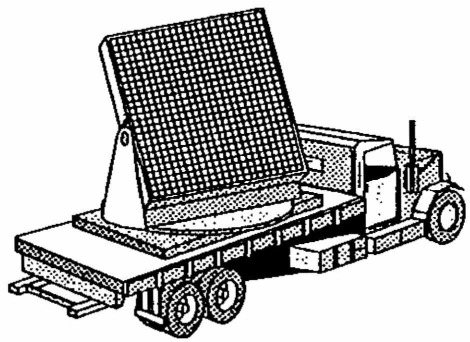
# AIRLIFT COMPARISON: PATRIOT vs THAAD

| *Equivalent Coverage In SW Asia Scenario* | *Sorties* C-130 | *Or* C-141 | *Or* C-17 | *Or* C-5 |
|---|---|---|---|---|
| **PATRIOT** 2 HQ Bn And 16 F / U (512 On-line Missiles, 512 Reload Missiles) | -- | 764 | 461 | 251 |
| **THAAD 2000** 1 HQ Bn And 4 F / B (288 On-line Missiles, 288 Reload Missiles) | 206 | 94 | 57 | 40 |

*Note: F / U = PATRIOT Fire Unit (8 Launchers)*
*F / B = THAAD Firing Battery (9 Launchers)*

# THEATER MISSILE DEFENSE - GROUND BASED RADAR (TMD-GBR)

## *TMD - GBR*

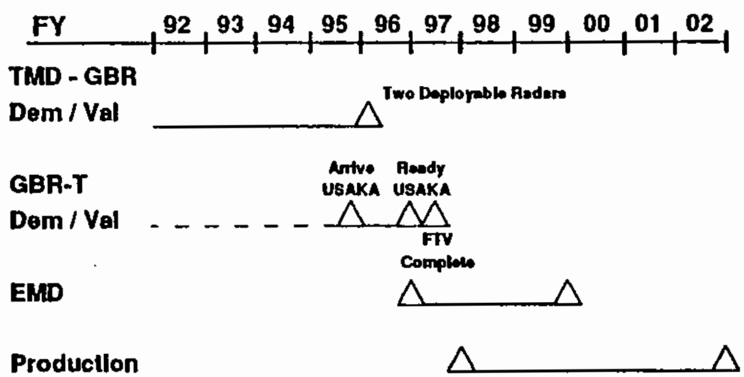


**First Increment Of Codevelopment With GBR-T In The "Family Of Radars"**

## *Missions*

- **Theater Wide Area Defense Providing Horizon And Volume Search**
- **Acquire, Track, And Classify Targets From Multiple Objects**
- **Multiple Target / Interceptor Tracking**
- **Provide Fire Control To THAAD, Kill Assessment And Cueing To PATRIOT / ERINT Underlay**
- **Operate In ECM Environment**
- **Launch / Impact Point Prediction**
- **C-130 Transportable**
- **Provide BM / $C^3$ Support**

## *Schedule*



# GBR PROCUREMENT

- White Sands Range Radar (1994)
- Two Deployable TMD-GBRs (1995)
- GBR-T At Kwajalein (1995)

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
    - Pillars
    - Sensors
    - Weapons
    - Theaters

# LAUNCH DETECTION STUDY
# FINDINGS / ACTIONS

- **Launch Detection Is Essential For Effective TMD**

- **Current System Is Only Viable Capability For Now Through Mid To Late 1990s**
  ***Action: Promulgate Tactical / Theater Mission Support Requirements For Launch Detection***

- **Tactical Mission Support Requirements Fundamentally Different From Strategic**
  ***Action: Implement Dedicated Tactical Processor / Display System***

- **Revisit Rate Does Not Support Quality Burnout Condition Determination**
  ***Action: Demonstrate Augmentation With High Revisit Rate Sensor***

- **Timely Delivery Of Launch Detection Data To Theater Is Mandatory**
  ***Action: Promulgate Communication Connectivity, Protocols, And Formats For TMD***

- **External Cueing Of Radar / TMD Components Is Very Beneficial To TMD Performance**
  ***Action: Develop / Implement Interfaces For Cueing Data Inputs At TMD Components***

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
    - Pillars
    - Sensors
    - Weapons
    - Theaters

# COUNTERFORCE

- Objective
  - Destroy Missiles Before Launch: Fueling / Arming / Transport, etc.
- Priority
  - Very High
- Critical Issues
  - Launcher Location Uncertainty
  - Decoys
  - Rapid Weapon Reaction
- Elements
  - Sensors
  - Integration / Coordination
  - Communications
  - Weapons

# COUNTERFORCE CHALLENGES

- Wide Area Search Capability
- All Weather, Day / Night Coverage
- Foliage Penetration
- Denied Surveillance Areas
- Very Timely Coverage
- Robust Detection And Identification Algorithms For Fixed And Moving Targets
- Decoys, Camoflage, Masking
- $C^2$ And Fusion Network For Rapid Dissemination Of Data
- Quick Response Weapon System Fly Out And Kill

# $C^3$ I FUNCTIONS

- Integration Of Information (Fusion)
  - Intelligence
  - Launch Detection
  - Remote Unattended Sensors
  - Communication Links
  - Satellites / Airborne Sensors
- Integration And Control Of Operations
  - Air Defense And Cruise Missile Defense
  - Navy Operations
  - Active TMD Defense
  - Counterforce

# TMD BM / $C^3$
# PROGRAM ASSUMPTIONS

- Theater Missile Defense (TMD) Is An Extension Of Tactical Air Defense

- TMD BM / $C^3$ Must Integrate With And Capitalize On Existing Heavy Service Investment In Air Defense BM / $C^3$

- TMD BM / $C^3$ Should Be Phased In With Air Defense BM / $C^3$ Upgrades Planned By Services

# PASSIVE DEFENSE

- **Objective:** Improve Asset Survivability
- **Measures:** Concealment, Hardening, Dispersion, Mobility, Deception
- **Note:** Iraq Used Such Measures To Protect Scud Launchers
- **Possible Efforts:**
  - Laser Sensing Of Chemical Dispersion After Warhead Destruction
  - Study PATRIOT And THAAD Protection From Attack
  - Study Common Techniques For Self-protection

# AIR FORCE PROGRAM

- Active Defense
  - DSP Upgrade
  - Surveillance Testing
  - Architecture And Analysis
- Counterforce
  - Studies Of Sensors And Weapons
- $C^3I$
  - Included In Active Defense And Counterforce

# NAVY TMD

- Near Term
  - Anti-air Warfare (AAW) Underlay Improvements Consisting Of AEGIS / SPY-1 Modifications And Improvements To SM-2 Block IV To Improve Performance In The TBMD Role
- Far Term
  - Long-range Endo- And Exo-intercept Capability Using THAAD Or Navy's Unique Weapon Coupled With AEGIS / SPY-1 Upgrades

# MARINE PROGRAM

- To Provide Limited Area, Highly Mobile TBM Defense For Marine Corps Operations
  - Upgrade OF TPS-59 To Provide Enhanced TBM Surveillance And Tracking Capability And Make Data Available On The Net
  - Upgrade Of HAWK Launcher To Interface With Digital Missile
  - Provide Guidance And Warhead Enhancements To HAWK Missile
  - Modify High Power Illuminating Radar System (HIPIRS) To Accept TPS-59 Data For Acquisition
  - R & D Of Air Defense Command Post To Act As A Node For Tactical Nets; JTIDS, TADIL-A, TADIL-B

# MIDCOURSE SENSING STUDY ACTIONS

- Initiate Development Of UAV Platform With IR And LADAR Sensors To Provide:
  - Hedge Against Radar Jammers And Penaids
  - Substitute For Ground Radars In Rapid Deployment Or Extension Of TMD Defense Coverage

- Support Mid-90s Deployment Of BE Block I In Order To Provide Large, Robust Defense Footprints For Theater Area Defense. BE Design Must Include Adequate Communications To Support Theater Defense

- Maintain Modularity In The GBR-TMD Development Program In Order To Have One Or Two Module (1/8 Or 1/4 Size) Radars To Support Remote Interceptor Sites For
  - Shoot-look-shoot Expansion
  - Interceptor Track And Communications
  - Rapid Deployment Or Expansion Of TMD To Theaters
  - Protection Of Amphibious Landing Area

# BRILLIANT EYES CONTRIBUTION TO TMD

- Possible Design
  - 18-36 SWIR / MWIR / LWIR Satellites
  - Orbit: Medium Altitude, Single Inclination

- Capabilities
  - Theater Wide Launch Detection
  - Cueing And Possible Pre-radar Commit For Active Defense
  - Global Capablitiy To Support
    - Rapid Deployment Forces
    - Deployed Naval ATBM Systems
    - Data Gathering

# BRILLIANT PEBBLES CONTRIBUTION TO TMD

- Possible Design
  - 500 SWIR / MWIR / H-T-K Satellites
  - Orbits: Low Altitude; Multiple Inclinations

- Capabilities
  - Global Launch Detection
  - Global Weapons Capability Against TBMs Of Over 500 km Range
  - Global Surveillance Support Similar To Brilliant Eyes

# CORPS SAM

- Protection Of Mobile Forces
- Capable Against Aircraft, Cruise Missiles And TBMs
- Replacement For HAWK
  - Airlift Deployability
  - Maneuverability
  - Reload
  - Firepower
- May Involve Allies
- Concept Definition Studies In FY 92 And FY 93, MS I In FY 93; IOC Beyond 2000

# TMD ADVANCED TECHNOLOGY REVIEW
# FINDINGS / ACTIONS

- **Airborne Laser Offers Greatest Potential For Boost Phase Intercept, But**
  - **Propagation And Lethality Are Major Uncertainties**
  - **Cost, Packaging, Major System Trades Must Be Done**

  ***Action: Emphasize Propagation and Lethality Measurements And Modeling; Support Concept Definition Studies***

- **Hypervelocity Gun And Projectiles (HVG&P) - Good Candidate For "Cheap Shot" Cluster Kill And Terminal Defense Of High Value Targets**

  ***Action: Focus HVG&P On Cluster Kill And Deployability***

- **Airborne LADAR Can Provide High Quality Tracking To Support Extended Surveillance, Discrimination And Kill Assessment, And Cluster Kill / Fire Control For HVG & P**

  ***Action: Develop Operational Concept For Implementing Airborne LADAR, Including Identification Of Airborne Platform And Flight Paths, Message Flow And Communication Links, And Command And Control Procedures***

# THEATER DEFENSE - ARCHITECTURE STUDIES

| BILATERAL | TMDAS | WESTPAC |
|---|---|---|
| United Kingdom | CoSyDe | LTV |
| Israel | SNIA | MHI |
| | MBB | |
| | Hughes | |
| | LTV | |

## PRODUCTS

- Candidate Architectures
- Mission Requirements
- Critical Technology Issues
- Effectiveness Analysis
- Life Cycle Cost Analysis
- Basing Analysis
- System Balancing
- Detailed System Requirements
- Interface Requirements
- BM / $C^3$ Requirements
- Technology Plan
- Development Plan
- Operational Concepts

# UK ARCHITECTURE STUDY

## Objectives

- Develop A BMD System To Protect Western Europe
- Identify Threat Excursions And Evaluate Architecture Sensitivities
- Examine Synergism Between European BMD / TMD Architectures And U. S. Strategic Defense System
- Coordinate U.S. / UK Joint Programs
- Refocus On GPALS Environment

## Task Description

- Develop Representative Threats And Scenarios
- Provide Simulation And Modeling Capability
- Develop And Evaluate Candidate Architectures
- Assess Interoperability Of Defense Systems
- Identify Means Of Enhancing Interoperability
- Assess Architectural Relevance Of U.S. / UK Joint Programs

## Issues

- Midcourse And Endo Discrimination
- Robustness Of Endo Defenses
- Interceptor Configurations And Tier Balance
- Cost-effectiveness

## Contractor Team

- Contract Managed By USASDC
- UK MOD / SDIPO
  - Siemens Plessey Defence Systems (Prime)
  - British Aerospace Corp.
  - Hunting Engineering Ltd.
  - PA Defence Systems
  - Data Sciences

# WESTPAC ARCHITECTURE STUDY

- Objective
  - To Provide USCINCPAC And WESTPAC Commanders With Vehicle To Study TMD
  - To Provide GOJ Insight To TMD Needs For JDF; Foundation For Testbed
  - To Provide SDIO / TD Insight Into WESTPAC Special Requirements

- Two Teams
  - Japanese Perspective: Mitsubishi Heavy Industries And SAIC
  - U.S. Perspective: LTV And Kawasaki Heavy Industries

- Three-phase Program
  - FY 89: Defense Of Japan Against Conventional Missile Threat
  - FY 90: Defense Of Japan Against Non-conventional Missile Threat
  - FY 91: Defense Of 1000 n.m. Radius Around Japan And Initial Excursions Into Korea And Other Asian Partners

- No Direct Government Of Japan Involvement

# ISRAELI ARCHITECTURE STUDY

- US-GOI Contract, Initiated In 1986 With WALES, Inc. Assisting GOI
- Looks At Middle East Region Focusing On Chemical Threat And Israeli Technology
- Includes System Engineering And Integration With Other US-GOI Joint Efforts

# TOPICS

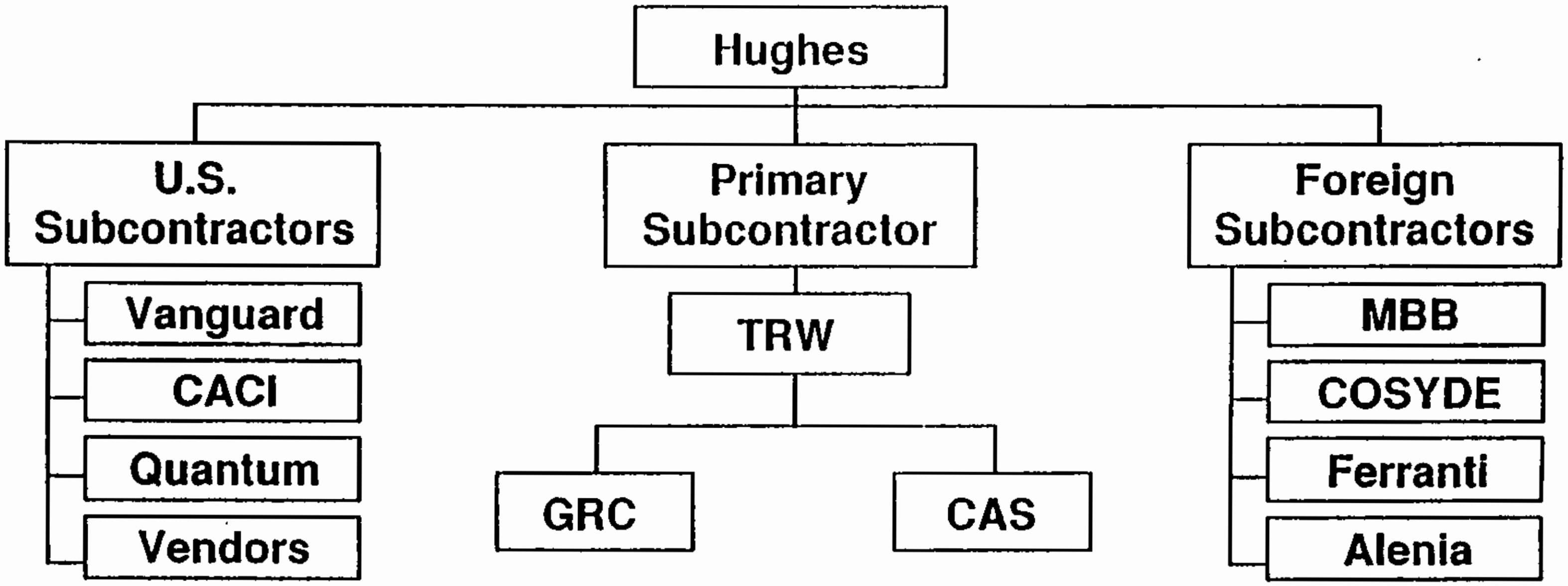
- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
  - Experimental Support
    - Test Beds
    - Lethality
    - CM / Discrimination
    - Experiments

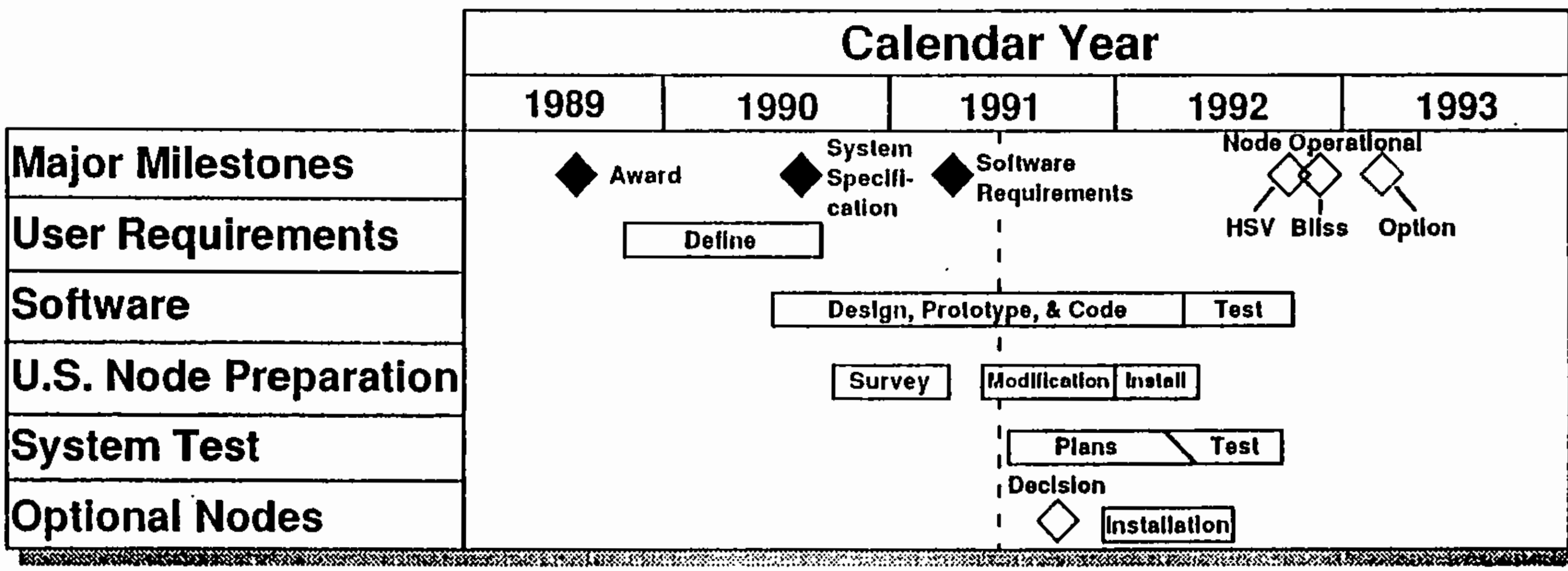
# THEATER TEST BEDS

- Objective
  - Provide Common Analysis Tools To Support Resolution Of Extended Air Defense (EAD) Issues Related To The Following Areas
    - Theater Level System Requirements, Architectures, Force Structures, And Operational Concepts
    - Doctrine And Battle Planning
    - Mix And Interaction Of Various Weapon Systems
    - System Integration, Interoperability And Interface
    - Technology Applications To Systems And Concepts
    - Wargaming, Live Exercise Preparation And Evaluation, And Training

- Activities
  - EADSIM
  - EADTB
  - EADTB - UK Node
  - Israeli Test Bed

# EADTB DEVELOPMENT



# UK TEST BED

## Objectives

- Extend UK Air Defense Test Bed To Evaluate TMD Issues
- Create EADTB Node Capable Of Stand-alone Operations And Networking With Other Nodes
- Develop Common And UK-unique High Fidelity Models

## Program Description

- Joint Program With Shared Costs (US 52%, UK 48%) SEP 88 - SEP 92
- Develop SIMBOX2/DISCON2 In Ada
- Enhance SIMBOX2/DISCON2 For TMD
- Create Libraries Of Models To Satisfy Initial Terminal Tier Experiment
- Design, Implement, Execute, And Analyze Experiment

## Status

- CONVEX C220 Installed - Operational
- SIMBOX 2 Framework Operational
- DISCON 2 Prototype Operational
- Terminal Tier Experiment Defined
  - Software In Development

## Contractor Team

- LOA Between USASDC And UK Defense Research Agency Electronics Division, Effort Contracted To
  - Data Sciences
  - Hunting Engineering

# ISRAELI TEST BED

## Objectives

- Provide Israeli And U.S. Capability For Evaluating TMD Architecture Concepts In The Middle East
- Support Evaluation Of Key Technologies To TMD
- Provide Resolution of Critical Man-In-The-Loop Issues

## Task Description

- Cooperative Venture Of U.S. And Israeli Governments
  - Develop Stand-alone Test Bed Unique To Israeli Environment
  - Evaluate Middle East Missile Defense Designs And BM / C3 Against Defined Threats
  - Include Man-In-the-loop And Hardware-In-the-loop Mechanisms
- Funding: U.S., 72%; GOI 28%
- Experiments Identified For Joint And Unilateral Participation

## Status

- Tadiran Contract Awarded June 1989
- Detailed Design Satisfactorily Reviewed
- Coding And Unit Testing Being Completed
- Integration Efforts Initiated
- Computer Hardware Selected
- Facility Location Selected (Tadiran)

## Contractor Team

- USASDC (Executing Agent)
- Tadiran (Prime)
  - ELTA
  - Contahal
  - Rafael (GOI Armament Authority)
  - Advanced Technology, Ltd (ATL)

# LETHALITY SUMMARY

- Hit-to-Kill, From A Lethality Perspective, Is The Most Promising Concept For Negation Of Stressing Threats
- Hit-to-Kill Can Be Achieved

# LETHALITY

- Priority Item
- Three-pronged Risk Reduction Approach
  - Detailed Simulations
  - Early Sub-scale And Full-scale Ground Tests (FY 91-93)
  - Flight Tests With Broad Spectrum Of Threat Warheads (FY 92-94)
- Funding
  - FY 90 $2.7M
  - FY 91 $10.0M
  - FY 92 $30.0M
  - FY 93 $30.0M

# KEY LETHALITY ISSUES

- Hit-to-Kill

  - Guidance Accuracy
    - Response Time
    - Seeker Noise / Bore Sight Errors
      - Active Seeker Cooling Effects

  - Target Uncertainties
    - Warhead Type / Design
    - Tumbling / Breakup
    - Countermeasures

  - Aimpoint Selection
    - Seeker Resolution
    - Aimpoint Algorithms

- Intercept Altitude
  - Endo Hit-to-Kill

- Warhead Lethality
  - Canister Submunitions

# HISTORY OF HIT-TO-KILL

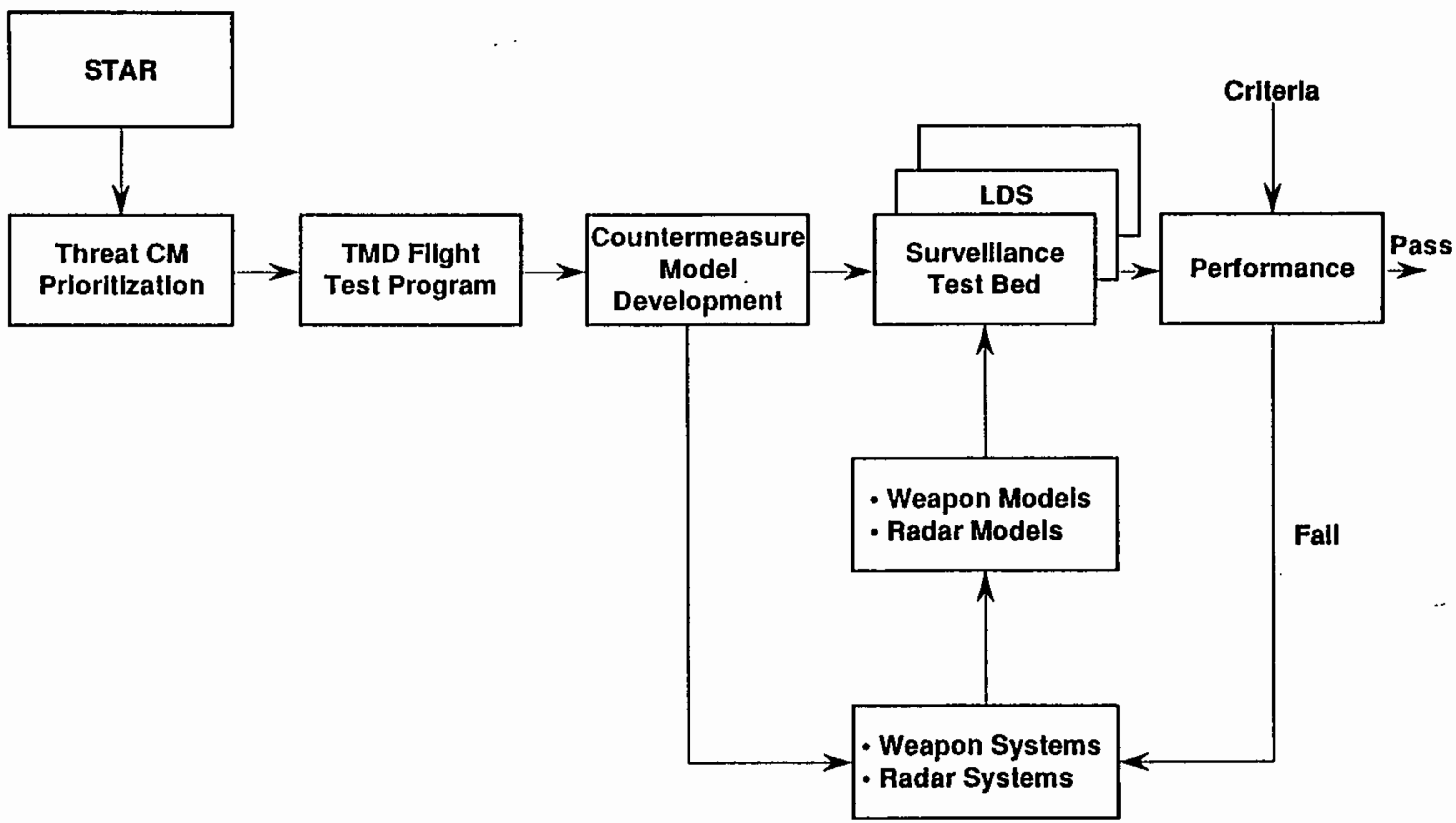
- Homing Overlay Experiment (HOE)
  - Demonstrated ≈0.5 m Miss (Exo)
    - ≈5 km / sec

- Miniature Homing Vehicle (MHV) (U.S. Anti Satellite Weapon (ASAT))
  - Demonstrated ≤1 m Miss (Exo)
    - ≈5 km / sec

- Flexible Lightweight Agile Guided Experiment (FLAGE)
  - Demonstrated ≈0.3 m Miss (Endo)
    - ≈3 km / sec

- Exoatmospheric Reentry Vehicle Intercept System (ERIS)
  - Demonstrated ≈0.3 m Miss (Exo)
    - ~5 km / sec

# DISCRIMINATION FLIGHT TEST PROGRAM




jm-23990 / 020592

# END-TO-END KILL ASSESSMENT STUDY

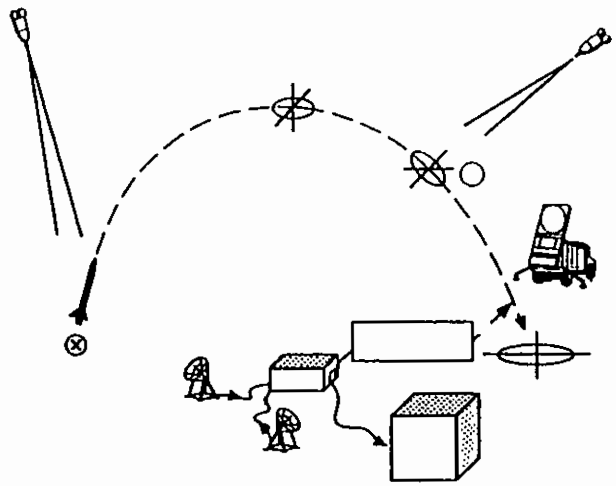
**Objective:**
- Review And Analyze End-to-end Effectiveness Of TMD Weapons Systems, Linking Engagement And Lethality Models And Experimental Data

**Organization:**
- SDIO Organized, POET Led, Service Participation

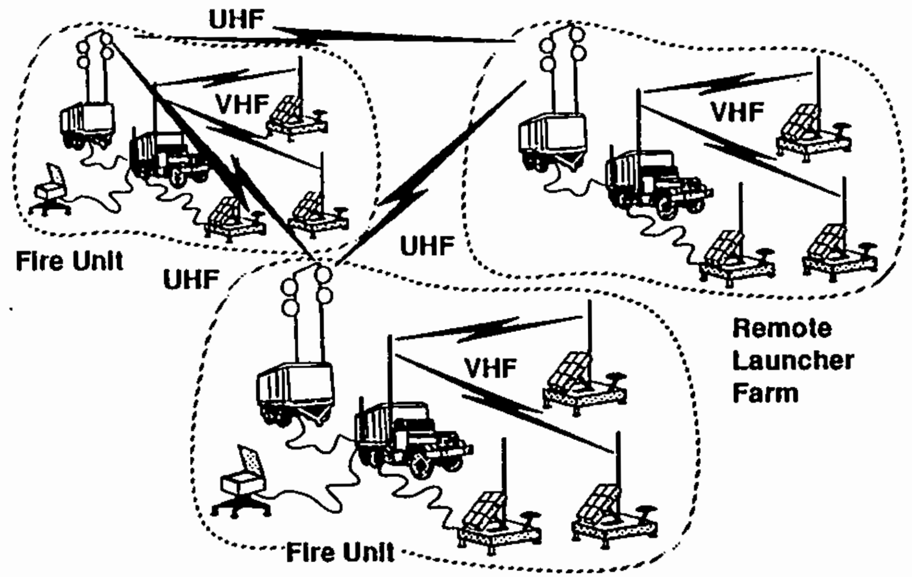
**Schedule:**
- Kick-off – January 1992
- Preliminary Recommendation – July 1992
- Final Report – October 1992

**Products:**
- Assessment Of Current Knowledge Of TMD Weapon System Effectiveness
- Recommendation Of Models, Algorithm And Methodologies Which Should Be Used In Effectiveness Analysis
- Recommendations For Associated FY 93 TMD Programs And Activities

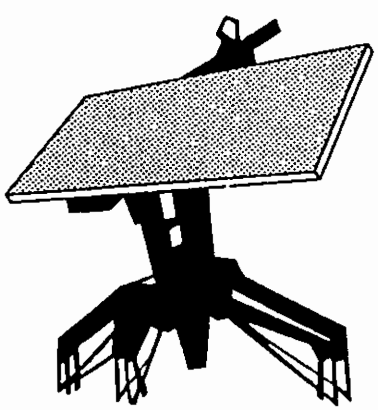
# EXPERIMENTS



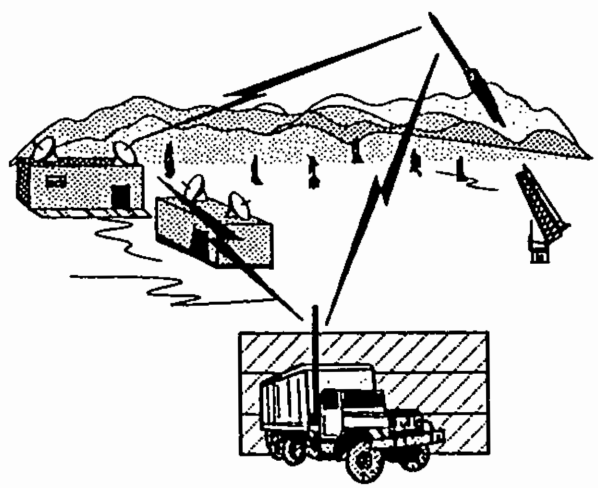
Aerojet Tactical
Surveillance Demo



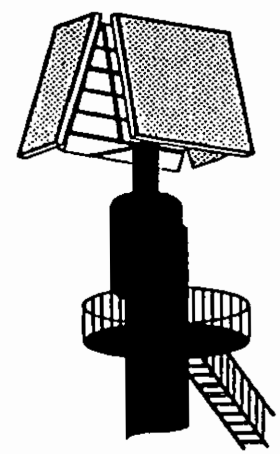

Raytheon Remote Launch Demo



Westinghouse Advanced Expert
Missile Tracker (EMT) Demo



IBM Passive Sensor System



Plessey Mesar Trials With
Adaptive Nulling Demo

82a

# INVITE, SHOW AND TEST (IST) BROAD AREA ANNOUNCEMENT (BAA)

- Objective
  - Follow-on To Current Experiments Program
  - Test And Evaluate New Concepts / Systems / Equipment
    - Full JMNS Theater Missile Threat
    - All Four Pillars
- Status (1 MAR 92)
  - $7.2 M For FY 92
  - 49 Proposals Received Covering All Categories
  - 14 Proposals Undergoing Final Review
  - Final Selection By 1 APR 92

# THEATER CAPABILITY EXPERIMENTS

*Purpose*

- Work With The CINCs And Services To Explore Thier Unique TMD Problems And Interfaces
- Conduct Experiments To Validate Problems And Solutions And Enhance Readiness

*Scope*

- All Four Pillars Of TMD
- Inclusion / Integration Of Warning & Intelligence

*Schedule Information*

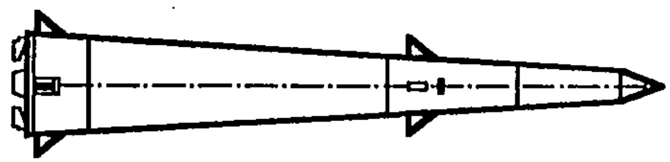
| Organization | Timeframe | Event |
|---|---|---|
| • CINCEUR | FY 89 | Torpid Sunset |
| • CINCEUR | FY 90, 91 | Torpid Shadow I & II |
| • CINCEUR | FY 92 | Questor Grail |
| • CINCPAC | FY 93 | TBD |
| • CINCCENT | FY 94 | TBD |

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
  - Experimental Support
  - Special Projects

# ARROW

## Arrow Missile Concept



## Objective

- Cooperative Program With Israel To Demonstrate Arrow's Capability To Intercept A Tactical Ballistic Missile
- Three-Year Firm-Fixed-Price Contract Signed With Israeli Aircraft Industries (IAI) In August 1988
- Four Flight Tests
  - Two Interceptor Flight Tests (AUG 90, MAR 91)
  - Two Propulsion And Control Tests (OCT 91)

# ARROW CONTINUATION EXPERIMENT (ACES)

- Follow-on To Arrow Development
- MOA Signed June 1991
- Contract With IAI
- Missile And Launcher Only
- 11 Flights Through 1995
- Changes
  - Booster
  - Warhead
- Provides Alternative Approaches / Insurance To THAAD

# TOPICS

- Background
- Requirements And Threat
- Program Organization And Scope
- Technical Activities
  - System Acquisition
  - Architecture And Analyses
  - Experimental Support
  - Special Projects
- Programmatics

# TMD DOCUMENTATION

- Theater Missile Defense Report To Congress, 30 MAR 91
- TMD Master Program Plan (Based On Service Program Plans)
- TMD Mission Requirements Document (Based On MNS, ORD, etc.)
- TMD System Description
- Active Defense Requirements Document
- $C^3I$ Requirements Document
- SDIO Report To Congress, June 1992

# TMD BUDGET IN FY 92

| Area | | $M |
|---|---|---|
| • System Acquisition Program | | 493 |
| - PATRIOT | 170 | |
| - ERINT | 171 | |
| - THAAD | 108 | |
| - TMD-GBR | 44 | |
| • Architecture And Analyses | | 180 |
| • Experimental Support | | 125 |
| • Special Projects | | 60 |
| | Total | $858M |

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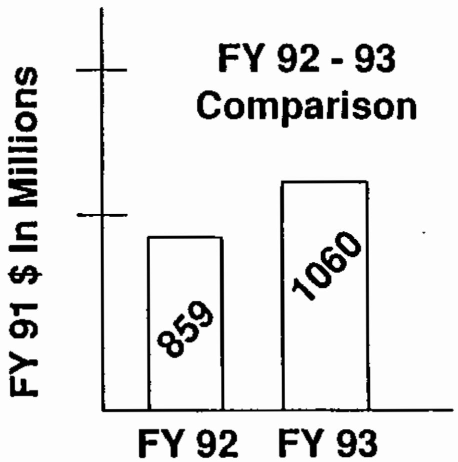
# TMD BUDGET FY 93




| | | | |
|---|---|---|---|
| *TMD MDAPS* | | *(TY $M)* | |
| CORPS SAM | | 25 | |
| PATRIOT | | 186 | |
| UTTMDS | | 381 | |
| THAAD | 258 | | |
| TMD-GBR | 123 | | |
| *Subtotal* | | | 592 |
| *Other TMD* | | | |
| ERINT | | 135 | |
| Navy | | 19 | |
| Air Force | | 14 | |
| ACES | | 58 | |
| TMD Integration | | 11 | |
| Advanced Sensors | | 72 | |
| TMD Studies | | 38 | |
| TD Countermeasures | | 11 | |
| $C^4I$ | | 19 | |
| Theater Test Bed | | 37 | |
| Other | | 54 | |
| *Subtotal* | | | 468 |
| *Total* | | | 1060 |

*Adjustments Required*

- Navy TMD
- AF TMD ($BMC^3$)
- Others

jm-24658 / 022792

# TECHNICAL PROBLEMS AND CHALLENGES

- Lethality
- Software
- Boost Phase Kill
- Countermeasures

# MAJOR INDUSTRY OPPORTUNITIES

- In Process
  - THAAD
  - TMD - GBR
  - IST BAA
- Upcoming
  - CORPS SAM
  - Navy TMD
  - Air Force Program

# SUMMARY

- High Administration And Congressional Interest In Theater Missile Defense (TMD)
- TMD Is Part Of GPALS, But Must Have An Earlier Stand Alone Capability
- An Aggressive TMD Program With Multiservice And International Participation Has Been Initiated
- THAAD / TMD-GBR And PATRIOT PAC - 3 Are The Centerpieces Of The Near Term Active Defense Segment Of TMD; Improved Processing And Distribution Of Launch Detection Data Is Required
- Navy, Air Force, And Marine Corps Programs Are Underway Or Are Being Formulated
- The TMD Program Also Features Architecture, Analyses, And Experimental Support Activities

FoI 92-0855

# STRATEGIC DEFENSE INITIATIVE

## Advance Planning Brief For Industry
## National Test Bed

NATIONAL TEST BED

2 MAR 92

CDR Ed Lenio, USN
Deputy Director, National Test Bed
Strategic Defense Initiative Organization

jm-21791a / 030292

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# OUTLINE

NATIONAL TEST BED

- NTB Mission
- Program Summary
- Industry Contributions

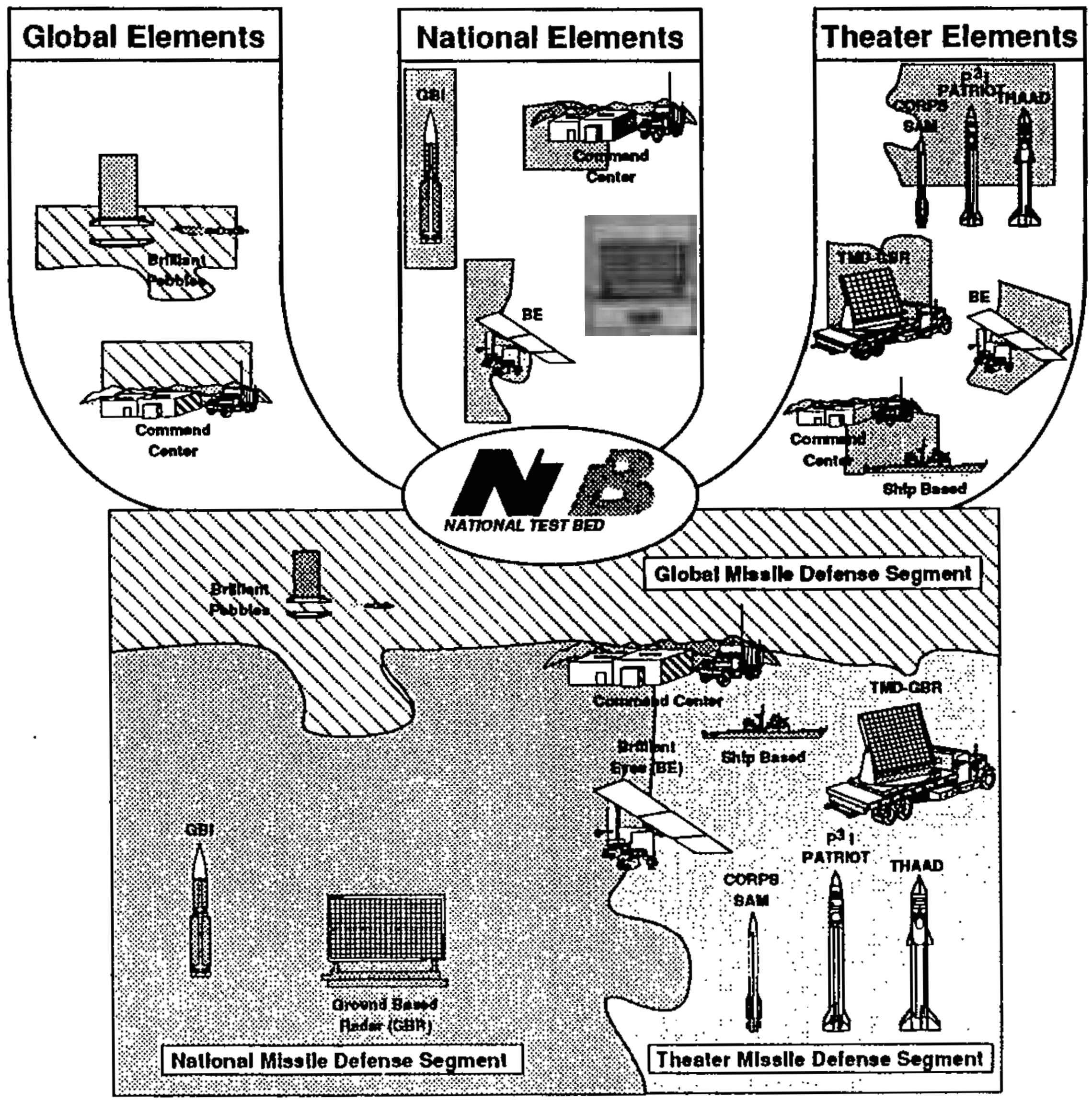
# NTB MISSION

NATIONAL TEST BED

Support Design And Development Of Missile Defense Elements

Support Testing And Element Integration Into Segments

Support Testing And Segment Integration Into GPALS

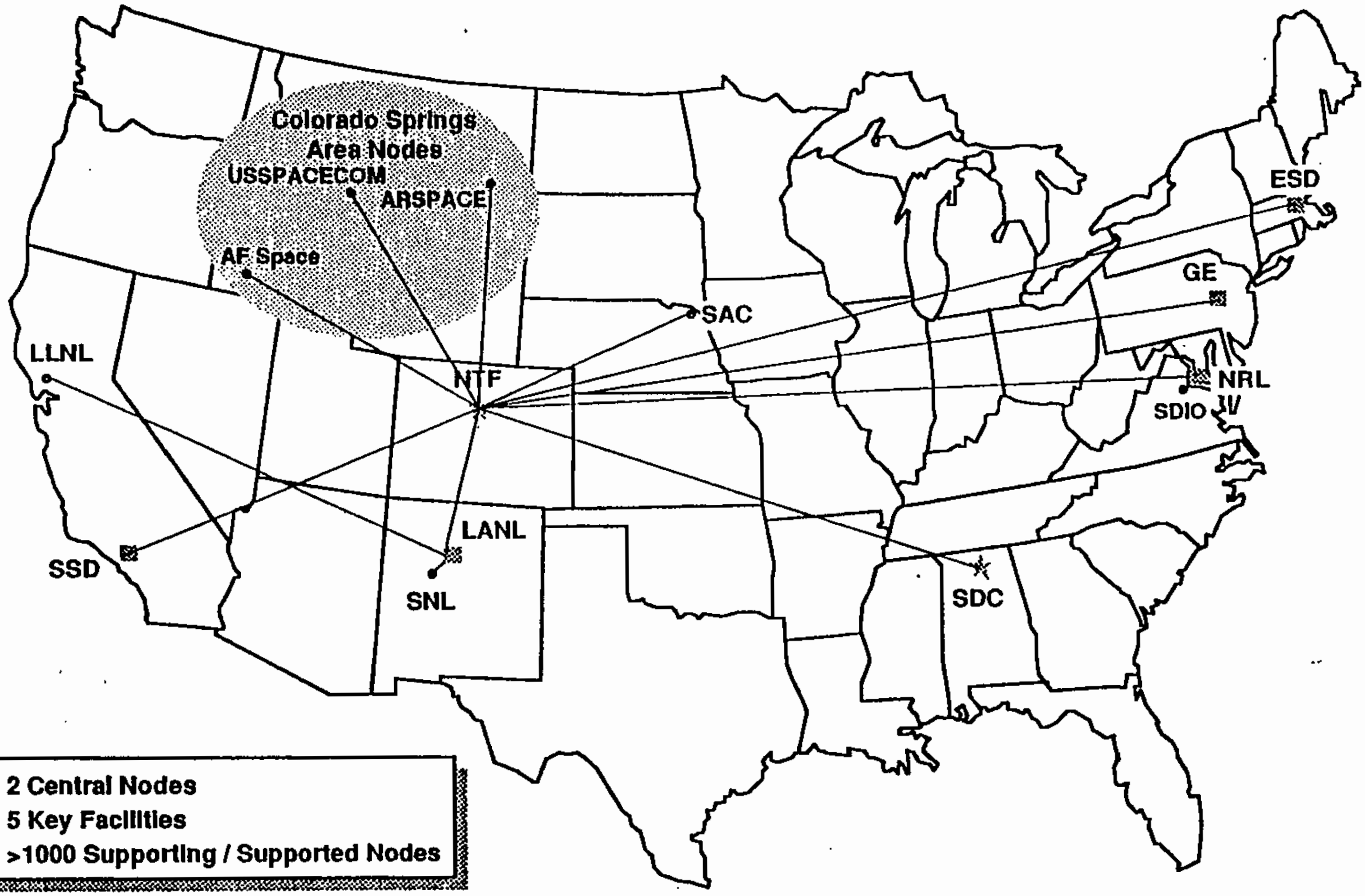



Global Protection Against Limited Strikes

jm-18382c / 022892

# NTB NETWORK

NATIONAL TEST BED




- ★ 2 Central Nodes
- ▩ 5 Key Facilities
- • >1000 Supporting / Supported Nodes

jm-183831 / 030292

# NTB PROGRAMS
# SIMULATIONS / EMULATIONS

NATIONAL TEST BED

### Background

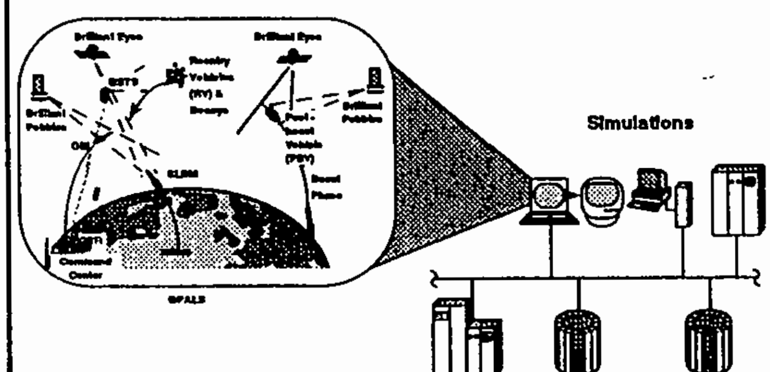
- BP Simulator
- KEW Digital Emulation Center (KDEC)
- End-to-end System Level Simulators (L1SS, L2SS)
- Analytical Tool Box Of Verified, Validated, And Accredited (VV&A) Simulations
- Support For Element Simulations

### Plans

- VV&A Program
- Surveillance Test Bed Integration
- EADTB Interface / Hosting
- GBR Test Facility Integration
- L2SS GPALS Element Integration

### Accomplishments

- L1B1 Tested Successfully
- L2B1 Requirements Defined
- KDEC Installed In SIMCEN



# NTB PROGRAMS - BM / $C^3$ SIMULATION, EMULATION, AND PROTOTYPING

NATIONAL TEST BED

### *Background*

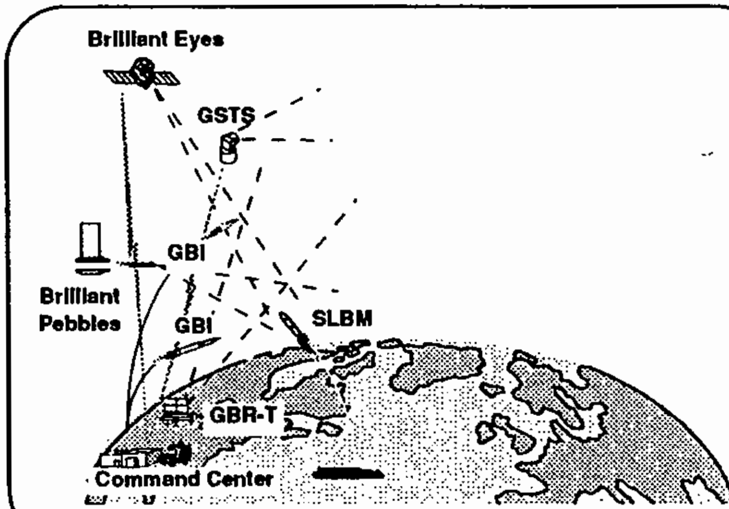
- Concept Of Operations Exercises (GPALS, And Initial Deployment Systems)
- BM / $C^3$ Development And Testing
- $C^2$E Prototype
- Multi-agency BM / $C^3$ Experiments

### *Plans*

- Two Major CONEXs
- $C^2$E Prototype
- Continued BM / $C^3$ Experiments
- Continued CONOPS Refinement
- EV Models Scripted In ARGUS

### *Accomplishments*

- Two Major $C^2$ Games Conducted
- CONOPS Refinement
- BM / $C^2$ Experiments
- EV LPS Scenario Demonstration
- ARC Node Involvement In CONEX 91-C



# NTB PROGRAMS - INTEGRATED SYSTEM TEST CAPABILITY (ISTC)

NATIONAL TEST BED

## Background

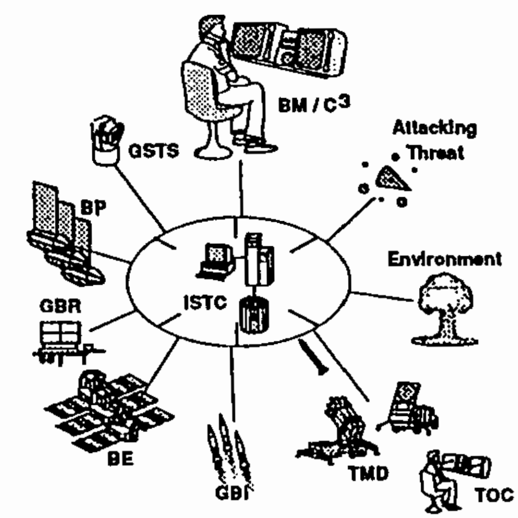
- Support Milestone And Fielding Decisions
- Hardware / Software-in-the-loop
- Individual And Multiple Element Testing
- Distributed Defense Concepts Testing

## Plans

- 2 Node Proof Of Concept
- ARC / NTF ISTC Integration
- Support GPALS DT / OT Process
- Maximum Use To Support Segment Integration / Testing

## Accomplishments

- ISTC Requirements In Final Draft
- ISTC Preliminary Design Completed
- Limited Test Cases Executed Successfully
- ISTC Prototype Installed At NTF And ARC



# NTB PROGRAMS - CENTER FOR RESEARCH SUPPORT (CERES)

NATIONAL TEST BED

### *Background*

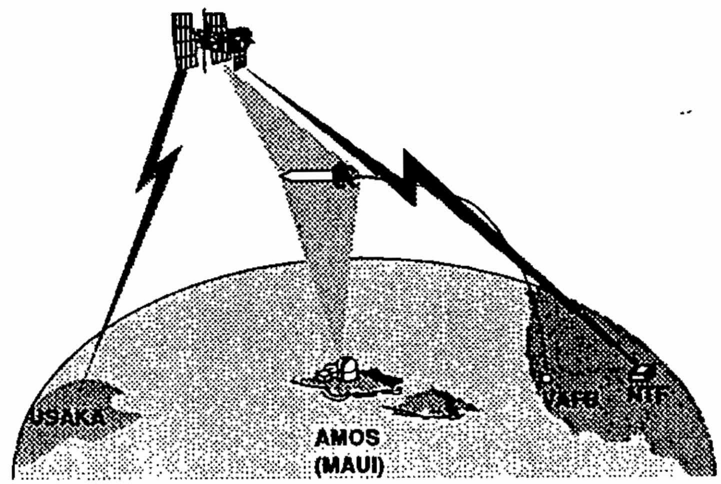
- Provides PMs With Mission And Science Operations Centers
- Links PMs With Test Ranges And Data Repositories

### *Plans*

- CSTC Communications
- Telemetry Processing, Phase I
- Facility Configuration

### *Accomplishments*

- CERES I, Phase I Facility Complete
- BP Support Facility Design Initiated




jm-21794 / 030292

# NTB NETWORK

NATIONAL TEST BED

### *Background*

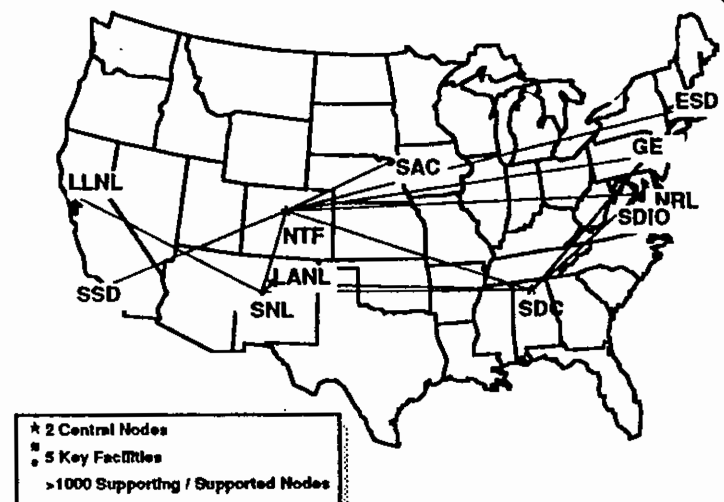
- Widely Distributed Network Links Through Primary To Support Nodes, Testbeds, And Centers
- Access To Super- And Parallel-Computers

### *Plans*

- Four New User Sites
- MLS Migration Strategy
- Integration Of Network Control Center
- Multimedia Capabilities
- Test Range Connectivity
- High Performance Network Enhancements

### *Accomplishments*

- SATCOM To Terrestial Conversion
- Five New User Nodes
- Open System Architecture Implementation
- 40% User Increase
- Secure Network Architecture Study Completed




jm-21820 / 022892

# WHERE INDUSTRY CAN HELP

NATIONAL TEST BED

### Simulations / Testing

- Real Time High Fidelity Simulations
- Multi-use Adaptability
- Multi-level Fidelity
- Non-intrusive Testing

### Software

- Parallelized Systems
- Testing Tools / Methodologies
- Visualization
- Hyper Matrix Tools
- Ada CAD / CAM
- Resource Accounting / Management

### Networks

- Heterogeneous Interfaces
- Low Latency
- High Data Transfer Rates
- MLS Capabilities
- Multimedia Capabilities

### Hardware

- Electronic Mass Data Storage
- High End Graphic Work Station Technology
- Security
- High Performance Gate Arrays

jm-21795 / 022892

## SIMULATIONS/TESTING

### REAL TIME HIGH FIDELITY SIMULATIONS

Real time high fidelity simulations are essential to the conduct of human in control experiments where human responses are critical. Large scale high fidelity simulations requiring controllable, discrete events necessitates real time computer operating systems to insure consistent repeatable experiments. Where specific execution times are critical to the issues at hand, a real time operating system is needed. Many times in troubleshooting or development of a system, operation in WARP time is required. This is where you process data in faster than real time to facilitate the concentrated analysis on a specific area of the simulation or to present a quick look at the entire simulation.

### MULTI-USE ADAPTABILITY

Simulations are needed that are readily adaptable to varying scenarios. This is needed to provide greater efficiency in the utilization of simulations. To meet milestone objectives requires flexible simulations that can readily be adapted to changing requirements in threat, performance, parameters or number of elements in the simulation. Ease of adaptability is key in providing an efficient simulation environment where time and cost are critical.

### MULTI-LEVEL FIDELITY

Simulations that provide multi-level fidelity are key to the efficient evaluation and development of strategic software. Simulations that can provide high fidelity modeling of an SDIO component such as a missile and yet be adapted to quickly simulate the entire GPALS scenario provide a broad base of uses. This also provides consistence between different levels of simulations when the same building blocks are used where the output of the components are consistent throughout the varying levels of fidelity.

### NON-INTRUSIVE TESTING

The need for non-intrusive test mechanisms and methodologies are particularly needed in the software area. As you know, it is impossible to effectively instrument software (insert "hooks") then collect and store data without perturbing the software function being tested. This is particularly true in real time functions where timing is critical. So, ideas are needed which will allow us to instrument and collect data during operations with minimal perturbation to timing and computer resources utilization (CPU time and memory).

# SOFTWARE

## Parallelized Systems

Recent technology advances and computational performance gains are in the area of massively paralleled processors connected together in various arrays and networks. These machines are great for some specific problems that can easily be "fitted" to their particular architecture. However, some problems require more ingenuity to partition and allocate across the parallel machine so as to take maximum advantage of its computational resources. In this area, software technology is needed to automate the process of converting those traditionally sequential functions to run in parallel.

## TESTING TOOLS/METHODOLOGIES

In the past, the accepted way to test software was to test it at the unit level by inputting a "range" of data inputs, execute the unit, check the outputs for accuracy or reasonableness. The units were then integrated into larger modules and tested with this process repeated until the total system is integrated. The problem with this methodology is that the all possible data ranges could not be inputted with all possible timing sequences.

As software systems have become larger and more complex, the integration process has led to timing/synchronization problems, data delays, control/lock-up problems and untested loops.

Static and dynamic testing software and methodologies are needed to alleviate these problems.

## VISUALIZATION

The age of sophisticated graphics and visualization is here. We now need to take full advantage of this technology to present test data and results of tests and analysis in the most optimum and understandable way possible. For instance, during an interceptor flight, it would be desirable to present selected telemetered flight data and ground support instrumentation data to project management personnel in formats that could be quickly understood. These formats could be tabular, bar graphics, etc... accompanied by data driven animation models.

Visualization has come a long way, but developing and rendering color models is still a slow and tedious process.

## HYPER MATRIX TOOLS

Solution of fluid flow and surface handling problems associated with high velocity flight of intercepting in the atmosphere require solutions to large matrix problems. Work is needed in the distribution of these problems across computational resources to optimize resources utilization and reduce the turnaround time for getting results.

The same multi-dimensional, large matrix problem is prevalent in high-fidelity simulation of these phenomena.

## ADA CAD/CAM

Computer Aided Software Engineering (CASE) tools are needed to maintain control and traceability of software and documentation from concept through final testing and delivery. These tools are needed for requirements traceability, configuration control, interface verification, documentation generation, and control and IV & V support. Software CAD/CAM or CASE tools are required for developing simulations and models as well as weapons systems software. Technology advances in this area are critical to the success of the SDI program.

## RESOURCE ACCOUNTING/MANAGEMENT

Improved, less intrusive tools are needed to collect and store information on CPU and I/O utilization for each account logged on to the computer. For security auditing purposes, information must be collected on classified files accessed and whether the files were modified.

Resource management tools are needed which automatically notify a requestor that he/she has resources scheduled. The automated management tool would then perform the required control functions to permit the user to log on to the allocated resources.

Automatic schedules/allocations should also be considered.

## NETWORKS

### HETEROGENEOUS INTERFACES

Industry's expertise in network technology and implementation methodology can be used in networking our testbeds and computers at the geographically distributed as well as at the local level.

Interfacing heterogeneous computers and networks refers to interfacing different kinds, different brands, different architecture machines such as VAXs and CRAYs. On the wide area or geographically distributed networks, ideas are needed in speeding up the transmission process while maintaining the ability to be highly interactive with smaller messages or data packet sizes.

Technology is needed to pass data between networks with unlike formats such as Ethernet and FDDI (Fiber-optic Digital Date Interchange).

### LOW LATENCY

Latency refers to the delay between the time a message is available to be sent from its origin until it is received by the requiring function at the destination. These delays may result from the waiting at the origin until a "full" message is ready to be sent; a delay results for the actual transmission time, say from the source to a geosynchroneous satellite some 45,000 miles high in the "clark belt" and then from the satellite back to the destination somewhere on the earth. This problem is then amplified by the "handshaking" process which requires the receiver to acknowledge receipt of a message across the same transmission path before the next message is sent. Industry's ideas are needed to reduce latency and maintain acceptable bit error rate levels with minimum overhead.

### HIGH DATA TRANSFER RATES

Improved capability is needed in the transfer and movement of large amounts of data between elements and within command and control centers. High transfer rates are required for both large and small packets of data. A reduction in the overhead of routing and verification is important especially with small packet sizes of data. The routing and verification data is often larger than the data when transmission of small packets are required. There is considerable variation in transfer rates between different computers due to varying methods used in preparing data for transmission across the network. Improved standardization is needed as well as overall transfer rates.

## MLS CAPABILITIES

More and more, computers and their operating systems are beginning to be certified for managing data and executing software with different classification levels (i.e. Confidential and Secret).

Now suppose we all have two or more computers, each executing programs simultaneously at the "Confidential" and "Secret" levels. Now further suppose that the "Secret" program on computer A is required to communicate or send data to the "Secret" level program on computer B. Furthermore, suppose the same requirement true for the "Confidential" level programs. The requirement now exists for a "multi-level" network. This can be accomplished now, but the process is clumsy and expensive. Work needs to be done in this area.

## MULTIMEDIA CAPABILITIES

Networks must be able to support multimedia requirements. Data, voice, and visual information should share the same network to reduce the requirement for many single-use networks. To efficiently evaluate system and element performance requires the rest of multiple media forms to ensure the problem is being assessed with the optimum of information. Recent advances in fiber optics technology are beginning to provide this capability, but greater effort is needed in the interfacing and expansion of this technology.

## HARDWARE

### ELECTRONIC MASS DATA STORAGE

Improved technology for electronic mass storage of large amounts of data is required to support resolution of strategic defense critical issues. Data must be readily available to perform analysis and develop methods to improve system performance such as discrimination of objects in a cluttered environment. There are large volumes of data currently available and this data is growing at an ever increasing rate, yet the accessibility of this data is impeded by the lack of efficient electronic mass storage devices.

### HIGH END GRAPHIC WORKSTATION TECHNOLOGY

Visualization provides a tremendous advantage in the analysis of data that is critical to the success of strategic and theater defense systems. Improved workstations are required to run the sophisticated software being developed to provide visualization of the strategic defense challenges. Workstations require higher performing central processing units with large amounts of memory that are rapidly accessible. Efficient workstations are the key in reducing the development time of critical software.

### SECURITY

Hardware is required to meet the increasing security needs of the SDIO user community. Multi-level security systems provide for a more efficient use of assets. It also provides for a greater degree of security of data to prevent the loss of technology vital to strategic defense. Current systems that provide this capability are not state-of-the-art computers. The process to develop and validate security systems takes several years. Security systems should be developed as an integral part of the system that meets NSA requirements and must be rapidly verifiable.

### HIGH PERFORMANCE GATE ARRAYS

Improved high performance gate arrays or other circuit technologies which can be quickly adapted to high performance, highly specialized designs such as special interfaces or test/test control devices for signal and data processing. Higher performance gate arrays will improve the access and exchange of data required to meet SDIO element and command center requirements. Improve access between system components is critical to meet the throughput requirements for real time system components.

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FOI 92-0855

# SDIO Test and Evaluation

## Advanced Planning Briefing for Industry

Col Michael T. Toole
SDIO, Director of T&E
February 1992

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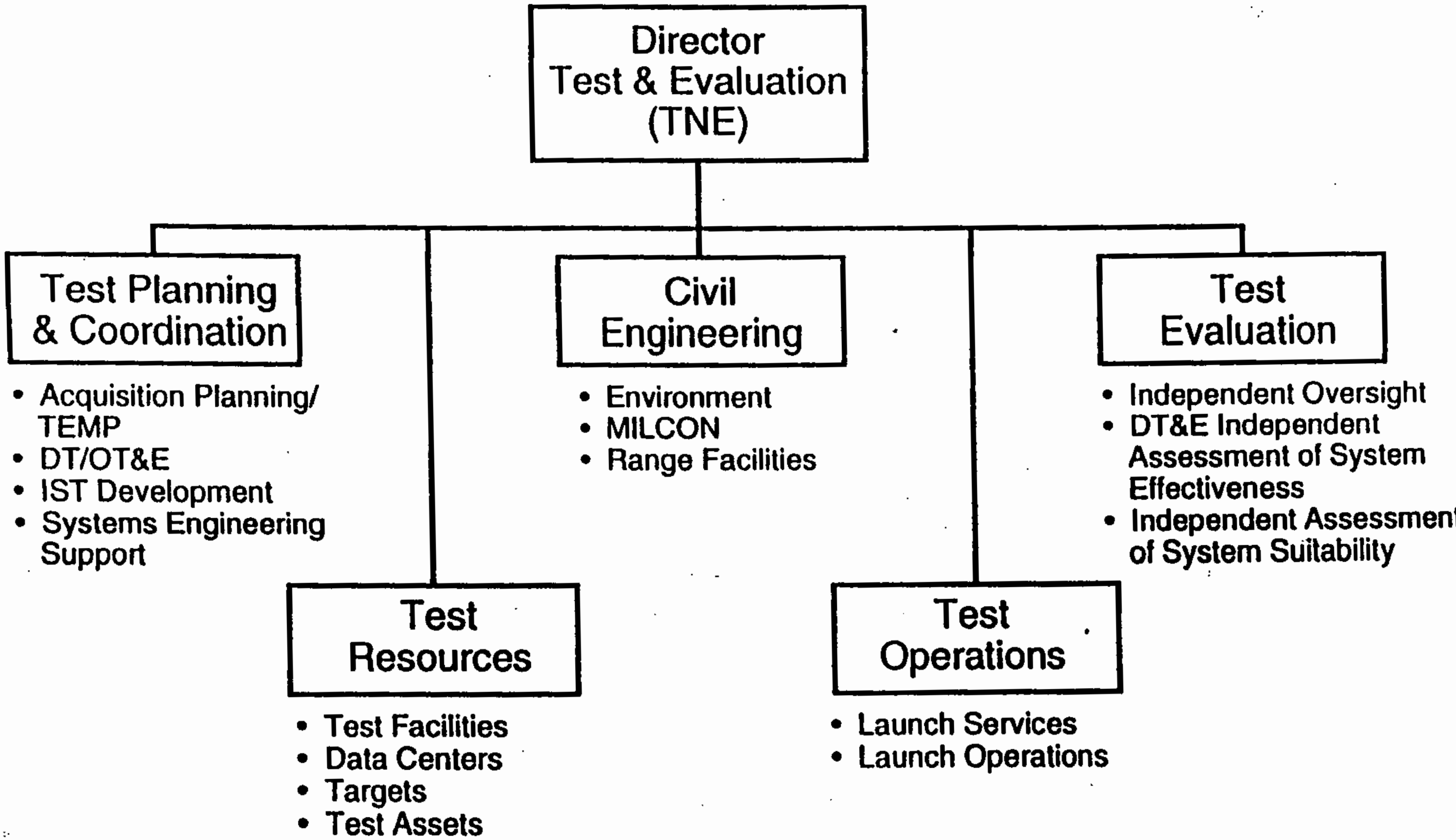
SDIO-SRS-92-985

# TNE Service Organization




SDIO-SRS-92-985

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# SDI Test and Evaluation Role

- ❑ Conduct Objective Test and Evaluation.
- ❑ Provide Accurate, Timely Information on Test Activities.
- ❑ Support National and Programmatic Decision Makers.

**Through:**

- ❑ Coordinated Test Planning;
- ❑ Efficient Test Resource Management;
- ❑ Comprehensive Civil Engineering Support (MILCON, Environmental, Site Activation);
- ❑ Responsive Test Operations Services;
- ❑ Independent Evaluation.

SDIO-SRS-92-985

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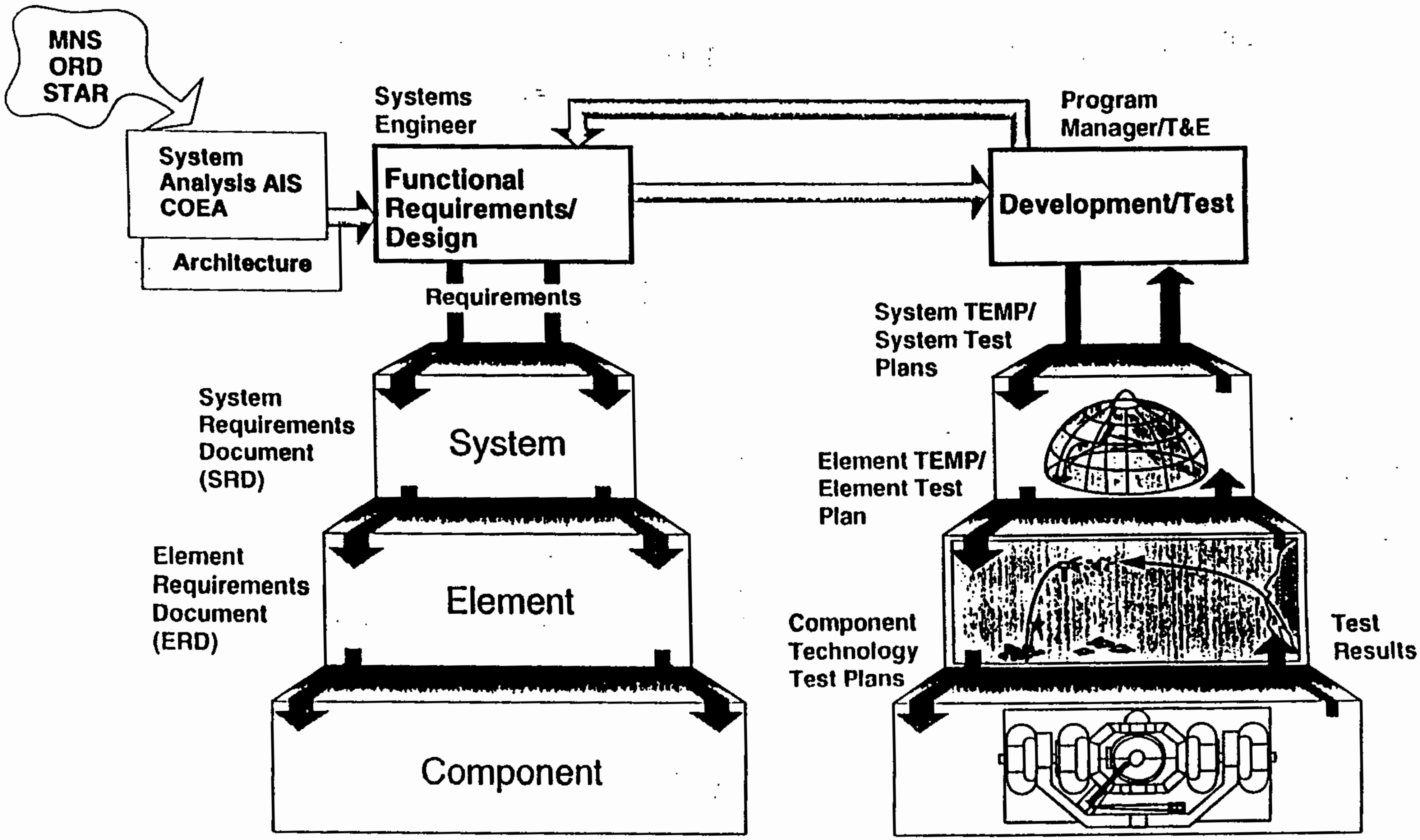
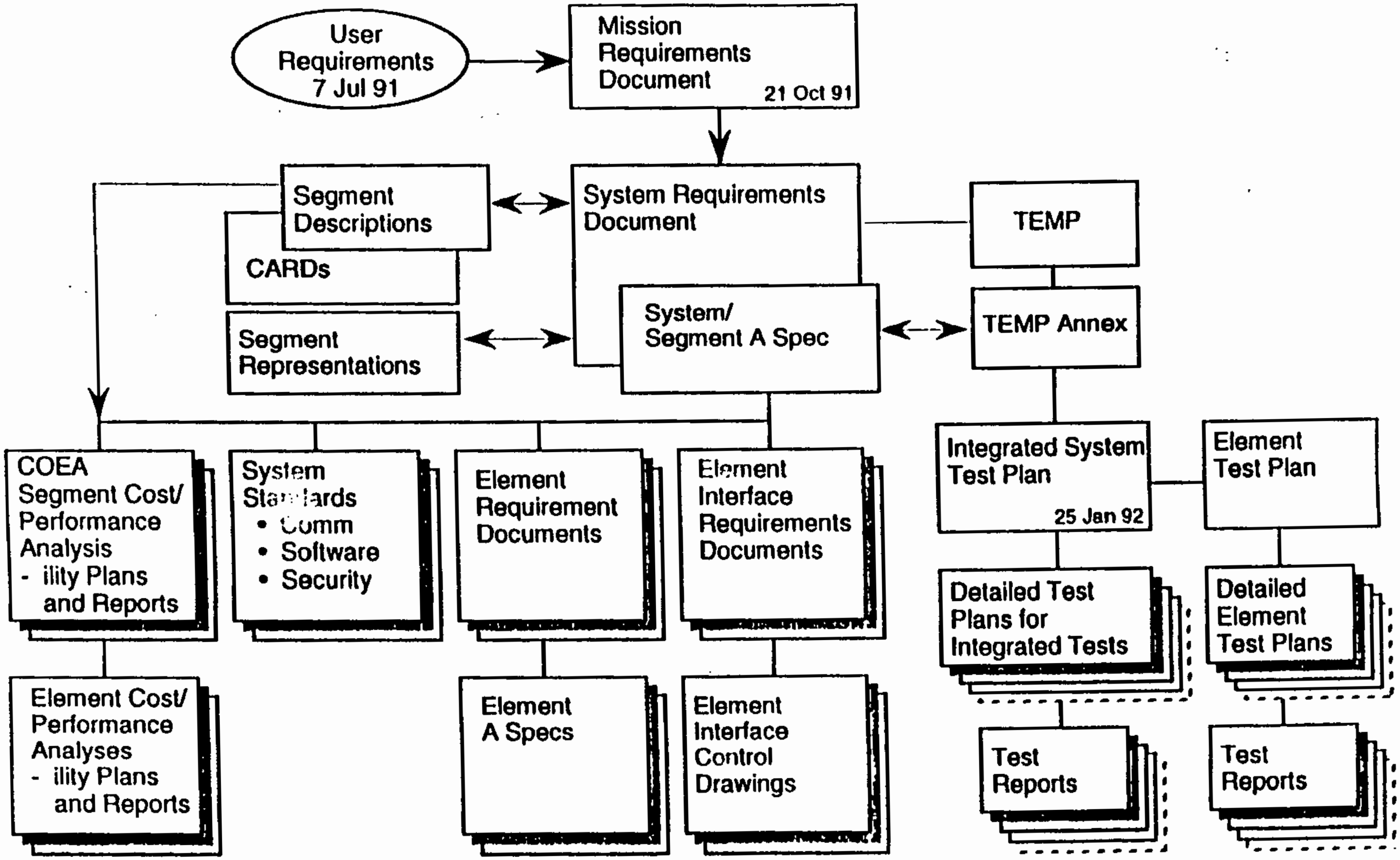
# Planning Process




SDIO-SRS-92-985

# Definition and Control of GPALS Segment Design Baseline




SDIO-SRS-92-985

# SDI TEWG Subcommittees

## SDI TEWG

### Test Resources and Targets

- Requirements Validation
- Scheduling
- Master Planning
- Accreditation
- Issue Resolution

### System Performance

- Methodology
- Confidence
- Demonstration of CTPs
- $BM/C^3$
- Issue Resolution

### System Integration Test Planning

- Address Detailed Planning
- Assess Utility
- Proposed Priorities
- Resolve Coordination Issues

### Modeling and Simulation

- Data Management
- Models and Simulations
- Asset Plan
- Software Testing
- Issue Resolution

### Operational Testing

- Operational Test Planning
- Effectiveness and Suitability
- Issue Resolution

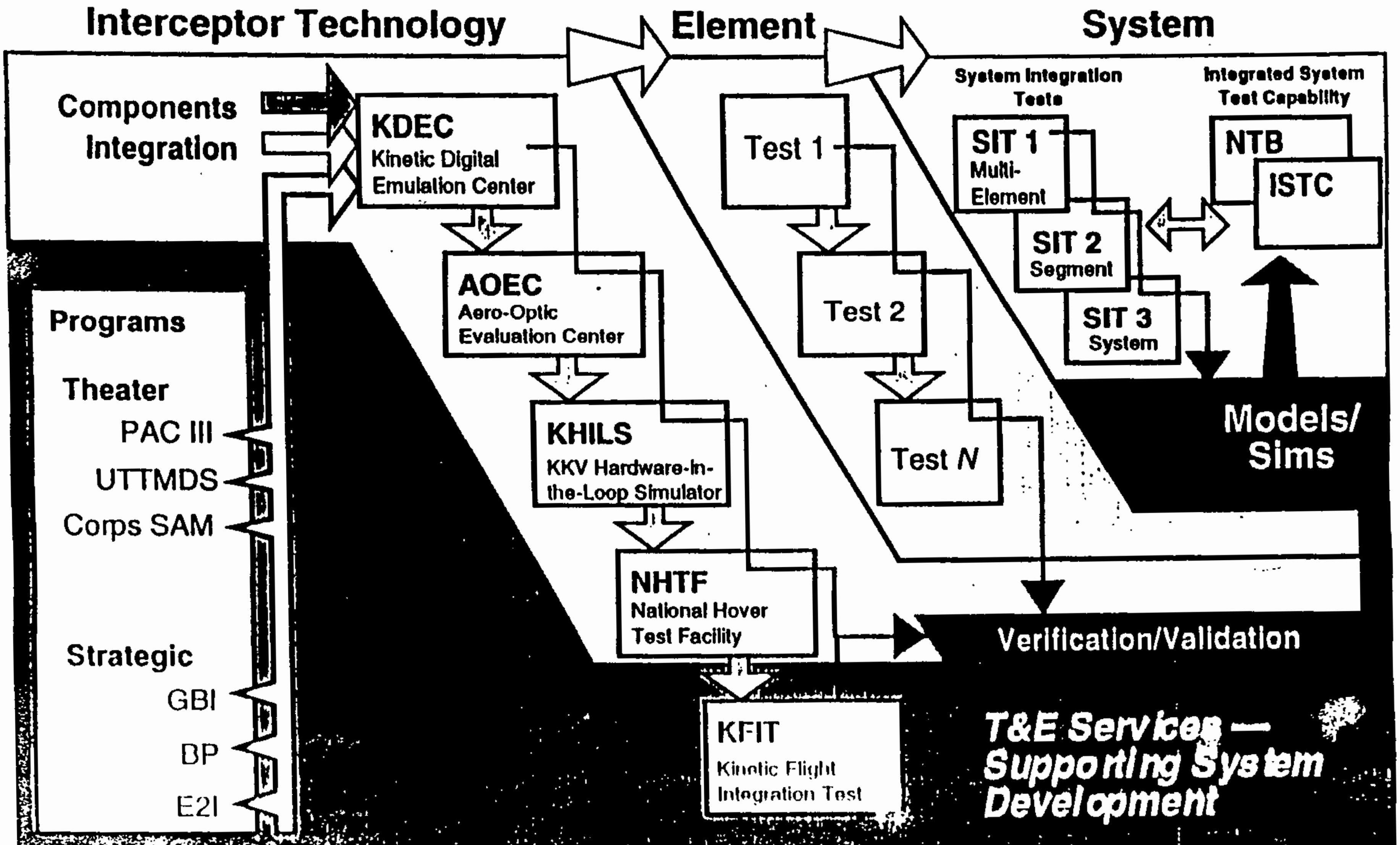
**Participants**

SEIC • NMD • GMD • TMD • Army • Air Force • AFOTEC • OPTEC • OPTEFOR • Range Representatives

SEIC • NMD • GMD • TMD • Army • Air Force • AFOTEC • OPTEC • OPTEVFOR • DOT&E • DDR&E(T&E)

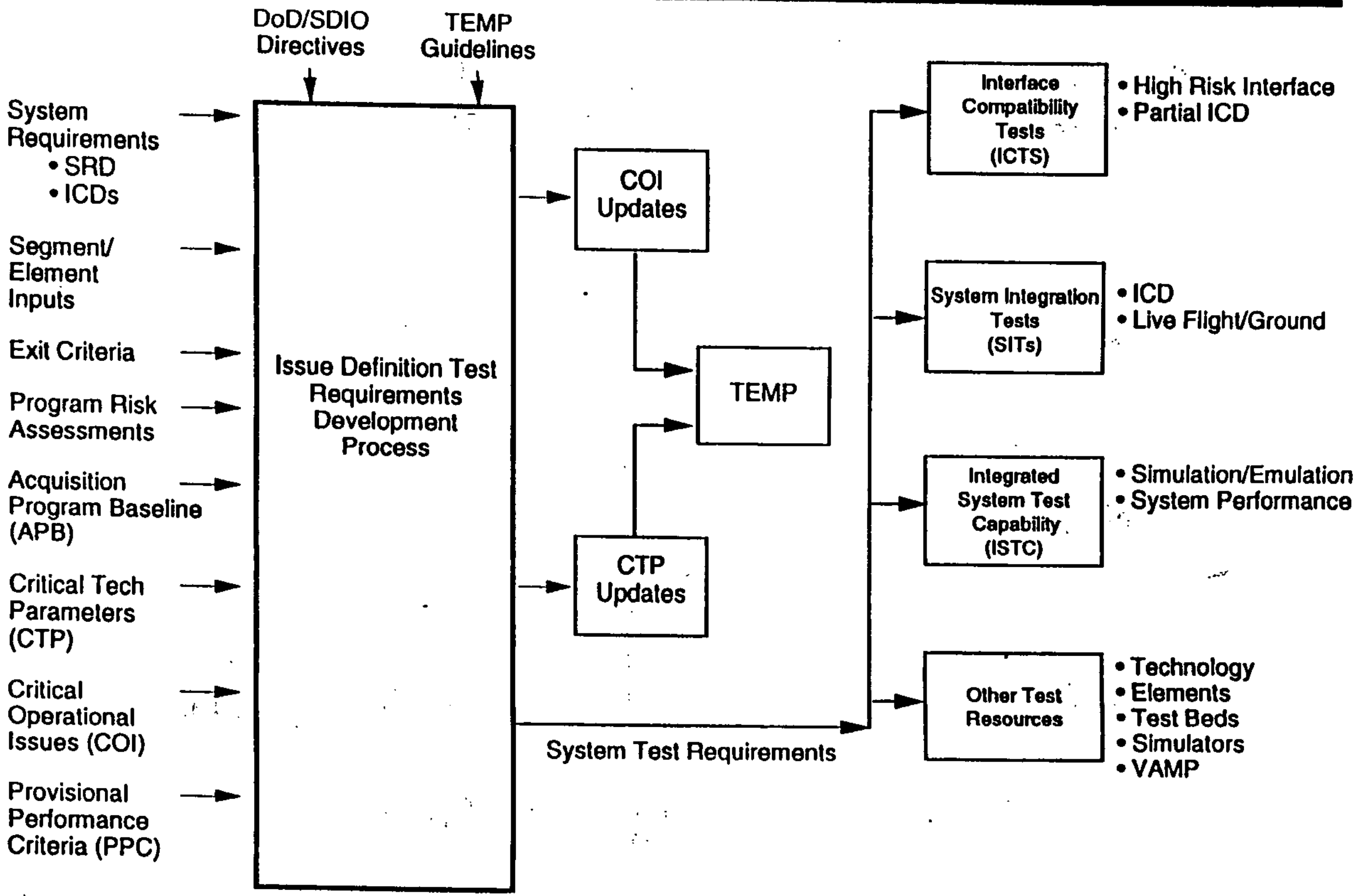
OPTEC • AFOTEC • OPTEVFOR • Users

# Sample Test Process




SDIO-SRS-91-506/12 Jul 91

# Test Requirements Development/Allocation



# System Test Concept Supports

- ❑ Development Testing
- ❑ Operational Testing
- ❑ User Testing
- ❑ $P^3I$ Testing

# System Integration Tests

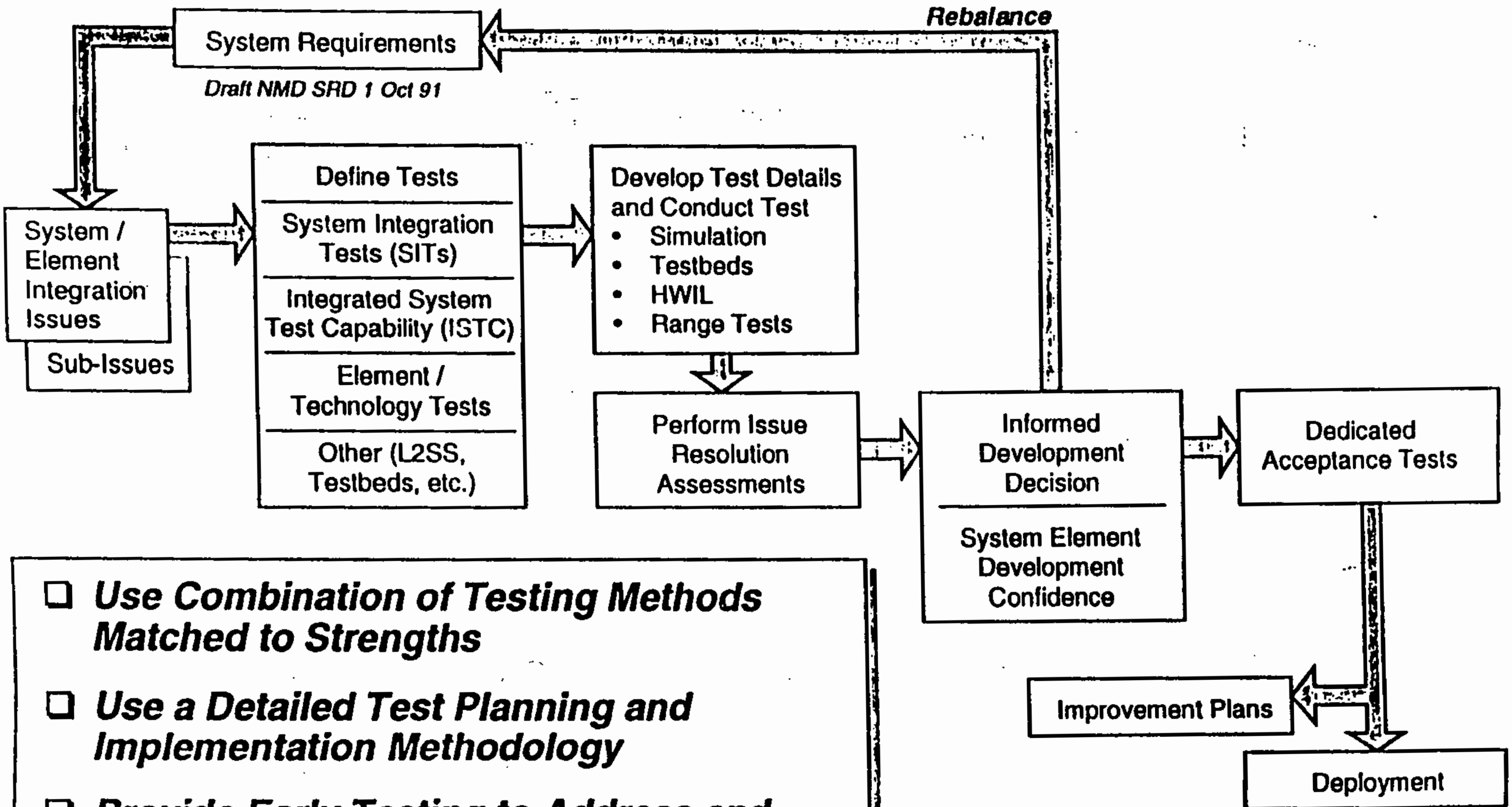
**Objective**

Initiate an Effort to Develop a Cost Effective Approach to Resolve System Integration Issues Using SITs and the ISTC as a Part of an Overall Test Program.

**Approach**

- ❑ Force Requirements Flow Down
  - — Define Performance Envelopes
  - — Identify Critical Issues
  - — Map Issues to Test Requirements
- ❑ Develop Integrated Testing Strategy
  - — Identify Live Testing Requirements
  - — Coordinate System Testing Activities
- ❑ Determine Executive Agent(s)
  - — Planning/Execution/Evaluation
- ❑ Use Proven Experience and Resources

# Approach to Design of System Integrated Tests




- ***Use Combination of Testing Methods Matched to Strengths***
- ***Use a Detailed Test Planning and Implementation Methodology***
- ***Provide Early Testing to Address and Resolve Issues***

# Current Status

## *Requirements That Should Be Tested*

| Requiring Ref | Req # | MOP(s) # | MOP Req # |
|---|---|---|---|
| SRD 3.2.1.1.3.2.1.2 | R 1 | 1 | 1 |
| SRD 3.2.1.1.3.1.1.6 | R 2 | 2, 3 | 2, 2.5 |
| SRD 3.2.1.1.3.1.b | R 3 | 4, 5 | 3 |
| SRD 3.2.1.1.3.3.2.5 | R 4 | 6 | 4 |
| SRD 3.2.1.1.3.3.2.5 | R 5 | 7 | 5 |
| SRD 3.2.1.2.1 | R 6 | 8 | 6 |
| SRD 3.2.1.1.2.1 | R 7 | 9 | 7 |
| SRD 3.2.1.1.3.1 | R 8 | 10 | 8 |
| SRD 3.2.1.1.3.2.1.2 | R 9 | 11 | 9 |
| SRD 3.2.1.1.3.2.1.2 | R 10 | 12 | 10 |
| SRD 3.2.1.1.3.2.1.2 | R 11 | 13 | 11 |
| SRD 3.2.1.1.3.2.1.3 | R 12 | 14 | 12 |
| SRD 3.2.1.1.3.2.2.1.1.c | R 13 | 15 | 13 |
| SRD 3.2.1.1.3.3 | R 14 | 16 | 14 |
| SRD 3.2.1.1.3.3.1 | R 15 | 17 | 15 |
| SRD 3.2.1.1.3.3.2 | R 16 | 18 | 16 |
| SRD 3.2.1.1.3.3.2.b | R 17 | 19 | 17 |
| SRD 3.2.1.1.3.3.3.a | R 18 | 20 | 18 |
| SRD 3.2.1.1.3.1.1.2.b | R 19 | 21, 22 | 19, 19.5 |
| SRD 3.2.1.1.3.1.1.4.b | R 20 | 23 | 20, 20.5, 20.6 |
| SRD 3.2.1.1.3.1.1.4.c | R 21 | 24 | 21, 21.5 |
| SRD 3.2.1.1.3.1.1.4.d | R 22 | 25 | 22, 22.5 |
| SRD 3.2.1.1.3.1.1.4.e | R 23 | 26 | 23 |
| SRD 3.2.1.1.3.1.2.2.b | R 24 | 27, 28 | 24, 24.5 |
| SRD 3.2.1.1.3.1.2.4.b | R 25 | 29 | 25, 25.5, 25.6 |
| SRD 3.2.1.1.3.1.2.4.c | R 26 | 30 | 26, 26.5 |
| SRD 3.2.1.1.3.1.2.4.d | R 27 | 31 | 27, 27.5 |
| SRD 3.2.1.1.3.1.2.4.e | R 28 | 32 | 28 |

## *Traceability*

| CTP |
|---|
| Battle Management |
| Surveillance |
| Surveillance |
| Communications |
| Battle Management |
| Battle Management |
| Human-In-Control |
| Surveillance |
| Battle Management |
| Battle Management |
| Battle Management |
| Battle Management |
| Kill Effectiveness |
| Kill Effectiveness |
| Battle Management |
| Kill Effectiveness |
| Communications |
| Kill Effectiveness |
| Surveillance |
| Battle Management |
| Battle Management |
| Kill Effectiveness |
| Surveillance |
| Surveillance |
| Battle Management |
| Battle Management |
| Kill Effectiveness |
| Surveillance |

## *Critical Issues That Can be Tested*

| Decomposed CTP | MOP | Units |
|---|---|---|
| Intercept Success | 1 | sec |
| Impact Point Prediction | 2, 3 | km, sec |
| Surveillance Tasking Response | 4, 5 | sec, sec |
| Reporting Capability | 6 | sec |
| Simultaneous Engagement | 7 | sec |
| Data Combination | 8 | sec |
| Threat Decision Support | 9 | sec |
| Surveillance Tasking Plans | 10 | sec |
| Kill Data Rate | 11 | sec |
| True Report | 12 | — |
| False Report | 13 | — |
| Keep Out Zone | 14 | sec |
| Weapon Tasking Plans | 15 | — |
| Minimum Engagement | 16 | — |
| Interceptor Select | 17 | sec |
| System Authorization | 18 | — |
| Receipt Report | 19 | sec |
| Effectiveness Value | 20 | — |
| Passive Search | 21, 22 | km, km/sec |
| Passive Commit Target Accuracy | 23 | meters |
| Final Uplink Target Accuracy-Passive | 24 | meters |
| Position of Object, Endgame-Passive | 25 | meters |
| Post-Intercept Passive Track | 26 | sec |
| Active Search | 27, 28 | km, km/sec |
| Active Commit Target Accuracy | 29 | meters |
| Final Uplink Target Accuracy-Active | 30 | meters |
| Position of Object, Endgame-Active | 31 | meters |
| Post-Intercept Active Track | 32 | sec |

# SIT Planning Matrix

| Opportunity | Prop. SIT No. | Involved Elements: C2E | GBR | GSTS | GBI | EWS | BE | Scheduled | ISTC | Targets | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Surr Funct | KREMS | AMOS AST | ERIS FTV 2 | ✗ | | 2/92 | | 1 | Sensor Weapon Handover KREMS-Lmtd GBR Functionality |
| 2 | | Surr Funct | KREMS | (EDX) AMOS AST | ERIS FTV-4 | ✗ | (MSX) | 2/93 | | 1 | Acquire, Track, Disc., Engage. KREMS-Lmtd GBR Functionality (EDX, MSX If Available) |
| 3 | | Bld #2 | GBR | 1 GSTS | 1 GBI | ✗ | | 1/95 | 12 Node | 1 | Sensor Handover; GBI not Integrated (Data Merge Post Test) |
| 4 | | Bld #2 | GBR | 1 GSTS | 1 GBI | ✗ | (1 BE) | 3/95 | 12 / 38 Node | 1 | Full 1 on 1 Engagement with C2E (Bld #2) |
| 5 | | Bld #3 | GBR | 2 GSTS | 2 GBI | ✗ | (1 BE) | 1/96 | 38 Node | 1 | Full 2 on 1 Engagement with C2E (Bld #3); Tactical H/W |
| 6 | | Bld #3 | GBR | 2 GSTS | Multiple GBI | ✗ | (1 BE) | 2/96 | 38 / 100 Node | 2 | Full 4 on 2 Engagement with C2E (Bld #3); Tactical H/W; S/W |
| 7 | | Bld #3 | GBR | 2 GSTS | Multiple GBI | ✗ | (1 BE) | 4/96 | 38 / 100 Node | 2 | Dedicated OT (4 on 2) |

**Significant Resources**

- 1 GBR
- 15 GBI
- 9 Targets
- 8 GSTS
- Tactical Launch System at KMR
- C2E Bld #3 H/W - S/W, Needed 4Q95, or very early 96.

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# SIT Planning Matrix

| Opportunity | Prop. SIT No. | Involved Elements: C2E | GBR | GSTS | GBI | EWS | BE | Scheduled | ISTC | Targets | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Surr Funct | KREMS | AMOS AST | ERIS FTV 2 | ✗ | | 2/92 | | 1 | Sensor Weapon Handover KREMS-Lmtd GBR Functionality |
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| 3 | | Bld #2 | GBR | 1 GSTS | 1 GBI | ✗ | | 1/95 | 12 Node | 1 | Sensor Handover; GBI not Integrated (Data Merge Post Test) |
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| 5 | | Bld #3 | GBR | 2 GSTS | 2 GBI | ✗ | (1 BE) | 1/96 | 38 Node | 1 | Full 2 on 1 Engagement with C2E (Bld #3); Tactical H/W |
| 6 | | Bld #3 | GBR | 2 GSTS | Multiple GBI | ✗ | (1 BE) | 2/96 | 38 / 100 Node | 2 | Full 4 on 2 Engagement with C2E (Bld #3); Tactical H/W; S/W |
| 7 | | Bld #3 | GBR | 2 GSTS | Multiple GBI | ✗ | (1 BE) | 4/96 | 38 / 100 Node | 2 | Dedicated OT (4 on 2) |

| Significant Resources | | |
|---|---|---|
| | • 1 GBR | • 8 GSTS |
| | • 15 GBI | • Tactical Launch System at KMR |
| | • 9 Targets | • C2E Bld #3 H/W - S/W, Needed 4Q95, or very early 96. |

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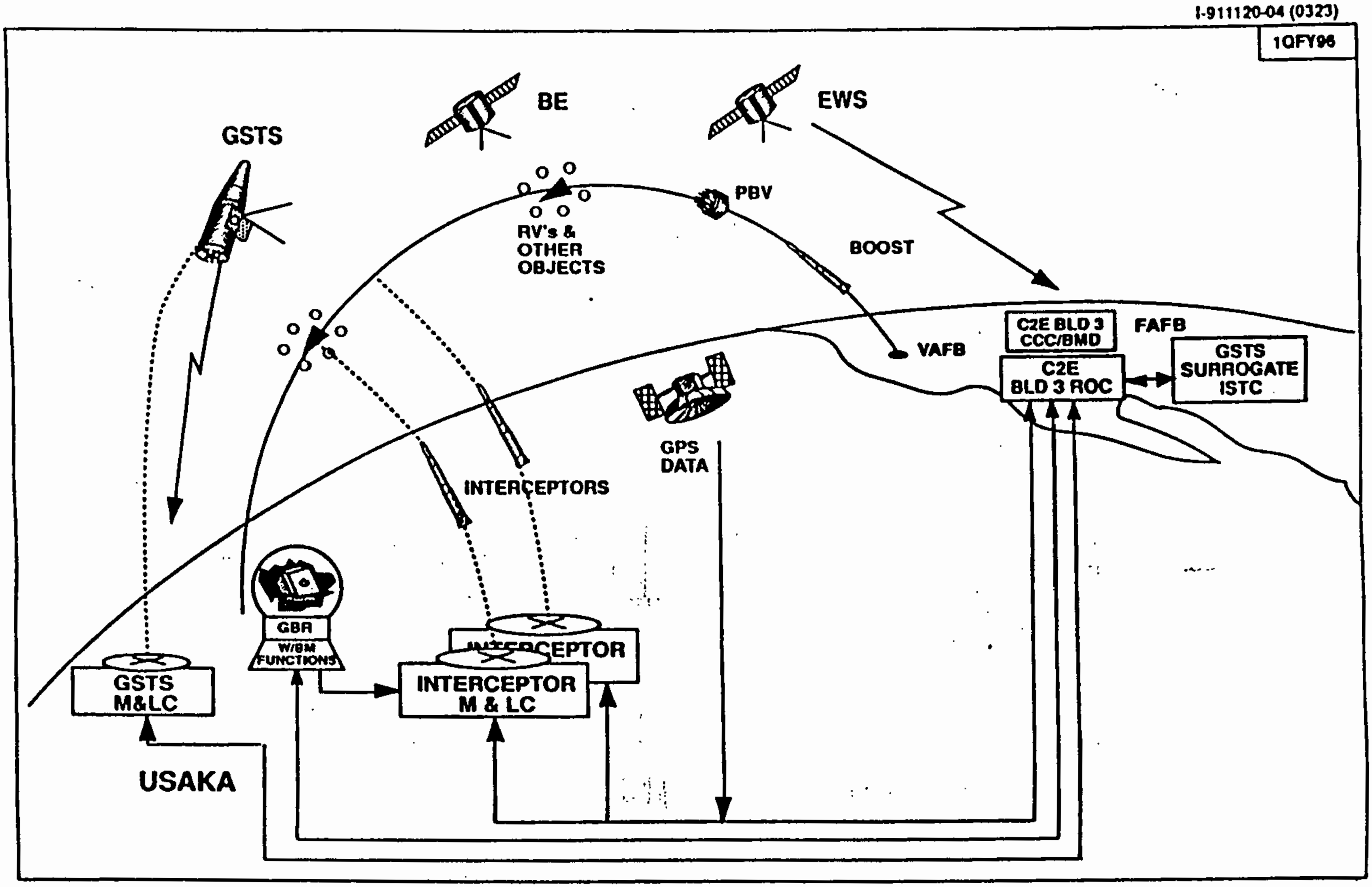
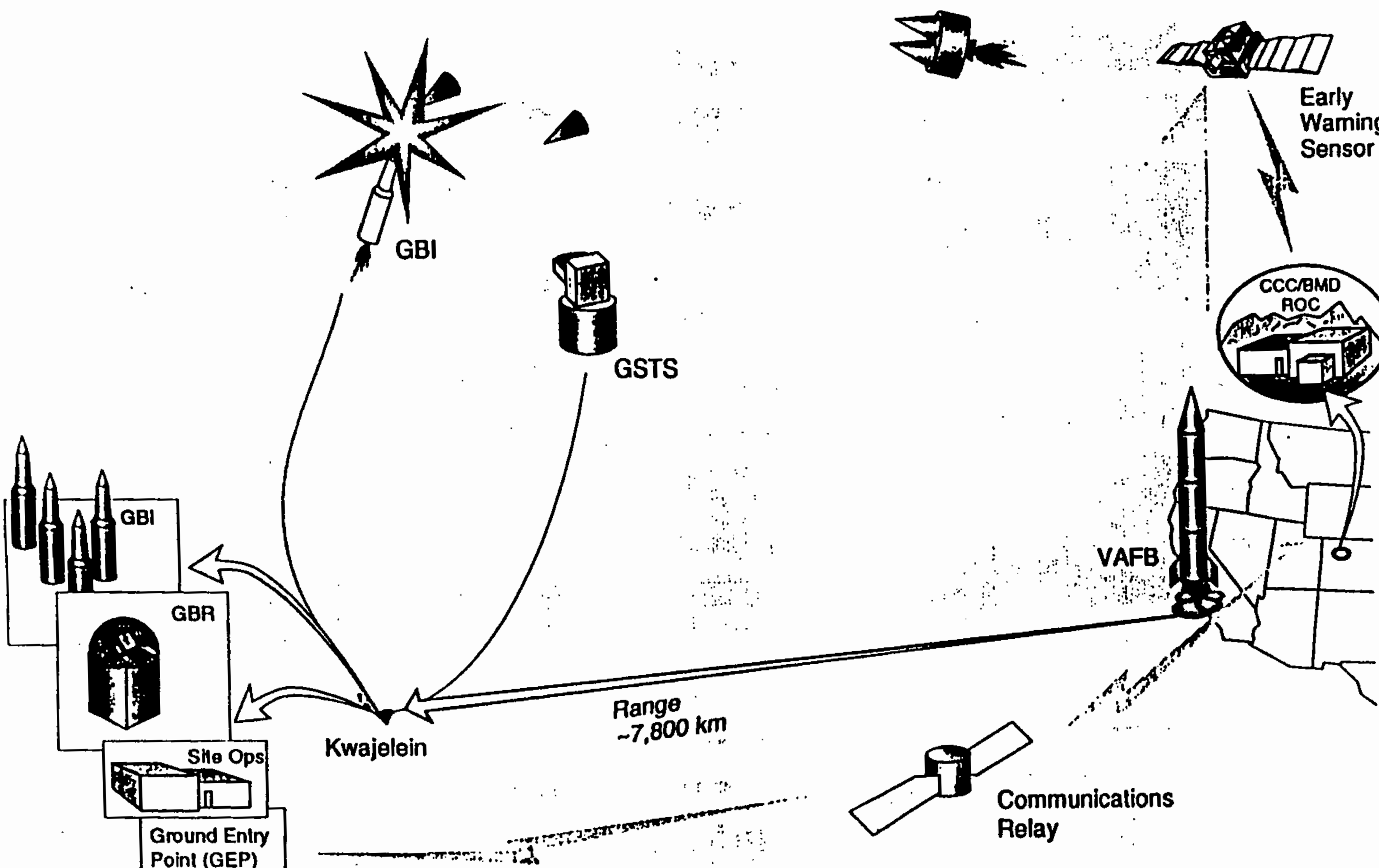
# SIT 5, SYSTEM DEMONSTRATION RANGE TEST (2 ON 1)



# NMD Test Scenario

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# Preliminary Mapping of 28 "Testable Requirements" Traced to SITs

| NMD Issue Categories & CTPs | Req't No. | 1 2/92 | 2 2/93 | 3 1/95 | 4 3/95 | 5 1/96 | 6 2/96 | 7 4/96 |
|---|---|---|---|---|---|---|---|---|
| **SURVEILLANCE** | | | | | | | | |
| Impact Point Prediction | 2 | | | | | | | |
| Surveillance Tasking Response | 3 | | | | | | | |
| Surveillance Tasking Plans | 8 | | | | | | | |
| Passive Search | 19 | | | | | | | |
| Post-Intercept Passive Track | 23 | | | | | | | |
| Active Search | 24 | | | | | | | |
| Post-Intercept Active Track | 28 | | | | | | | |
| **BATTLE MANAGEMENT** | | | | | | | | |
| Intercept Success | 1 | | | | | | | |
| Simultaneous Engagement | 5 | | | | | | | |
| Data Combination | 6 | | | | | | | |
| Kill Data Rate | 9 | | | | | | | |
| True Report | 10 | | | | | | | |
| False Report | 11 | | | | | | | |
| Keepout Zone | 12 | | | | | | | |
| Interceptor Select | 15 | | | | | | | |
| Passive Commit Target Accuracy | 20 | | | | | | | |
| Final Uplink Target Accuracy-Passive | 21 | | | | | | | |
| Active Commit Target Accuracy | 25 | | | | | | | |
| Final Uplink Target Accuracy-Active | 26 | | | | | | | |
| **COMMUNICATIONS** | | | | | | | | |
| Reporting Center | 4 | | | | | | | |
| Receipt Report | 17 | | | | | | | |
| **KILL EFFECTIVENESS** | | | | | | | | |
| Weapon Tasking Plans | 13 | | | | | | | |
| Minimum Engagement | 14 | | | | | | | |
| System Authorization | 16 | | | | | | | |
| Effectiveness Value | 18 | | | | | | | |
| Position of Object, Endgame-Passive | 22 | | | | | | | |
| Position of Object, Endgame-Active | 27 | | | | | | | |
| **HUMAN-IN-CONTROL** | | | | | | | | |
| Threat Decision Support | 7 | | | | | | | |

Legend:
- No/ Limited Relevant Data
- Some Data to Assess Requirement
- Data to Qualify Spec/ CTPs

# Integrated System Test Capability

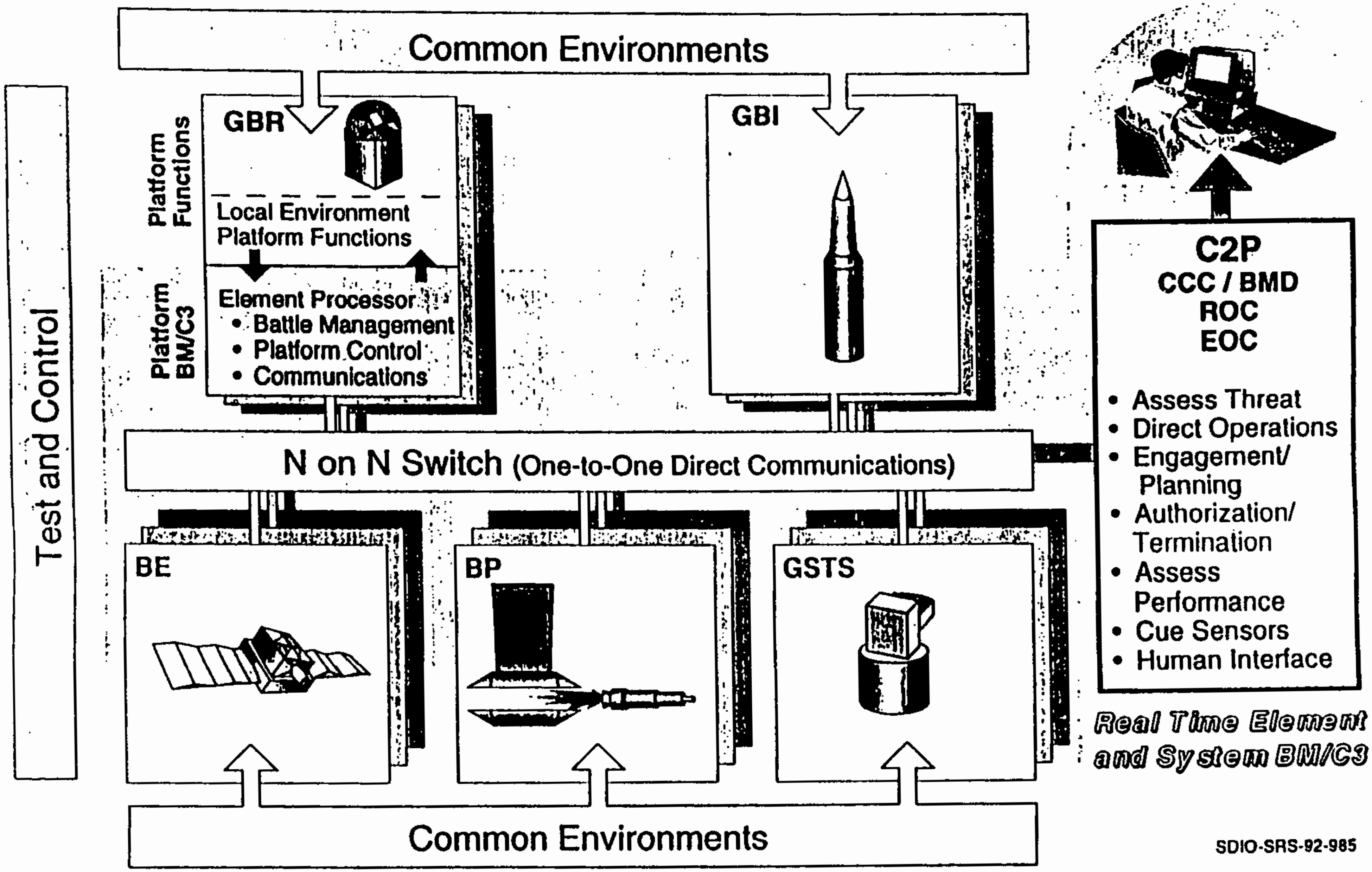
## Objective

- ❑ Develop a Real-Time, HWIL Testing Capability To Conduct Statistically Significant Iterations for Integrated System Performance Assessment
- ❑ Provide the Ability to Extend the Test Envelope to Include Stressing Environments and Fully Representative System Operation

## Approach

- ❑ Design the Tool to be a Valid Representation of the Full GPALS
  - — Model Each Element Platform Independently in HW and SW
  - — Incorporate Actual Element Hardware and Software
- ❑ Develop the ISTC to Support Engineering Integration, Operational Testing, and User Training
- ❑ Include DT and OT Representation in Development Process to Ensure ISTC Validation and Accreditation

# ISTC Architecture

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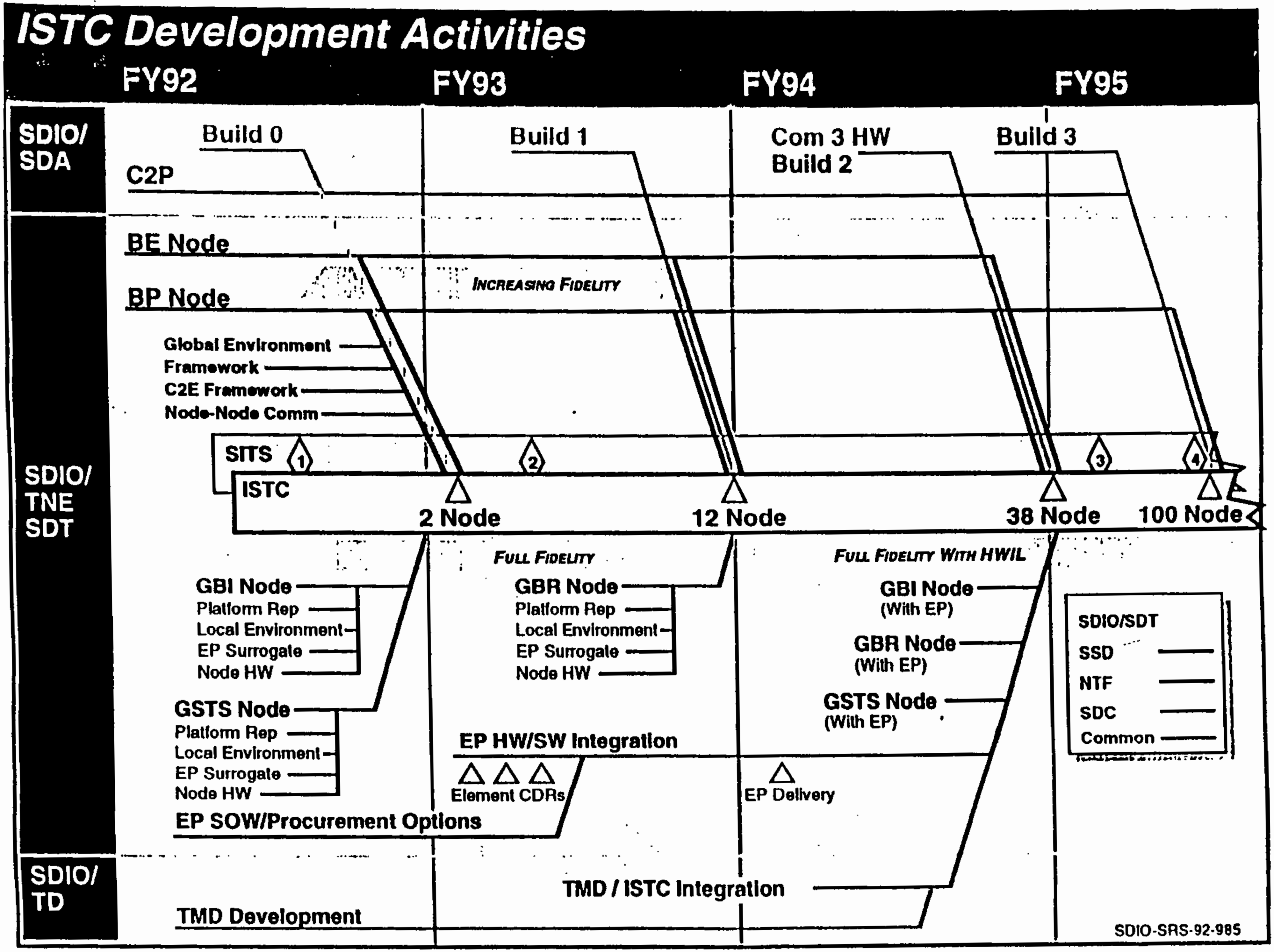
# Integrated System Test Capability

- ❑ Provide Engineering Integration Between Elements
  - — Algorithms
  - — ICD Testing/Demonstration
- ❑ Predict Performance of USAKA System Integration Tests
- ❑ Validate System and Segment Performance
- ❑ Provide Operational Test Resource
- ❑ Provide User Training Resource



ISTC Development Activities
FY92
FY93
FY94
FY95
SDIO/ SDA
Build 0
Build 1
Com 3 HW
Build 2
Build 3
C2P
SDIO/ TNE SDT
BE Node
BP Node
INCREASING FIDELITY
Global Environment
Framework
C2E Framework
Node-Node Comm
SITS
1
2
3
4
ISTC
2 Node
12 Node
38 Node
100 Node
FULL FIDELITY
FULL FIDELITY WITH HWIL
GBI Node
Platform Rep
Local Environment
EP Surrogate
Node HW
GBR Node
Platform Rep
Local Environment
EP Surrogate
Node HW
GBI Node
(With EP)
GBR Node
(With EP)
GSTS Node
(With EP)
GSTS Node
Platform Rep
Local Environment
EP Surrogate
Node HW
EP HW/SW Integration
Element CDRs
EP Delivery
EP SOW/Procurement Options
SDIO/SDT
SSD
NTF
SDC
Common
SDIO/ TD
TMD / ISTC Integration
TMD Development
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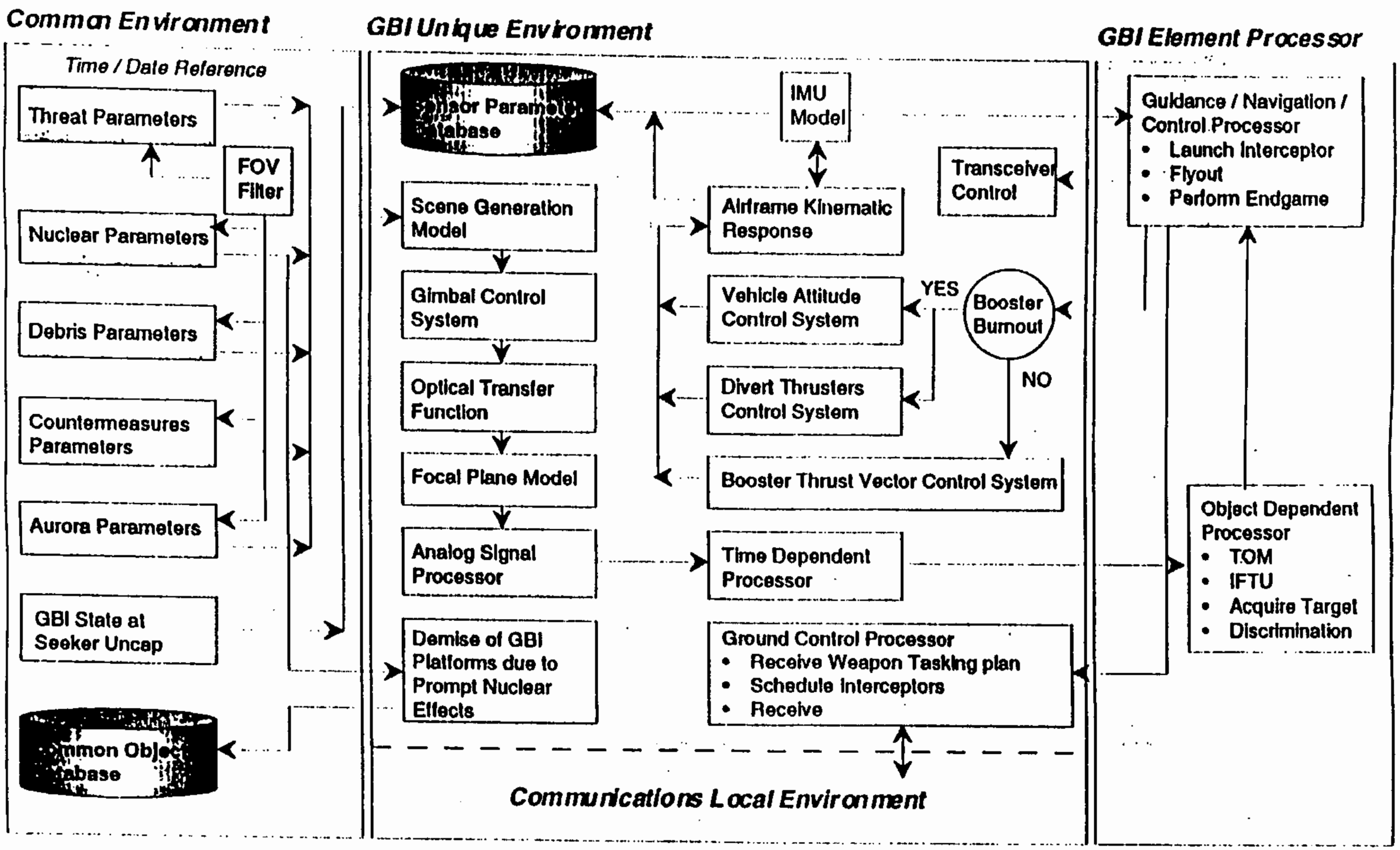
# GBI Functional Flow

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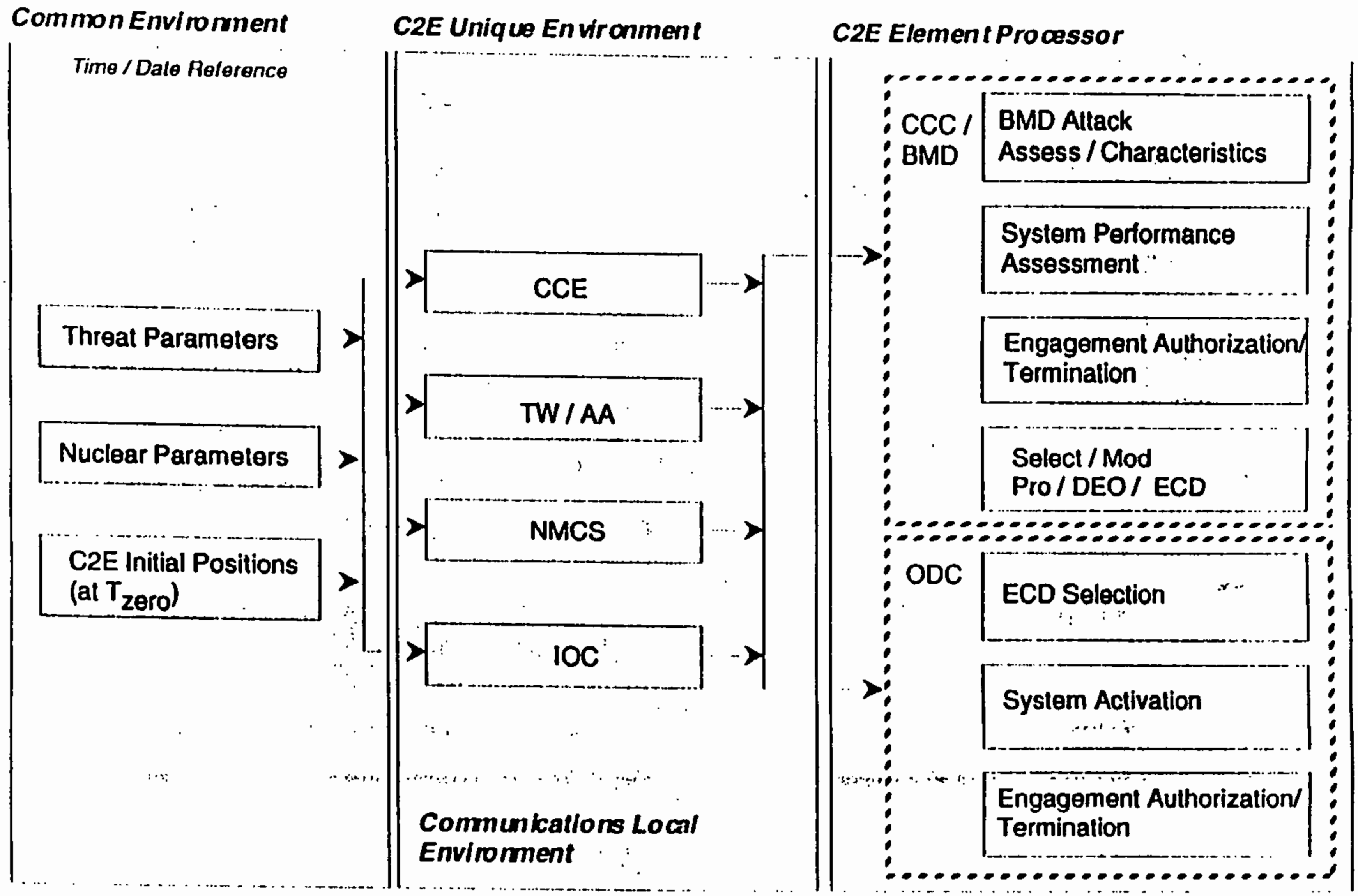
# C2E Functional Flow



# ISTC Planning Matrix

| ISTC Config | Involvement Elements | | | | | | | Sched. | ISTC | Targets | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | C2E | GBR | GSTS | GBI | COM3 HW | BE | BP | | | | |
| 0 | Build 0 | | PL Rep LE EP Sur | PL Rep LE EP Sur | | | | 1/93 | 2 Node | | • Global Environment<br>• Framework<br>• C2E Framework |
| 1 | Build 1 | PL Rep LE EP Sur | PL Rep LE EP Sur | PL Rep LE EP Sur | | | | 1/94 | 12 Node | | • Available for GPALS Utilization<br>• Use for SIT 3 Prediction |
| 2 | Build 2 | PL Rep LE EP | PL Rep LE EP | PL Rep LE EP | X | PL Rep LE EP | | 1/95 | 38 Node | | • Use as NMD System Performance Tool Following SIT 3 |
| 3 | Build 3 | ↓ | ↓ | ↓ | ↓ | ↓ | | 1/96 | 38 Node | | • Use as GPALS System Performance Tool Allocate |
| 4 | Build 3 | ↓ | ↓ | ↓ | ↓ | ↓ | | 1/97 | XXX Node | | • 38 Node Tool to GPALS SIT Predictions |
| 5 | Build 4 | | | | | | | | | | |
| *TBD* | | | | | | | | | | | |

PL Rep = Platform Representation
LE = Local Environment
EP = Element Processor
Sur = Surrogate

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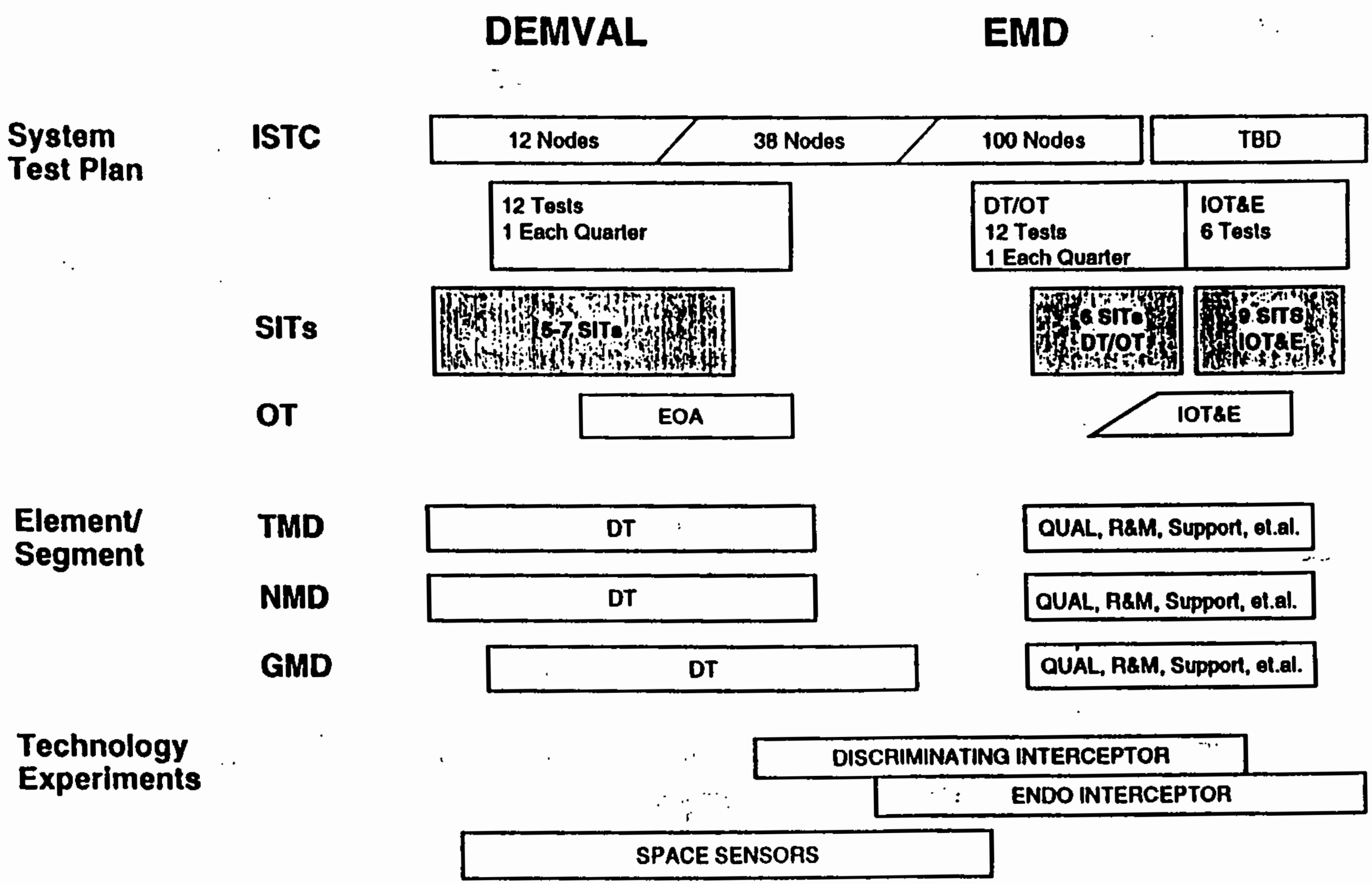
# Element Impacts From System Testing

| | |
|---|---|
| ***ICTs*** | ❑ Elements Required to Provide Windows of Opportunity in Their Test Schedules for Interface Testing with Other Elements of Critical Interface Functions / Requirements |
| ***SITs*** | ❑ Elements Required to Supply Test Articles in Sufficient Number to Meet Schedules for SIT Testing.<br>❑ Test Articles Will be Functionally Complete "Platforms", e.g., A GBI, a GSTS, etc. |
| ***ISTC*** | ❑ Elements Required to Supply Test Articles in Sufficient Number to Meet Schedules for ISTC Testing.<br>❑ Test Articles Will be Functionally Complete "Processors" with Hardware and Software, e.g., a GSTS "Object Dependent Processor", a GBI "Guidance / Navigation Control Processor", etc. |

# System CARD
# SITs and ISTC Phasing

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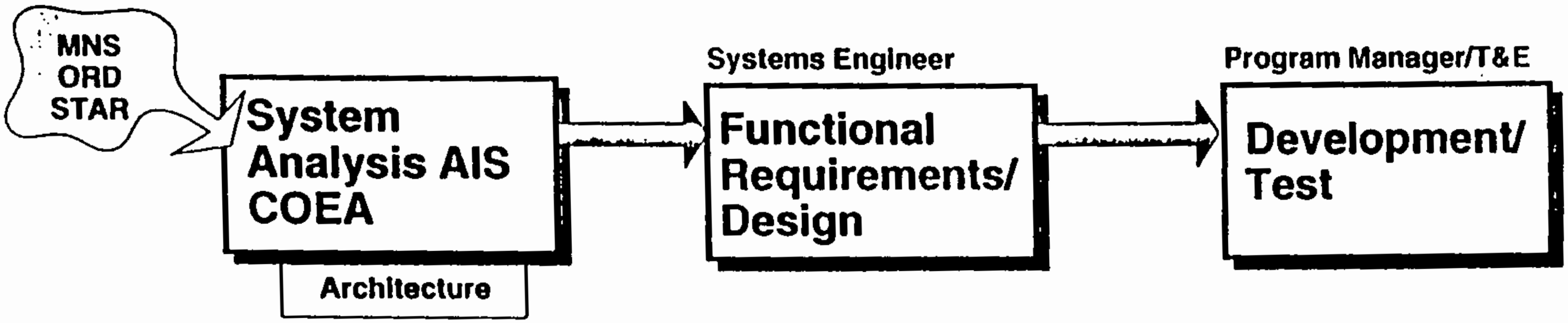
# T&E Resources Policy

- Use Existing Test Resources Where Possible
- Before Initiating New Resources, Coordinate with T&E
- Consolidate Existing Resources

# Test Resources




| | | | | | |
|---|---|---|---|---|---|
| Testbeds (TB) (Models/Sims) | EADTB, UKTB, ISTB<br>BP SIM | Level 1 System Simulator (L1SS)<br>KDEC<br>Various Engineering Models | L2SS<br>ISTC<br>Surveillance (STB)<br>Weapons (WTB) | C2TB<br>CNE<br>HICTB | C2 Prototype (C2P) |
| Facilities | | | LSTC (7V / 10V), KHILS, NHTF, AMOS, CERES, Milstone Hill Radars | | |
| Mobile Assets | | | USNS Redstone, AST, HALO, ARGUS, COBRA EYE, COBRA JUDY, COBRA BALL | | |
| Ranges | | | USAKA, Wake Island, ESMC LC20 WSMC, WSMR, PMRF | | |
| Data Center | | | Plume, Midcourse, Background | | |
| Targets | | | TTV, ATV, SMRV,ODES, PENAIDS, STARS, MM, ... | | |

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# Civil Engineering and Environmental

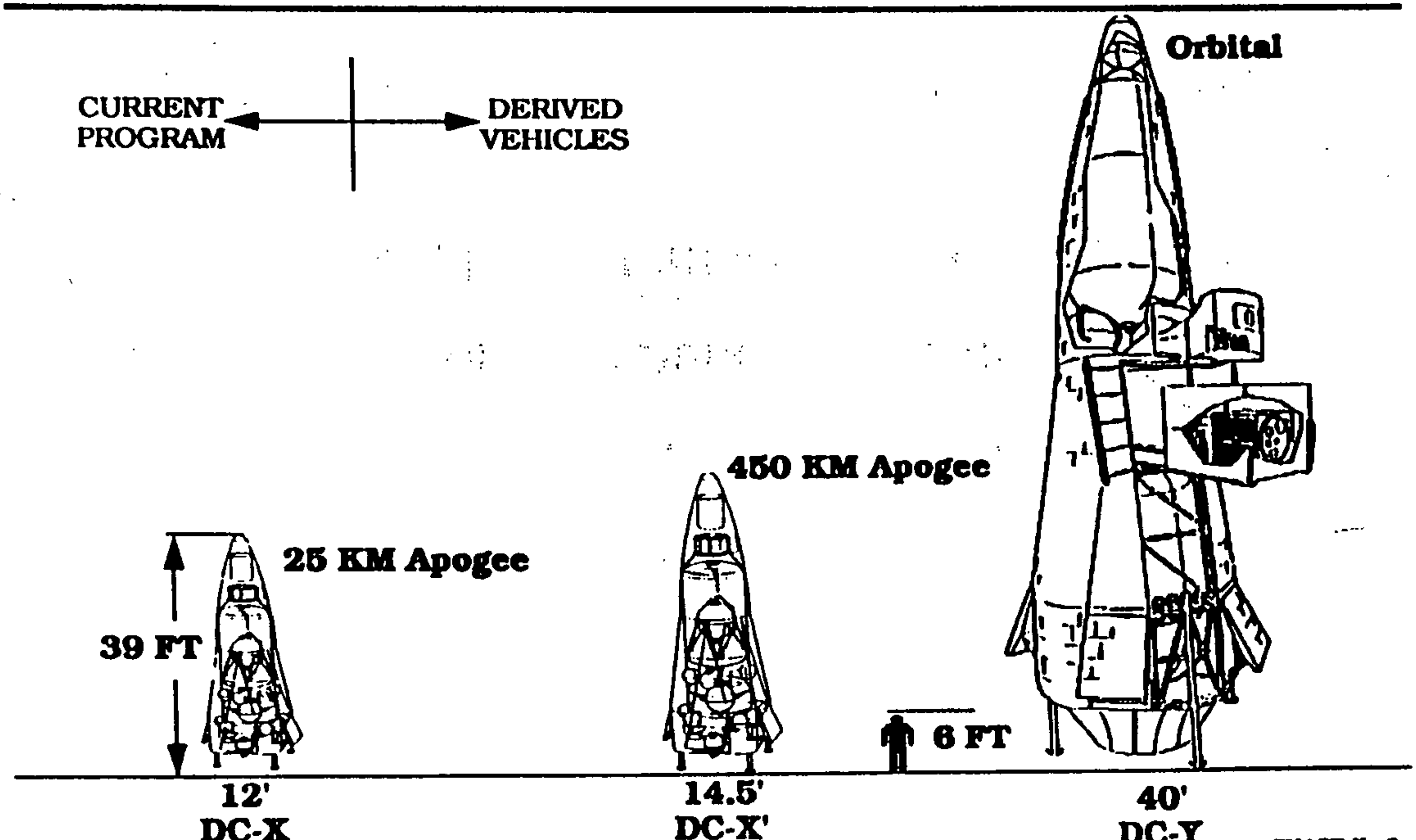
## *Advance Planning Activities*

- ❑ Environmental Documentation and Siting Analysis
- ❑ Real Property Engineering Studies
- ❑ Facility Design Requirement Definition
- ❑ Geologic and Topographic Surveys
- ❑ Site Activation Facilities
- ❑ Facility Refurbishment
- ❑ Construction Contracts Anticipated in FY93

# Test Operations

- FY93 Procurement
- Full and Open Competition
- Suborbital Launch Services for FY94-97
- Number of Launches TBD

# POTENTIAL DERIVED VEHICLES



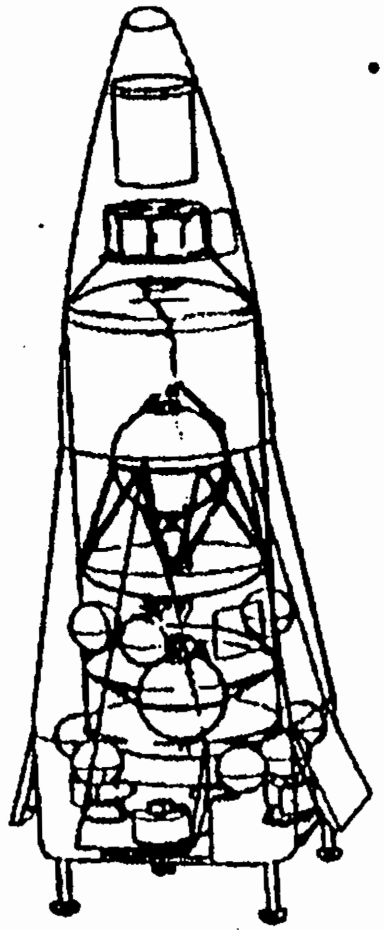
# PHASE II
## DC - X DESIGN
## 1/3 SIZE OF DC-Y

**MATERIALS & STRUCTURES**

- Aluminum & Steel Tanks
- Aluminum intertank & thrust structure
- Graphite epoxy aeroshell

**REACTION CONTROL SYSTEM**

- $GO_2/GH_2$ Thrusters



**PROPULSION SYSTEM**

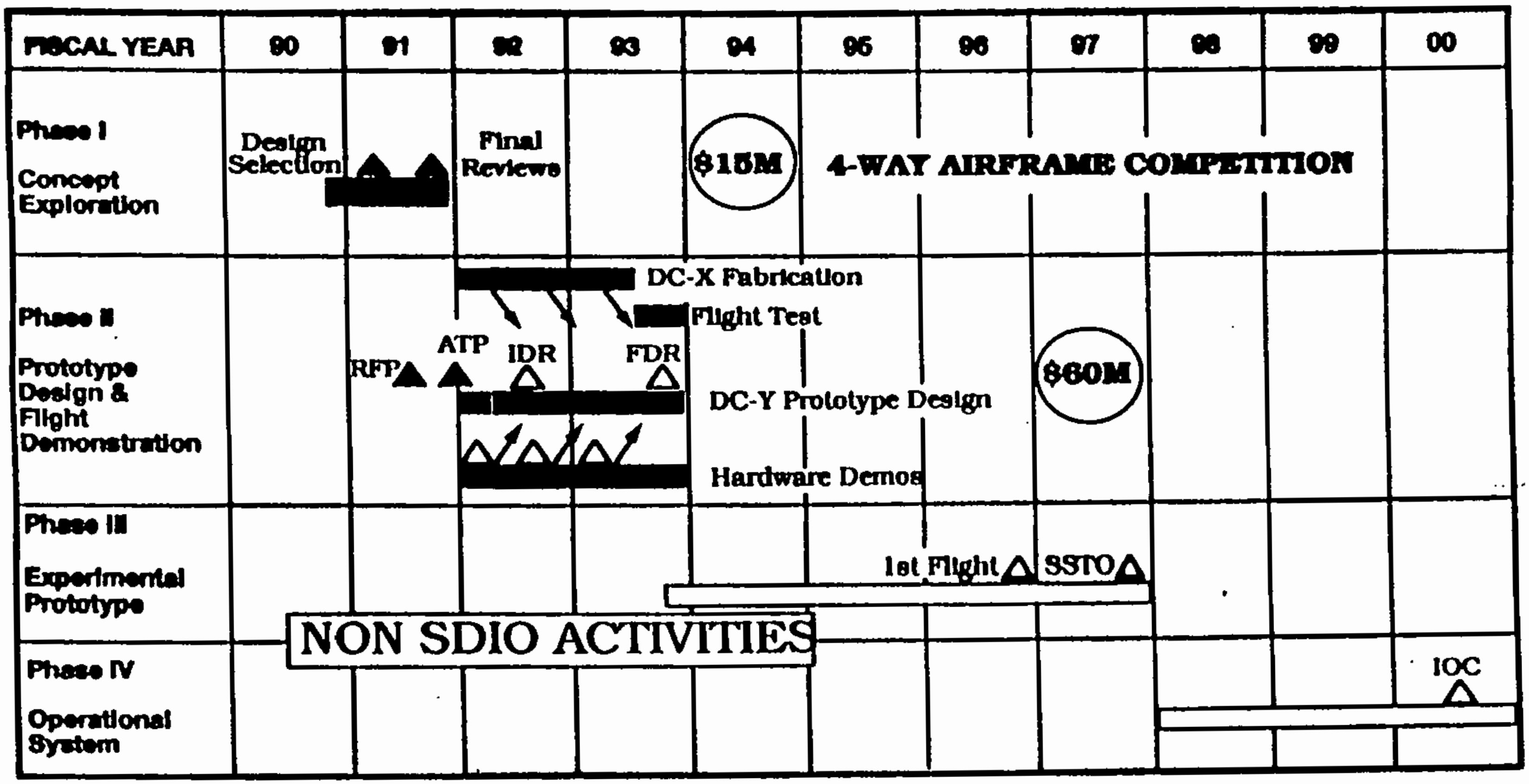
- Four RL-10's modified for sea level start & throttling

**VEHICLE CHARACTERISTICS**

| | |
|---|---|
| Base diameter | 12 ft |
| Vehicle height | 39 ft |
| Gross lift-off weight | 35,980 lb |
| • Payload experiment | 500 lb |
| Empty weight | 15,940 lb |

# SCHEDULE

## INCREMENTAL DEVELOPMENT APPROACH

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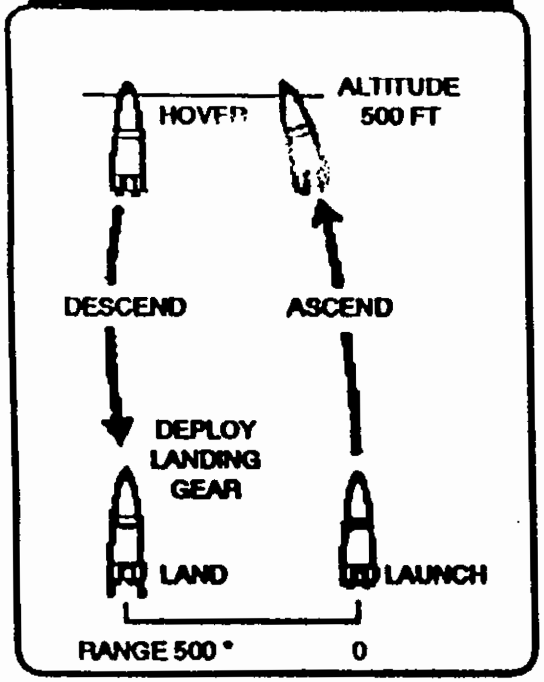
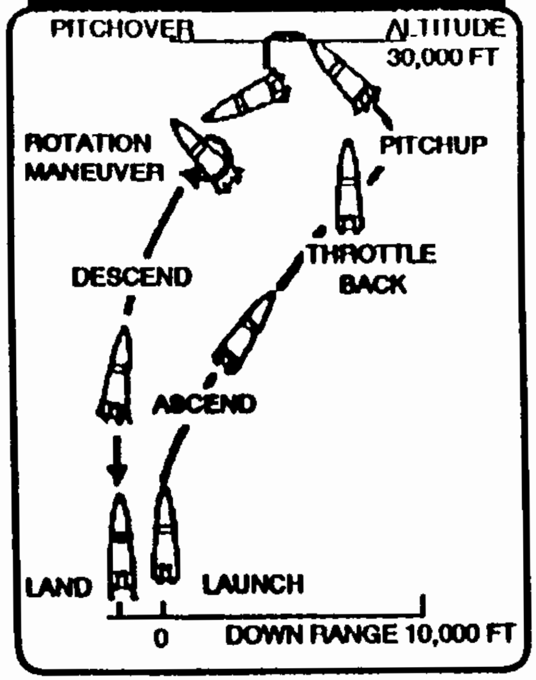
# PHASE II
# WSMR FLIGHT TEST PROGRAM
## AIRCRAFT ENVELOPE EXPANSION - - NO DESTRUCT PACKAGE

### FLIGHT TEST SERIES 1



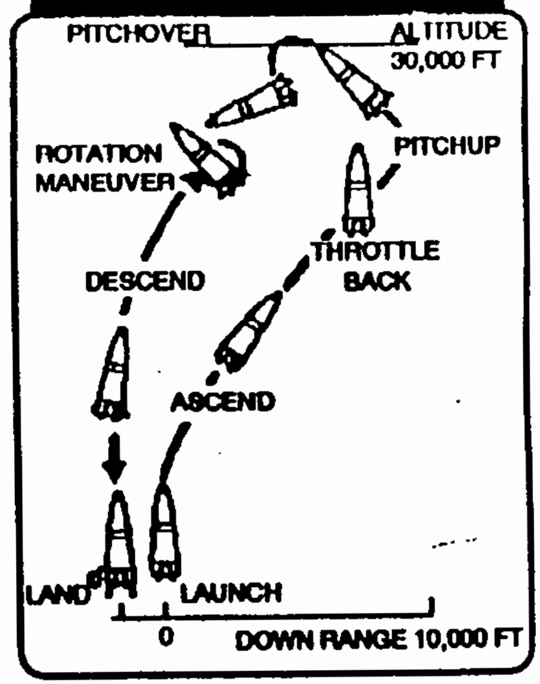

- LAUNCH & ASCEND
- DIFFERENTIAL THROTTLING CONTROL
- RCS ROLL CONTROL
- DESCEND & LAND

### FLIGHT TEST SERIES 2



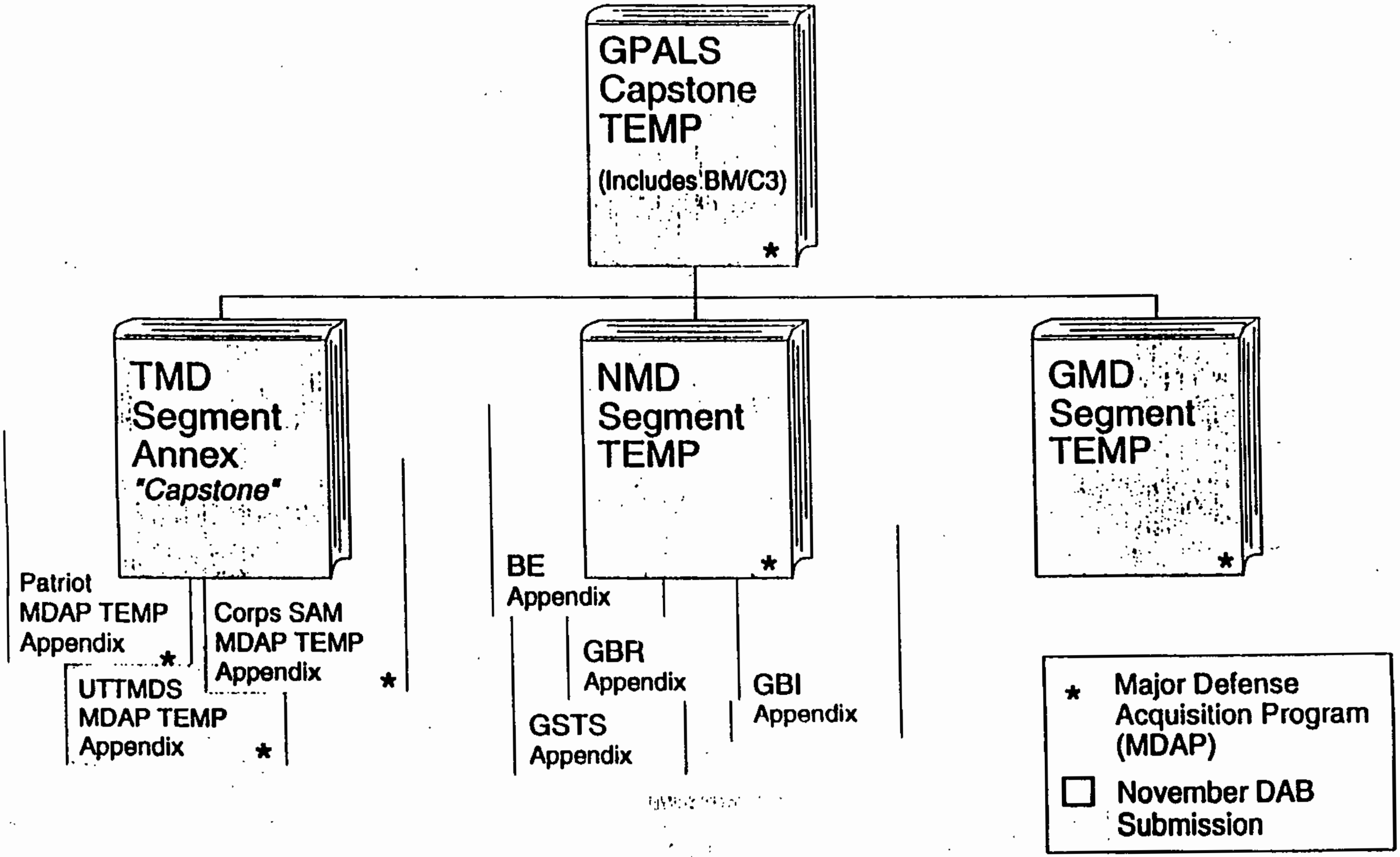

- AERODYNAMIC LIFT UNDER LOWER POWER THROUGH APOGEE
- ROTATION MANEUVER

### FLIGHT TEST SERIES 3




- EXPAND FLIGHT ENVELOPE
- DEMONSTRATE O&S GOALS
  - 3 DAYS TURNAROUND
  - RESPONSIVE CALL-UP

# TEMP Structure

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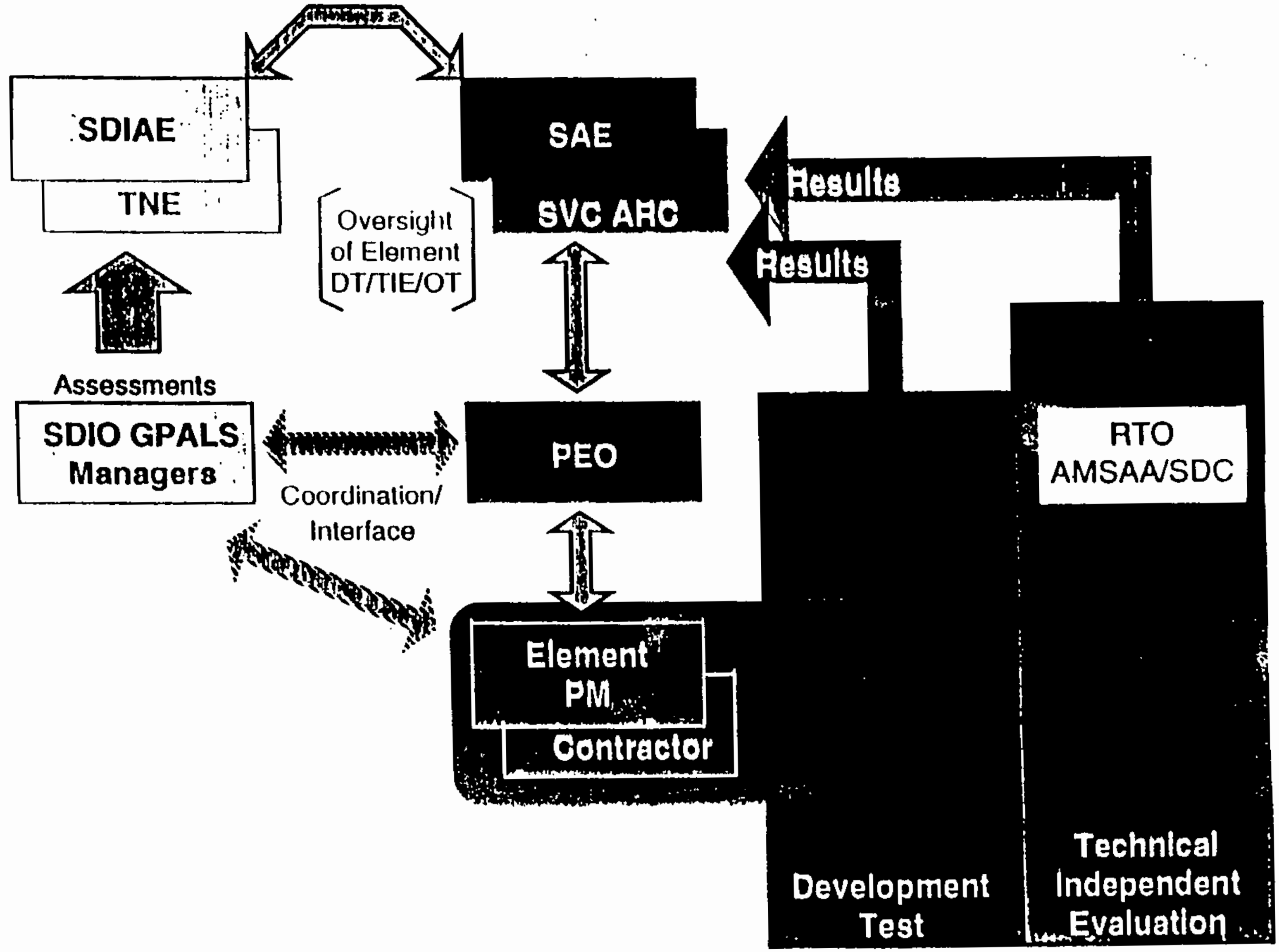
# Element T&E

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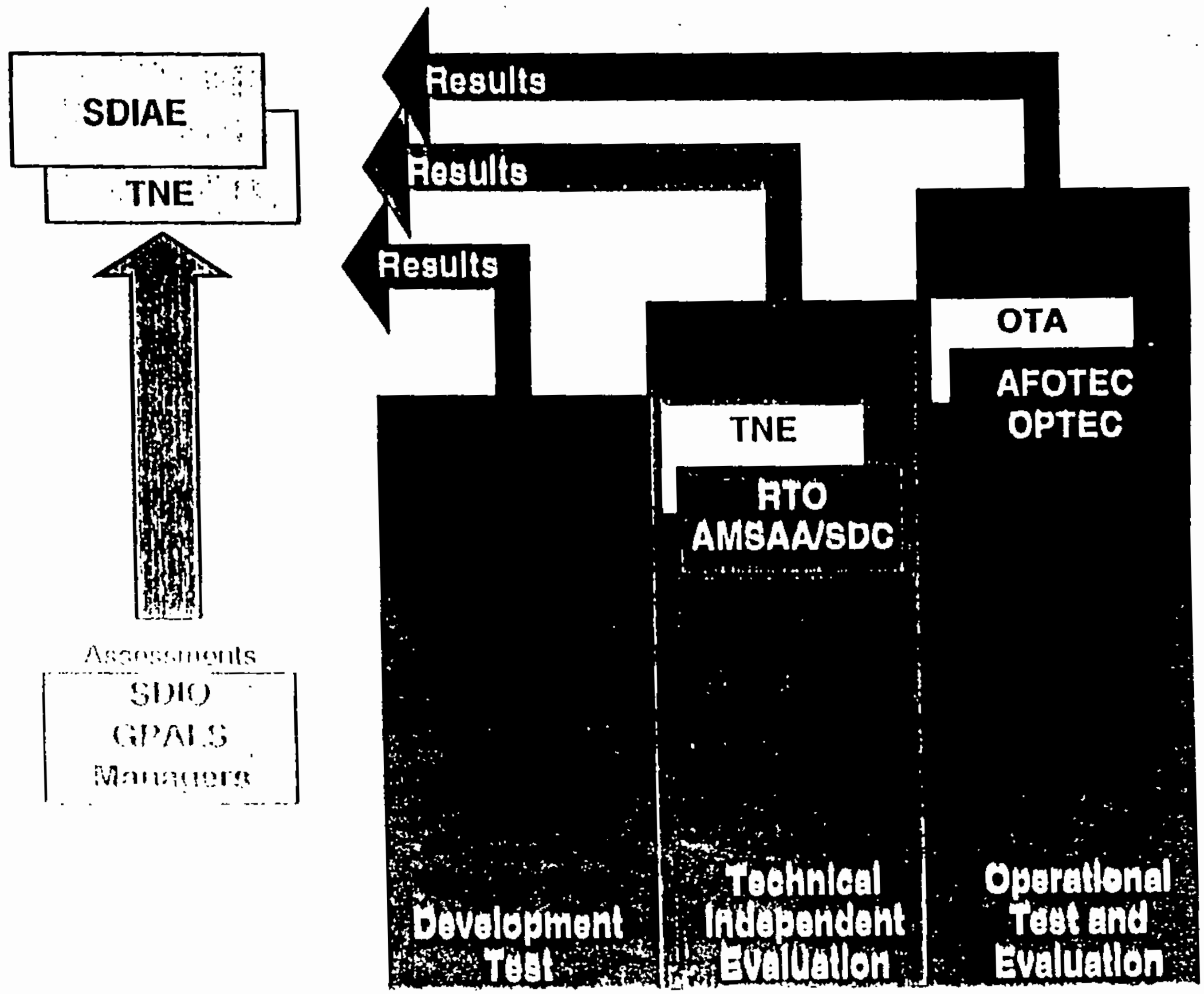
# System / MDAP T&E

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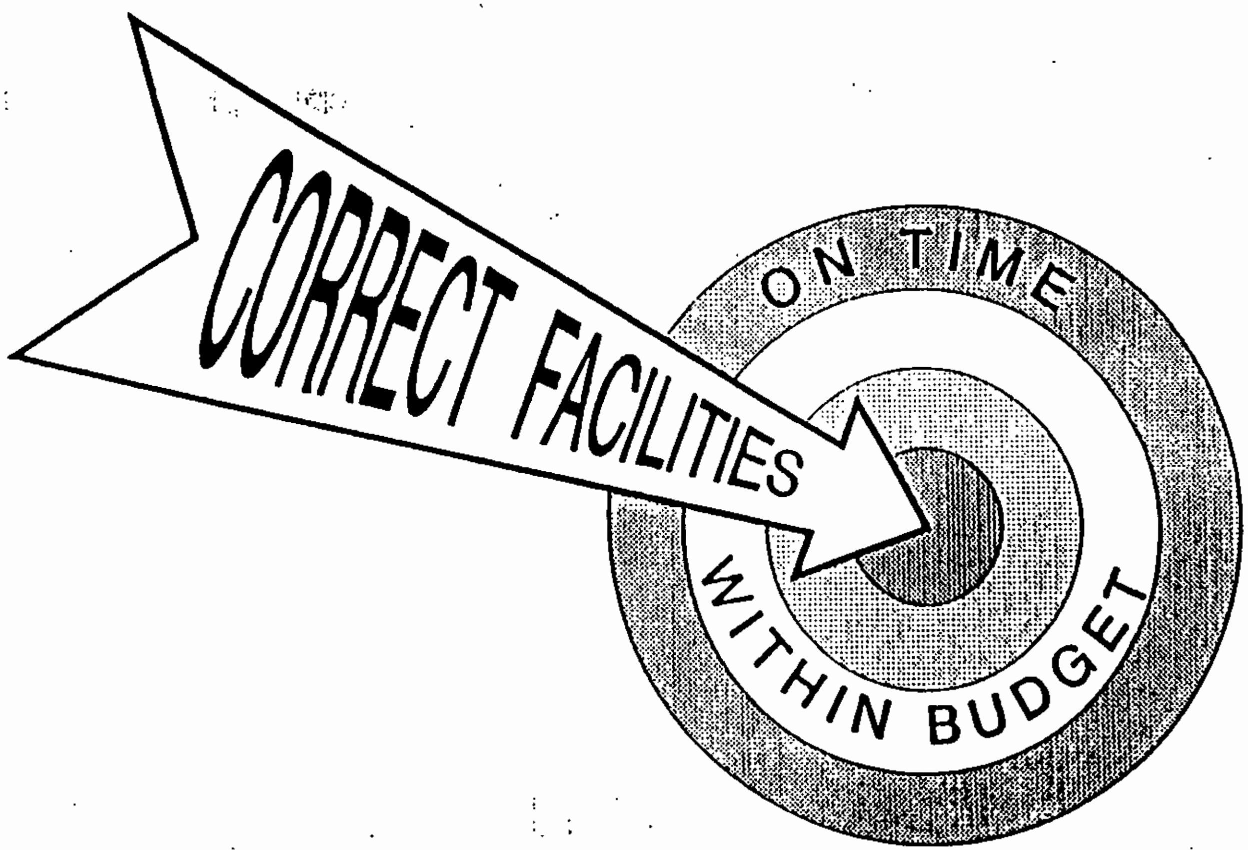
# OUTLINE

- ☐ The Goal
- ☐ Lessons Learned
- ☐ The Military Construction Process
- ☐ NMD Facility Acquisition Timelines
- ☐ Summary

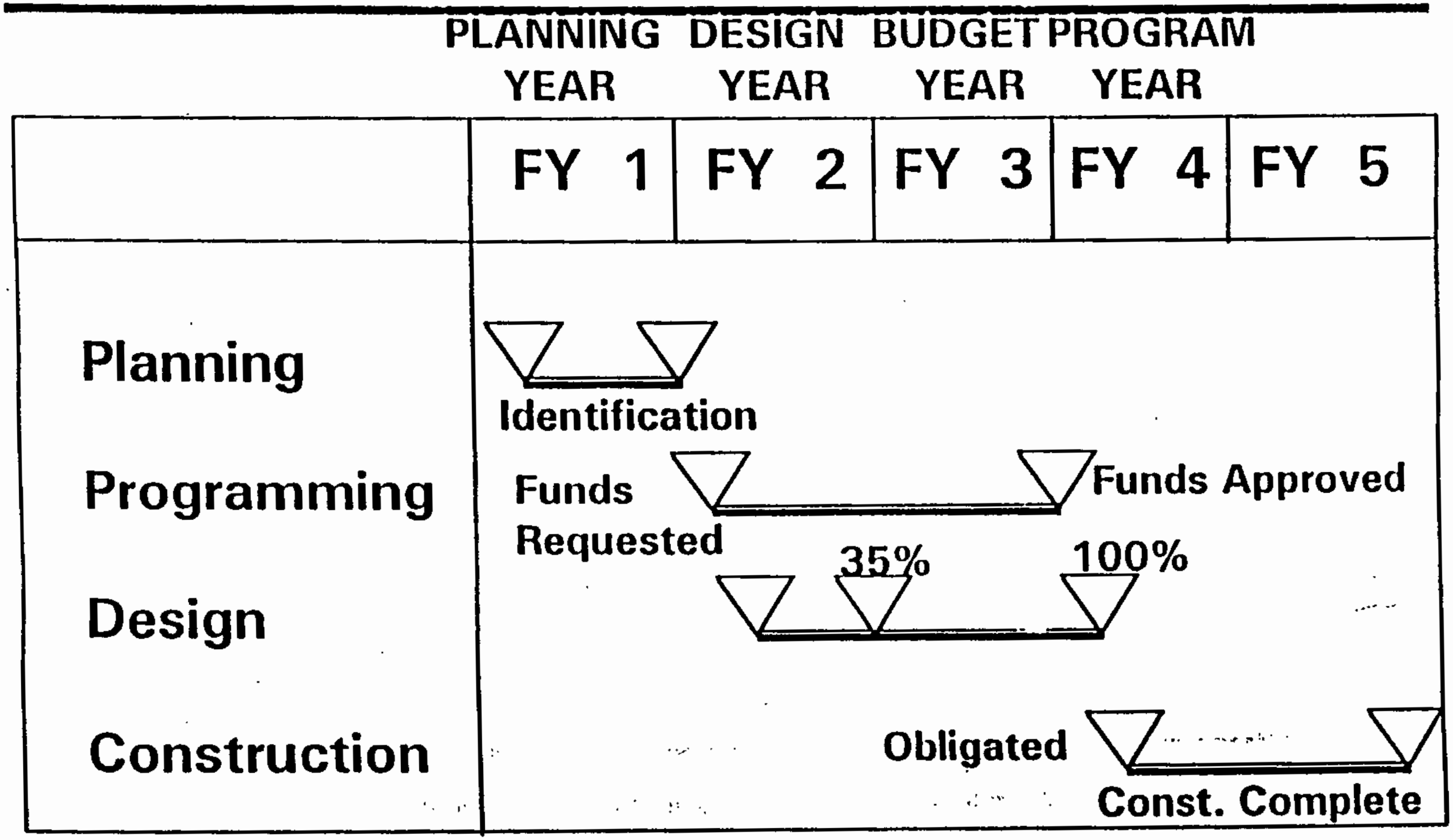
# THE GOAL



# LESSONS LEARNED

- ☐ Establish Clear Lines of Authority and Responsibility
  - Fast Track Decisions
- ☐ Maintain Strong Executive Agent Control
  - Identify Requirements Upfront
  - Specify Realistic Facility Standards
  - Actively Direct the Configuration Change Order Process
  - Ensure System & Facility Contractor Communications
- ☐ Make Civil Engineering Part of the "Acquisition Team"
  - A/E Designer and Element System Contractor Partnership
  - Get User Involved Early and Keep Him Involved
- ☐ Keep NEPA Requirements and Timeliness Upfront

# THE MILITARY CONSTRUCTION PROCESS

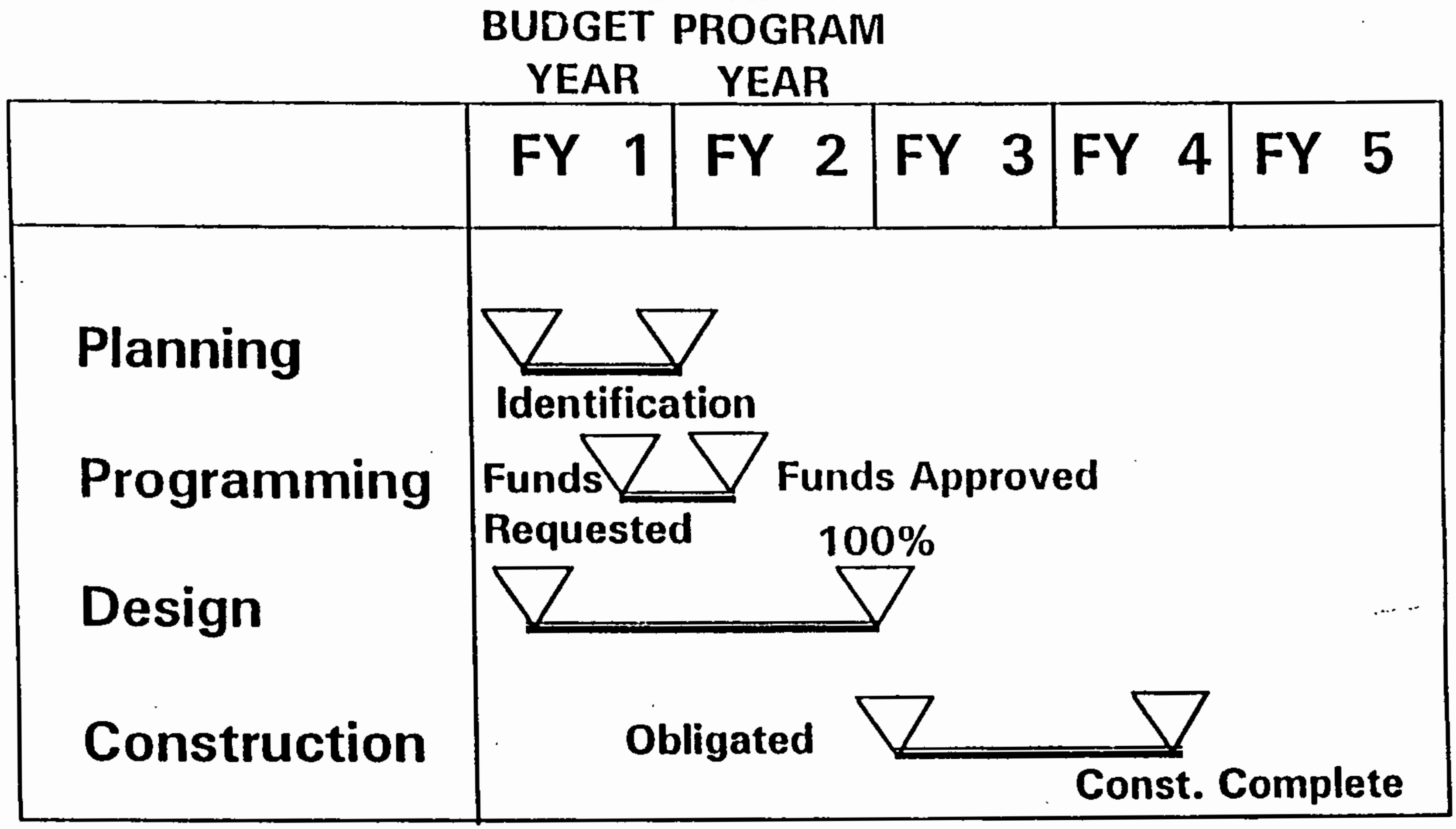





[illegible] 10/30/91

UNCLASSIFIED

# THE RDT&E CONSTRUCTION PROCESS

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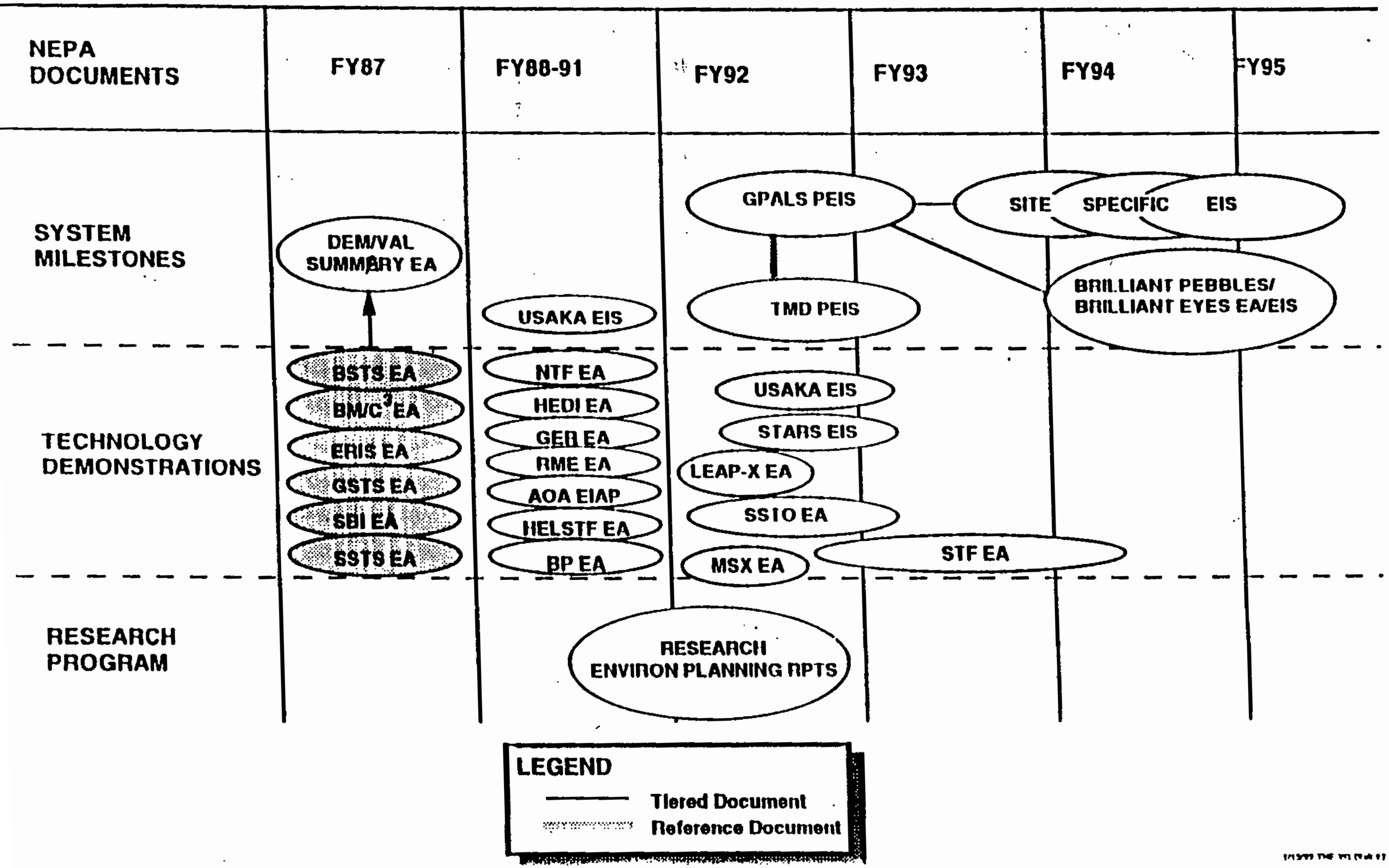
# SDIO NEPA COMPLIANCE STRATEGY



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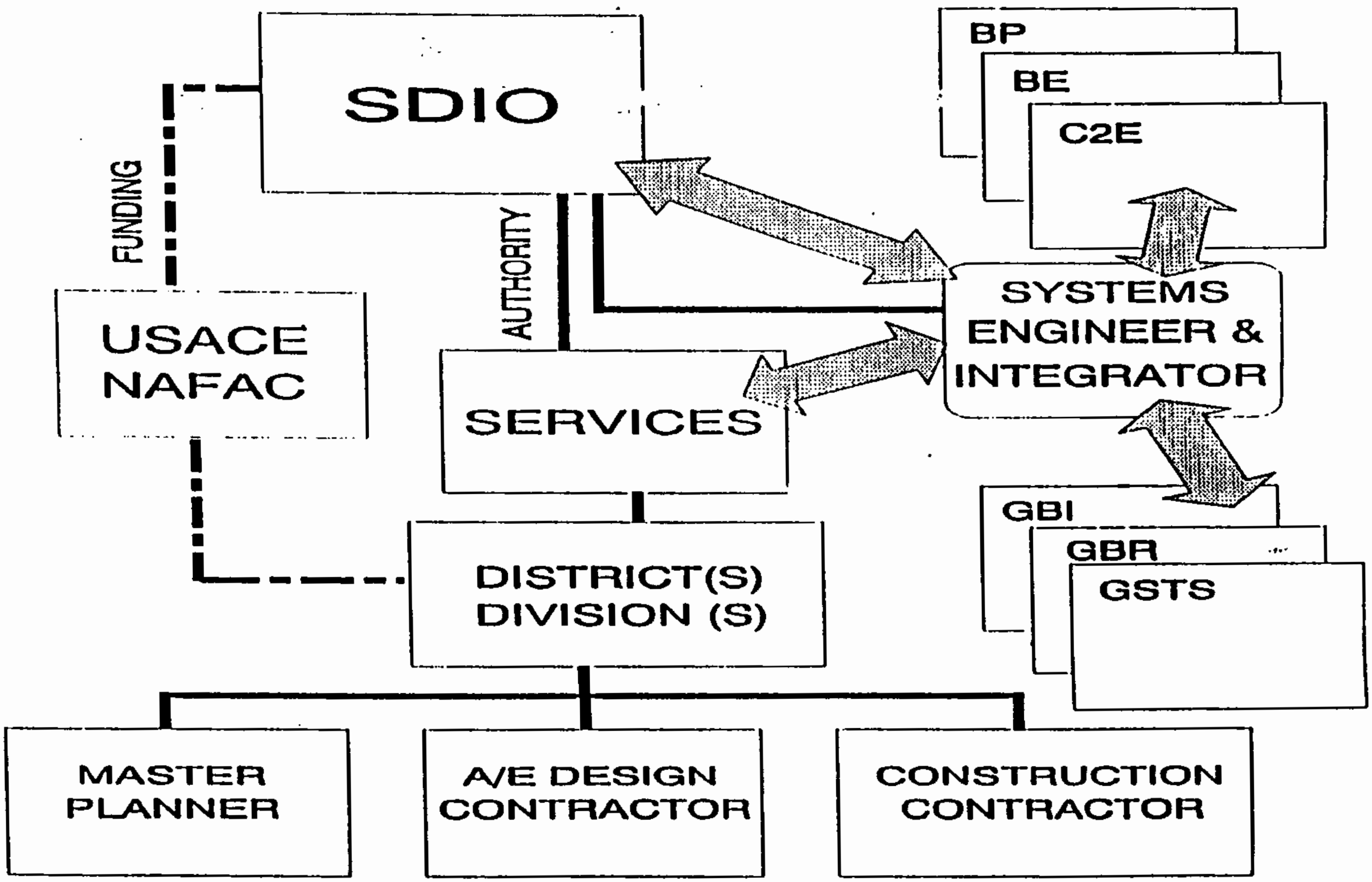
# IMPACT OF SYSTEMS ACQUISITION

## THE MILITARY CONSTRUCTION PROCESS

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# THE MILITARY CONSTRUCTION PROCESS

## ROLES AND RESPONSIBILITIES

- ☐ **Congress**

  Provides Funds

- ☐ **SDIO** (Exective Agent)

  Executes PPBS Process

  Ensures NEPA Compliance

  Issues Authority & Funding to Executing Agents

  Provides Congressional Interface

  Directs SE & I Process

  Provides Executive Oversight

# THE MILITARY CONSTRUCTION PROCESS

## ROLES AND RESPONSIBILITIES (CON'T)

- ☐ **Services** (Executing Agent)
  - Establishes Site Specific Facilities Requirements
  - Assigned as Design/Construction Manager
  - Executes the Site Specific NEPA Process
- ☐ **Design/Construction Agent** (USACOE, NAVFAC)
  - Executes Design/Construction Activity
  - Oversees Design/Construction Contractors
- ☐ **Installation Commander/System User**
  - Establishes User Requirements
  - Accepts, Operates and Maintains Facilities and Systems

# THE MILITARY CONSTRUCTION PROCESS

## ROLES AND RESPONSIBILITIES (CON'T)

- Services (Executing Agent)
  - Establishes Site Specific Facilities Requirements
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  - Oversees Design/Construction Contractors
- Installation Commander/System User
  - Establishes User Requirements
  - Accepts, Operates and Maintains Facilities and Systems

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FOI 92-0855

# STRATEGIC DEFENSE INITIATIVE

## Strategic Defense In The 1990's


**Col Simon P. (Pete) Worden, USAF**
**Deputy For Technology**
**Strategic Defense Initiative Organization**

# SDIO TODAY

Amb Cooper - Director
MG O'Neill - Deputy Director
Dr. Gerry - System Architect

Staff Functions

**Technology**

1. Technology Insertion
2. Alternatives
3. Follow-on Systems
4. Innovative Technologies
5. Test & Evaluation

**Theater Defense**

1. Sensors (GBR, BE)
2. Weapons (THAAD, ERINT, PATRIOT III)
3. BM / $C^3$

**Strategic Defense (GPALS)**

1. Global (BE, BP)
2. National (GBI, GBR)
3. BM / $C^3$ (NTB)

# TECHNOLOGY OVERVIEW

TEST AND EVALUATION

INTERCEPTOR TECHNOLOGY

SENSOR TECHNOLOGY

KEY TECHNOLOGY

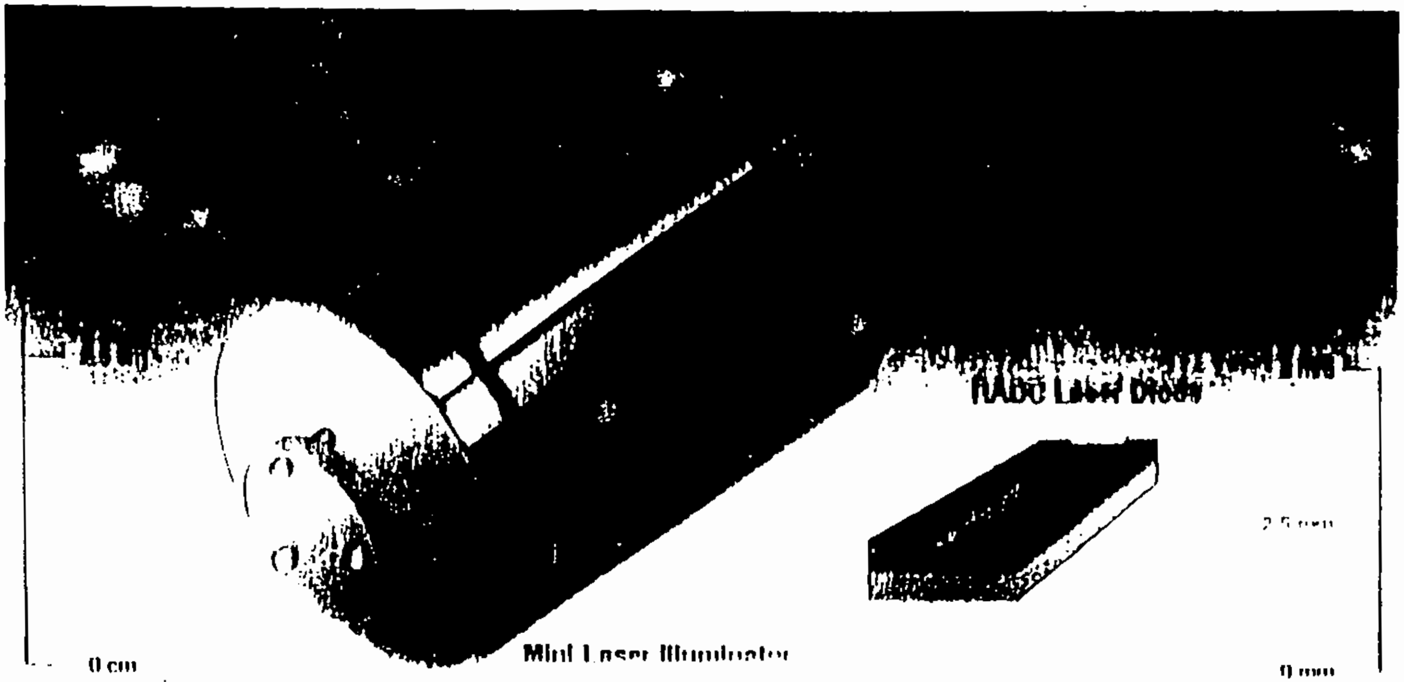
DIRECTED ENERGY

INNOVATIVE SCIENCE & TECHNOLOGY

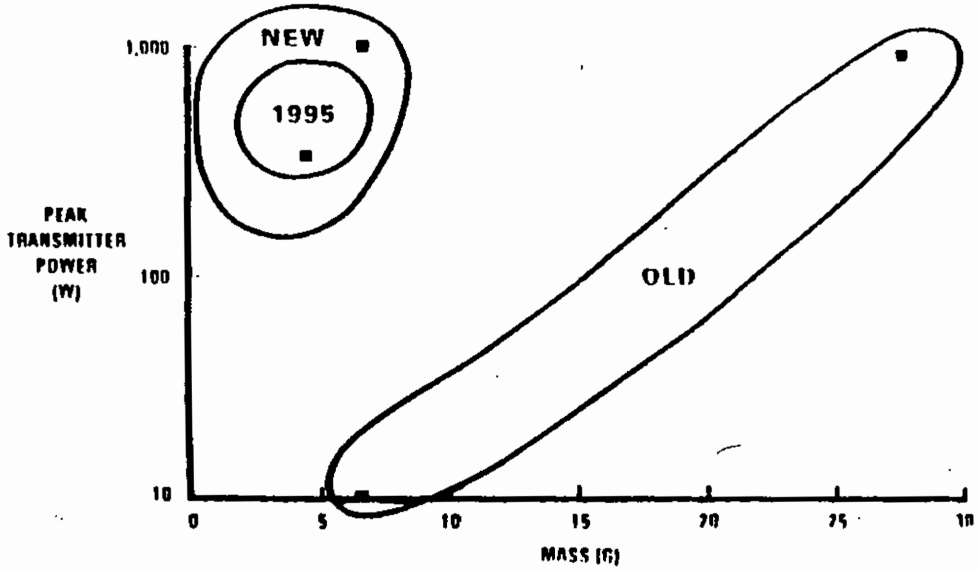
# TECHNOLOGY
# FASTER, CHEAPER AND BETTER

# TECHNOLOGY INSERTION

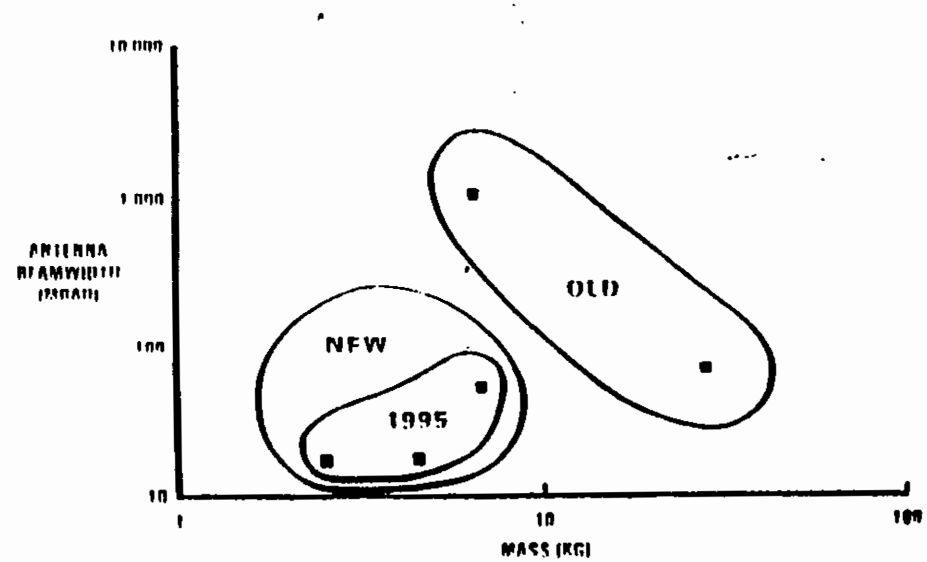
# ACTIVE SEEKERS COMPONENTS



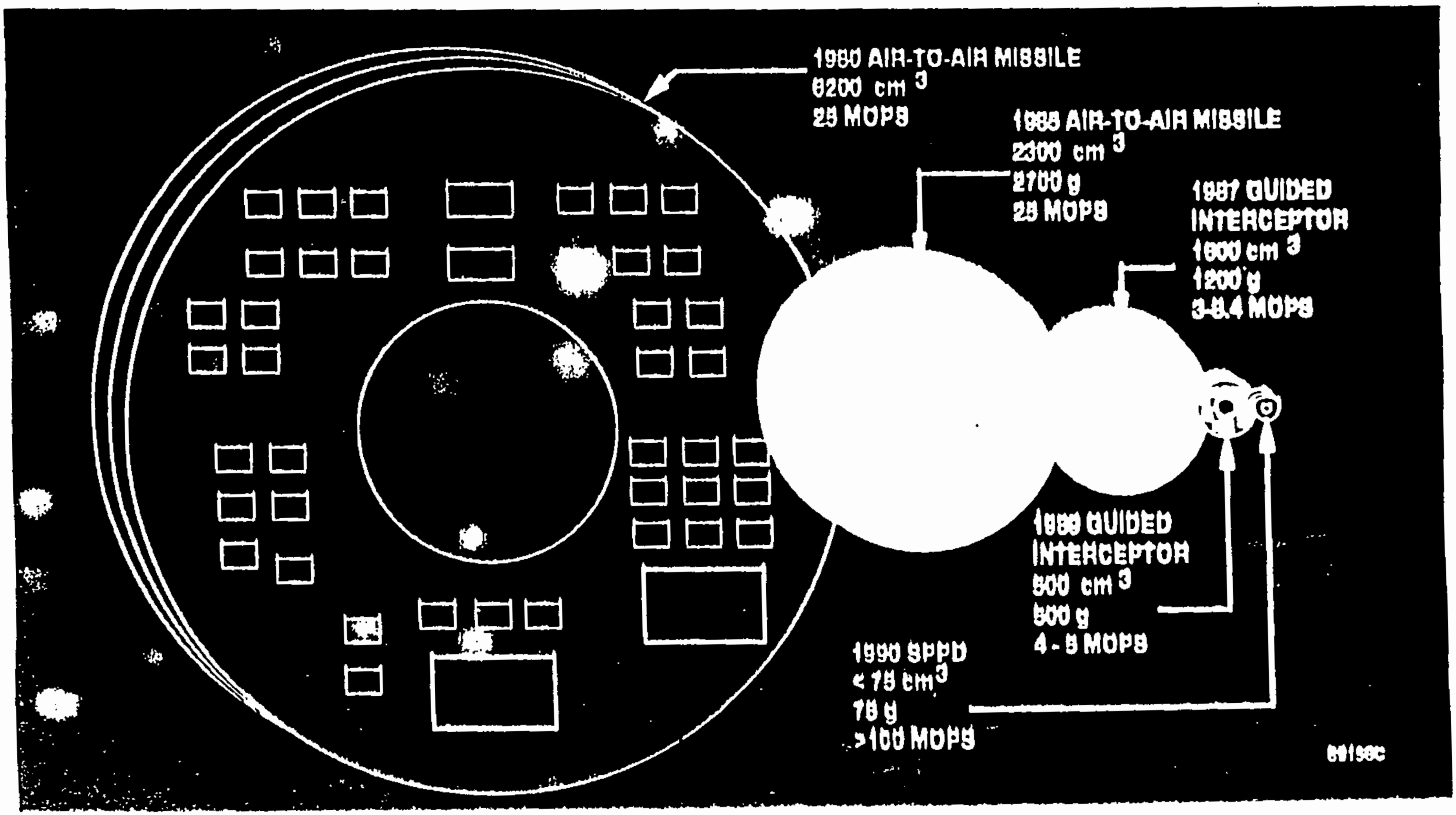

RF TRANSMITTER PEAK POWER VS. MASS




RADAR ANTENNA BEAMWIDTH VS. MASS



# SIGNAL PROCESSOR VOLUME IS A KEY DRIVER OF INTERCEPTOR



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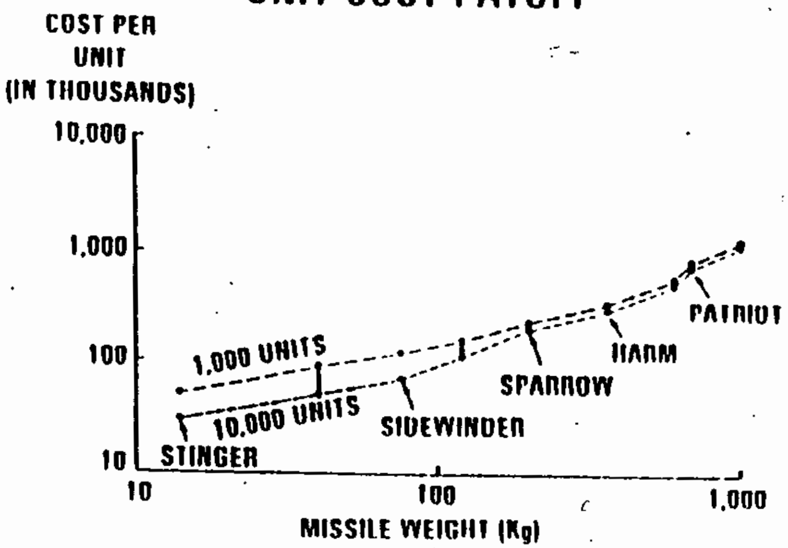
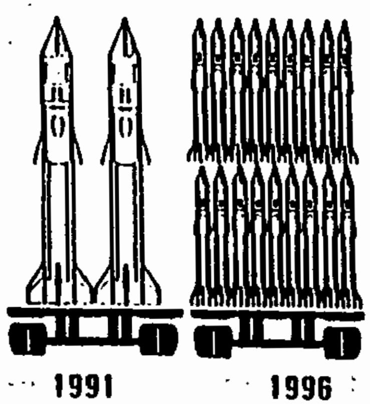
# BOTTOM LINE ON SIZE AND COST

## UNIT COST PAYOFF

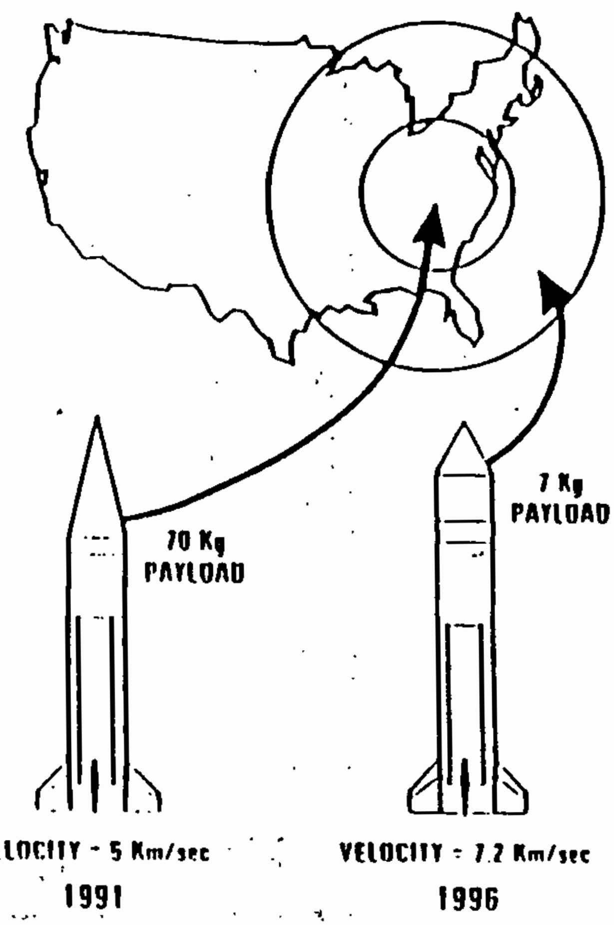



## THAAD
MOBILITY LOGISTICS PAYOFF




8 TIMES LOADOUT FOR SMALL INTERCEPTORS

## GBW
PERFORMANCE LOGISTICS PAYOFF




ONE-TENTH SIZE YIELDS 4 TIMES PROTECTED AREA

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# LEAP FLIGHT TEST SCHEDULE

**LEAP 1**
MISSION CHECKOUT

**LEAP 2**
SPACE INTERCEPT
RV TARGET

**LEAP 3**
SPACE INTERCEPT
RV TARGET

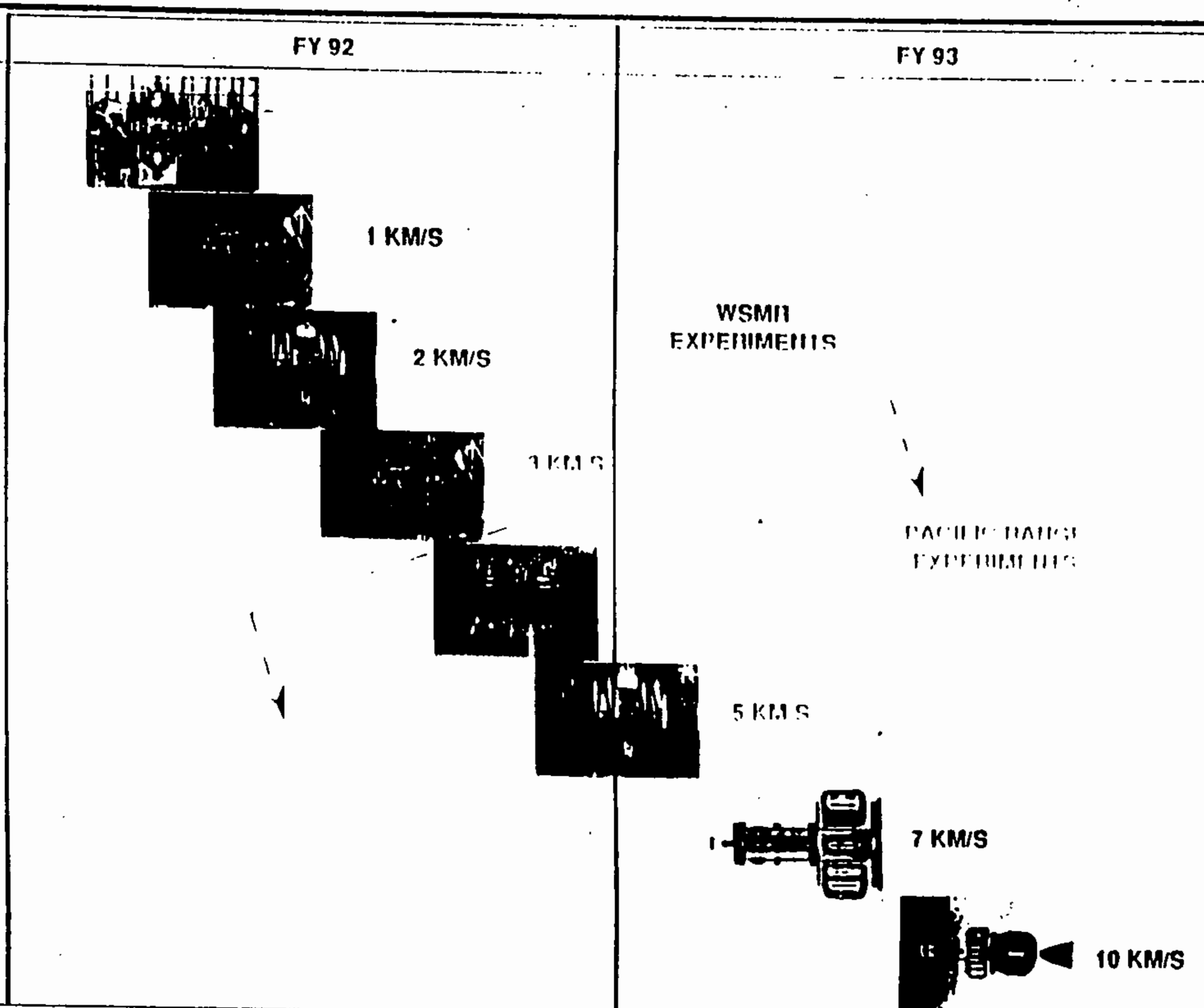
**LEAP 4**
MODERATE ΔV INTERCEPT
RV TARGET

**LEAP X**
COMPONENT TECHNOLOGY
DEMONSTRATION

**LEAP 5**
HIGH ΔV INTERCEPT
RV TARGET

**LEAP 6 W/ALAS**
HIGH ΔV INTERCEPT
RV TARGET

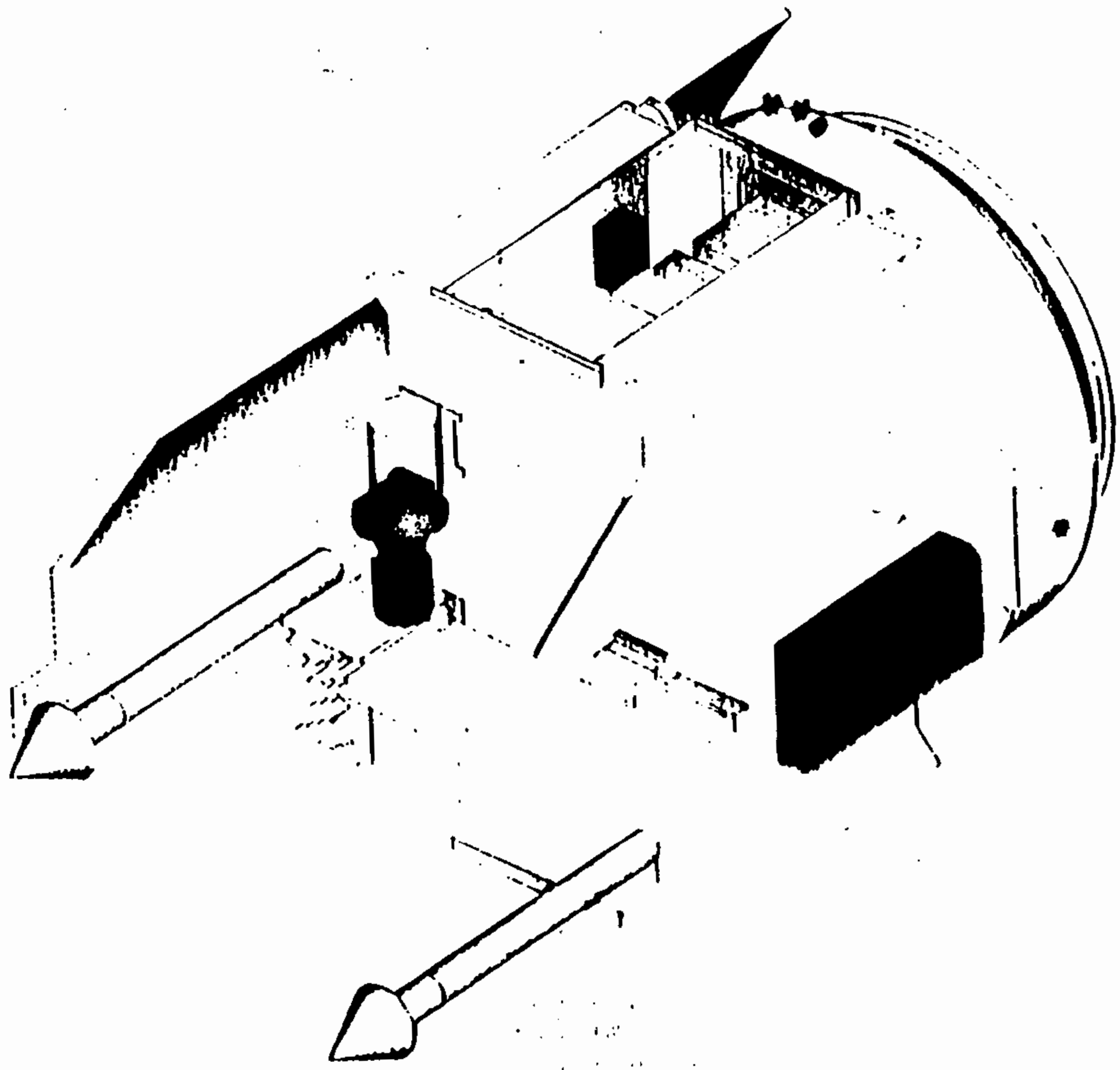
**LEAP 7 W/ALAS, ASAS**
HIGH ΔV INTERCEPT
PBV TARGET



# ALTERNATIVES

UNCLAS

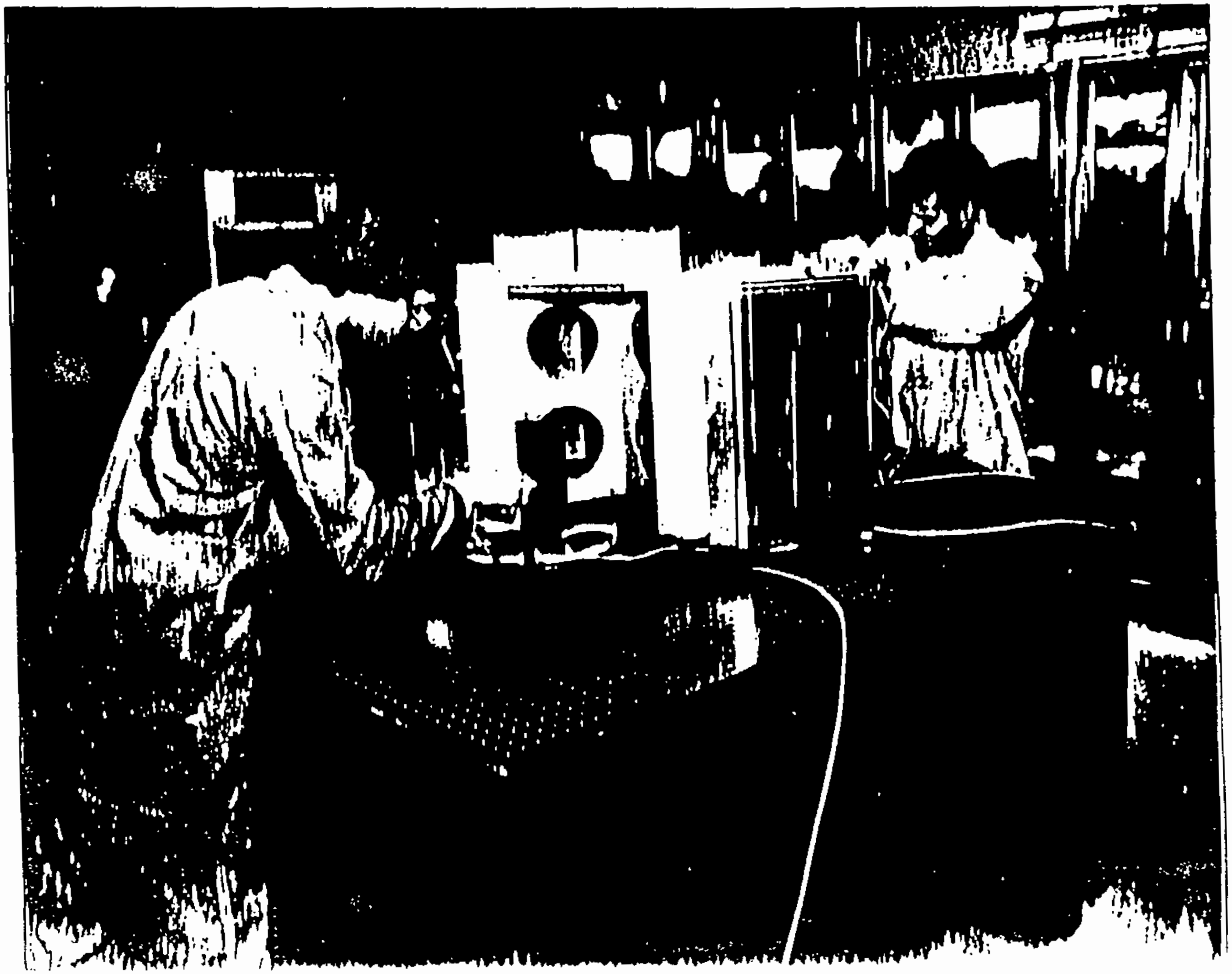
# MSTI SATELLITE MULTIMISSION BUS CONCEPT



UNCLASSIFIED

UNCLASSIFIED

# MSTI SATELLITE INTEGRATION AT PHILLIPS LAB EDWARDS AFB



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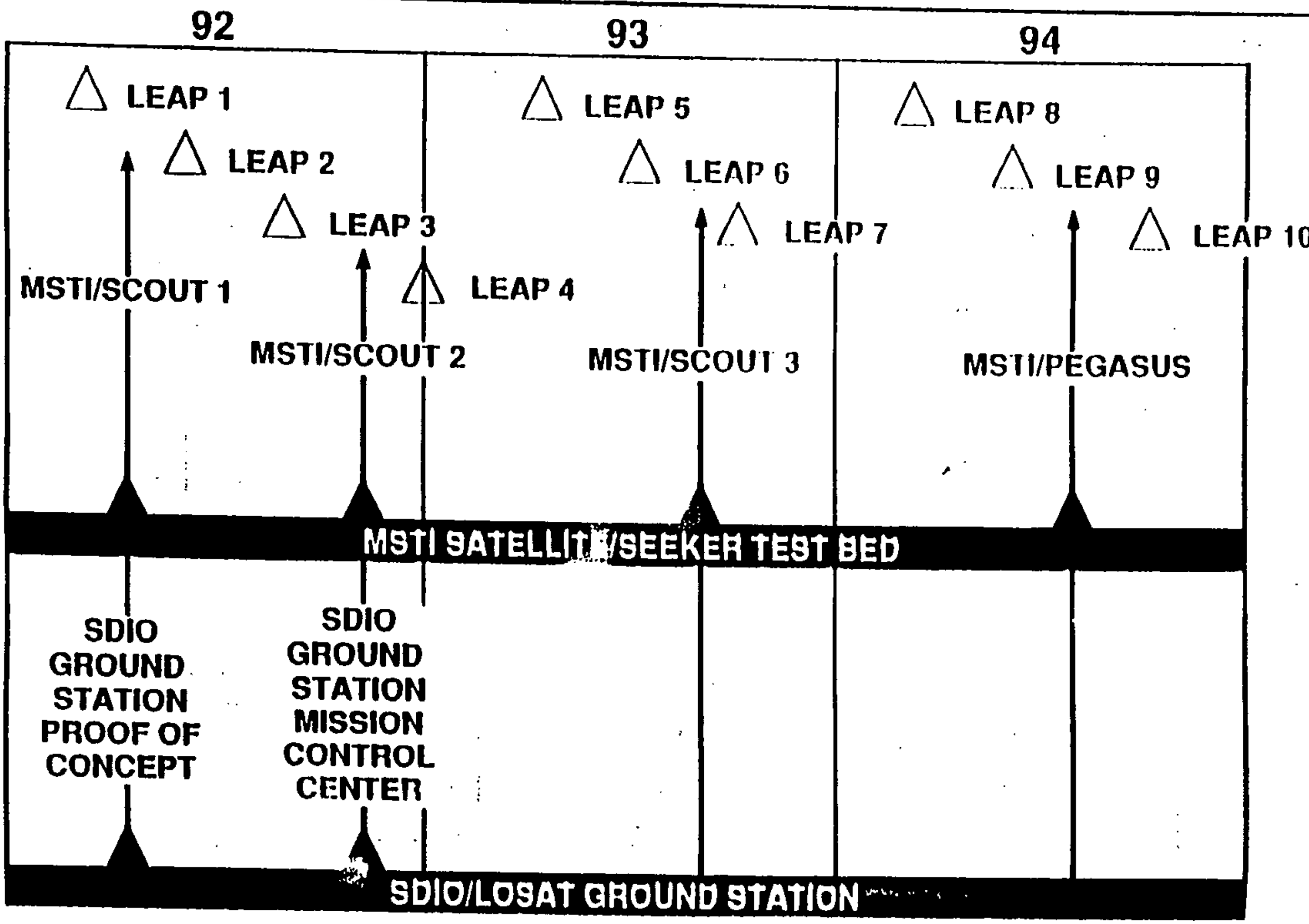
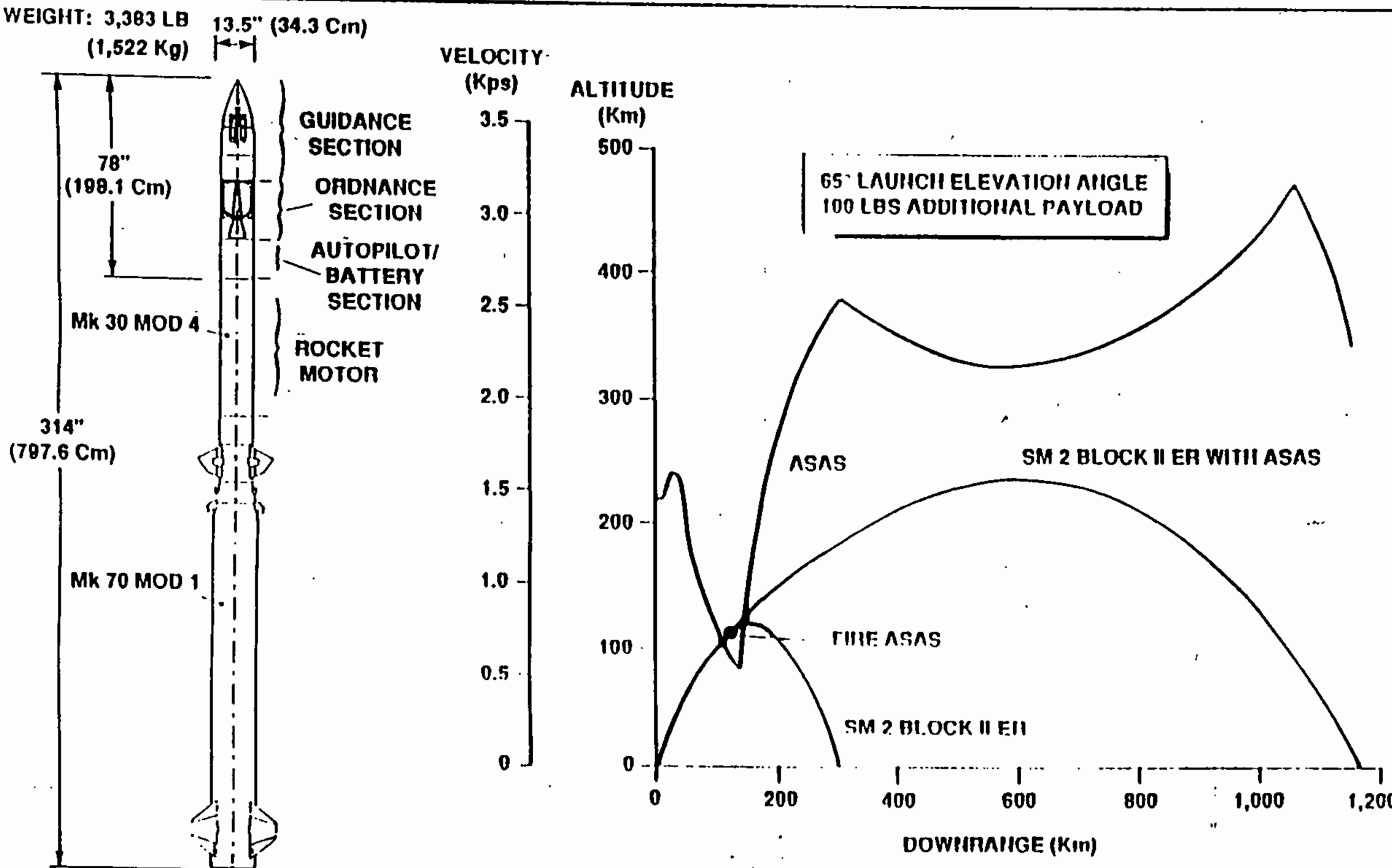
# MSTI DEPLOYMENT AND LEAP FLIGHT TESTS



# LEAP LAUNCH VEHICLE PERFORMANCE USING SM 2 BLOCK II ER (TERRIER) BOOSTER AND SUSTAINER PLUS ASAS



# NAVY LEAP GETS YOU . . .

| FLIGHT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| DATE | FEB 92 | MAY 92 | SEP 92 | DEC 92 | FEB 93 | MAR 93 | JUN 93 | SEP 93 | DEC 93 |
| RANGE | AFWTF | WSMR | | | | ETR, AFWTF, OR PACIFIC RANGE | | | |
| INTERCEPTOR LAUNCH MODE | SHIPBOARD RAIL | DESERT SHIP RAIL | | | WSMR VLS/ RAIL | SHIPBOARD VLS/RAIL | SHIPBOARD VLS OR RAIL | | |
| KICK MOTOR | NONE | | MASS MOCKUP | ADVANCED SOLID | | AXIAL STAGE [illegible] | | | |
| SUSTAINER | MK 30 MOD 2 | | | | MK 30/MK 104 | | | | |
| BOOSTER | SM2 BLOCK II ER | | | | SM2 BLOCK II ER OR SM2 BLOCK IV | | | | |
| INTERCEPTOR | MASS MOCKUP | | LEAP 1 OR | | LEAP 2 OR | | LEAP 3 | | |
| FIRE CONTROL ELEMENTS | TIMING | TIMING | TIMING | RADAR TRACK AND ALERT | SHIPBOARD AEGIS (MOD)/ TERRIER | | | | |
| CLOSING VELOCITY | 2.2 KM/S | 2.2 KM/S | 1.2 KM/S | 2 KM/S | 2.2-2.8 KM/S | [illegible] KM/S | [illegible] KM/S | [illegible] KM/S | [illegible] KM/S |

- 9 FLIGHT TESTS
- 5 AT SEA DEMO
- EARLY SHIPBOARD DEMONSTRATION
- PROVIDES AGGRESSIVE PRE-THAAD TMD ROLE
- MERGES SDIO/NAVY TEST AND TECHNOLOGY INFRASTRUCTURES
- BRINGS NAVY TO TECHNOLOGY READINESS

**NAVY LEAP WILL HAVE DEMONSTRATED EXO-TMD CAPABILITY BY 1993**

# AIRBORNE LASER

# INITIAL OBSERVATIONS

- BOOST PHASE INTERCEPT WOULD BE A COMPELLING ADDITION TO THEATER MISSILE DEFENSE
- AIRCRAFT-BASED LASERS (ABL) OFFER PROMISE IN PROVIDING SUCH A CAPABILITY
- ABL IS NOT A NEW CONCEPT; A $10^{14}$ W/sr CLASS LASER SHOT DOWN AIR-TO-AIR MISSILES IN 1983-84
- THE TECHNOLOGY BASE CREATED IN OVER TWO DECADES OF WORK SUPPORTS THE CONCEPT
- FOCUSED PROGRAM COULD YIELD OPERATIONAL CAPABILITY EARLY IN THE NEXT DECADE

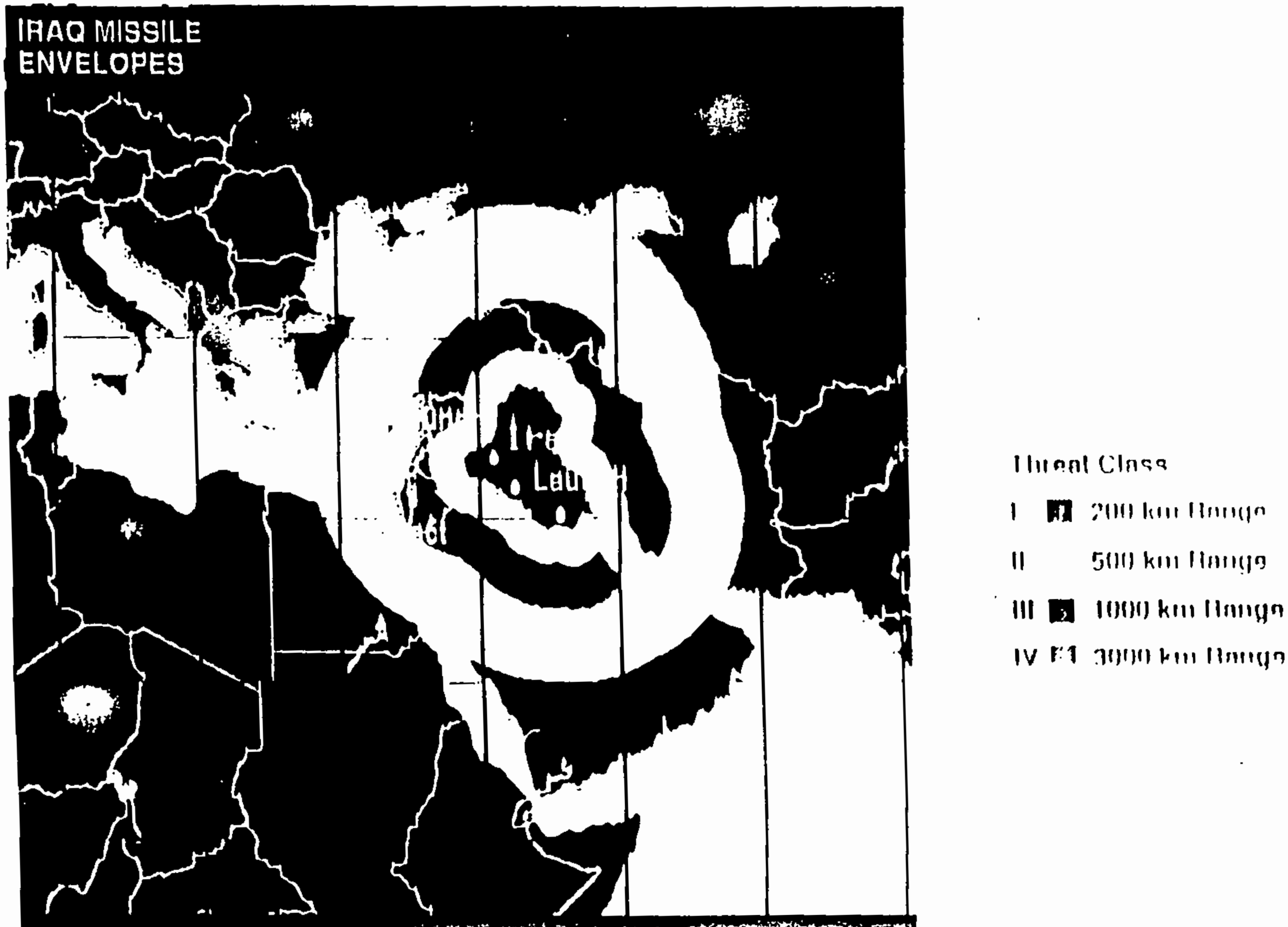
112M022

# Airborne Laser Laboratory (ALL)

- Demonstrator program: 1970 to 1983
- Laser- High Energy $CO_2$ GDL (10.6 μm)
- 60 cm Pointer telescope
- Demonstated
  - •• 6 μrad class tracking (1sigma - 1 axis)
  - •• Destroyed 5 Air to Air missiles (AIM-9)
  - •• Destroyed 2 Cruise missiles (BQM-34)

# IRAQ "SCENARIO SUMMARY"

- **OPTIMIZED THREAT BASING ASSUMED FOR MAXIMUM OFFENSE CAPABILITY**



# FOLLOW-ON

# STARWARS - THE DREAM IS ALIVE AND WELL!

- **DoD Has Made Considerable Investments In Directed Energy (Speed-Of-Light) Weapons Technology For Two Decades**

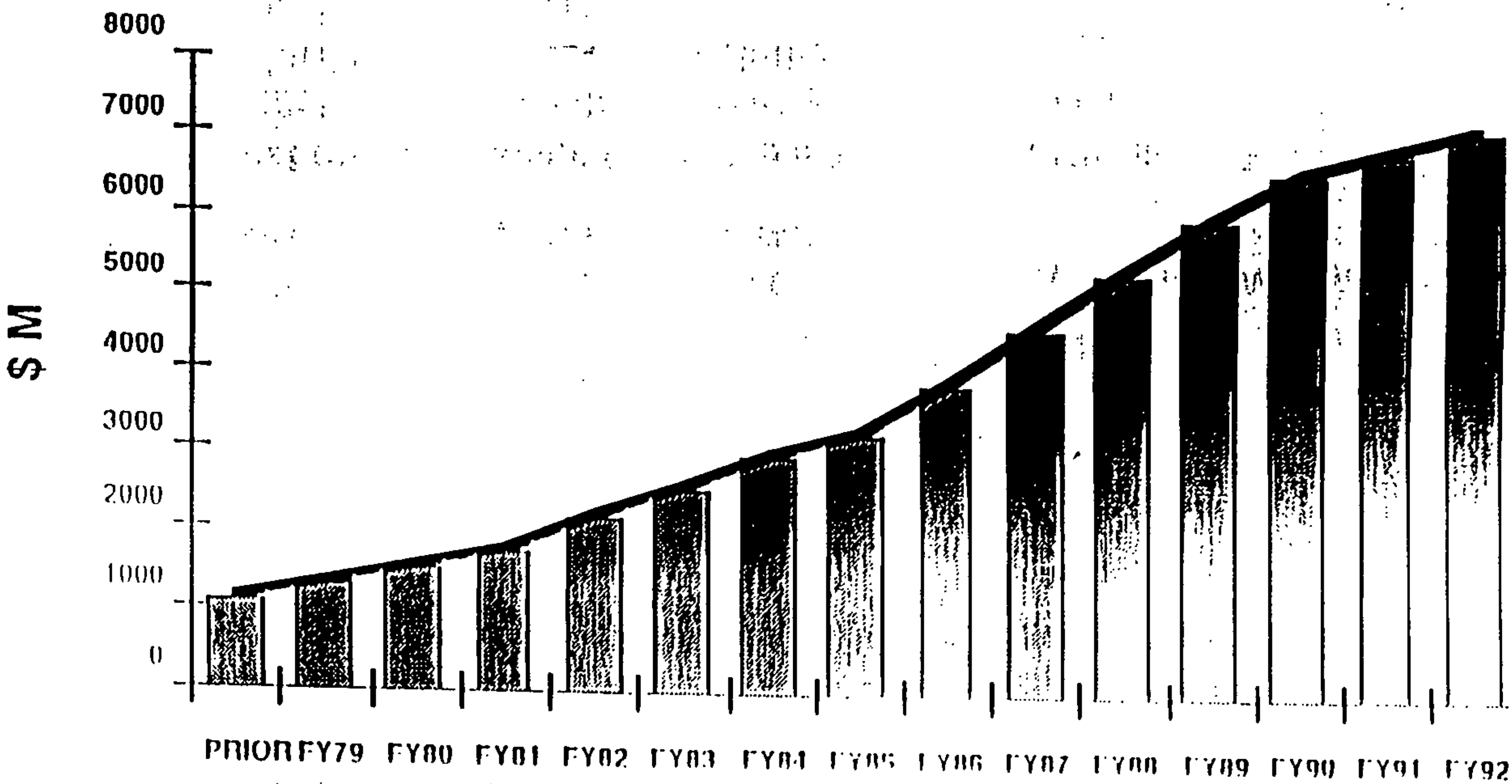
- **Pay-Offs Are Emerging Now**

  - **Near Weapon Level Components Have Been Built And Tested, And Are Now Being Integrated For Mid-90s Tests**

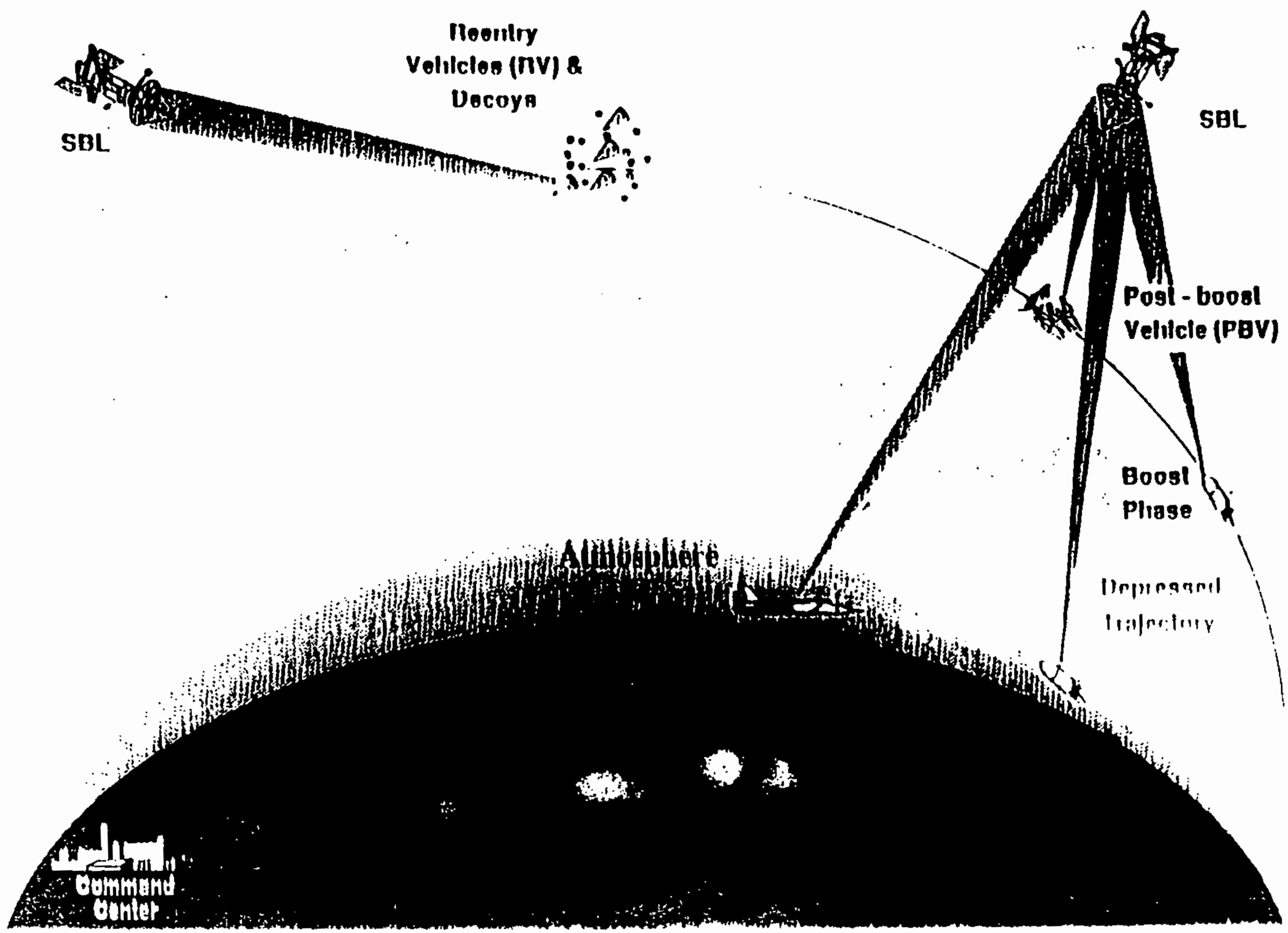
- **In The Next Decade, This Nation Can Field Truly Unique Weapon Systems For A Broad Variety Of Defense Missions, e.g.**

  - **Boost-Phase Intercept Of Strategic And Theater Missiles**
  - **Interactive Discrimination Of Decoys From Warheads**
  - **Worldwide Full-Time Air Superiority**
  - **Highly Robust Surveillance**

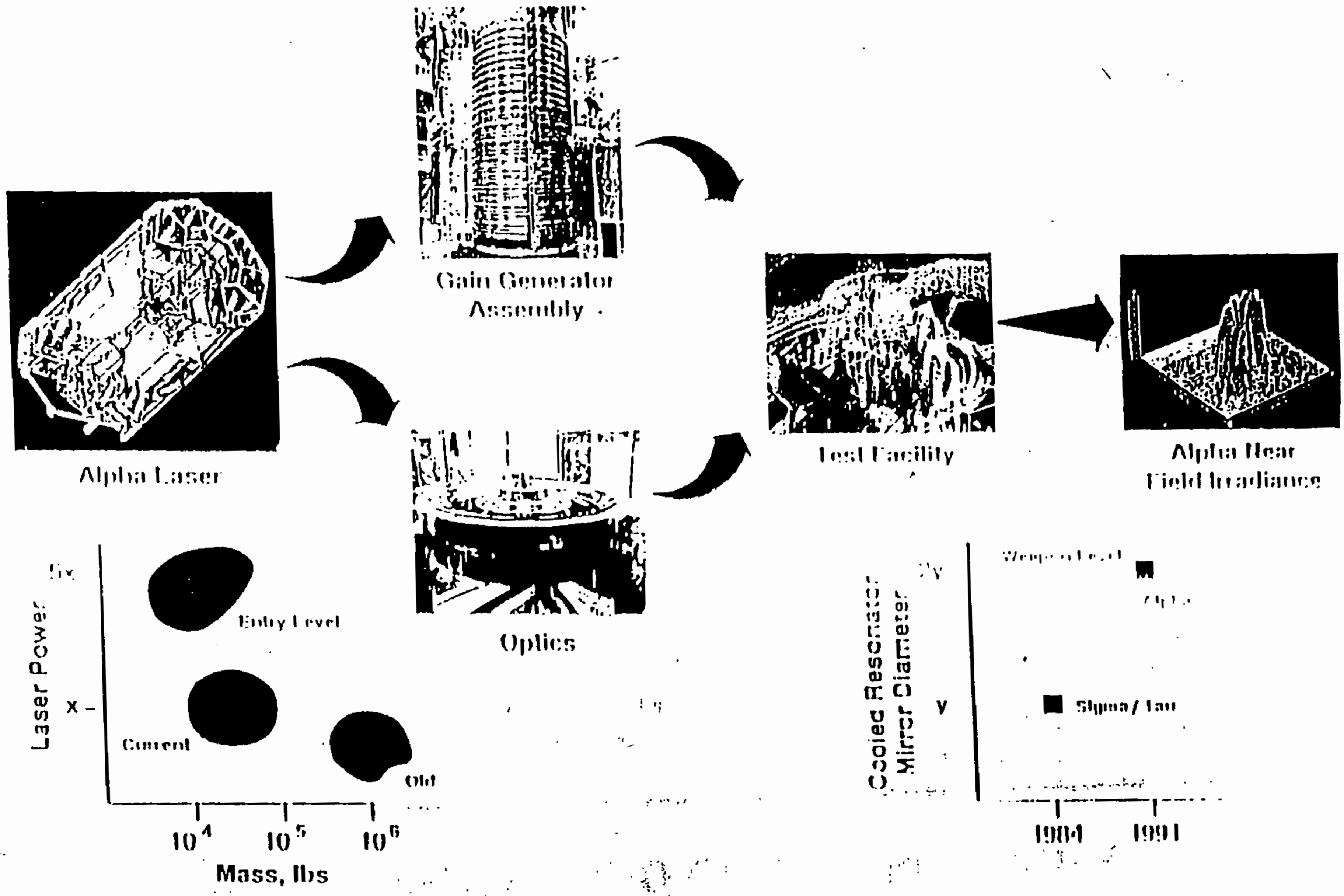
# DIRECTED ENERGY INVESTMENT
# THEN YEAR DOLLARS



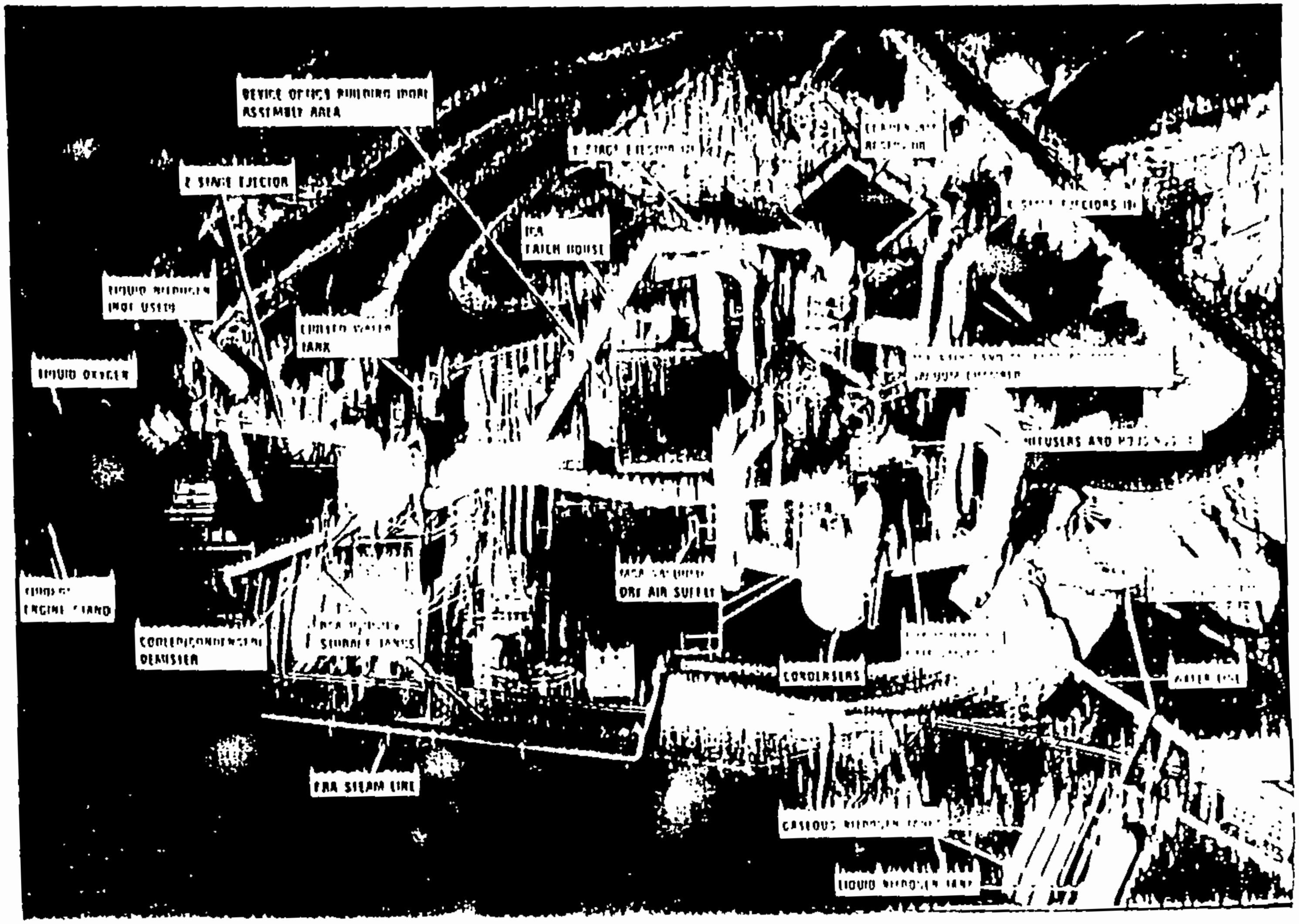
# SPACE BASED CHEMICAL LASER



# LASER DEVICE TECHNOLOGY



# ALPHA TEST FACILITY



# INNOVATIVE TECHNOLOGY

# MISSION ISSUE

*Create New Materials To Improve The Performance, Survivability And Miniaturization Of SDI Systems*

## *Technical Goal*

- Thrust The U.S. Into A New "Age" Of Diamond For Windows, Coatings, And Electronics

## *Payoff*

- Integrated Circuits With Higher Density, Higher Temperature And Faster Speed
- Thin Rocket Windows To Withstand High Speeds
- Diamond Hard Protective Coatings For *Everything*

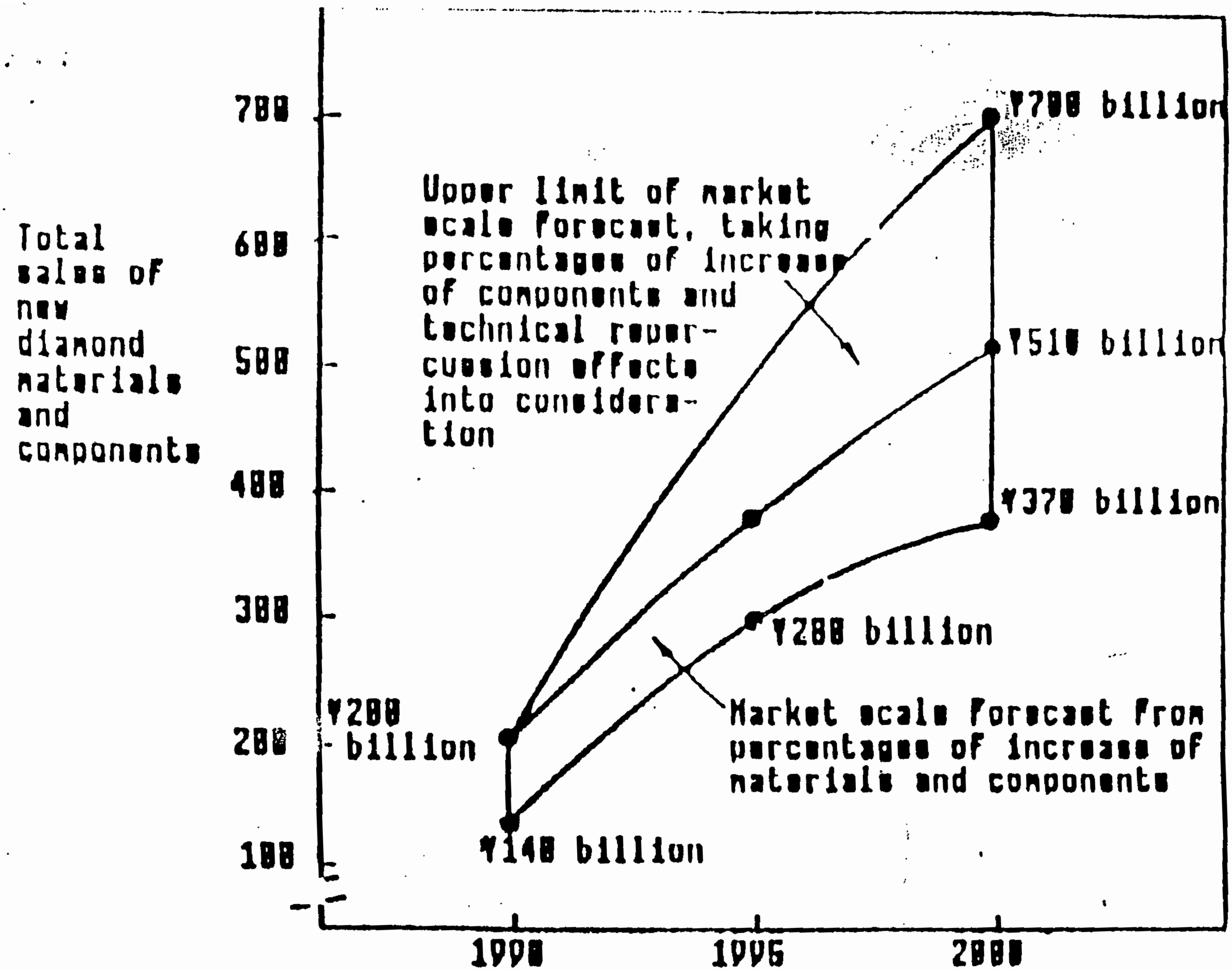
# DIAMOND PROPERTIES

| PROPERTIES | DIAMOND | ALTERNATIVE MATERIAL |
|---|---|---|
| HARDNESS ($kg/mm^2$) | 9000 | 4500 (Boron Carbide) |
| THERMAL CONDUCTIVITY (W/m/K) | 2000 | 130 (Silver) |
| OPTICAL TRANSMISSION (μm) | 0.22 to > 100 | 0.2 to 4 (Silica) |
| COEFFICIENT OF FRICTION | 0.05 - 0.1 | 0.1 (Teflon) |
| ELECTRICAL RESISTIVITY (Ωcm) | $1 \times 10^{16}$ | $1 \times 10^{15}$ (Alumina) |
| THERMAL SHOCK (W/m) | 10,900,000 | 10,600 (Zerodur) |
| TENSILE STRENGTH ($kg/mm^2$) | 290 | 35 (Alumina) |

IST

# DIAMOND

| DIAMOND PROPERTIES | APPLICATION |
| --- | --- |
| • HIGH THERMAL CONDUCTIVITY | DENSE LOGIC CIRCUITS, HIGH-ENERGY LASER WINDOW COATINGS |
| • HIGH E BREAKDOWN STRENGTH | μ-WAVE & MILLIMETER WAVE POWER |
| • RADIATION-HARD | SPACE ELECTRONICS |
| • PHYSICALLY HARD | COATINGS: GLASSES, SURGICAL INSTRUMENTS, PROSTHESES, COMPUTER DISCS, AUDIO SPEAKERS |
| • HIGH-TEMPERATURE (REFRACTORY) | SPACE ELECTRONICS, COMPUTERS, AUTO IGNITIONS & MONITORING |
| • HIGH DIELECTRIC STRENGTH | HIGH POWER CAPACITORS, ULTRA-FAST MICROELECTRONICS |



Total sales of new diamond materials and components
700
600
500
400
300
200
100
Upper limit of market scale forecast, taking percentages of increase of components and technical repercussion effects into consideration
¥700 billion
¥510 billion
¥370 billion
¥280 billion
¥200 billion
¥140 billion
Market scale forecast from percentages of increase of materials and components
1990
1995
2000

# LAUNCH SERVICES

# OBJECTIVE

- CENTRALIZE THE ACQUISITION, MANAGEMENT, AND CONTROL OF LAUNCH REQUIREMENTS AND

  — REDUCE LAUNCH COST (MULTIPLE LAUNCH VS SINGLE LAUNCH PROCUREMENTS.

  — CREATE CENTER OF LAUNCH EXPERTISE

  — MAXIMIZE THE BENEFITS OF LESSONS LEARNED

  — ELIMINATE DUPLICATION OF EFFORT

  — REMOVE LAUNCH VEHICLE / LAUNCH SERVICES RESPONSIBILITY FROM EXPERIMENTER/SCIENTIST

# CURRENT MANIFEST

- **BASIC CONTRACT FLIGHTS**

  LEAP 1
  LEAP 2
  LEAP 3
  LEAP 4
  PLACEHOLDER
  SPFE 6 (BP?)

- **FIRST CONTRACT OPTION FLIGHTS**

  ZEST 1
  ZEST 2
  SPFE DEMO (BP 1M)
  ASTRAL DANCER 1 & 2 (CANCELLED)

- **SECOND CONTRACT OPTION FLIGHTS**

  LEAP X
  LEAP 5
  LEAP 6
  LEAP 7

- **THIRD CONTRACT OPTION FLIGHTS**

  ENDO LEAP 1, 2, & 3
  PLACEHOLDER
  PLASMA RADIATION

STRATEGIC DEFENSE INITIATIVE
DEPARTMENT OF DEFENSE

SDIO

# PHASE II DC-X TECHNOLOGY DEMO

# PROGRAM GOALS

- FLIGHT TEST OF REUSABLE SUBORBITAL ROCKET

- ENABLING TECHNOLOGY DEMONSTRATION

  - APPLICATION OF EXISTING TECHNOLOGY

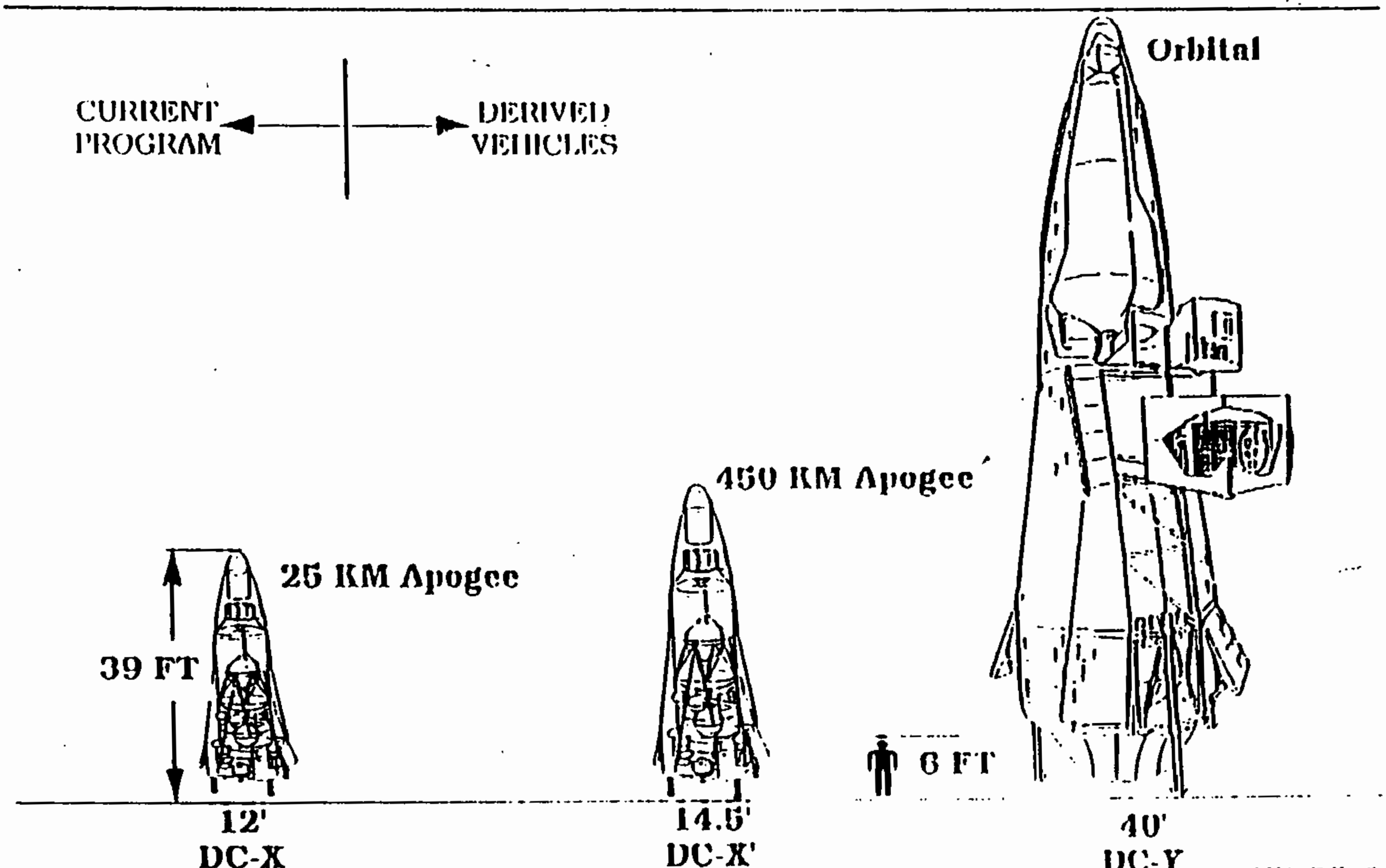
  - SYSTEMS APPROACH TO LAUNCH

- DEVELOP AND DEMONSTRATE TECHNOLOGY BASE FOR DERIVED VEHICLES COST EFFECTIVE TO SDIO

  - CREATE DATABASE ENABLING A NEW CLASS OF SUBORBITAL TRANSPORTATION

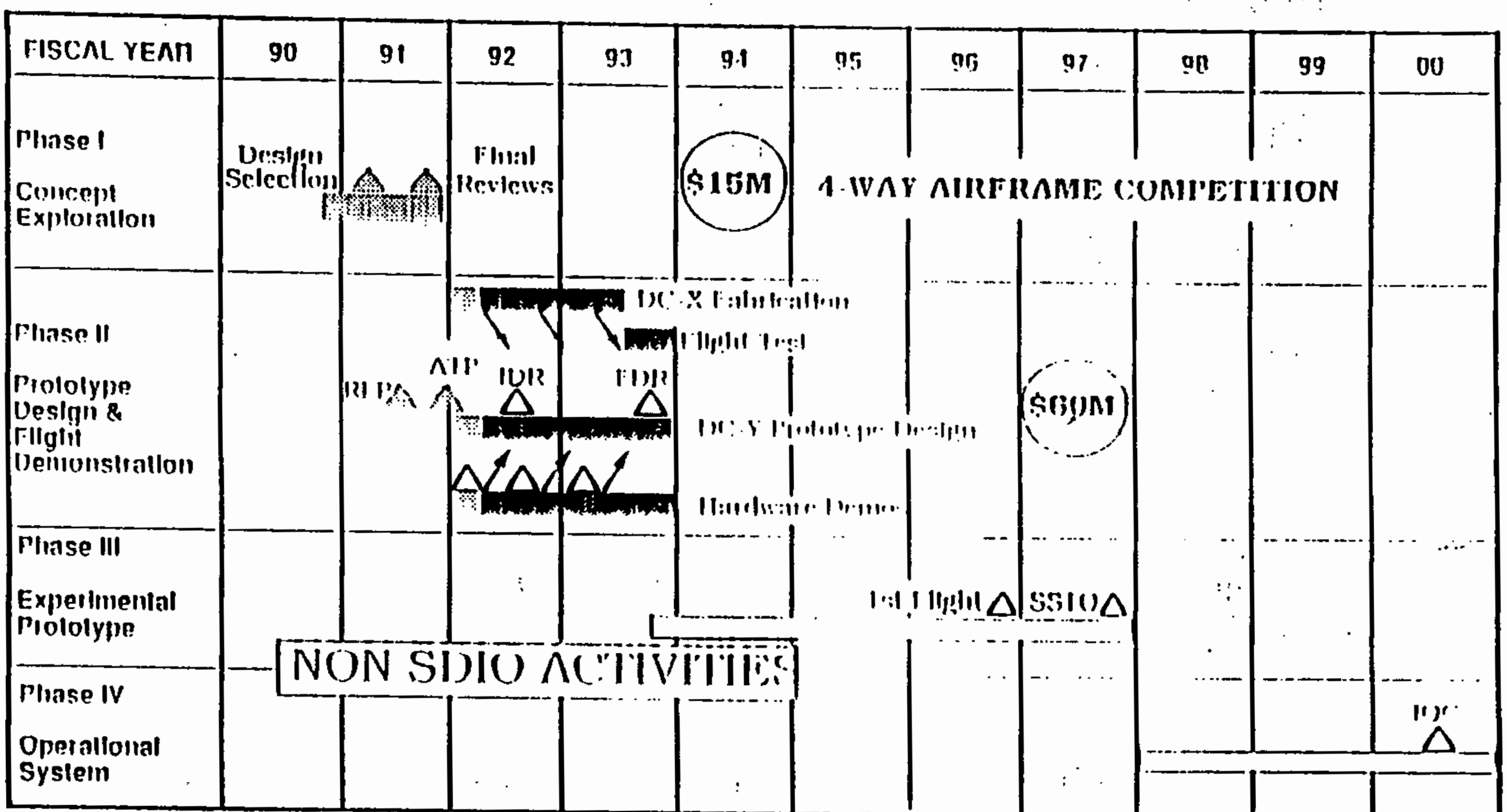
  - ENABLE NATIONAL OPTION TO INVEST IN COST EFFECTIVE SSTO VEHICLE

# POTENTIAL DERIVED VEHICLES



# SCHEDULE

## INCREMENTAL DEVELOPMENT APPROACH




COMPLETED

# CONCLUSIONS

- PHASE II IS A TECHNOLOGY DEMONSTRATION PROGRAM TO:

  - DETERMINE IF CURRENT CONCEPTS AND TECHNOLOGIES WILL SUPPORT THE DEVELOPMENT OF A SUBORBITAL RECOVERABLE ROCKET DEVELOPMENT FOR USE IN SDIO SYSTEM TESTING

- SDIO HAS NO PLAN NOR BUDGET FOR FULL SCALE ORBITAL VEHICLE DEVELOPMENT

- PHASE II EFFORTS WILL MAXIMIZE TECHNOLOGY TRANSFER TO A FUTURE ORBITAL VEHICLE

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FOI92-0855

# Advance Planning Briefing For Industry

## SDI International And External Programs Overview

STRATEGIC DEFENSE INITIATIVE
DEPARTMENT OF DEFENSE

**3 MAR 92**

**Dr. J. David Martin**
**Director**
**International And External Programs**
**Strategic Defense Initiative Organization**

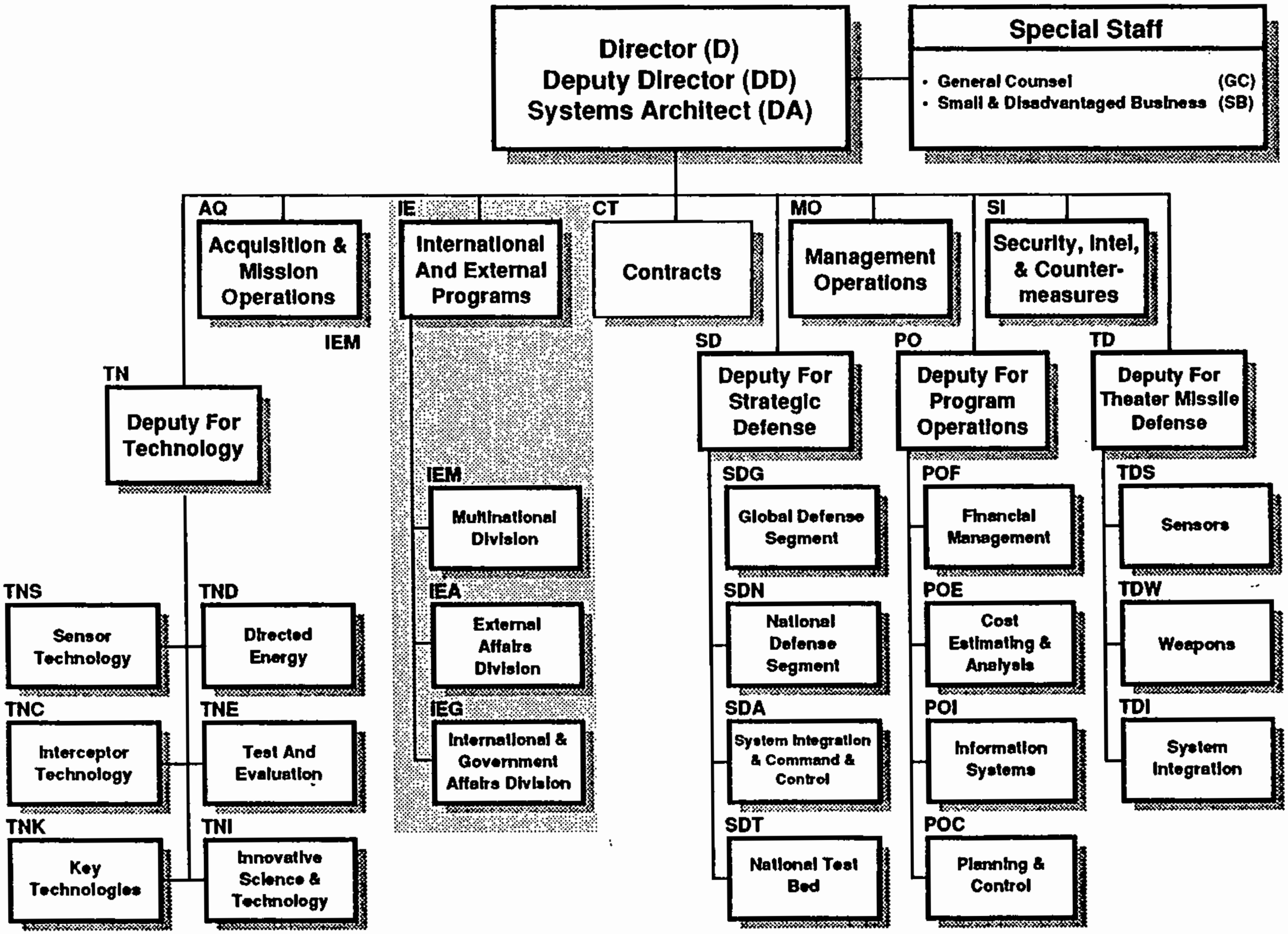
jm-11732 / 022692

12

# INTERNATIONAL AND EXTERNAL PROGRAMS

- **Overview**
  - Organizational Structure
  - Congressional Issues Impacting GPALS
  - Government To Government Discussions
  - Multinational Activities

# STRATEGIC DEFENSE INITIATIVE ORGANIZATION




jm-8825b / 022692

# CONGRESSIONAL ISSUES IMPACTING GPALS

- Missile Defense Act Of 1991
- Bilateral ABM Treaty Discussions
- Growth Of Theater Missile Defense

# MISSILE DEFENSE ACT OF 1991

*Missile Defense Goal Of The United States*

- It Is The Goal Of The United States To

  - Deploy An Antiballistic Missile System, Including One Or An Adequate Additional Number Of Antiballistic Missile Sites And Space Based Sensors, That Is Capable Of Providing A Highly Effective Defense Of The United States Against Limited Attacks Of Ballistic Missiles

  - Maintain Strategic Stability

  - Provide Highly Effective Theater Missile Defenses (TMDs) To Forward Deployed And Expeditionary Elements Of The Armed Forces Of The United States And To Friends And Allies Of The United States

# MISSILE DEFENSE ACT OF 1991 (Cont'd)

- **ABM Treaty**
  - Congress Urges The President To Pursue Immediate Discussions With The Soviet Union On The Feasibility And Mutual Interests Of Amendments To The ABM Treaty To Permit
    - Additional Ground Based Sites
    - Increased Use Of Spaced Based Sensors For Direct Battle Management
    - Clarification About Permitted Development And Testing Of Space Based Defenses
    - Clarification Of Distinctions Between Theater And Strategic ABM Defenses

# THEATER MISSILE DEFENSE

- Growth Industry
  - FY 91 / $396 M - -FY 92 / $857 M - - -FY 96 / $1,899 M

- Several Active Defense Procurement Opportunities
  - PATRIOT Upgrades
  - ERINT
  - CORPS SAM
  - THAAD
  - TMD-GBR

- Other TMD Procurement Opportunities
  - Architecture Studies
  - TMD Targets
  - Attack Ops / Counter Force
  - Test Beds
  - BM / $C^3$
  - Passive Defense
  - Advanced Technology Demonstrations
    - Lethality
    - Sensors
    - Discrimination

# GOVERNMENT TO GOVERNMENT DISCUSSIONS

- Five Nations Have Signed Memoranda Of Understanding To Participate In SDI
- Other Nations Are Also Actively Involved In SDI Research
- Recent NATO Strategy Recognizes Problem Arising From Missile Technology Proliferation
- Many Allies Are Thinking About The Need For Missile Defenses

# PARTICIPATION OF ALLIES / FRIENDS

- Allied Participation In SDI Predates Refocus Toward GPALS

- U.S. Open To Many Avenues Of Participation And Cooperation
  - Wants To Discuss With Allies / Friends Their Interests / Ideas

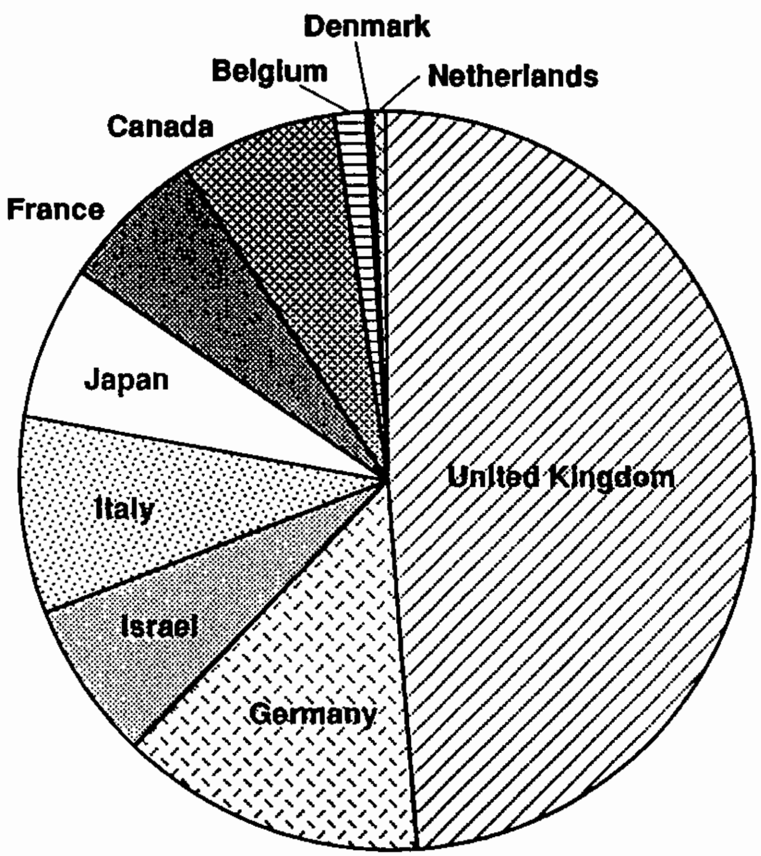
- General Areas For Participation In GPALS
  - Participation In SDIO's Basic Research And Development Programs For GPALS

  - Government To Government Cooperation, Specifically In TMD Aspects Of GPALS

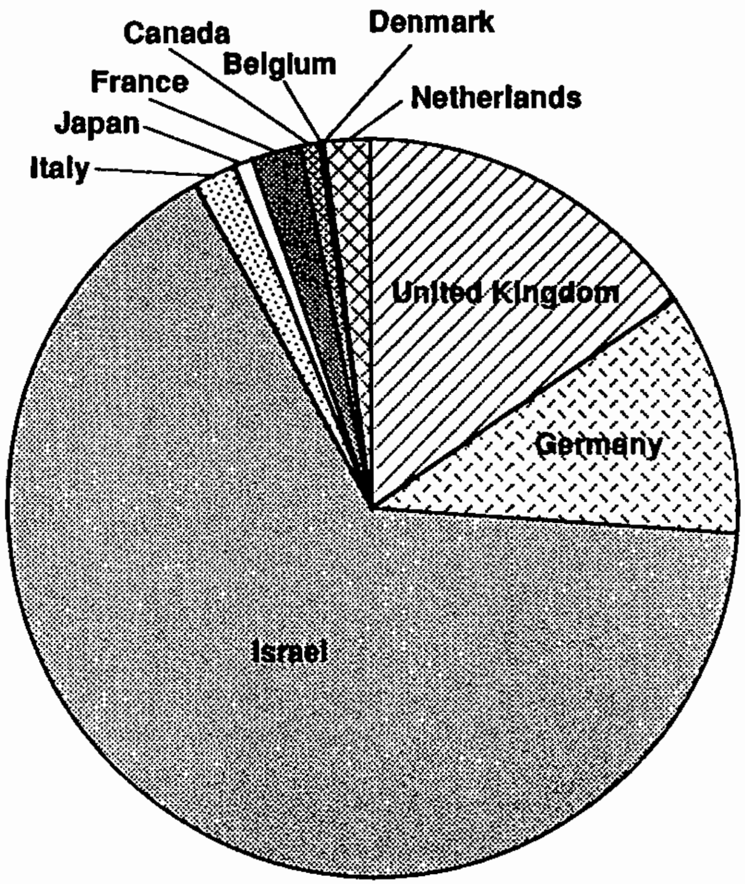
  - Independent Acquisition Of TMD Systems Which Would Be Interoperable With U.S. GPALS Elements
    - Indigenously Developed
    - Purchased From Another Country Such As U.S.

# ALLIED PARTICIPATION

## 303 Contracts




## $833.33 Million




jm-5434 / 012792

# STATUS OF ALLIED CONTRACTS

| Country | Number Of Contracts | $ Values (M) |
|---|---|---|
| United Kingdom | 148 | 129.10 |
| Germany | 40 | 88.55 |
| Israel | 22 | 549.24 * |
| Italy | 25 | 15.11 |
| Japan | 20 | 6.00 |
| France | 19 | 17.37 |
| Canada | 21 | 8.00 |
| Belgium | 4 | 0.52 |
| Denmark | 1 | 0.03 |
| The Netherlands | 3 | 19.41 ** |
| Total | 303 | $833.33 |

* Includes $137.160 Million Contribution By Israel

** Includes $7 Million Contribution By The Netherlands

jm-1098a / 012792

# SDIO COOPERATIVE ARRANGEMENTS WITH ALLIES

| Country | Program | $ In Millions Value | US / Ally Funding (Approximate) |
|---|---|---|---|
| UK | Data Fusion | 26.000 | 40% / 60% |
| UK | Flight Test | 20.000 | 50% / 50% |
| UK | Extended Air Defense Test Bed | 19.300 | 60% / 40% |
| UK | Artificial Intelligence | 0.685 | 80% / 20% |
| Israel | Arrow Experiment | 158.000 | 80% / 20% |
| Israel | Arrow Continuation Experiments | 322.00 | 72% / 28% |
| Israel | Theater Missile Defense Test Bed | 33.100 | 72% / 28% |
| Israel | Hybrid Electromagnetic Gun | 3.088 | 80% / 20% |
| Japan | Western Pacific Architecture Study | 6.500 | 90% / 10% |
| France | Free Electron Laser (FEL) MOA | — | — |
| Netherlands | Hypervelocity Gun Test | 12.000 | 40% / 60% |

jm-2652B / 101691

F

# STRATEGIC DEFENSE INITIATIVE

## Program Budget Considerations

**3 MAR 92**

**Lt Col Steve Mullen, USAF**
**Assistant Director, Financial Management Directorate**
**Program Operations**
**Strategic Defense Initiative Organization**

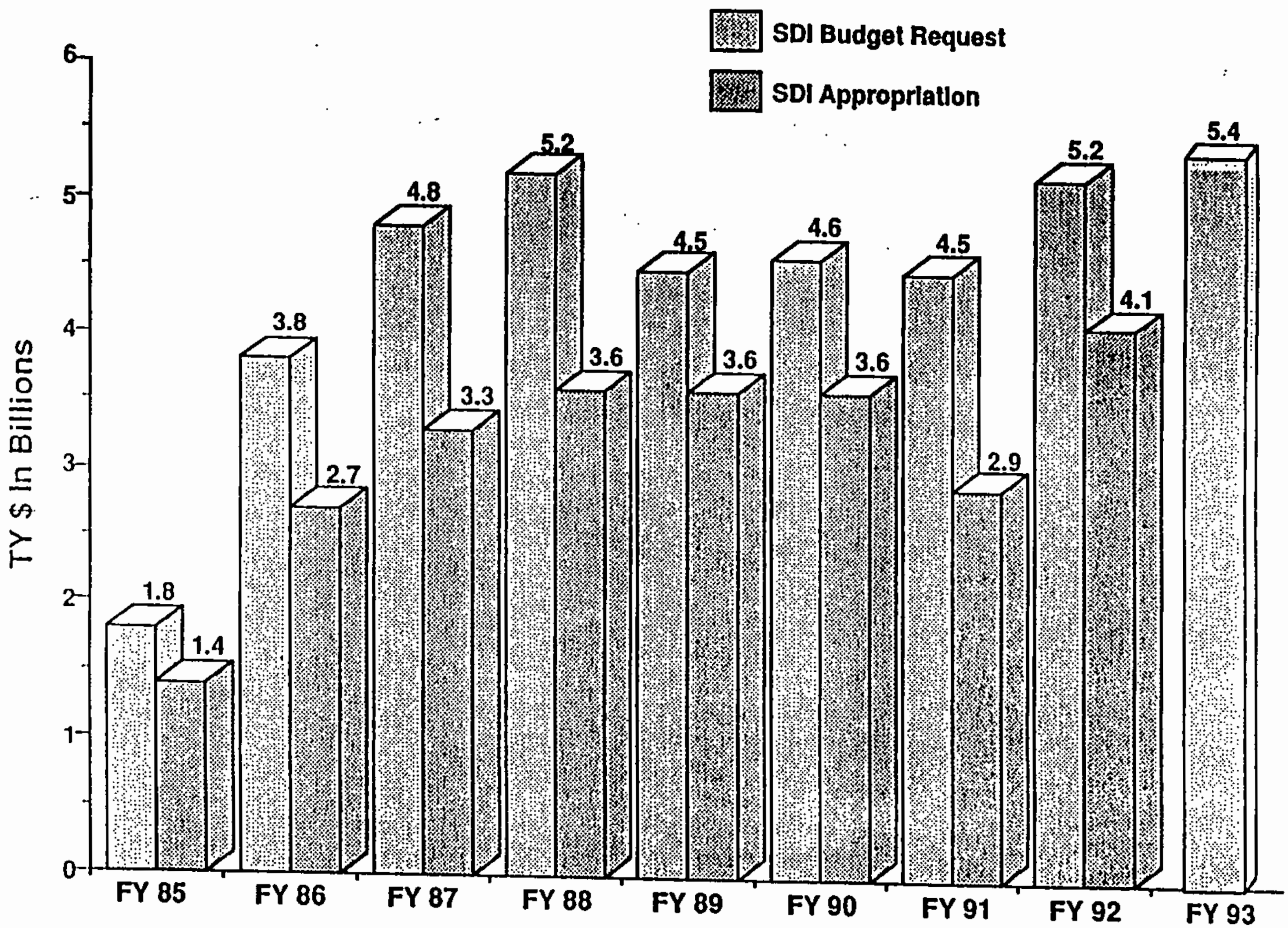
jm-7133a / 022492

# PROGRAM ELEMENT STRUCTURE

| FY 85 - 89 | FY 90 | FY 91 | FY 92 - 97 |
|---|---|---|---|
| SATKA | SATKA | Phase I | Space Based Interceptor |
| KEW | KEW | LPS | Limited Defensive Sys |
| DEW | DEW | TMD | Theater Missile Defense |
| SA / BM | SA / BM | TMDI | |
| SLKT | SLKT | Follow-on | Other Follow-on |
| Hq Mgt | | Res & Support | Res & Support |

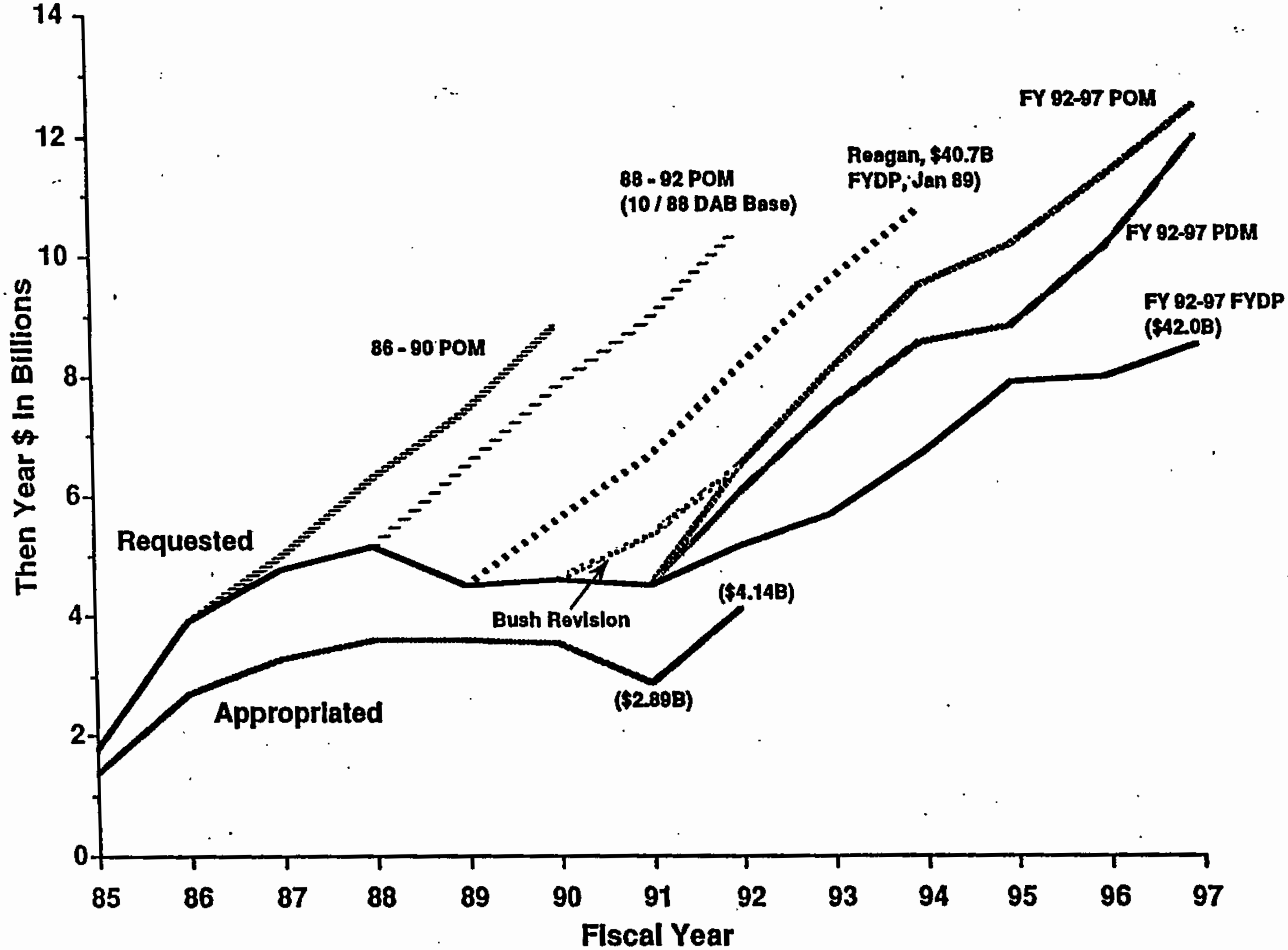
jm-24411 / 022192

# STRATEGIC DEFENSE INITIATIVE



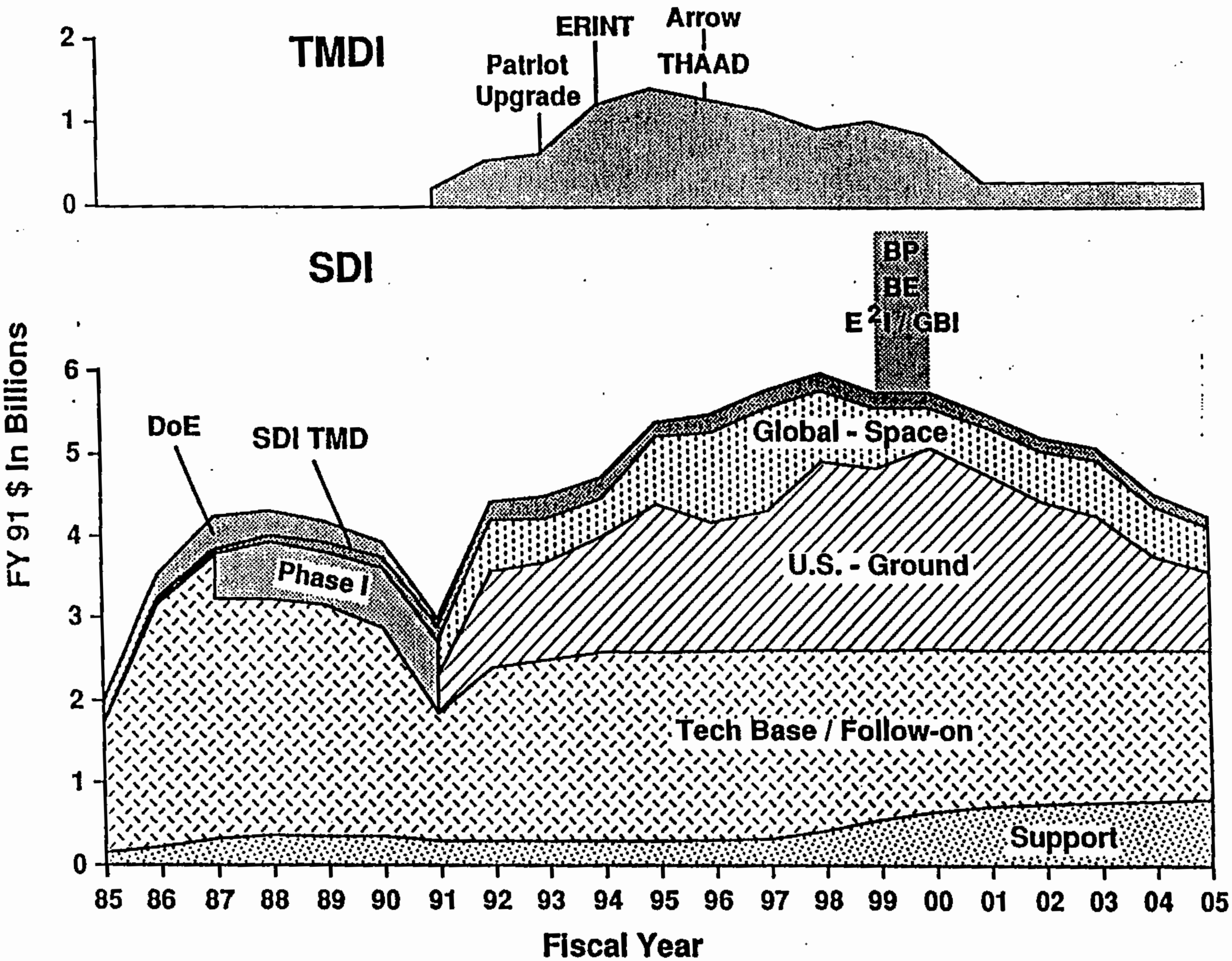

jm-5299B / 020792

# PROGRAM BUDGET HISTORY

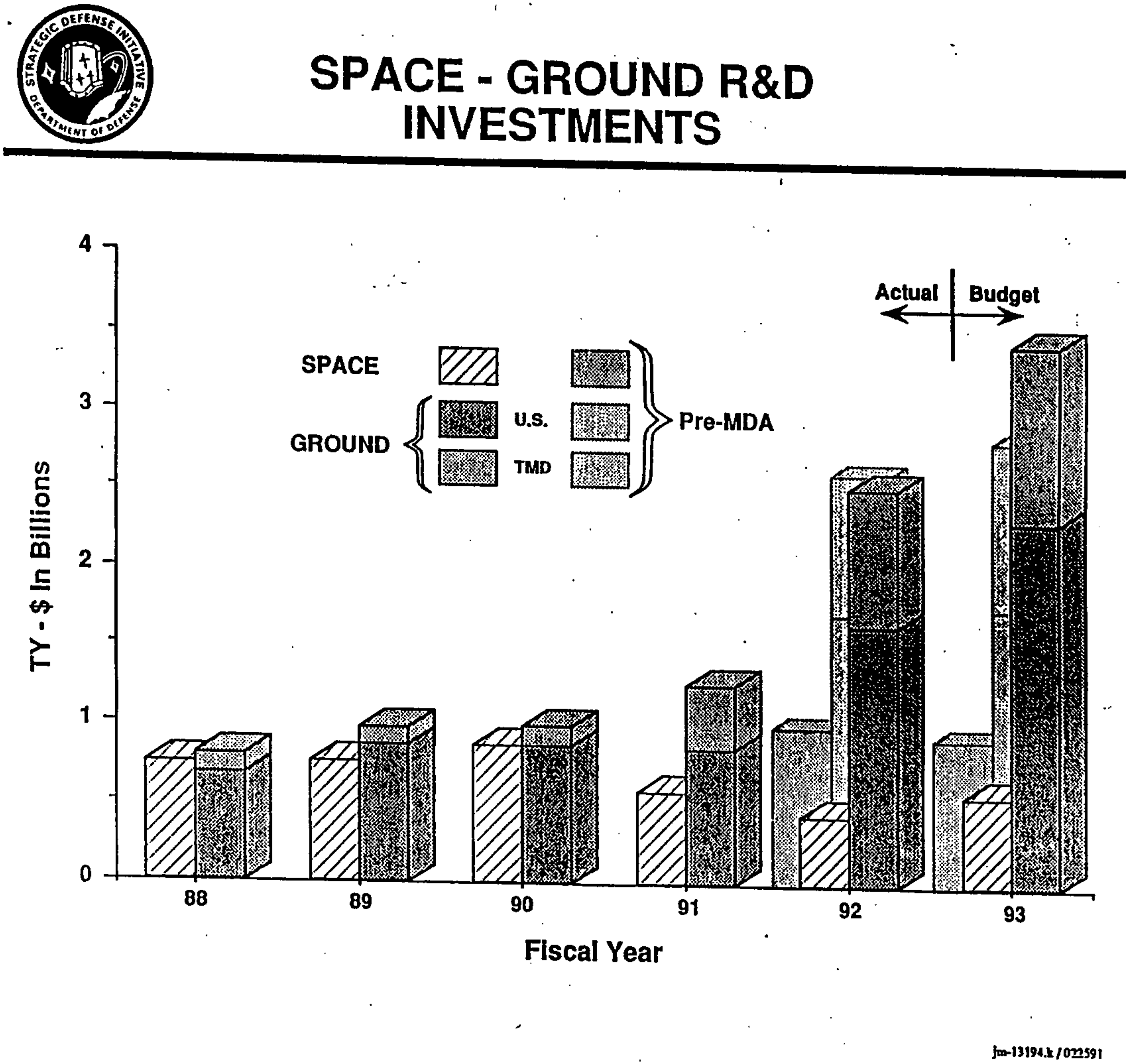



jm-5232q / 022592

# BMD BUDGET EVOLUTION




jm-14322.a / 020691



SPACE - GROUND R&D INVESTMENTS
4
3
2
1
0
TY - $ In Billions
Actual
Budget
SPACE
GROUND
U.S.
TMD
Pre-MDA
88
89
90
91
92
93
Fiscal Year
jm-13194.k / 022591

# STRATEGIC DEFENSE INITIATIVE
# FY 93 AMENDED BUDGET FYDP PROGRAM

*TY $ In Thousands*

| RDTE | | FY 91 | FY 92 | FY 93 |
|---|---|---|---|---|
| Dem / Val 6.3 | | | | |
| | Theater Missile Defense | 178,452 | 802,710 | 857,725 |
| | Limited Defense System | 394,148 | 1,434,343 | 2,134,755 |
| | Space Based Interceptor | 867,583 | 466,069 | 575,558 |
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| | Research And Support | 731,150 | 715,027 | 754,740 |
| | Total Dem / Val | 2,868,812 | 4,084,501 | 5,172,374 |
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| | Theater Missile Defense | | 31,000 | 140,000 |
| | Limited Defense System | | | |
| | Space Based Interceptor | | | |
| | Total EMD | | 31,000 | 140,000 |
| | Total RDTE | 2,868,812 | 4,115,501 | 5,312,374 |
| Procurement | | | | |
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| | Limited Defense System | | | |
| | Total Procurement | | 25,000 | 62,500 |
| MILCON | | | | |
| | Limited Defense System | | | 40,200 |
| | Space Based Interceptor | 3,870 | | |
| | Research And Support | 6,000 | 5,100 | 10,000 |
| | Total MILCON | 9,870 | 5,100 | 50,200 |
| | Total SDIO | 2,878,682 | 4,145,601 | 5,425,074 |

jm-23575 / 021892

# STRATEGIC DEFENSE INITIATIVE ORGANIZATION
# EXECUTING AGENT DISTRIBUTION

*($ In Millions)*

| Executing Agent | FY 90 | FY 91 | FY 92 | FY 93 | % |
|---|---|---|---|---|---|
| DARPA | 1.000 | 0.000 | .000 | .000 | >1 |
| DNA | 67.517 | 42.955 | 55.029 | 52.405 | 1 |
| DOE | 161.036 | 222.647 | 141.125 | 116.240 | 2 |
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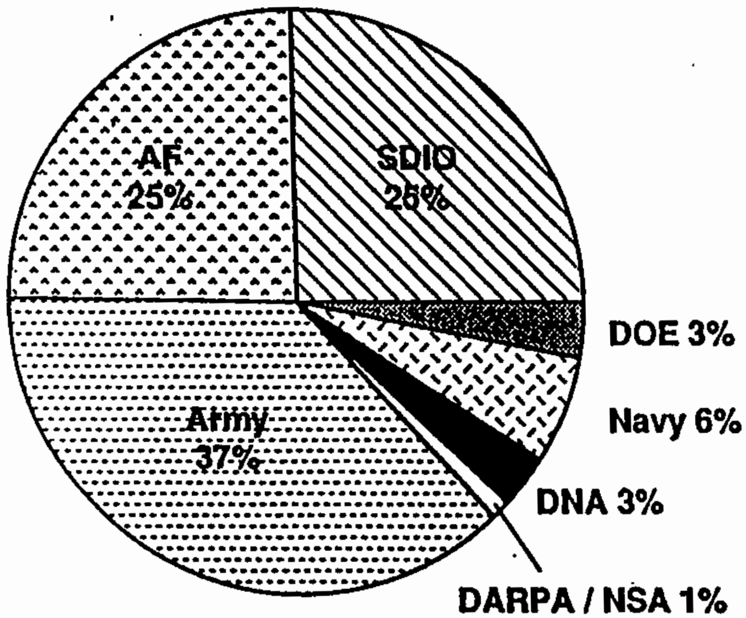
| USSPACECOM | 1.001 | .850 | .760 | .645 | >1 |
| SDI Total | 3600.228 | 2878.682 | 4145.601 | 5425.074 | |

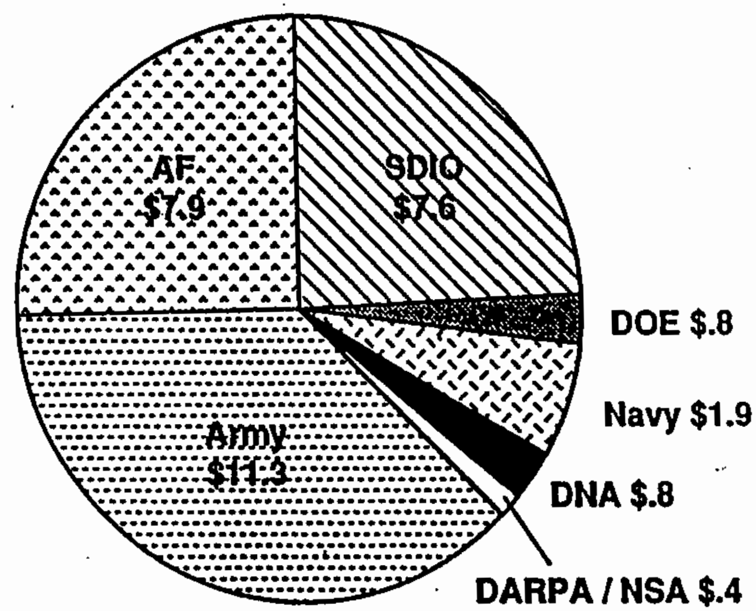
jm-14409 / 021892

# STRATEGIC DEFENSE INITIATIVE BY EXECUTING AGENT FY 85 - 93

*Percentage*




*TY $ Billions*




jm-23617 / 021192

# FY 93 AMENDED PRESIDENT'S BUDGET

*TY $ In Millions*

| RDT&E | FY 92: FY 92 / 93 Budget | FY 92: Delta | FY 92: FY 93 Amended Budget | FY 93: FY 92 / 93 Budget | FY 93: Delta | FY 93: FY 93 Amended Budget |
|---|---|---|---|---|---|---|
| Theater Missile Defense | 857.5 | -23.8 | 833.7 | 890.7 | +107.0 | 997.7 |
| Limited Defensive Sys | 1,600.4 | -166.1 | 1,434.3 | 1,736.8 | +398.0 | 2,134.8 |
| Space Based Interceptor | 829.9 | -363.8 | 466.1 | 768.4 | -192.8 | 575.6 |
| Follow-on | 1,168.2 | -501.8 | 666.4 | 1,255.9 | -406.3 | 849.6 |
| Research And Support | 694.6 | +20.4 | 715.0 | 831.4 | -76.7 | 754.7 |
| Total | 5,150.6 | -1,035.1 | 4,115.5 | 5,483.2 | -170.8 | 5,312.4 |

jm-24357 / 021992

# CONTRACT TERMINATIONS
# FY 92 APPROPRIATION

| Program | Title | ($000) | # Of People | Contractors / Subcontractors | City / State |
|---|---|---|---|---|---|
| 1101 | Passive Sensors | 1,975 | 104 | Rockwell | Anaheim, CA |
| | | | | Hughes | El Segundo, CA |
| | | | | Aerojet | Sacramento, CA |
| | | | | NRC | Colorado Springs, CO |
| | | | | TRW | Redondo Beach, CA |
| | | | | Spire Corp | Boston, MA |
| | | | | Harris | Melbourne, FL |
| 1103 | Laser Radar | 178 | 4 | Laser Science | Cambridge, MA |
| 1104 | Signal Processing | 1,645 | 72 | Honeywell | Plymouth, MN |
| | | | | Raytheon | Sudbury, MA |
| | | | | Phillips Lab | Hanscom AFB, MA |
| | | | | David Sarnoff | Princeton, NJ |
| | | | | Spire Corp | Bedford, MA |
| | | | | Allied Signal | Columbia, MD |
| | | | | IBIS | Danvers, MA |
| | | | | N.C. State | Raleigh, NC |
| | | | | Univ Of FL | Gainesville, FL |
| | | | | Texas Instruments | Dallas, TX |
| 1201 | Interceptor Component Technology | 2,212 | 13 | Thiokal | Huntsville, AL |
| | | | | Aerojet | Sacramento, CA |
| | | | | Westinghouse | Pittsburgh, PA |

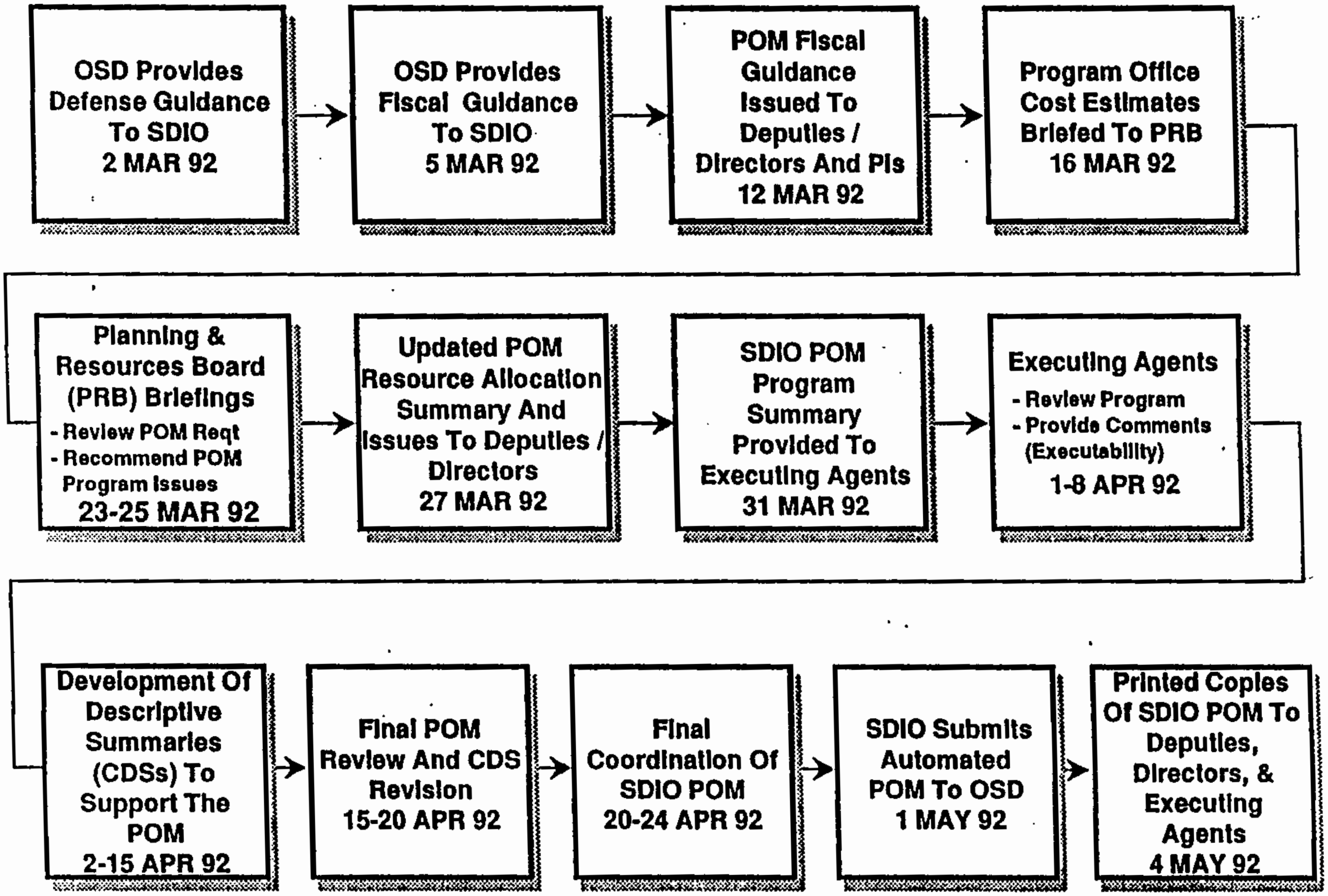
jm-24699 / 021892

# CONTRACT TERMINATIONS
# FY 92 APPROPRIATION (Cont'd)

| Program | Title | ($000) | # Of People | Contractors / Subcontractors | City / State |
|---|---|---|---|---|---|
| 1302 | Chemical Laser | 14,558 | 10 | United Tech | West Palm Beach, FL |
| 1303 | Neutral Particle Beam | 3,939 | 73 | Grumman Corp | Long Island, NY |
| | | | | Kirk Meyer Co | Santa Fe, NM |
| | | | | Butler Svcs | Santa Fe, NM |
| | | | | Salem Technical | Santa Fe, NM |
| | | | | DOE | Los Alamos, NM |
| | | | | Mission Rsch | Albuquerque, NM |
| | | | | Spectra Tech | Bellview, WA |
| | | | | Titan Tech | Albuquerque, NM |
| | | | | Univ Of NM | Albuquerque, NM |
| | | | | K–Tech | Albuquerque, NM |
| | | | | Sandia Lab | Sandia Base, NM |
| 1503 | Power + Power Cond | 10,000 | 15 | GE | San Jose, CA |
| | | | | GE | Valley Forge, PA |
| | | | | Westinghouse | Pittsburgh, PA |
| | | | | TECO | Boston, MA |
| 1105 | Discrimination | 1,183 | 27 | Hughes | El Segundo, CA |
| | | | | Boeing | Seattle, WA |
| | | | | Nichols | Huntsville, AL |

jm-24700 / 022492

# SDIO FY 94 - 99 POM PROCESS




jm-7134a / 022492

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FOI92-0855

# STRATEGIC DEFENSE INITIATIVE
## Technical Information Center
## Information Briefing

**3 MAR 92**

**Mrs. Jeanette Clay**
**Information Systems Directorate**
**Strategic Defense Initiative Organization**

15

# PURPOSE OF BRIEFING

- Provide Awareness Of The Existence Of The Strategic Defense Initiative (SDI) Technical Information Center (TIC) And The Functions Available To SDIO Contractors And Government Personnel

# TIC MISSION

- Serve As The SDI Library
- Conduct Current Awareness Activities
- Operate A Bidders Library
- Operate A Data Management Library

# SDI LIBRARY FUNCTIONS

- Collect And Provide Access To Basic Scientific, Technical, And Programmatic Documentation Needed By The Entire SDI Community And Its Contractors
  - Collect Current And Historical Data
  - Provide Unclassified And Classified Reading Rooms
  - Perform Keyword Searches Of Databases For Required Material
- Respond To Bibliographic And Technical Inquiries
- Provide Referrals To Other Information Sources
- Lend Videotapes, Documents, Books To The SDI Community
- Provide Access To A Microfilm Library Of DoD Directives, MIL-STDs, FIPs, MIL-SPECS, And MIL-HBKs

# RESOURCES AVAILABLE

- Over 35,000 Documents Related To SDI Program
- Documents Include Books, Audio And Videotapes, Maps, And Engineering Drawings
- More Than 40 Specialized Journals, Newsletters, Other Material Focusing On SDI Related Science, Technology, And Policy Issues
- Collections Include / Will Include: DART / DAB, Theater Missile, Projected Defender, Environmental, BP, Directed Energy, And References To Other Appropriate Collections Such As Threat And Survivability

# INFORMATION SOURCES

- Documents Acquired From
  - SDIO And Services
  - SDI Contractors
  - Government Agencies And Departments
- Specialized Scientific And Technical Publications
- Foreign Broadcast Information Service (FBIS) And Joint Publication Research Service (JPRS) Reports
- Online Access To External Database Services Such As
  - Dialog
  - DROLS (DTIC)
  - Newsnet
  - Lexis / Nexis

# DIALOG

- Over 350 Databases In Excess Of 200 Million Records
- Books And Monographs - Library Of Congress
- Chemistry - Beilstein On-line, Chem Abstracts
- Energy And Environment - DoE Energy, Nuclear Science Abstracts
- Law And Government - CBD, GPO Monthly Catalog, Federal Register
- News - UPI News, Mideast File, Current Digest Of The Soviet Press, World Affairs Report, Reuters
- Patents And Trademarks - World Patents Index
- Science And Technology - Aerospace, Jane's Defense And Aerospace News / Analysis, Engineered Materials Abstract, Scisearch, Soviet Science And Technology, NTIS

# DROLS (DTIC)

- DoD's Central Facility For Collection And Dissemination Of Scientific, Technical, And Management R&D Info Of Military Organizations And Their Contractors
- Technical Report Database - Over 30,000 Technical Reports Submitted Annually
- Work Unit Information System Database - Research Being Performed, By Whom, Effort, Dollars, etc.
- IR&D Database - Descriptions Of Technical Programs Not Wholly Funded By DoD. Used To Avoid Duplicating Ongoing Efforts And Identify Contractors With Expertise Of Interest To DoD

# NEWSNET

- A Database Of Newsletters Covering Worldwide Events And Business News
- Over 380 Business Newsletters (Space Daily, Space Business News, Defense Daily, Defense R&D Update, C31 Report, Advances Military Computing, Military Space, SDI Monitor, NASA SW Directory)
- 11 Worldwide News Wires Delivered In Real Time (UPI, AP Data Stream Business News, Rueters, Etc.)
- TRW Business Profiles
- Stock And Commodity Quotes
- Investment Company And Industry Review

# LEXIS / NEXIS

- World's Largest Full Text On-line Database. Covers Law, Regulation, Legislation, People In Government International Information, Global News
- International Sources - TASS, The Economist, BBC Summary Of World Broadcasts, Current Digest Of The Soviet Press, Asahi And JiJi News Service
- Government Documents - FAR And Supplements, Federal Register, Federal Trade Commission Reports, etc.
- Newspapers, Newsletters, And Magazines - Defense And Foreign Affairs Weekly, National Journal, National Review, Time, U.S. News And World Report, New York Times, etc.

# CURRENT AWARENESS ACTIVITIES

- Publish The Weekly "Tech Center Update" Containing Summaries Of News Publications And Journals
- Distribute A "Bimonthly Bulletin" Of Items Of Interest To The SDI Community
- Maintain A "Master Schedule" Of Events Of Interest To The SDI Community
- Provide Direct Mailings To Government, Industry, And Academic Users
- Provide On-site TIC Representative At SDIO

# BIDDERS LIBRARY FUNCTIONS

- Provide Reading Room For Bidders

- Serve As The Respository Of The Government Furnished Information (GFI) Related To SDIO And SDIO Executing Agent Solicitations*

* Availability Of GFI Subject To Terms And Conditions Mutually Agreed Upon Between SDIO And Executing Agents

jm-22293 / 112191

# DATA MANAGEMENT LIBRARY FUNCTIONS

- Receive SDIO CDRL Deliverables
- Review Deliverables Against Contract Requirements
- Maintain All SDIO CDRL Submissions

# FUTURE SERVICES

- On-line Access To The TIC From Remote Sites (e.g., SDC, SSD, NTF)
- Publication Of Topical Bibliographies
- Dial Up Capability For Access To
  - Weekly Tech Center Updates
  - SDI TIC Bulletin
  - Selected Bibliographies Of Unclassified Material
  - Master Schedule
  - Documents Of Interest To SDI

# SDI TIC SITE INFORMATION

**Address:**

SDI TIC
1755 Jefferson Davis Highway
Suite 708
Arlington, Virginia 22202

**Telephone:** (703) 521-7703

**Fax:**

(703) 521-4123
(703) 521-9737 (Security)

**Hours Of Operation:**

Unclassified 8:00 am To 5:00 pm
Classified 8:00 am To 4:30 pm

F

# STRATEGIC DEFENSE INITIATIVE
# Technical Information Center
# Information Briefing

## 3 MAR 92


**Mrs. Jeanette Clay**
**Information Systems Directorate**
**Strategic Defense Initiative Organization**


Jm-22288 / 030292

# PURPOSE OF BRIEFING

- **Provide Awareness Of The Existence Of The Strategic Defense Initiative (SDI) Technical Information Center (TIC) And The Functions Available To SDIO Contractors And Government Personnel**

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| **Fax:** | (703) 521-4123<br>(703) 521-9737 (Security) |
| **Hours Of Operation:** | Unclassified 8:00 am To 5:00 pm<br>Classified 8:00 am To 4:30 pm |

jm-22303 / 112191

# STRATEGIC DEFENSE INITIATIVE

## Program Budget Considerations

**3 MAR 92**

**Lt Col Steve Mullen, USAF**
**Assistant Director, Financial Management Directorate**
**Program Operations**
**Strategic Defense Initiative Organization**

jm-7133a / 022492

# PROGRAM ELEMENT STRUCTURE

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|---|---|---|---|
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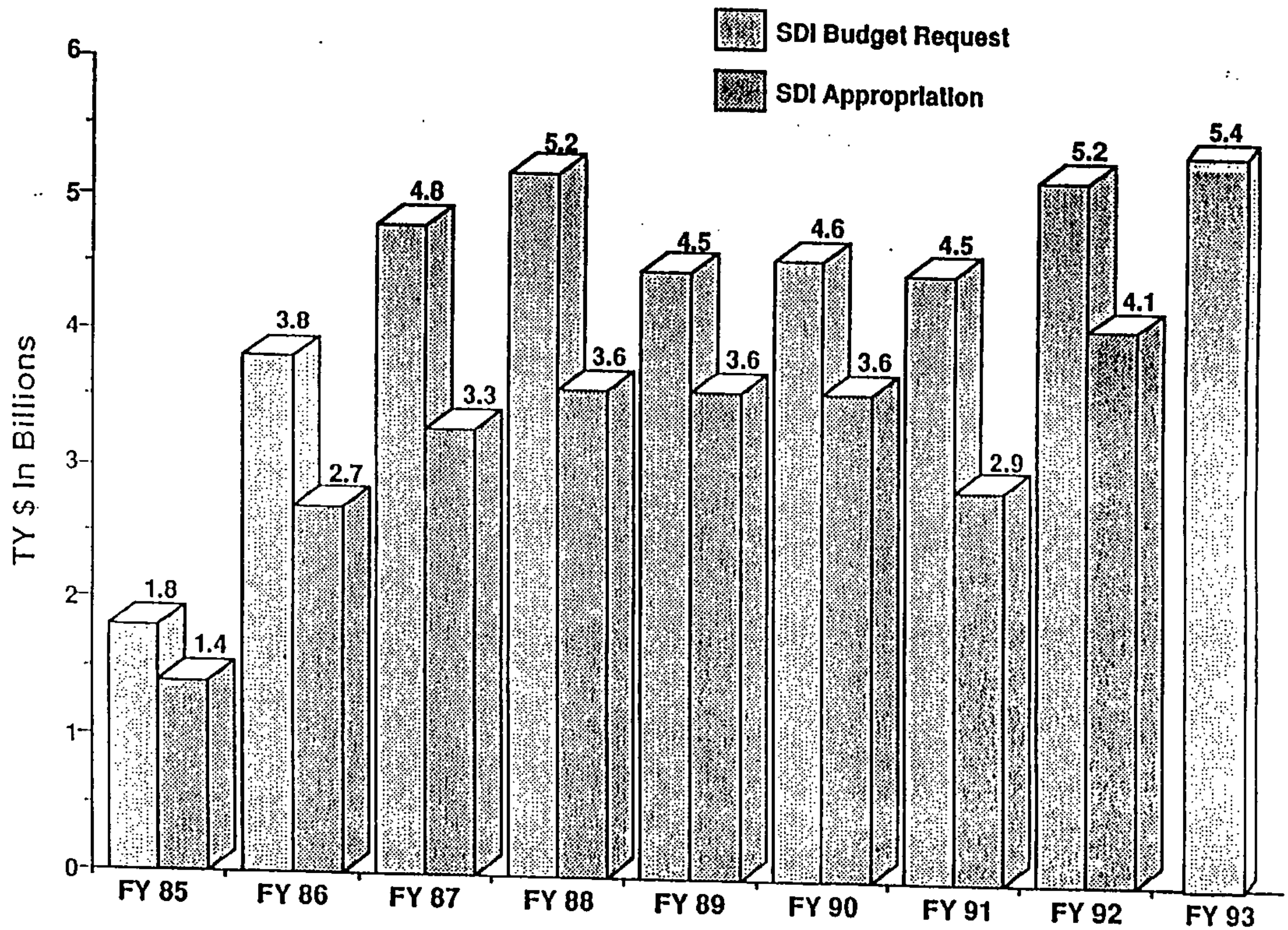
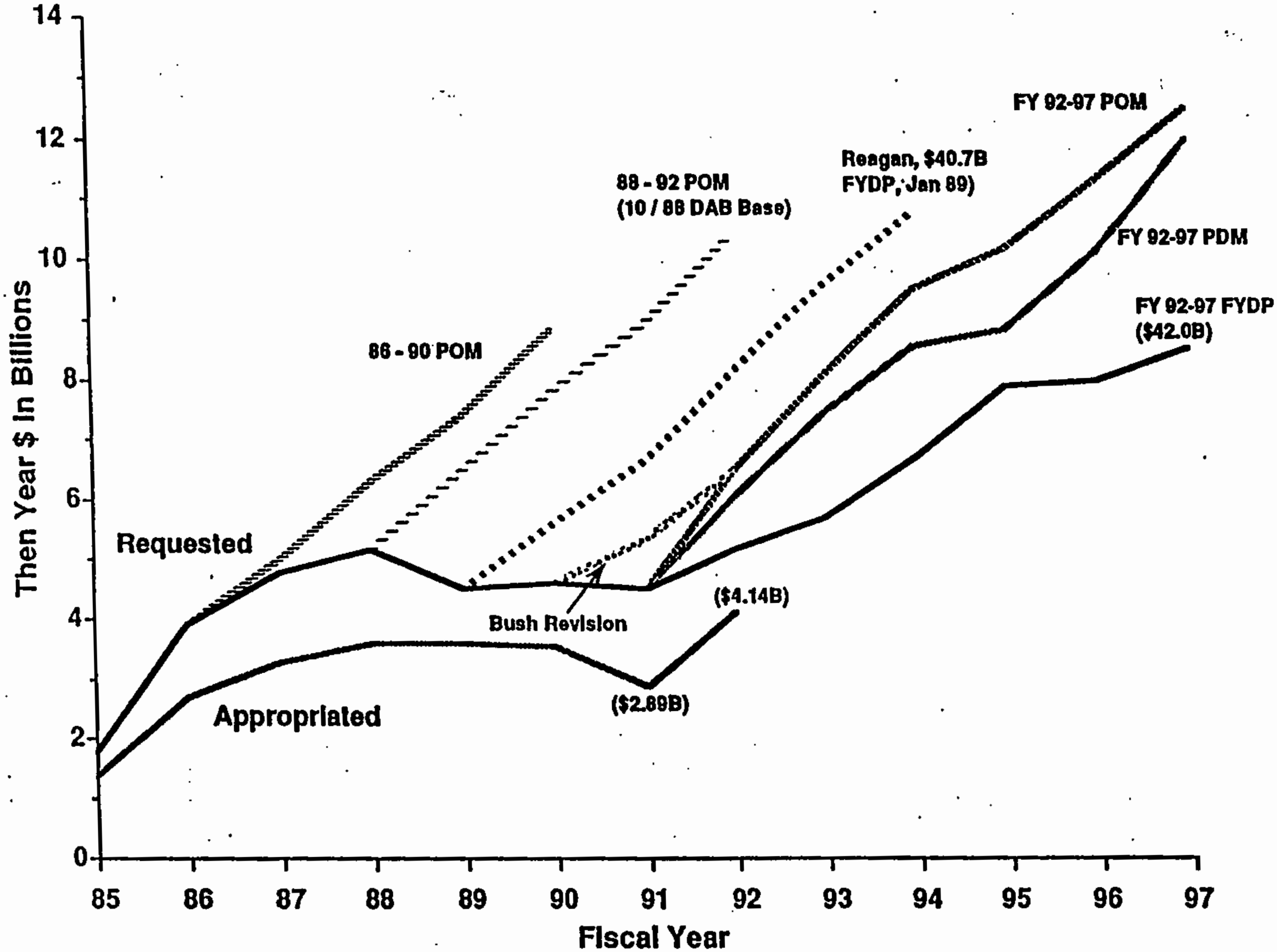
| Hq Mgt | | Res & Support | Res & Support |

# STRATEGIC DEFENSE INITIATIVE




jm-5299B / 020792

# PROGRAM BUDGET HISTORY




jm-5232q / 022592

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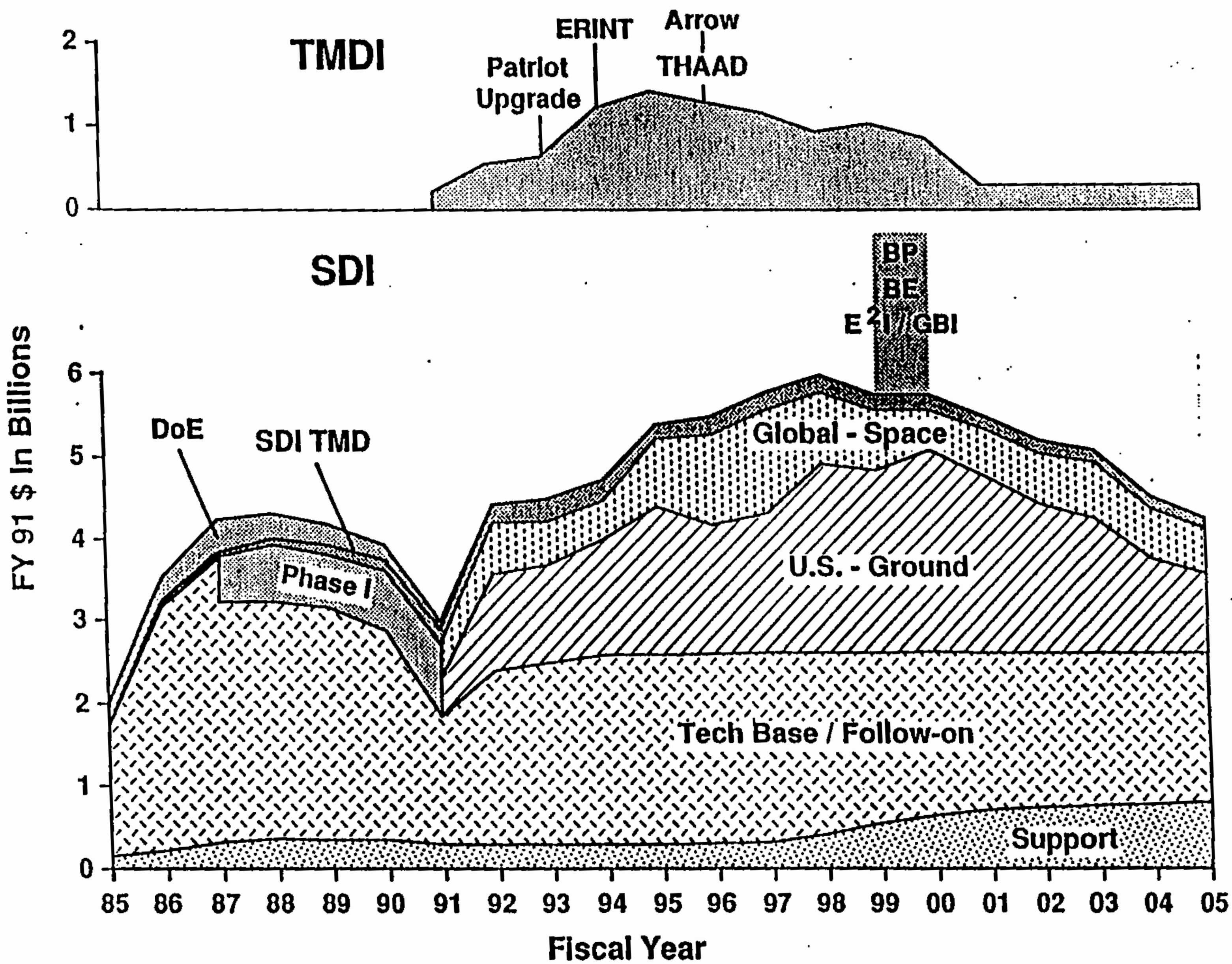
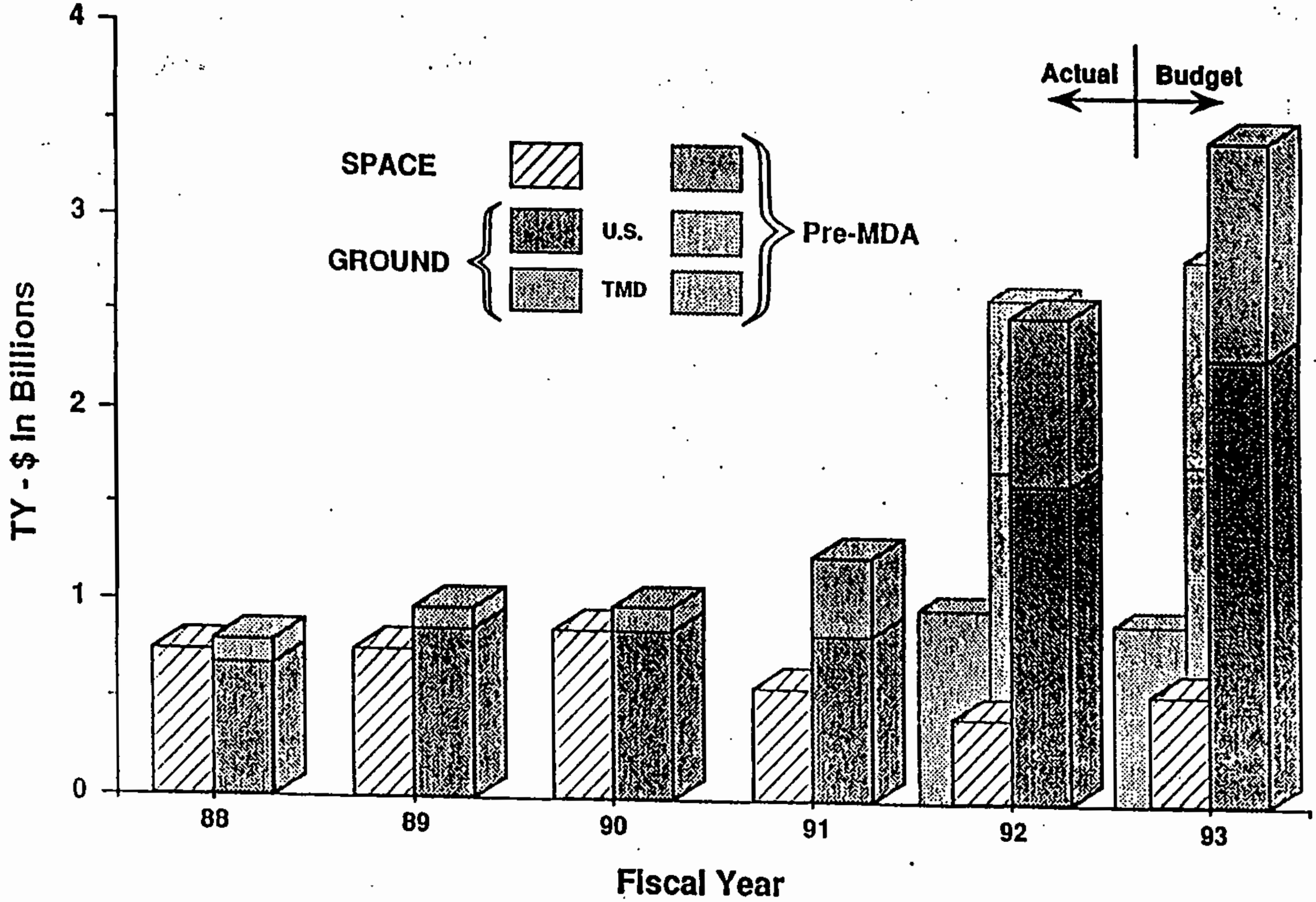



jm-14322.e / 020691

# SPACE - GROUND R&D INVESTMENTS




jm-13194.k / 022591

# STRATEGIC DEFENSE INITIATIVE
# FY 93 AMENDED BUDGET FYDP PROGRAM

*TY $ In Thousands*

| RDTE | | FY 91 | FY 92 | FY 93 |
|---|---|---|---|---|
| Dem / Val 6.3 | | | | |
| | Theater Missile Defense | 178,452 | 802,710 | 857,725 |
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| | Total SDIO | 2,878,682 | 4,145,601 | 5,425,074 |

jm-23575 / 021892

# STRATEGIC DEFENSE INITIATIVE ORGANIZATION
# EXECUTING AGENT DISTRIBUTION

*($ In Millions)*

| Executing Agent | FY 90 | FY 91 | FY 92 | FY 93 | % |
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| U.S. Navy | 182.563 | 132.611 | 231.608 | 221.727 | 4 |
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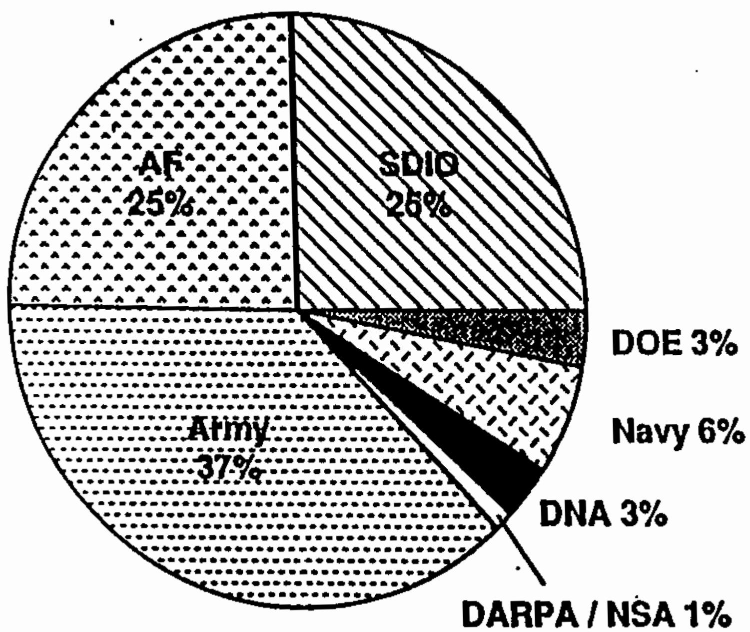
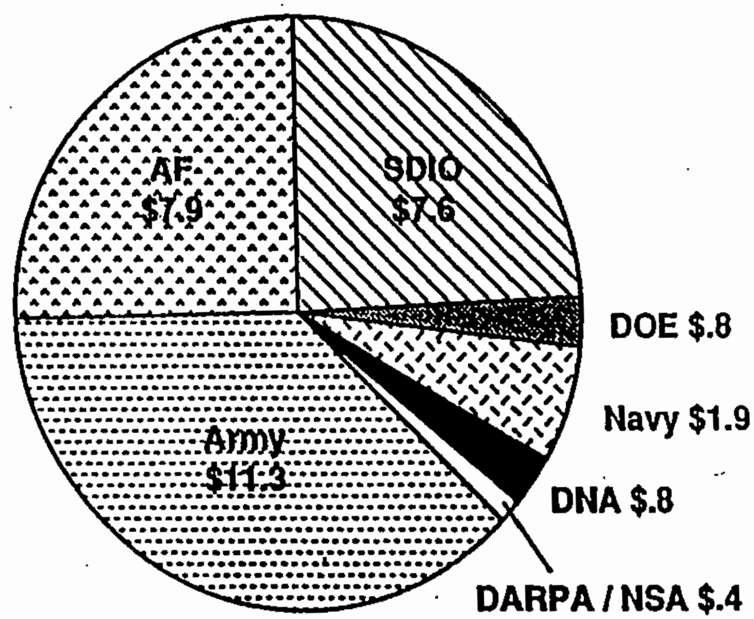
jm-14409 / 021892

# STRATEGIC DEFENSE INITIATIVE BY EXECUTING AGENT FY 85 - 93

*Percentage*




*TY $ Billions*




jm-23617 / 021192

# FY 93 AMENDED PRESIDENT'S BUDGET

*TY $ In Millions*

| RDT&E | FY 92 FY 92 / 93 Budget | FY 92 Delta | FY 92 FY 93 Amended Budget | FY 93 FY 92 / 93 Budget | FY 93 Delta | FY 93 FY 93 Amended Budget |
|---|---|---|---|---|---|---|
| Theater Missile Defense | 857.5 | -23.8 | 833.7 | 890.7 | +107.0 | 997.7 |
| Limited Defensive Sys | 1,600.4 | -166.1 | 1,434.3 | 1,736.8 | +398.0 | 2,134.8 |
| Space Based Interceptor | 829.9 | -363.8 | 466.1 | 768.4 | -192.8 | 575.6 |
| Follow-on | 1,168.2 | -501.8 | 666.4 | 1,255.9 | -406.3 | 849.6 |
| Research And Support | 694.6 | +20.4 | 715.0 | 831.4 | -76.7 | 754.7 |
| Total | 5,150.6 | -1,035.1 | 4,115.5 | 5,483.2 | -170.8 | 5,312.4 |

# CONTRACT TERMINATIONS
# FY 92 APPROPRIATION

| Program | Title | ($000) | # Of People | Contractors / Subcontractors | City / State |
|---|---|---|---|---|---|
| 1101 | Passive Sensors | 1,975 | 104 | Rockwell | Anaheim, CA |
| | | | | Hughes | El Segundo, CA |
| | | | | Aerojet | Sacramento, CA |
| | | | | NRC | Colorado Springs, CO |
| | | | | TRW | Redondo Beach, CA |
| | | | | Spire Corp | Boston, MA |
| | | | | Harris | Melbourne, FL |
| 1103 | Laser Radar | 178 | 4 | Laser Science | Cambridge, MA |
| 1104 | Signal Processing | 1,645 | 72 | Honeywell | Plymouth, MN |
| | | | | Raytheon | Sudbury, MA |
| | | | | Phillips Lab | Hanscom AFB, MA |
| | | | | David Sarnoff | Princeton, NJ |
| | | | | Spire Corp | Bedford, MA |
| | | | | Allied Signal | Columbia, MD |
| | | | | IBIS | Danvers, MA |
| | | | | N.C. State | Raleigh, NC |
| | | | | Univ Of FL | Gainesville, FL |
| | | | | Texas Instruments | Dallas, TX |
| 1201 | Interceptor Component Technology | 2,212 | 13 | Thiokal | Huntsville, AL |
| | | | | Aerojet | Sacramento, CA |
| | | | | Westinghouse | Pittsburgh, PA |

jm-24699 / 021892

# CONTRACT TERMINATIONS
# FY 92 APPROPRIATION (Cont'd)

| Program | Title | ($000) | # Of People | Contractors / Subcontractors | City / State |
|---|---|---|---|---|---|
| 1302 | Chemical Laser | 14,558 | 10 | United Tech | West Palm Beach, FL |
| 1303 | Neutral Particle Beam | 3,939 | 73 | Grumman Corp | Long Island, NY |
| | | | | Kirk Meyer Co | Santa Fe, NM |
| | | | | Butler Svcs | Santa Fe, NM |
| | | | | Salem Technical | Santa Fe, NM |
| | | | | DOE | Los Alamos, NM |
| | | | | Mission Rsch | Albuquerque, NM |
| | | | | Spectra Tech | Bellview, WA |
| | | | | Titan Tech | Albuquerque, NM |
| | | | | Univ Of NM | Albuquerque, NM |
| | | | | K–Tech | Albuquerque, NM |
| | | | | Sandia Lab | Sandia Base, NM |
| 1503 | Power + Power Cond | 10,000 | 15 | GE | San Jose, CA |
| | | | | GE | Valley Forge, PA |
| | | | | Westinghouse | Pittsburgh, PA |
| | | | | TECO | Boston, MA |
| 1105 | Discrimination | 1,183 | 27 | Hughes | El Segundo, CA |
| | | | | Boeing | Seattle, WA |
| | | | | Nichols | Huntsville, AL |

# SDIO FY 94 - 99 POM PROCESS

1. OSD Provides Defense Guidance To SDIO — 2 MAR 92
2. OSD Provides Fiscal Guidance To SDIO — 5 MAR 92
3. POM Fiscal Guidance Issued To Deputies / Directors And PIs — 12 MAR 92
4. Program Office Cost Estimates Briefed To PRB — 16 MAR 92
5. Planning & Resources Board (PRB) Briefings
   - Review POM Reqt
   - Recommend POM Program Issues

   23-25 MAR 92
6. Updated POM Resource Allocation Summary And Issues To Deputies / Directors — 27 MAR 92
7. SDIO POM Program Summary Provided To Executing Agents — 31 MAR 92
8. Executing Agents
   - Review Program
   - Provide Comments (Executability)

   1-8 APR 92
9. Development Of Descriptive Summaries (CDSs) To Support The POM — 2-15 APR 92
10. Final POM Review And CDS Revision — 15-20 APR 92
11. Final Coordination Of SDIO POM — 20-24 APR 92
12. SDIO Submits Automated POM To OSD — 1 MAY 92
13. Printed Copies Of SDIO POM To Deputies, Directors, & Executing Agents — 4 MAY 92

jm-7134a / 022492

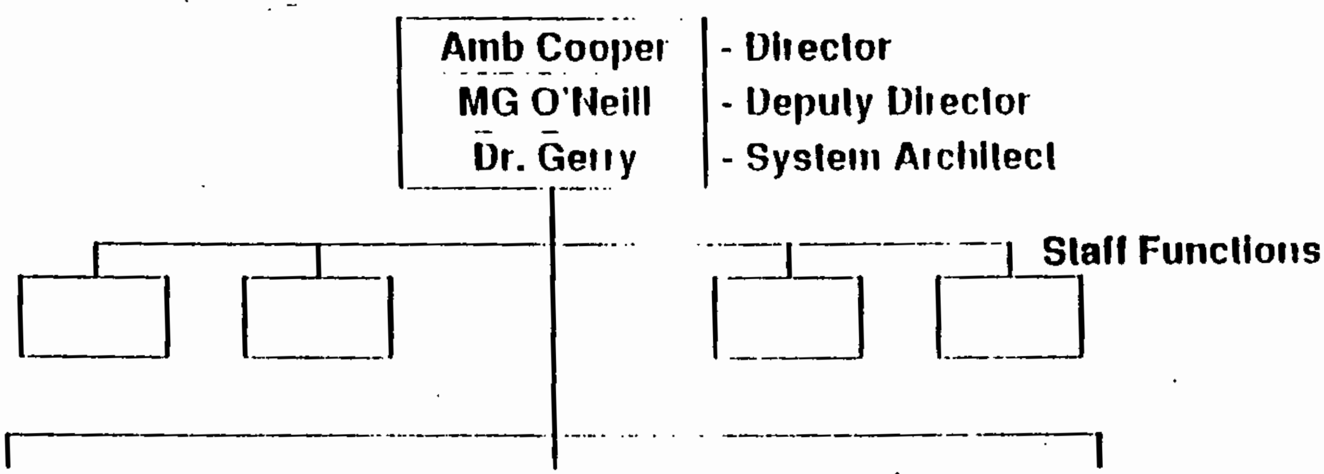
F FOI92-0855

# STRATEGIC DEFENSE INITIATIVE

## Strategic Defense In The 1990's

Col Simon P. (Pete) Worden, USAF
Deputy For Technology
Strategic Defense Initiative Organization

# SDIO TODAY




**Technology**

1. Technology Insertion
2. Alternatives
3. Follow-on Systems
4. Innovative Technologies
5. Test & Evaluation

**Theater Defense**

1. Sensors (GBR, BE)
2. Weapons (THAAD, ERINT, PATRIOT III)
3. BM / $C^3$

**Strategic Defense (GPALS)**

1. Global (BE, BP)
2. National (GBI, GBR)
3. BM / $C^3$ (NTB)

TEST AND EVALUATION

INTERCEPTOR TECHNOLOGY

SENSOR TECHNOLOGY

# TECHNOLOGY OVERVIEW

KEY TECHNOLOGY

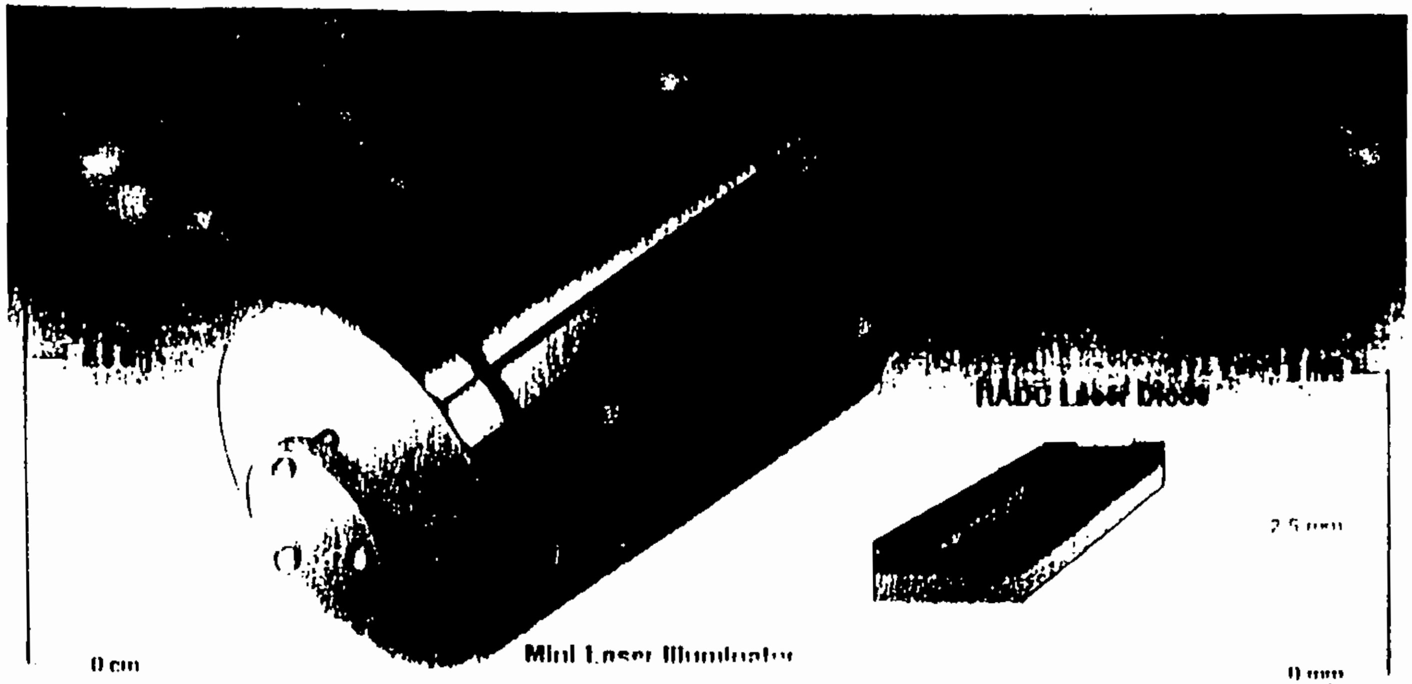
DIRECTED ENERGY

INNOVATIVE SCIENCE & TECHNOLOGY

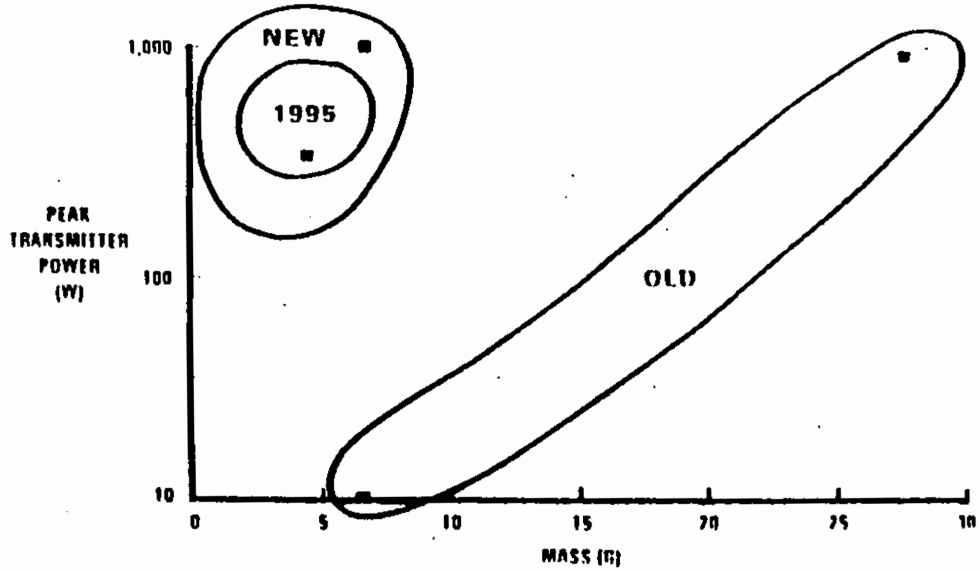
# TECHNOLOGY
# FASTER, CHEAPER AND BETTER

# TECHNOLOGY INSERTION

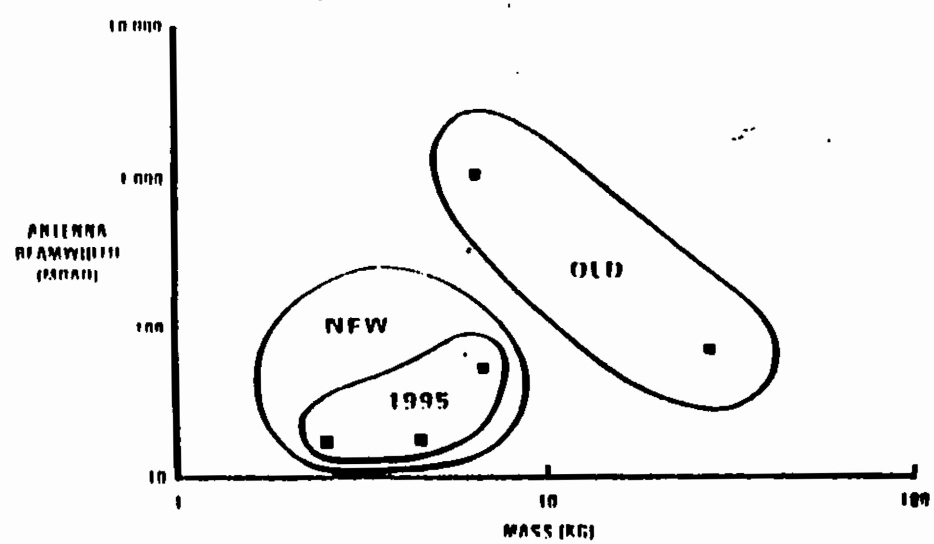
# ACTIVE SEEKERS COMPONENTS



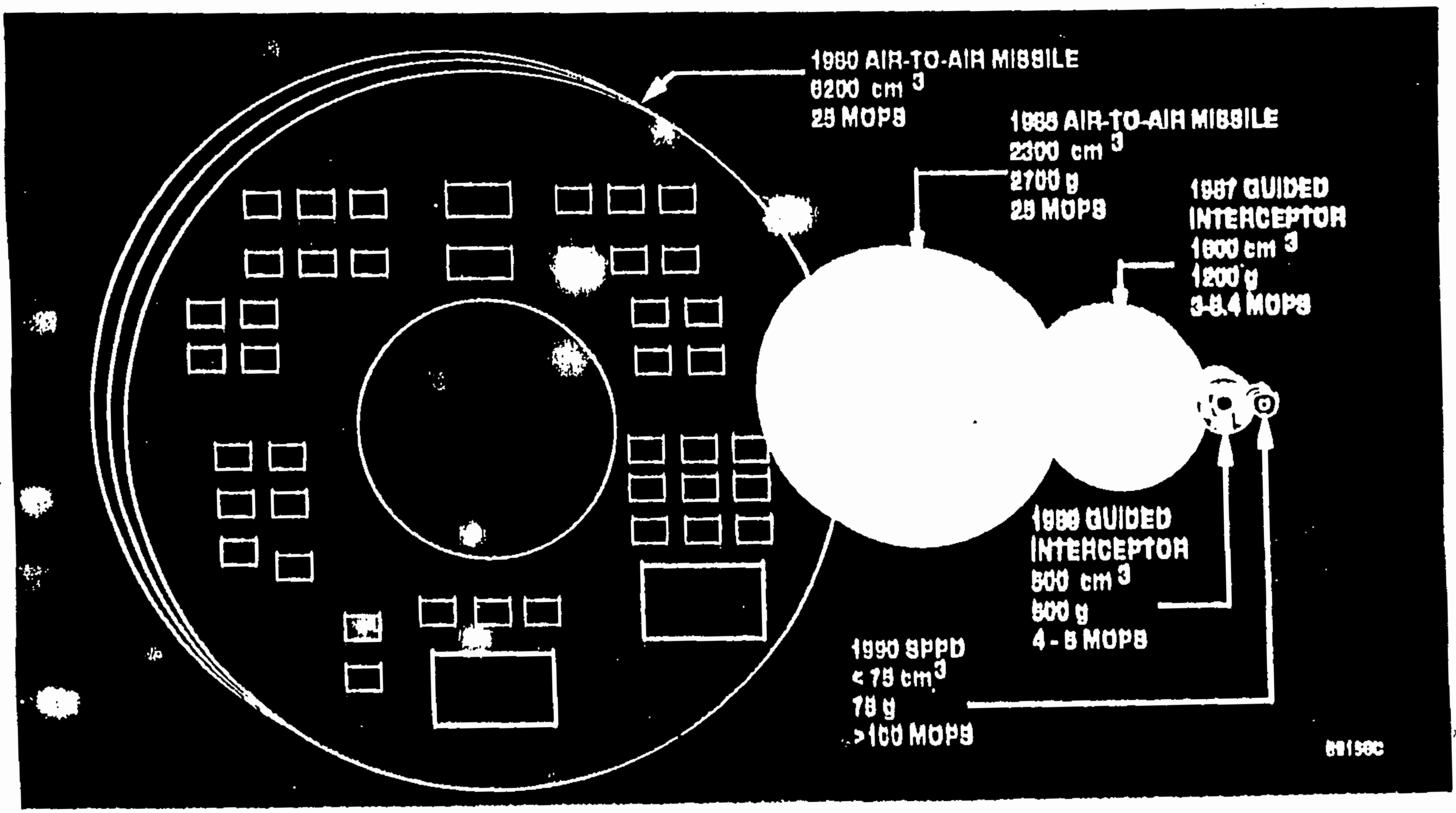

RF TRANSMITTER PEAK POWER VS. MASS




RADAR ANTENNA BEAMWIDTH VS. MASS



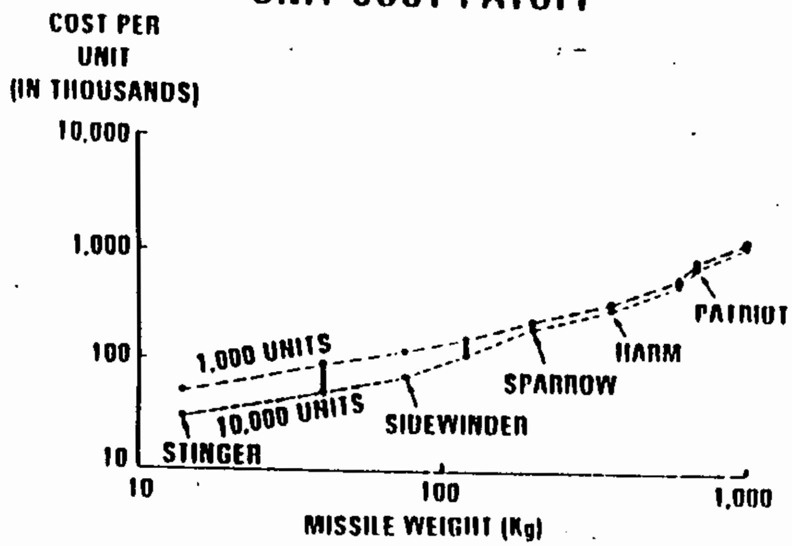
# SIGNAL PROCESSOR VOLUME IS A KEY DRIVER OF INTERCEPTOR



UNCLASSIFIED

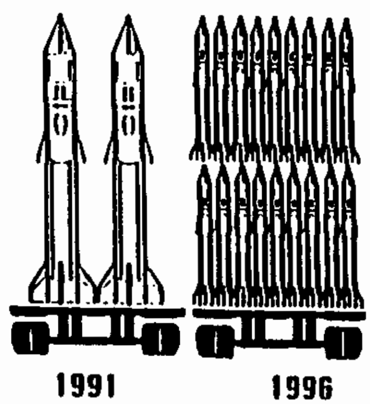
# BOTTOM LINE ON SIZE AND COST

## UNIT COST PAYOFF




## THAAD

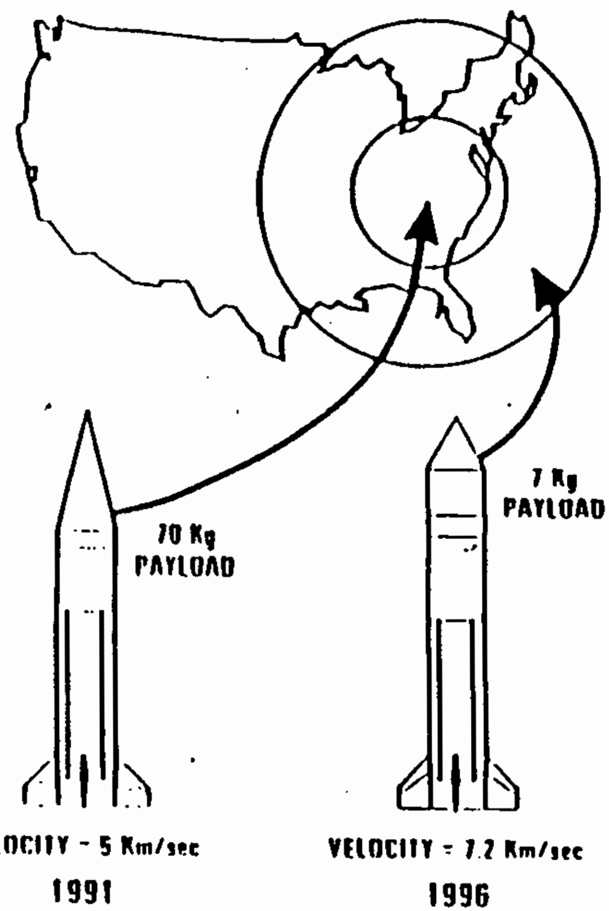
### MOBILITY LOGISTICS PAYOFF




8 TIMES LOADOUT FOR SMALL INTERCEPTORS

## GBW

### PERFORMANCE LOGISTICS PAYOFF




ONE-TENTH SIZE YIELDS 4 TIMES PROTECTED AREA

UNCLASSIFIED

# LEAP FLIGHT TEST SCHEDULE

**LEAP 1**
MISSION CHECKOUT

**LEAP 2**
SPACE INTERCEPT
RV TARGET

**LEAP 3**
SPACE INTERCEPT
RV TARGET

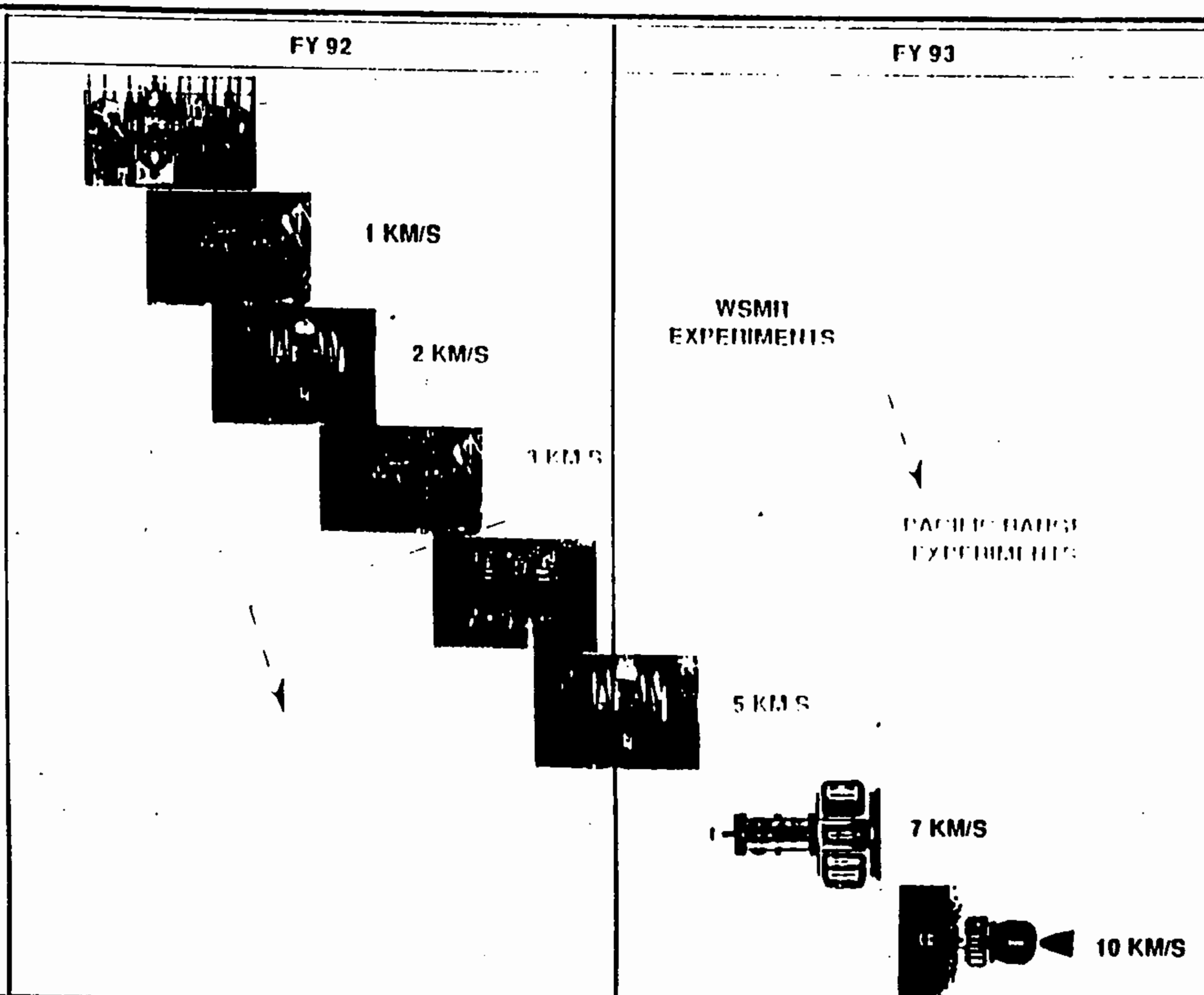
**LEAP 4**
MODERATE ΔV INTERCEPT
RV TARGET

**LEAP X**
COMPONENT TECHNOLOGY
DEMONSTRATION

**LEAP 5**
HIGH ΔV INTERCEPT
RV TARGET

**LEAP 6 W/ALAS**
HIGH ΔV INTERCEPT
RV TARGET

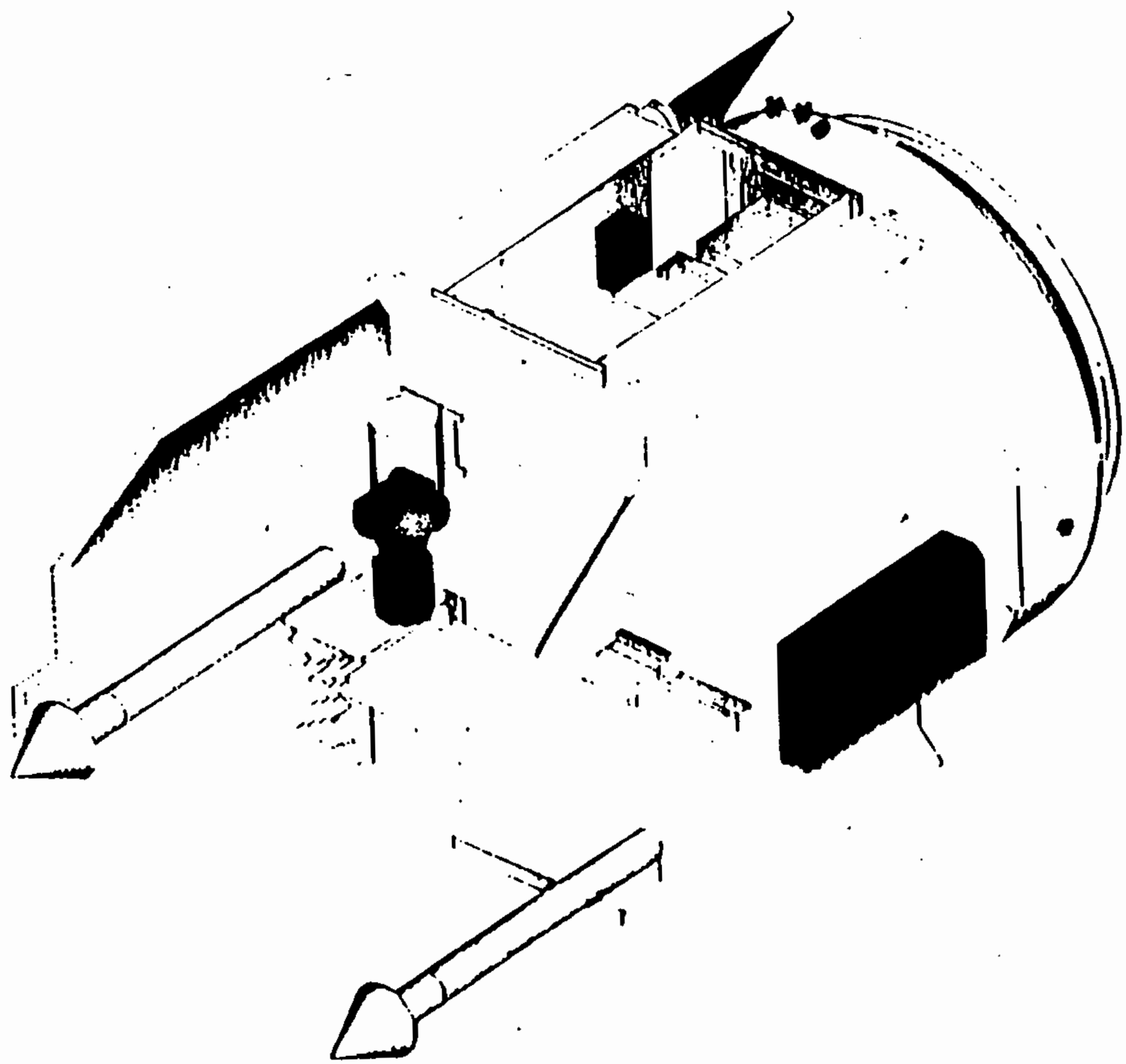
**LEAP 7 W/ALAS, ASAS**
HIGH ΔV INTERCEPT
PBV TARGET



# ALTERNATIVES

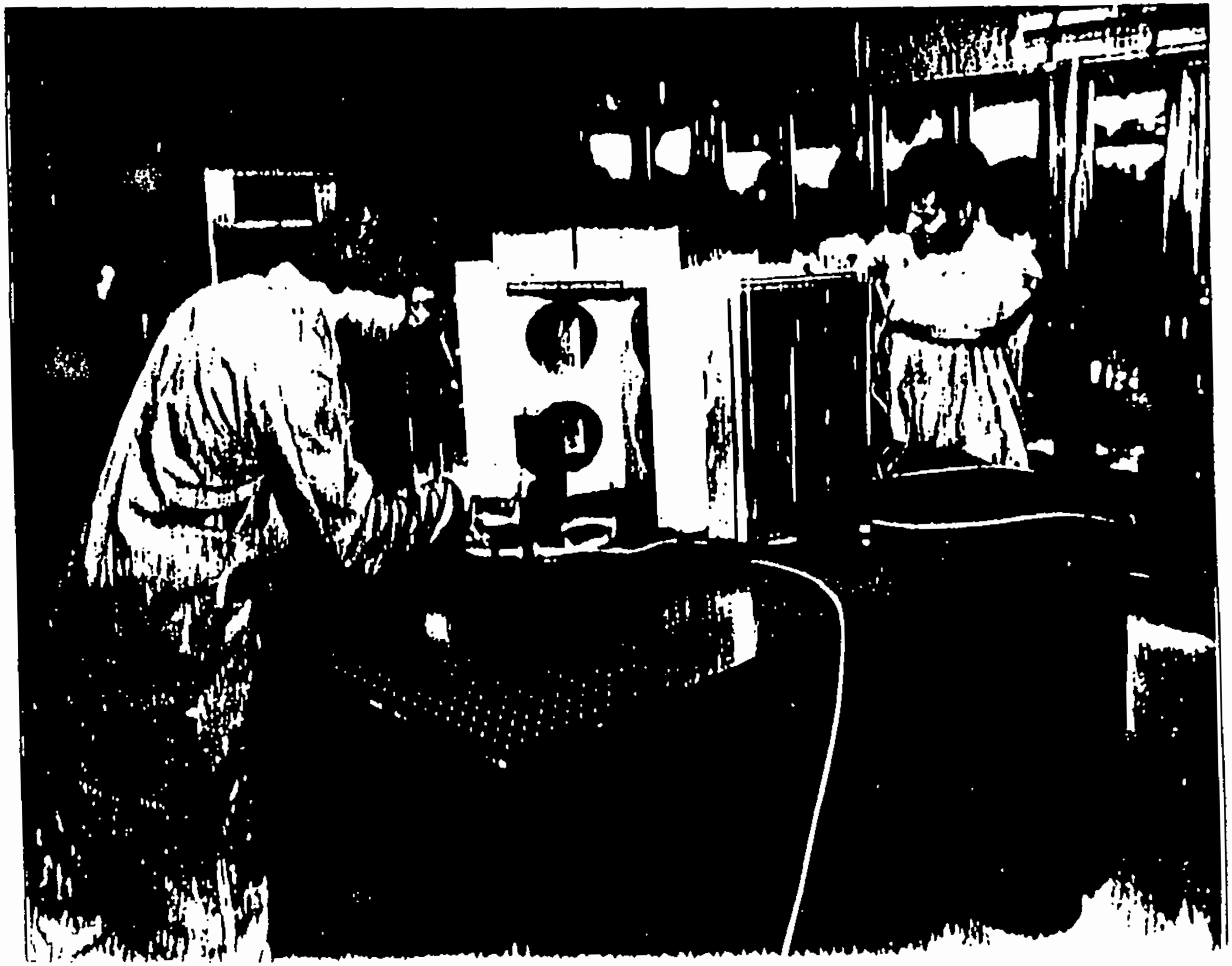
UNCLA

# MSTI SATELLITE MULTIMISSION BUS CONCEPT

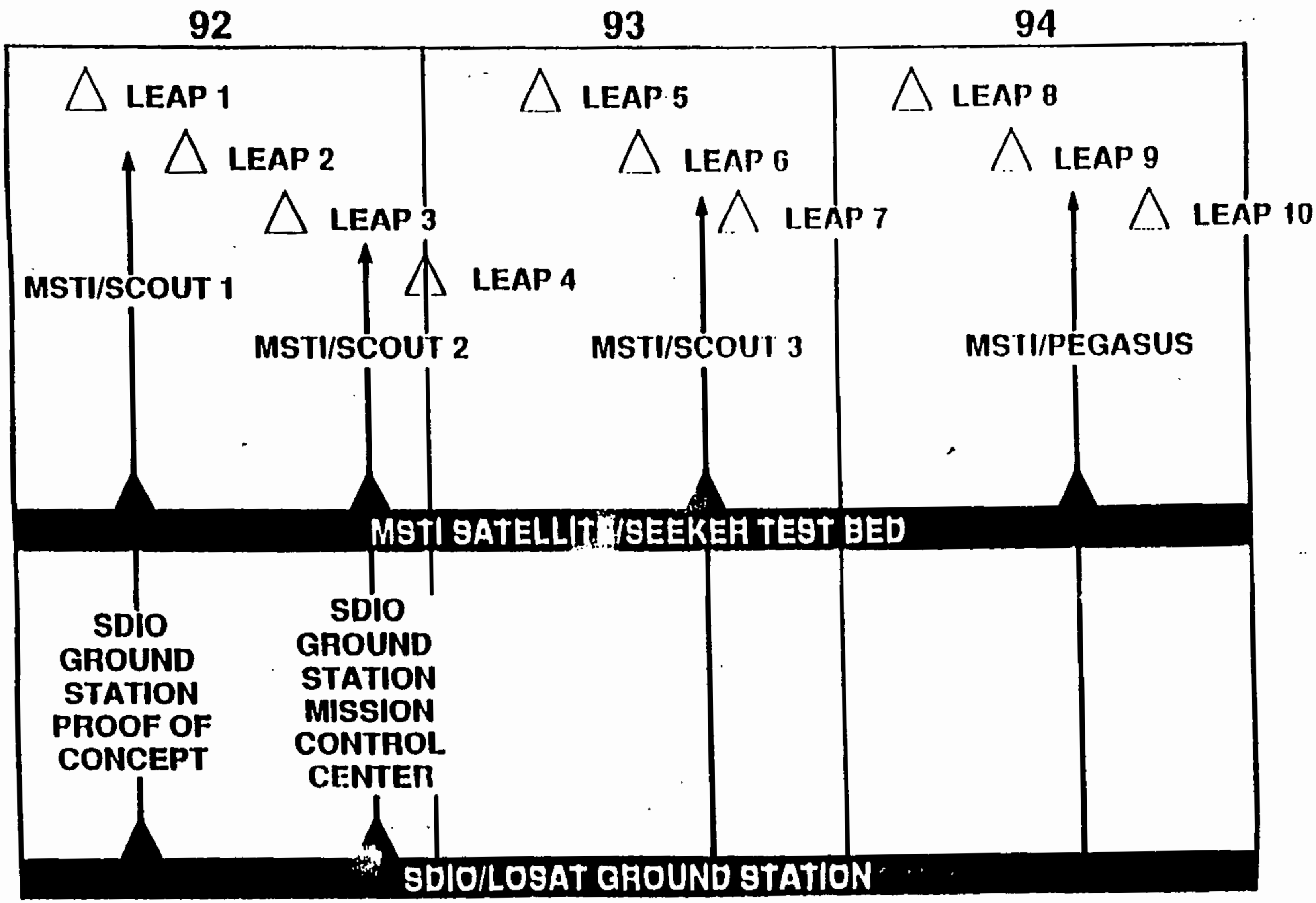


UNCLASSIFIED

# MSTI SATELLITE INTEGRATION AT PHILLIPS LAB EDWARDS AFB

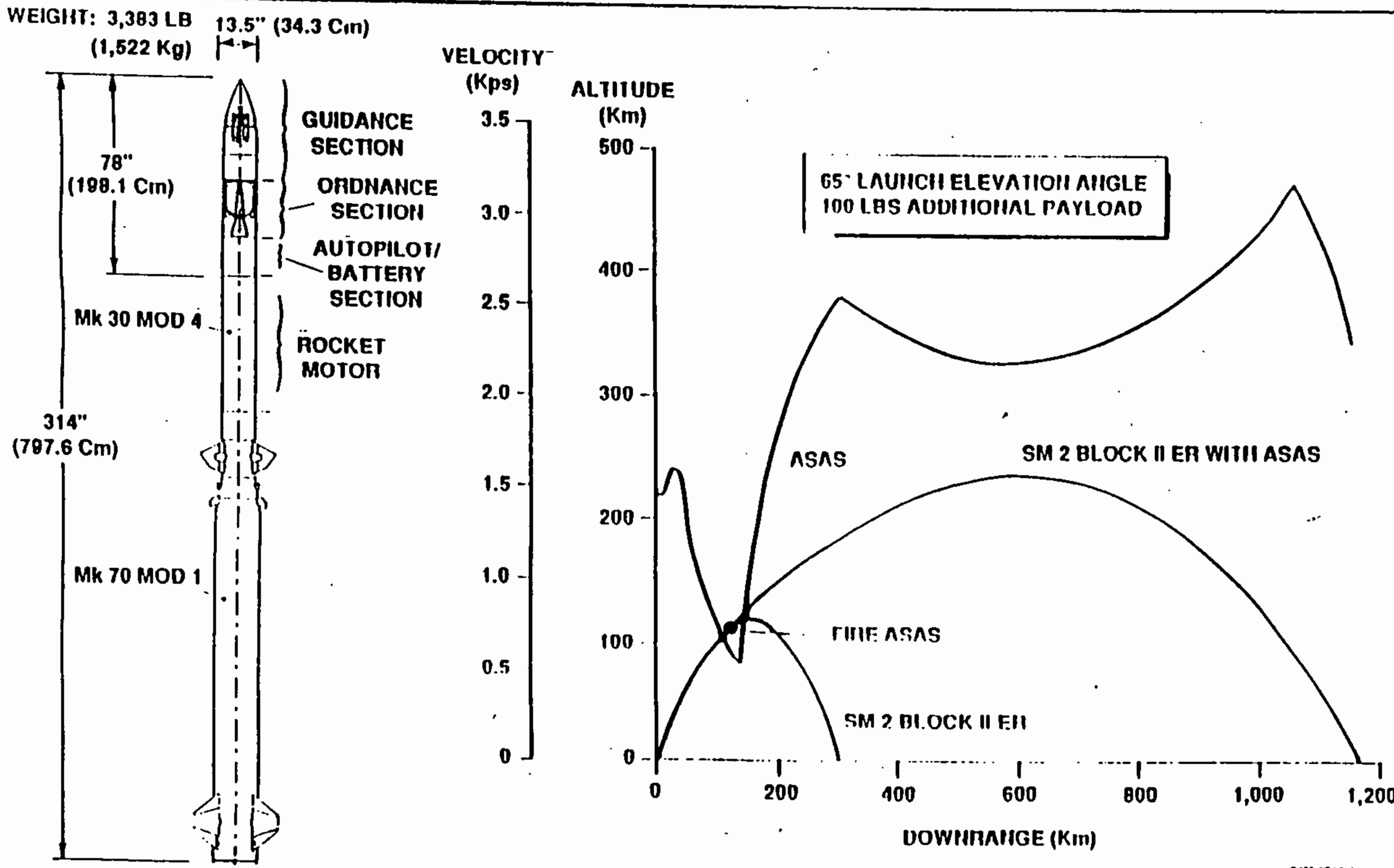


# MSTI DEPLOYMENT AND LEAP FLIGHT TESTS



UNCLASSIFIED

# LEAP LAUNCH VEHICLE PERFORMANCE USING SM 2 BLOCK II ER (TERRIER) BOOSTER AND SUSTAINER PLUS ASAS




UNCLASSIFIED

# NAVY LEAP GETS YOU . . .

| FLIGHT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| DATE | FEB 92 | MAY 92 | SEP 92 | DEC 92 | FEB 93 | MAR 93 | JUN 93 | SEP 93 | DEC 93 |
| RANGE | AFWTF | WSMR | | | | ESR, AFWTF, OR PACIFIC RANGE | | | |
| INTERCEPTOR LAUNCH MODE | SHIPBOARD RAIL  | DESERT SHIP RAIL  | | | WSMR VLS/ RAIL  | SHIPBOARD VLS/RAIL  | SHIPBOARD VLS OR RAIL  | | |
| KICK MOTOR | NONE | | MASS MOCKUP | ADVANCED SOLID | | AXIAL STAGE [illegible] | | | |
| SUSTAINER | MK 30 MOD 2 | | | | | MK 30/MK 104 | | | |
| BOOSTER | SM2 BLOCK II ER | | | | | SM2 BLOCK II ER OR SM2 BLOCK IV | | | |
| INTERCEPTOR | MASS MOCKUP | |  LEAP 1 OR | | |  LEAP 2 OR |  LEAP 3 | | |
| FIRE CONTROL ELEMENTS | TIMING | TIMING | TIMING | RADAR TRACK AND ALERT | SHIPBOARD AEGIS (MOD/ TERRIER) | | [illegible] | | |
| CLOSING VELOCITY | 2.2 KM/S | 2.2 KM/S | 1.2 KM/S | 2 KM/S | 2.2-2.8 KM/S | [illegible] KM/S | [illegible] KM/S | [illegible] KM/S | [illegible] KM/S |

- 9 FLIGHT TESTS
- 5 AT SEA DEMO
- EARLY SHIPBOARD DEMONSTRATION
- PROVIDES AGGRESSIVE PRE-THAAD TMD ROLE
- MERGES SDIO/NAVY TEST AND TECHNOLOGY INFRASTRUCTURES
- BRINGS NAVY TO TECHNOLOGY READINESS

**NAVY LEAP WILL HAVE DEMONSTRATED EXO-TMD CAPABILITY BY 1993**

# AIRBORNE LASER

# INITIAL OBSERVATIONS

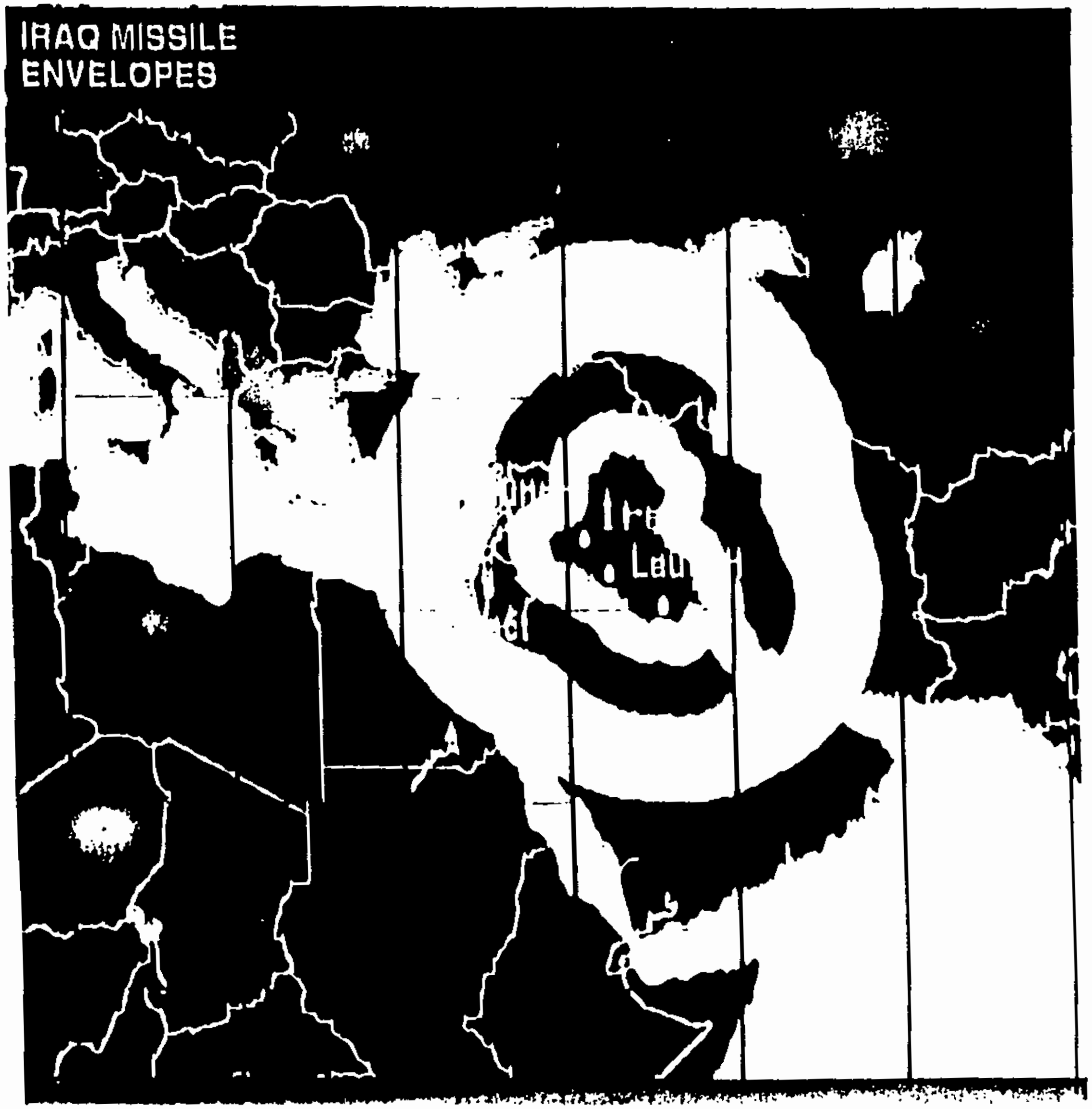
- BOOST PHASE INTERCEPT WOULD BE A COMPELLING ADDITION TO THEATER MISSILE DEFENSE
- AIRCRAFT-BASED LASERS (ABL) OFFER PROMISE IN PROVIDING SUCH A CAPABILITY
- ABL IS NOT A NEW CONCEPT; A $10^{14}$ W/sr CLASS LASER SHOT DOWN AIR-TO-AIR MISSILES IN 1983-84
- THE TECHNOLOGY BASE CREATED IN OVER TWO DECADES OF WORK SUPPORTS THE CONCEPT
- FOCUSED PROGRAM COULD YIELD OPERATIONAL CAPABILITY EARLY IN THE NEXT DECADE

# Airborne Laser Laboratory (ALL)

- Demonstrator program: 1970 to 1983
- Laser- High Energy $CO_2$ GDL (10.6 μm)
- 60 cm Pointer telescope
- Demonstated
  - 6 μrad class tracking (1sigma - 1 axis)
  - Destroyed 5 Air to Air missiles (AIM-9)
  - Destroyed 2 Cruise missiles (BQM-34)

# IRAQ "SCENARIO SUMMARY"

- **OPTIMIZED THREAT BASING ASSUMED FOR MAXIMUM OFFENSE CAPABILITY**




Threat Class

I 200 km Range

II 500 km Range

III 1000 km Range

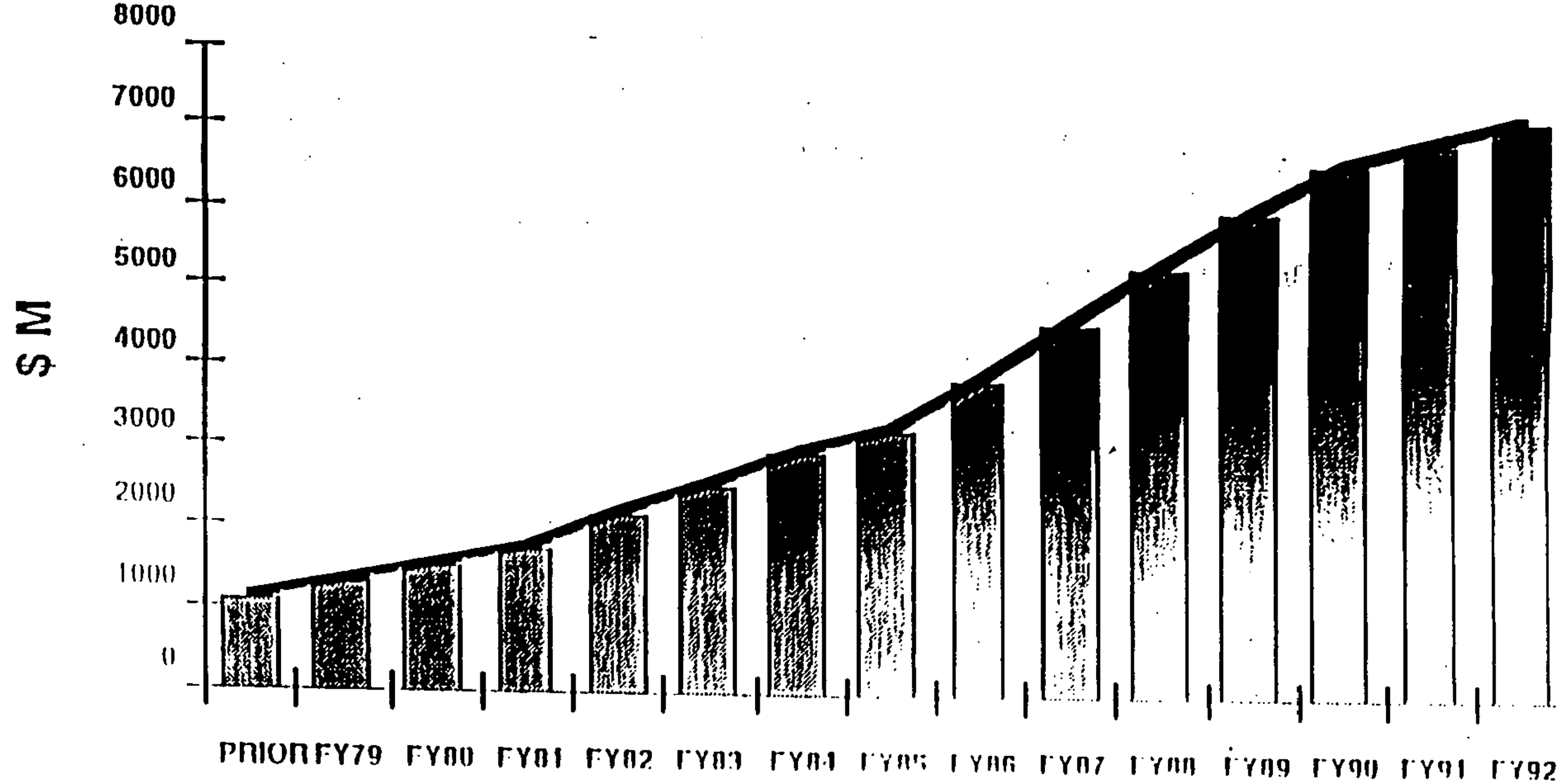
IV 3000 km Range

# FOLLOW-ON

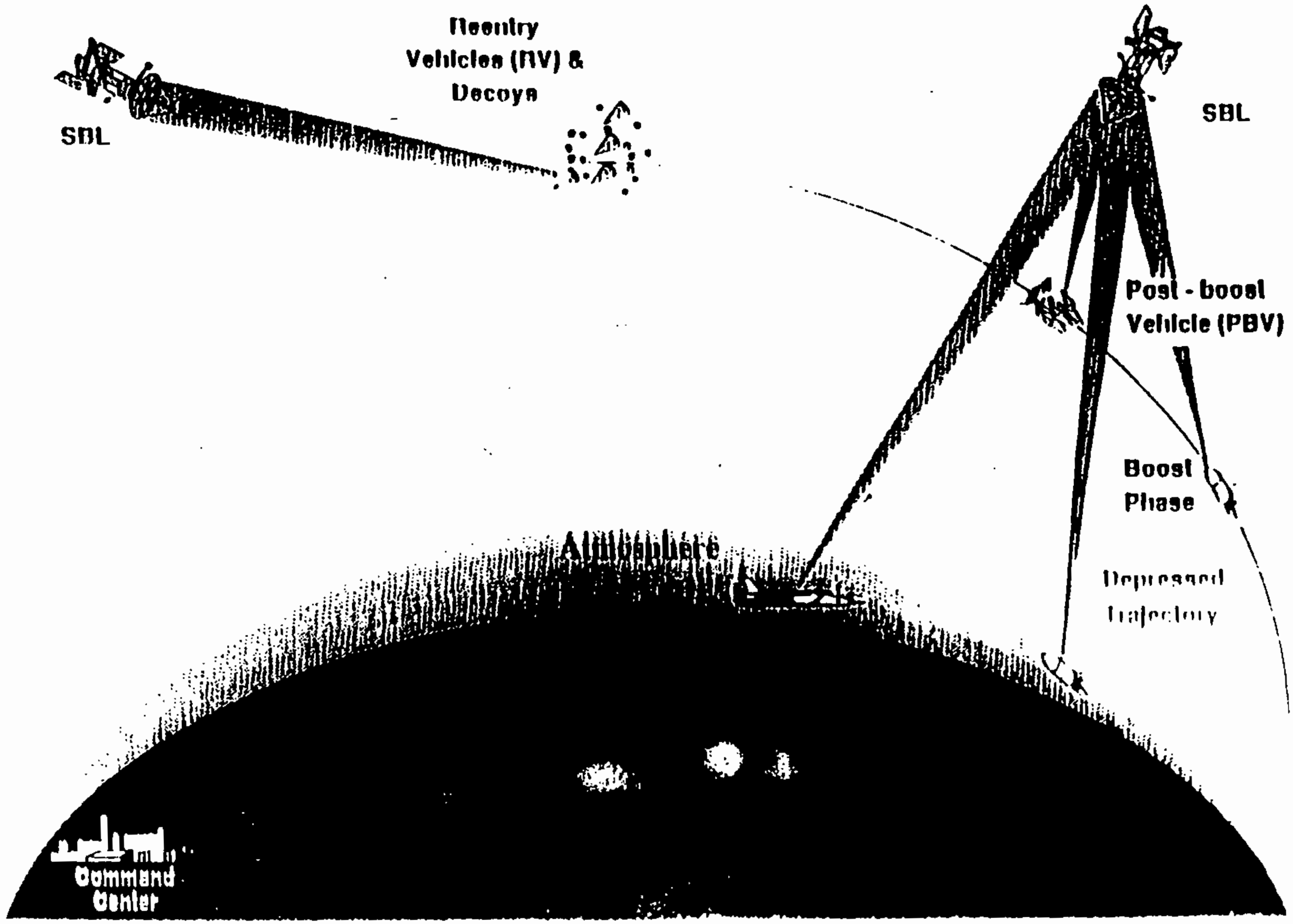
# STARWARS - THE DREAM IS ALIVE AND WELL!

- DoD Has Made Considerable Investments In Directed Energy (Speed-Of-Light) Weapons Technology For Two Decades
- Pay-Offs Are Emerging <u>Now</u>
  - Near Weapon Level Components Have Been Built And Tested, And Are Now Being Integrated For Mid-90s Tests
- In The Next Decade, This Nation Can Field Truly Unique Weapon Systems For A Broad Variety Of Defense Missions, e.g.
  - Boost-Phase Intercept Of Strategic And Theater Missiles
  - <u>Interactive</u> Discrimination Of Decoys From Warheads
  - Worldwide Full-Time Air Superiority
  - Highly Robust Surveillance

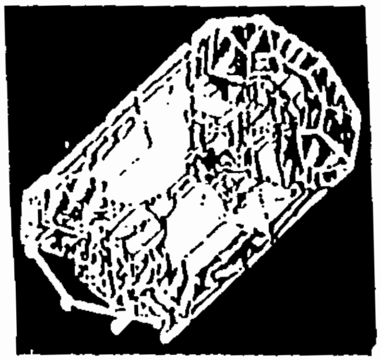
# DIRECTED ENERGY INVESTMENT
# THEN YEAR DOLLARS



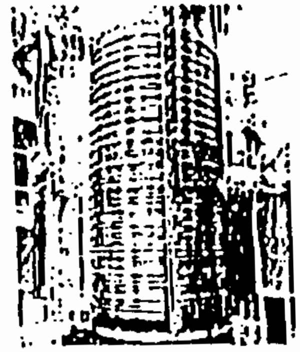
# SPACE BASED CHEMICAL LASER



# LASER DEVICE TECHNOLOGY



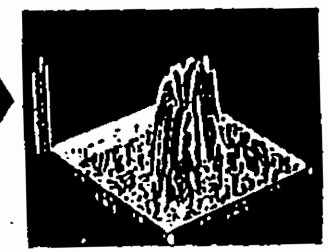
Alpha Laser



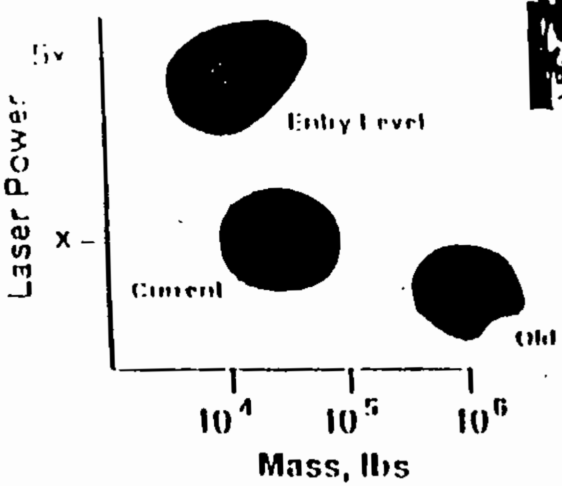
Gain Generator Assembly

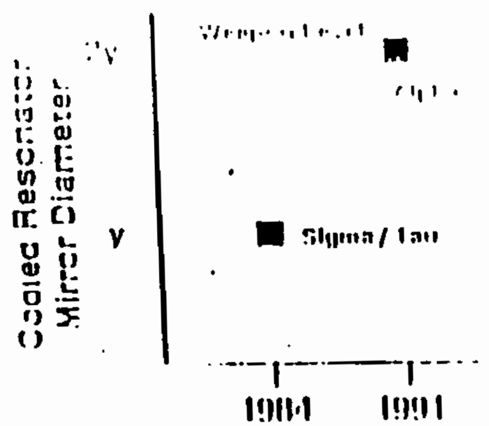
Optics

Test Facility

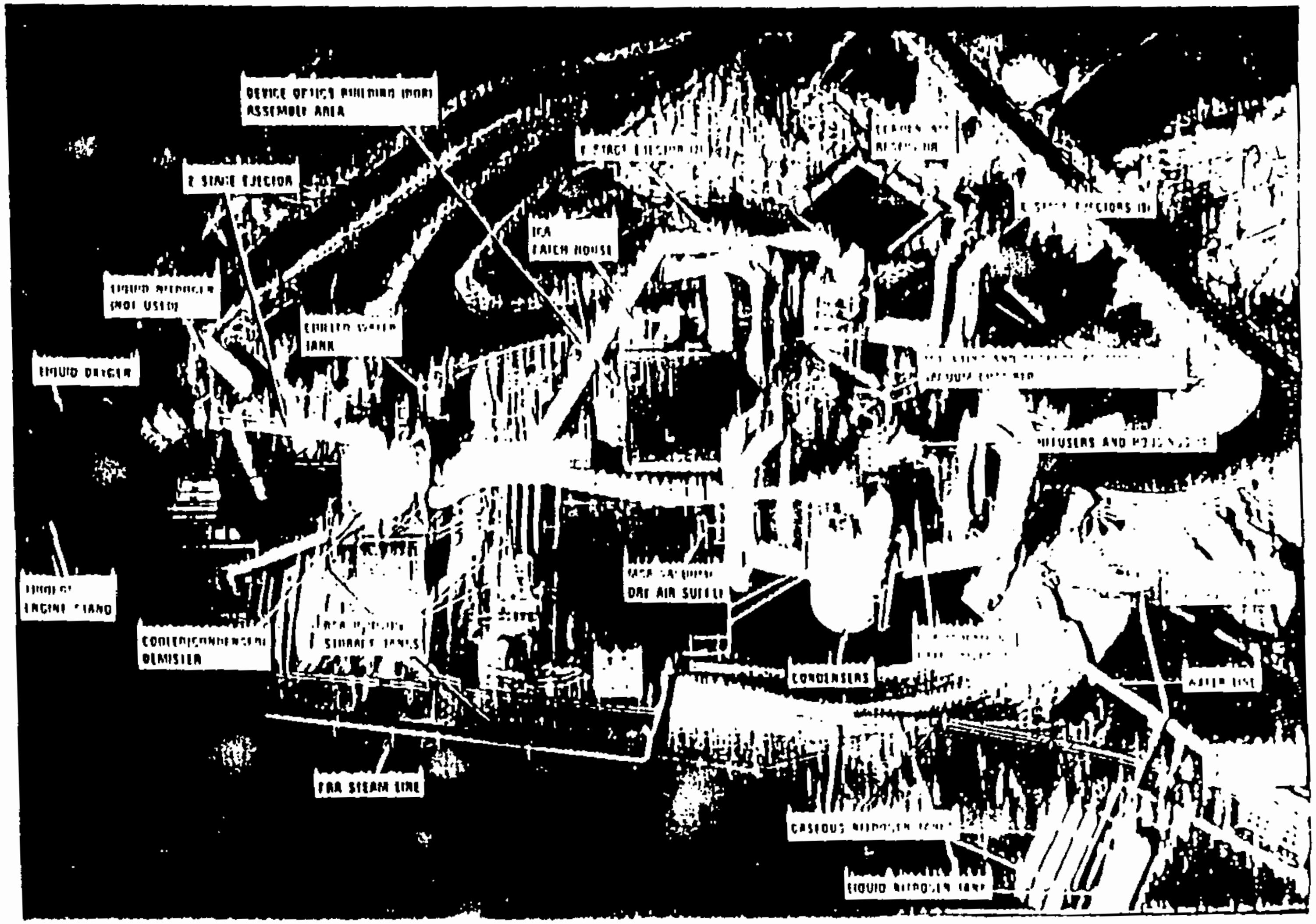


Alpha Near Field Irradiance



# ALPHA TEST FACILITY



# INNOVATIVE TECHNOLOGY

# MISSION ISSUE

*Create New Materials To Improve The Performance, Survivability And Miniaturization Of SDI Systems*

## *Technical Goal*

- **Thrust The U.S. Into A New "Age" Of Diamond For Windows, Coatings, And Electronics**

## *Payoff*

- **Integrated Circuits With Higher Density, Higher Temperature And Faster Speed**
- **Thin Rocket Windows To Withstand High Speeds**
- **Diamond Hard Protective Coatings For *Everything***

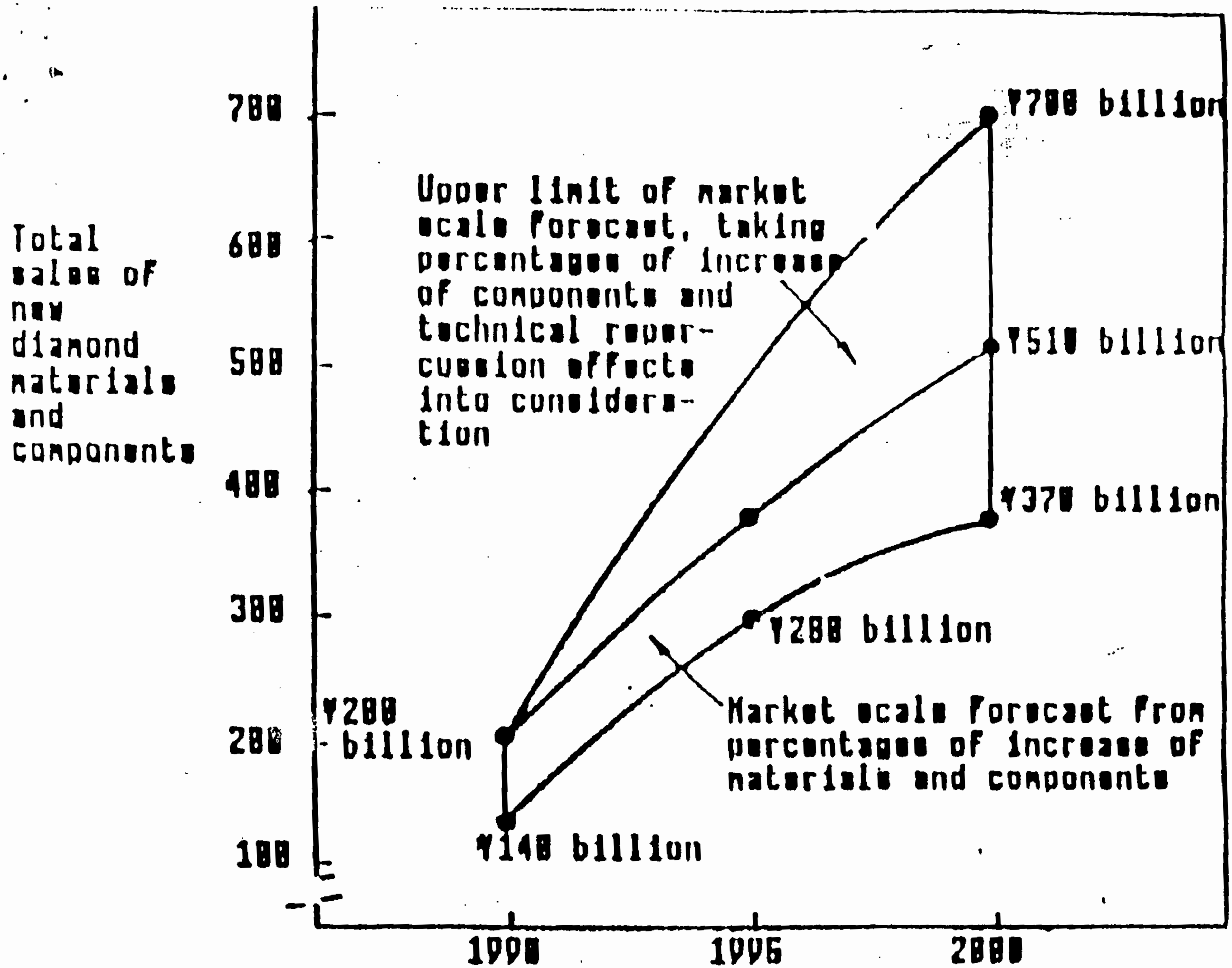
# DIAMOND PROPERTIES

| PROPERTIES | DIAMOND | ALTERNATIVE MATERIAL |
|---|---|---|
| HARDNESS ($kg/mm^2$) | 9000 | 4500 (Boron Carbide) |
| THERMAL CONDUCTIVITY (W/m/K) | 2000 | 430 (Silver) |
| OPTICAL TRANSMISSION (μm) | 0.22 to > 100 | 0.2 to 4 (Silica) |
| COEFFICIENT OF FRICTION | 0.05 - 0.1 | 0.1 (Teflon) |
| ELECTRICAL RESISTIVITY (Ωcm) | $1 \times 10^{16}$ | $1 \times 10^{15}$ (Alumina) |
| THERMAL SHOCK (W/m) | 10,900,000 | 10,600 (Zerodur) |
| TENSILE STRENGTH ($kg/mm^2$) | 290 | 35 (Alumina) |

IST

# DIAMOND

| DIAMOND PROPERTIES | APPLICATION |
|---|---|
| • HIGH THERMAL CONDUCTIVITY | DENSE LOGIC CIRCUITS, HIGH-ENERGY LASER WINDOW COATINGS |
| • HIGH E BREAKDOWN STRENGTH | μ-WAVE & MILLIMETER WAVE POWER |
| • RADIATION-HARD | SPACE ELECTRONICS |
| • PHYSICALLY HARD | COATINGS: GLASSES, SURGICAL INSTRUMENTS, PROSTHESES, COMPUTER DISCS, AUDIO SPEAKERS |
| • HIGH-TEMPERATURE (REFRACTORY) | SPACE ELECTRONICS, COMPUTERS, AUTO IGNITIONS & MONITORING |
| • HIGH DIELECTRIC STRENGTH | HIGH POWER CAPACITORS, ULTRA-FAST MICROELECTRONICS |


Total sales of new diamond materials and components
700
600
500
400
300
200
100
1990
1996
2000
¥700 billion
¥510 billion
¥370 billion
¥280 billion
¥200 billion
¥140 billion
Upper limit of market scale forecast, taking percentages of increase of components and technical repercussion effects into consideration
Market scale forecast from percentages of increase of materials and components

STRATEGIC DEFENSE INITIATIVE
DEPARTMENT OF DEFENSE

# LAUNCH SERVICES

SDIO
TEST OPERATIONS

# OBJECTIVE

- CENTRALIZE THE ACQUISITION, MANAGEMENT, AND CONTROL OF LAUNCH REQUIREMENTS AND

  — REDUCE LAUNCH COST (MULTIPLE LAUNCH VS SINGLE LAUNCH PROCUREMENTS.

  — CREATE CENTER OF LAUNCH EXPERTISE

  — MAXIMIZE THE BENEFITS OF LESSONS LEARNED

  — ELIMINATE DUPLICATION OF EFFORT

  — REMOVE LAUNCH VEHICLE / LAUNCH SERVICES RESPONSIBILITY FROM EXPERIMENTER/SCIENTIST

# CURRENT MANIFEST

- **BASIC CONTRACT FLIGHTS**

  LEAP 1
  LEAP 2
  LEAP 3
  LEAP 4
  PLACEHOLDER
  SPFE 6 (BP7)

- **FIRST CONTRACT OPTION FLIGHTS**

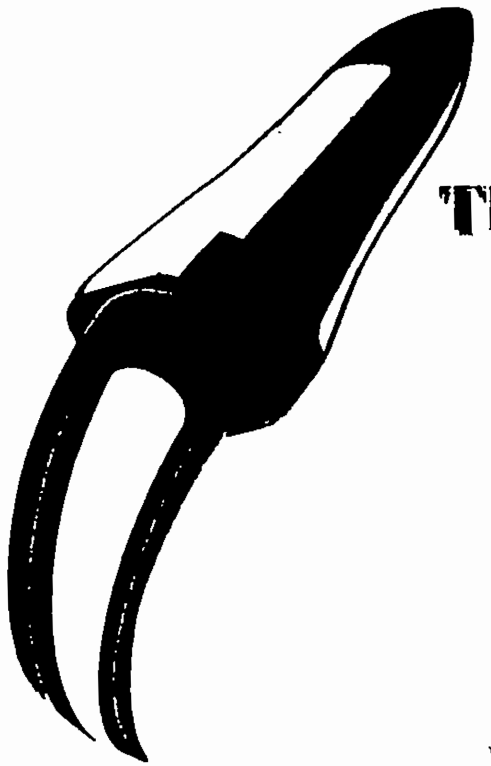
  ZEST 1
  ZEST 2
  SPFE DEMO (BP 1M)
  ASTRAL DANCER 1 & 2 (CANCELLED)

- **SECOND CONTRACT OPTION FLIGHTS**

  LEAP X
  LEAP 5
  LEAP 6
  LEAP 7

- **THIRD CONTRACT OPTION FLIGHTS**

  ENDO LEAP 1, 2, & 3
  PLACEHOLDER
  PLASMA RADIATION

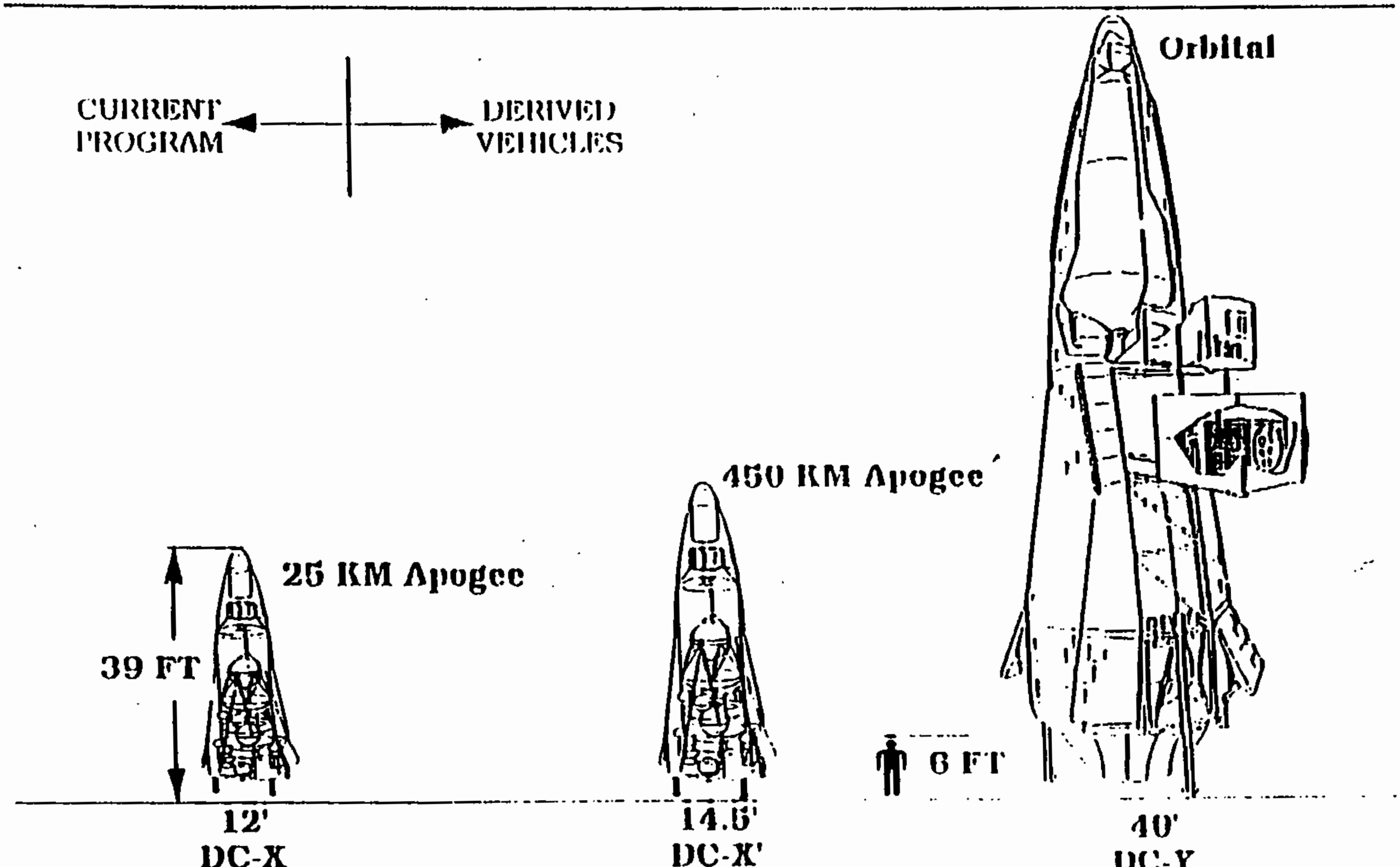


# PHASE II DC-X TECHNOLOGY DEMO

# PROGRAM GOALS

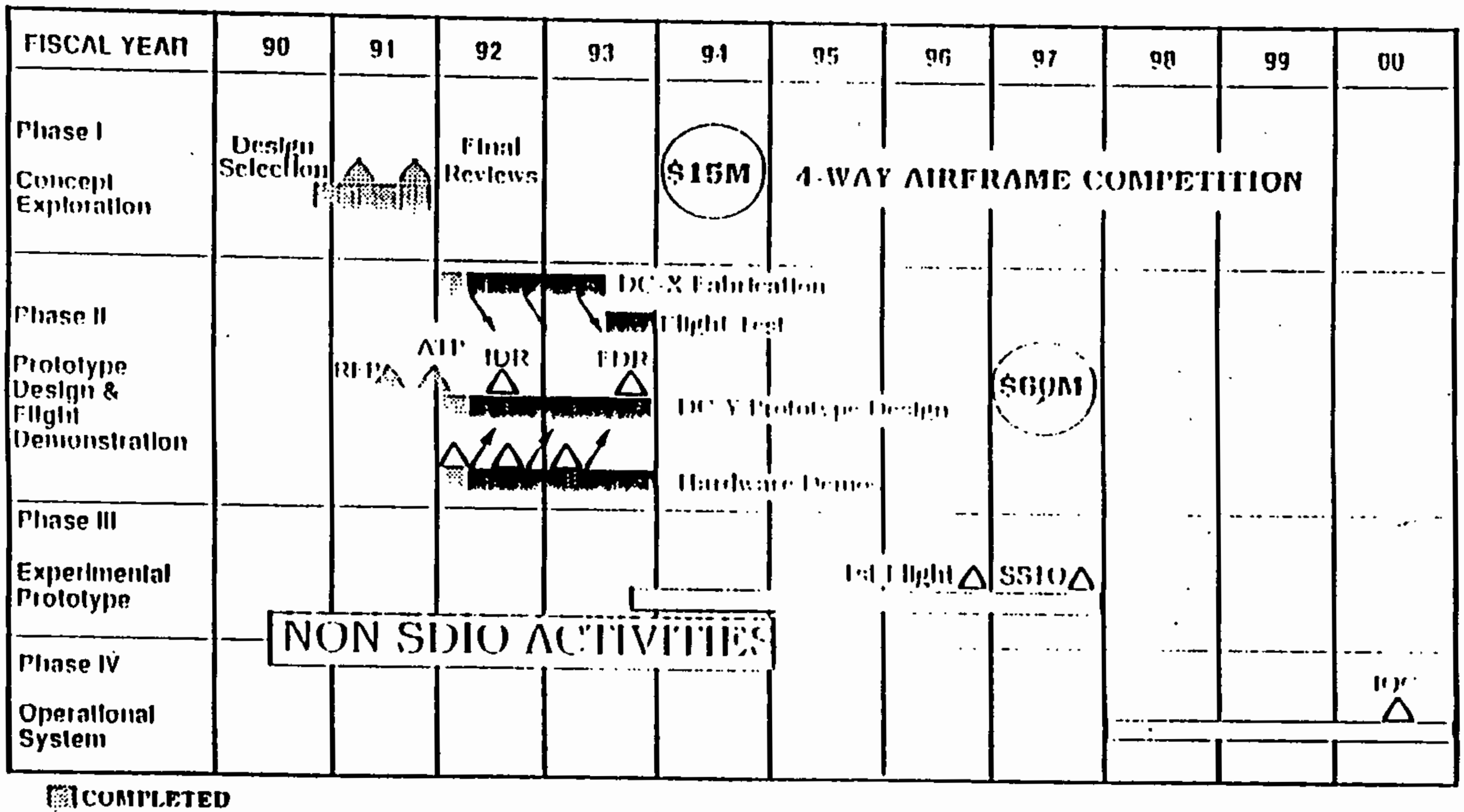
- FLIGHT TEST OF REUSABLE SUBORBITAL ROCKET
- ENABLING TECHNOLOGY DEMONSTRATION
  - APPLICATION OF EXISTING TECHNOLOGY
  - SYSTEMS APPROACH TO LAUNCH
- DEVELOP AND DEMONSTRATE TECHNOLOGY BASE FOR DERIVED VEHICLES COST EFFECTIVE TO SDIO
  - CREATE DATABASE ENABLING A NEW CLASS OF SUBORBITAL TRANSPORTATION
  - ENABLE NATIONAL OPTION TO INVEST IN COST EFFECTIVE SSTO VEHICLE

# POTENTIAL DERIVED VEHICLES



# SCHEDULE

## INCREMENTAL DEVELOPMENT APPROACH



# CONCLUSIONS

- PHASE II IS A TECHNOLOGY DEMONSTRATION PROGRAM TO:
  - DETERMINE IF CURRENT CONCEPTS AND TECHNOLOGIES WILL SUPPORT THE DEVELOPMENT OF A SUBORBITAL RECOVERABLE ROCKET DEVELOPMENT FOR USE IN SDIO SYSTEM TESTING
- SDIO HAS NO PLAN NOR BUDGET FOR FULL SCALE ORBITAL VEHICLE DEVELOPMENT
- PHASE II EFFORTS WILL MAXIMIZE TECHNOLOGY TRANSFER TO A FUTURE ORBITAL VEHICLE