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**MISSILE DEFENSE SESSION
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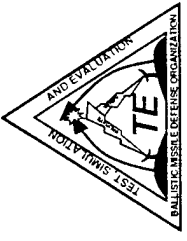


**Patrick T. Clancy
Deputy Director, Test Resources
Ballistic Missile Defense Organization
7-9 November 2000**

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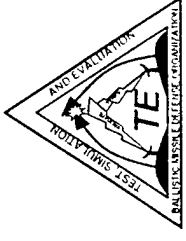


BMDO/TER_____

As a way of introducing the "TEST" context of this session, this brief will describe how the BMDO T&E Program is structured and how the Test Infrastructure which includes Targets, Ground Test Facilities (GTFs), Ranges and Air borne Sensors is designed to support BMDO MDAP and Technology Program Test Requirements. The majority of our speakers today have used the BMDO GTFs or Test Ranges to conduct the programs they are reporting on.



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BMDO/TER

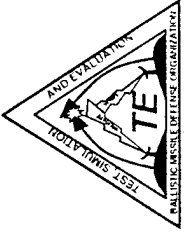
Agenda

Today's Briefing will address...

- BMDO Organization and Management
- BMDO Corporate Test Program
- T&E Ranges, Instrumentation, and Facilities
 - BMDO Ground Test Facilities
 - BMDO Test Ranges and Launch Facilities
 - BMDO Ground Test Facilities
 - BMDO Auxiliary Assets
- Future Test Support Considerations and Issues



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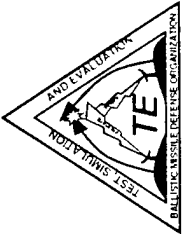


BMDO/TER

This chart depicts the BMDO organization as of 1 September 2000. The T&E program is led by the Deputy for Test, Simulation and Evaluation, Dr. Patricia Sanders. Her organization works closely with the Chief Architect, Deputy for System Engineering, and the Deputy for Acquisition, Strategy and Long-Range Planning to organize and conduct the Corporate Test Program. The T&E program also supports the BMDO Technology Programs under the Chief Scientist



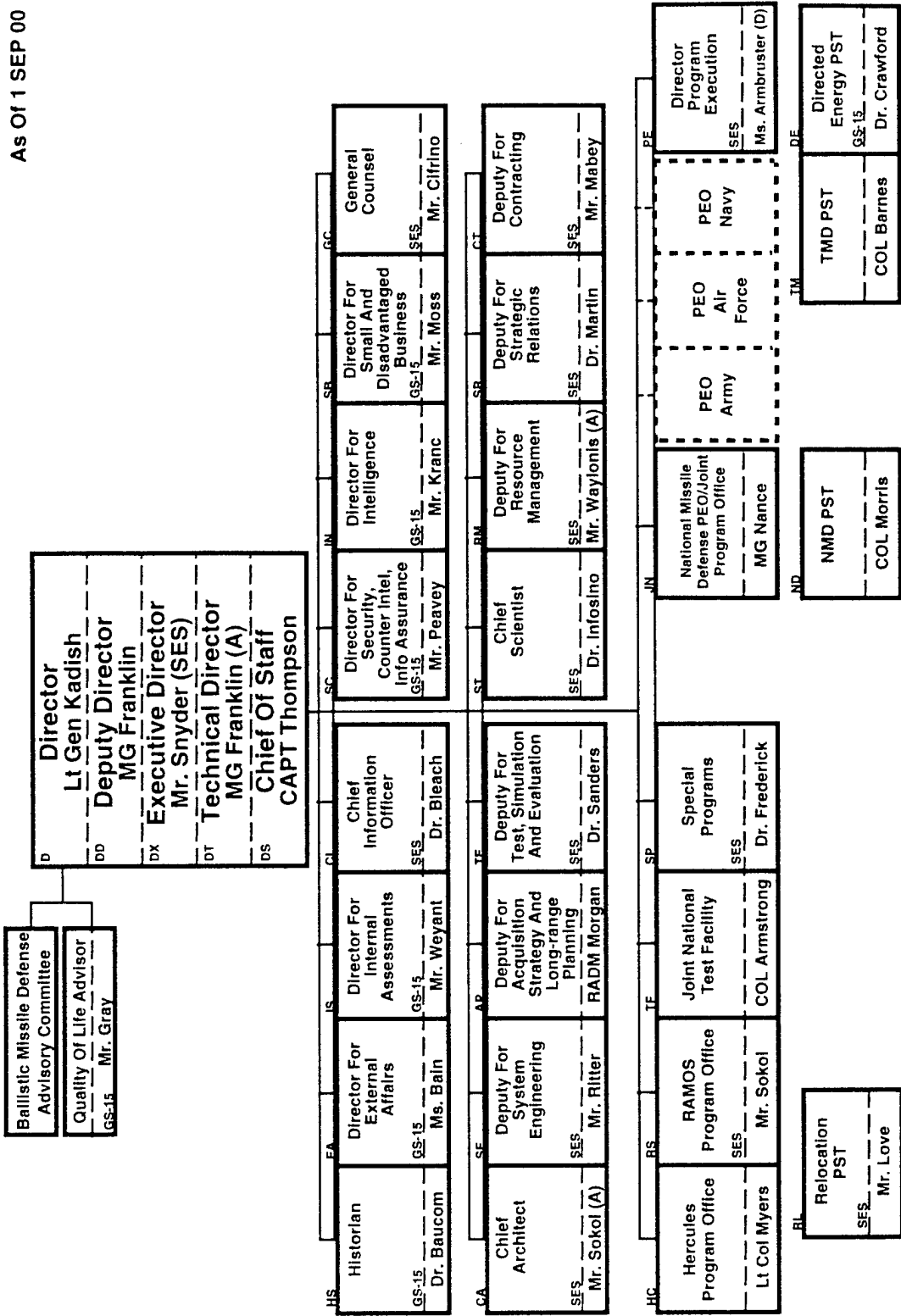
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BMDO Reorganization

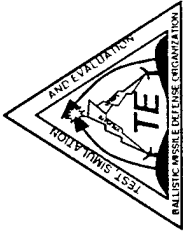
BMDO/TER

As Of 1 SEP 00





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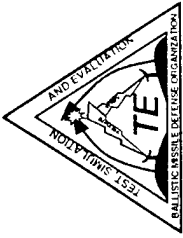
BMDO/TER

This chart shows the four major focus areas within TE. Each area is the purview of a Directorate. All must work together to execute the required BMDO Test Program.

Until Recently, I was the Acting Director of TER. Now that Commander Price has joined us, I am serving as the Deputy Director with overall control over the Test Infrastructure



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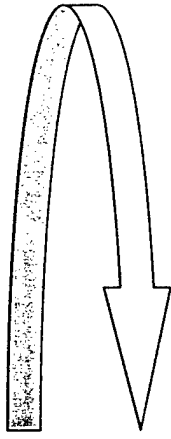
TE Corporate Management

BMDOTER

Corporate Management



Policy &
Administration



TEP
POLICY AND INTEGRATION
Mr Adessa , 703-695-8127x1104

TEXO
ADMIN/OPERATIONS
Maj Beyers, 703-695-8107, x1202

TEP
PROGRAMS AND POLICIES
(ANALYSIS, POLICY, AND
TECHNICAL SUPPORT)

TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

TEP
PROGRAMS AND POLICIES
(ANALYSIS, POLICY, AND
TECHNICAL SUPPORT)

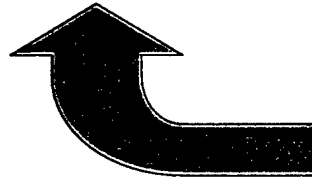
TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

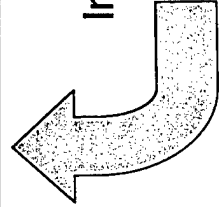
TEP
ASSESSMENT AND EVALUATION
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)

TEP
TECHNICAL SUPPORT
(POLICY, POLICY, AND
TECHNICAL SUPPORT)



Corporate
Test
Program

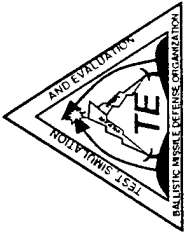


Infrastructure
&
Targets

Core
M & S



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BMDO/TER

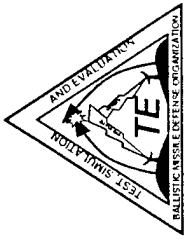
This chart shows the major Corporate T&E Program Objectives. Technology development and insertion insures the future performance of the T&E FoS; evaluating the performance of the individual systems, as well as the interoperability between systems is necessary to make deployment decisions.



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Corporate T&E Program Objectives

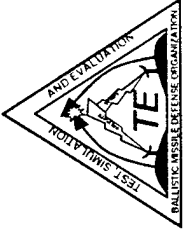
BMDO/TER



- Support Technology Development.
- Support of Technology Insertion for Evolutionary Acquisition in Spiral Development.
- Support of Systems Engineering for Interoperability and Other Family of Systems (FoS) Capabilities
- Characterization, Demonstration and Verification of Achievement of FoS Capabilities to Include Interoperability.
- Collection of Other Necessary Test Data, That Is Not Exclusively the Responsibility of an Individual MDAP



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BMD O/T

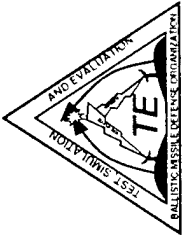
This schedule shows which programs will be tested -- where and when.

The schedule, although always in flux, none-the-less can be used as a basis to plan corporate target development programs, necessary range and GTF improvements, and sensor support



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MDAP T&E Execution



BMDO/TER

MDAP TESTING	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
NMD ¹ - KMR	1 2 3 4 IFT-3	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4 IOT&E	1 2 3 4	1 2 3 4 IFT-27	1 2 3 4	1 2 3 4	1 2 3 4 IFT-33
THAAD ² - WSMR - KMR					▲▲	▲▲	DT 5-6	DT/OT-1 (9-15 FTS)	IOTE (8-14 FTS)	DT/OT-2 (8-14 FTS)	FOT&E (6-8 FTS)
NTW ³ - PMRF		▲▲ FTR-1-7	▲▲		▲	DT/OA FTR-8-16			BLK 1B DT/OT		BLK 1C DT/OT FTR 29-33
PAC-3 ⁴ - WSMR - KMR	DT-7 IPT-6 HERA	DT-8-10 OT-1, 3, & 4									
Navy Area ⁵ - WSMR - PMRF	CTV-2	TBM-1-6 LB-1-3	DT(1-7), DT/OT(1-4), & OT(1-4) Testing								
OTHER ⁶ - KMR - Wake Island - WSMR/VAFB		TCMP-3b SIT II	ABL II/SD, DRFT 1-4 & ERFT			EMD					

LEGEND

▲ Planned Flight Test

▲ TBD Flight Test Date

▲ Successful Flight Test

▲ Unsuccessful Flight Test

▲ Related flight Test Activity

¹ Data for FY00 provided from NMD JPO Calendar 22 June 00. FY01-07 from NMD SE IPT 18 Apr 00. Data for FY08-10 from NMD CARD as Feb 00.

² Data from the THAAD TEMP (Revision D) 22 Mar 00 & TTTC by SMDC for 26 June 00.

³ Data for FY00 provided by NTW Action Officer (AO) Meeting 31 May 00. FY01-10 from NTW CARD (Rev 2.0) 14 April 00 & Integration IPT 12 May 00.

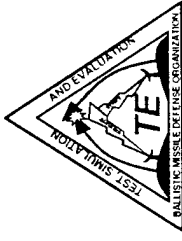
⁴ Data for FY00 provided by PAC-3 AO Meeting 1 June 00. FY01 from Patriot Program Office (PPO) 31 May 00.

⁵ Data from the Navy Area TEMP April 00 (Classified) & TTTC by SMDC for 26 June 00.

⁶ TCMP-3b Data from the TTTC produced by SMDC for 10 May 00. Notional SIT II data provided by FoS. ABL data from SMDC 26 June 00.



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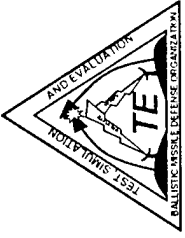
BMDO/TER

This chart shows some of the key integration test events that are part of the overall Corporate Test Program.

TCMP, SIT, and the Space Technology Research Vehicle were flight tests, the other tests involve modeling and simulation to include operators in the loop in the Joint Service Exercises. The chart also shows the BMDO Program focus for each test.



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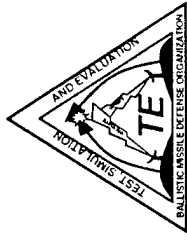
Corporate Test Program Overview

BMDO/TER

Data Collection Events	FY00	FY01	FY02	BMDO Programs							
				Phenomenology	Project Hercules	Technology Development	System Engineering	CINCP Assessments	Interoperability	MSS	
Hardware-in-the-Loop Tests (HWILT)	▲ 00a	▲ 01a ▲ 01b	▲ 02a ▲ 02b			●	●	●	●	●	
TMD Critical Measurements Program (TCMP)	▲ 3a	▲ 3b			●		●	●	●	●	
System Integration Test (SIT) II/Overlays			▲		●		●	●	●	●	
Transport Response Experiment (TREx)	▲ Phase 1	▲ Phase 2			●						
Space Technology Research Vehicle	▲				●	●	●				
TAMDI/ACTD	▲								●		
Wargames	JTBMD ▲	▲ NMD BMC3					●				
Joint Service Exercises	JP V ▲ RS	▲ FE RS ASCIET FE RS	▲ FE RS							●	●



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BMDO/TER

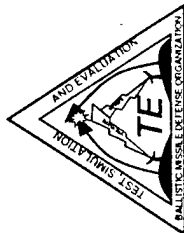
This chart depicts BMDO's primary HWIL facility - the JNTF.

The HWILT exercises focus on FoS interoperability assessments using a distributed, real-time data architecture.



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Hardware-In-The-Loop Using TMDSE Tool



BMDOT/ER

**THEATER MISSILE DEFENSE SYSTEMS EXERCISER
(TMDSE) IS...**

.... A Computer Based Hardware-in-the Loop (HWIL) Developmental Test Tool

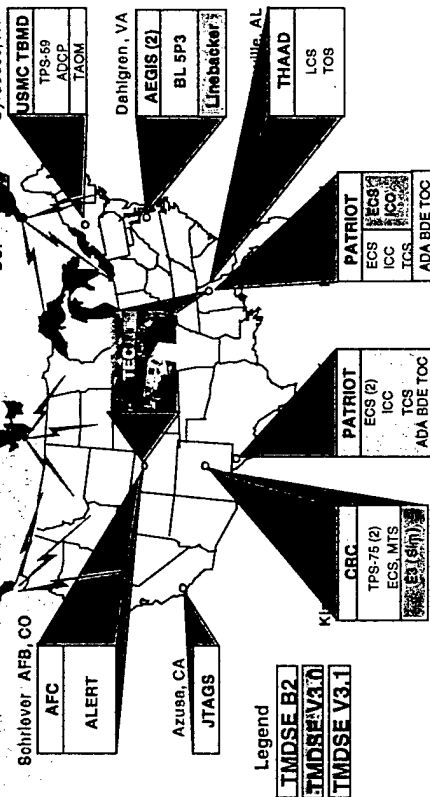
For Interoperability Assessment

Sensors
Tactical Processors
BM/C3

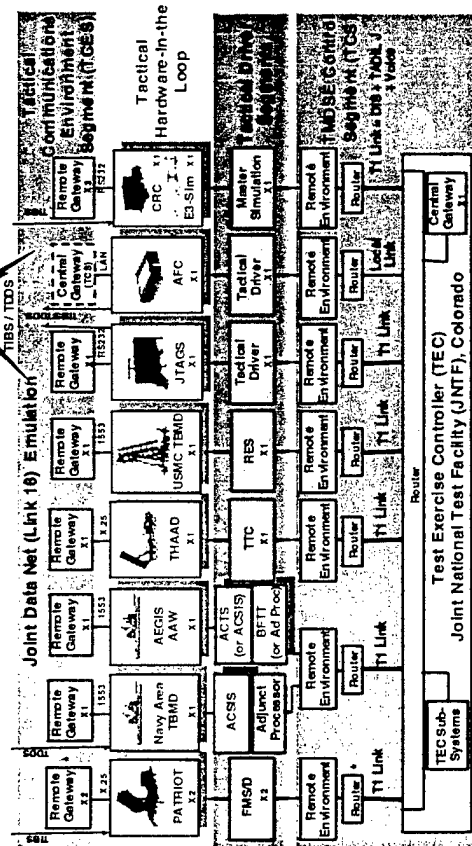
**Real Time, Dynamic, Interactive
Centrally Controlled From JNTF
Geographically Distributed Architecture**



BASELINED TMDSE B3 ARCHITECTURE

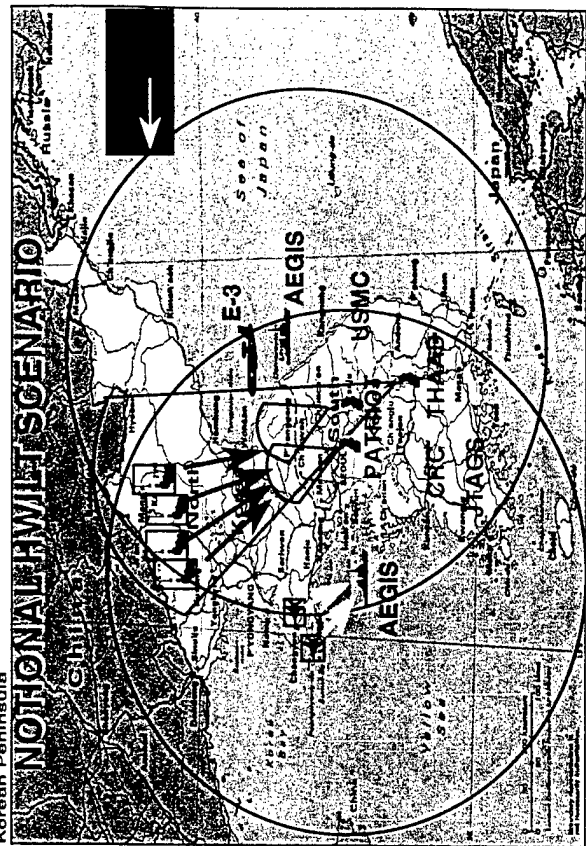


BASELINED TMDSE B3 ARCHITECTURE



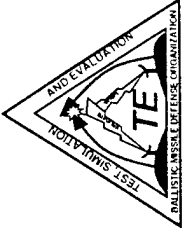
* Each Remote Boulder provides a connection (not shown) to the JON Gateway

NOT ON A WILT SCENARIO





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BMDO/TER

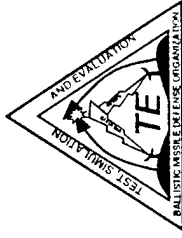
SIT II will be a major interoperability exercise, testing the ability of the MDAPs to work together during live fire tests.

The plan is to have four target flights, with three form Wake Island.. There will be two planned intercepts (Patriot and Navy Area).



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System Integration Test II (SIT-II)



BMDO/TER

Location / Time Frame / Scenario

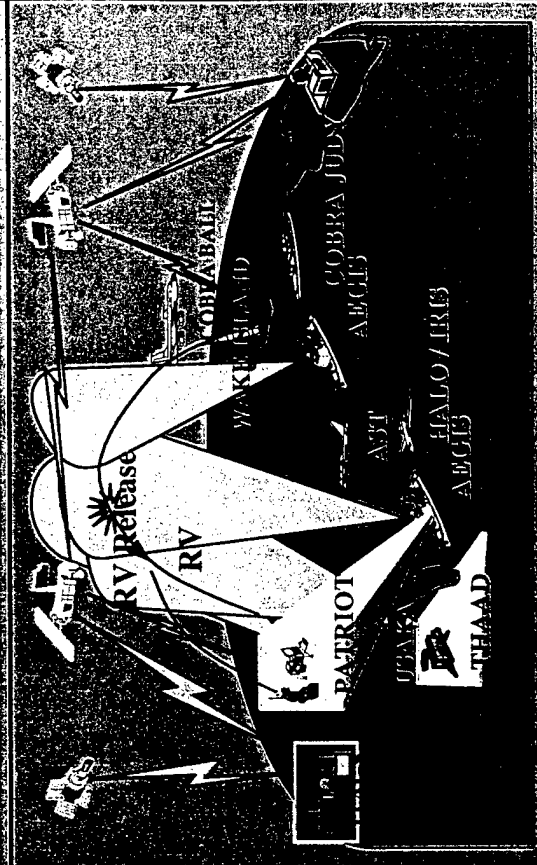
- 1QFY02
- Kwajalein Missile Range
- 4-6 Week Duration
- Multiple TBM Scenarios
- Threat Representative Targets
- Intercepts

Core Participants

- PATRIOT PAC-3
- Navy Area TBMD
- Navy Theater Wide
- THAAD
- Theater Event System (TIES)

BMDO Objectives

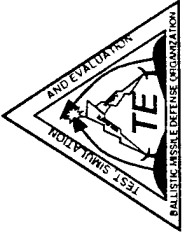
- Interoperability Assessment
- Model and Simulation Validation Data
- IMPACT 98 Lower Tier System Demonstration
- Target Characterization



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BMDO/TER

TCMP is both a BMC3 interoperability and countermeasures test. The forward sensors gather target /object data and the relay the target data to the other participants via JTADS, Link 16.

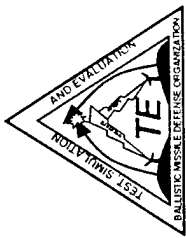
The live target data will later be used to validate threat models and discrimination algorithms.

The TCMP target consists of the aero-booster - SR-19 (2 stacks) -and a threat representative RV and countermeasures suite launching from Wake into KMR



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TMD Critical Measurements Program

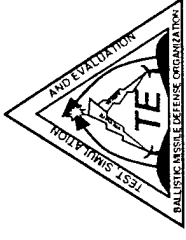


BMDO/TER

	Program Purpose Reduce Theater Missile Defense System Risks Through: - Threat Missile Emulation - Signature - Threats - Collateral Measurements - Assess - Posterior Complex, Stressing Target Scenes Comprehensive Radar & Optical Data Collection
TCMP Objectives TCMP3B - Provide a Common Data Collection Opportunity on a Threat Representative Medium Range Ballistic Missile - IMPACT 98 - Booster Segmentation and Liquefaction Pump Experiment TCMP4 - Provide a Common Data Collection Opportunity on a Threat Representative Short Range Ballistic Missile - Test Current and Currently Updated Version of the Threat - Off-Nominal Threat Scenario, With Separating EV Event	TCMP2B FASP Image



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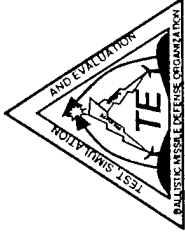
BMDO/TER

Before you can execute a Corporate Test Program, however, you need to plan for and fund the "test infrastructure." This is the Program that my Directorate within BMDO/TE is responsible for. It consists of ground test facilities, ranges and sensors, and targets. Collectively it is approximately a \$150M/year program or about 3-4% of the overall BMDO budget



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BMDO Test Infrastructure

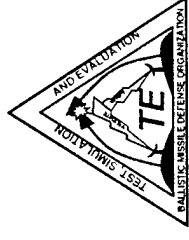


BMDO/TER

- Ground Test Facilities
- Ranges
- Mobile Sensors
- Targets



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BMDOTER

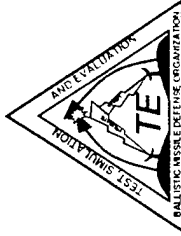
Before you can go to the range and conduct live flight testing as in SIT II and TCMP, a lot of interceptor developmental testing must be accomplished in the BMDO supported ground test facilities.

This chart shows the five main categories of ground testing: Nuclear Weapons Effects, Lethality, Aerodynamic Evaluation, Hardware/Software Evaluation and Sensor Characterization.

The chart also shows what kind of testing needs to be done at each stage in an interceptors flight and the BMDO supported test facilities that do the tests.

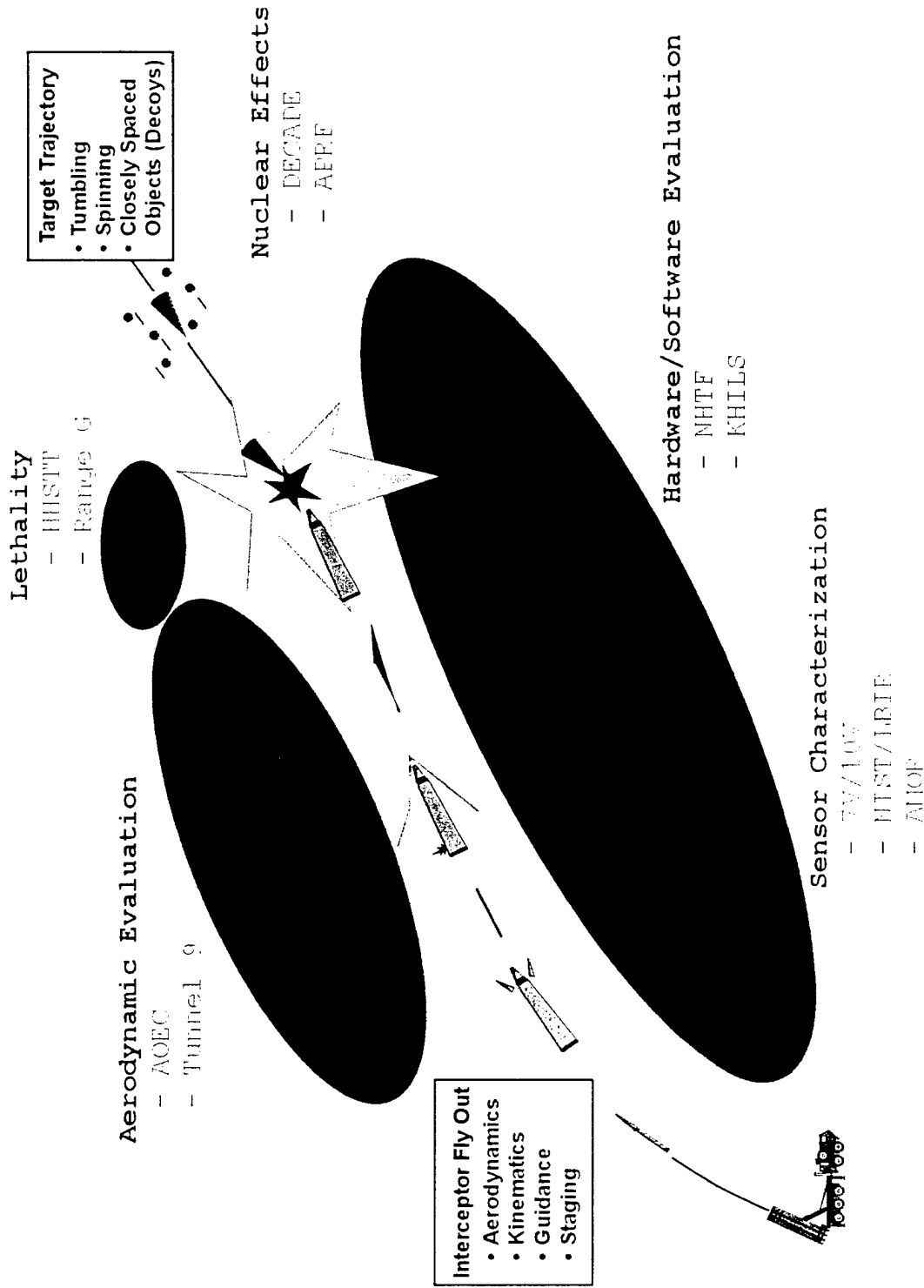


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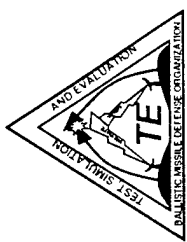
GTF Test Focus Areas

BMDO/TER





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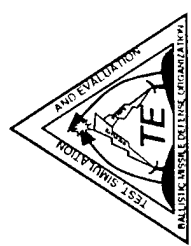
BMDO/TER

This chart shows the geographic locations of the BMDO sponsored ground test facilities, all located within the contiguous United States

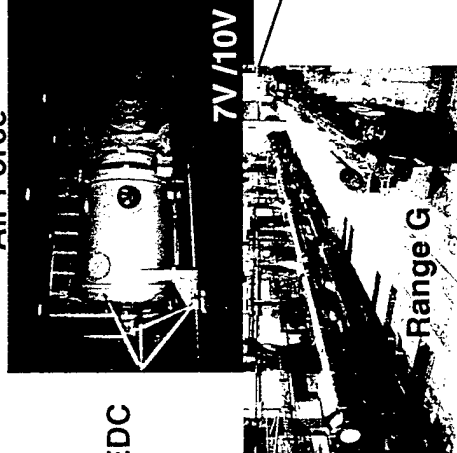


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BMDO Funded Ground Test Facilities



BMDO/TER
Tullahoma, TN
Air Force

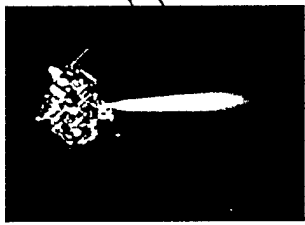
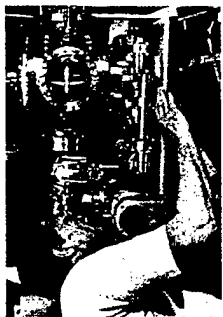


AEDC

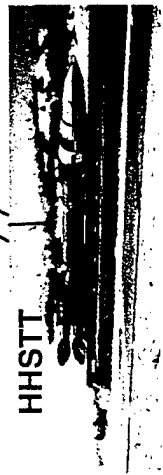
Buffalo, NY
Army



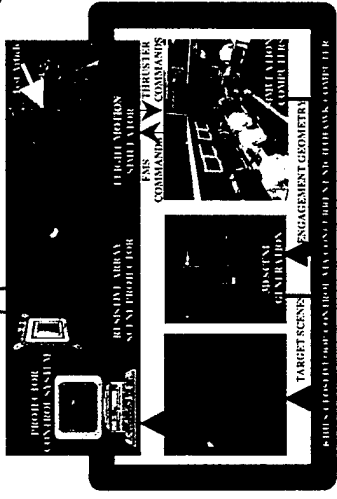
Gaithersburg, MD
Air Force



Edwards AFB, CA
Air Force



Holloman AFB, NM
Air Force



Eglin AFB, FL
Air Force



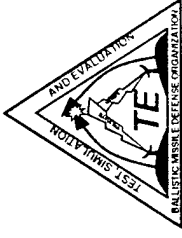
White Oak, MD
Air Force



Huntsville, AL ²⁵
Army



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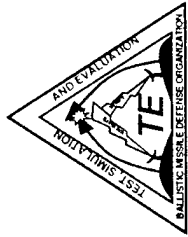
BMDO/TER

The developmental programs also use some ground test facilities that are not currently funded by BMDO

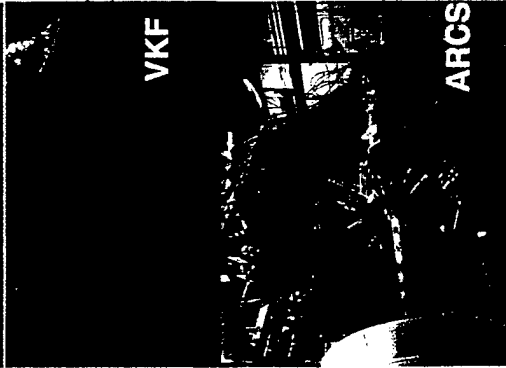


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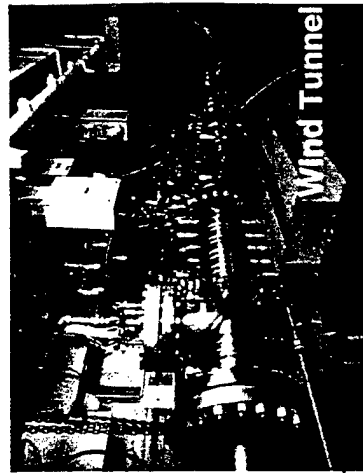
Other Ground Test Facilities Used By BMDO



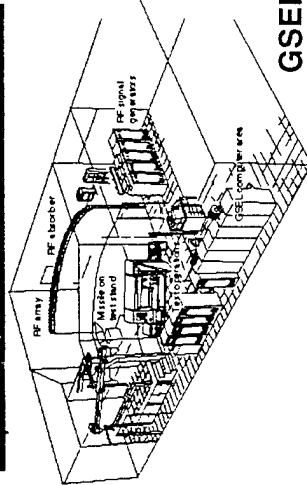
BMDO/TER



Aberdeen, MD
Army

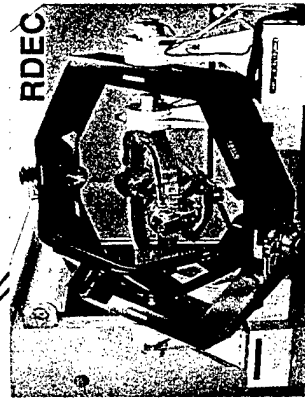


APL

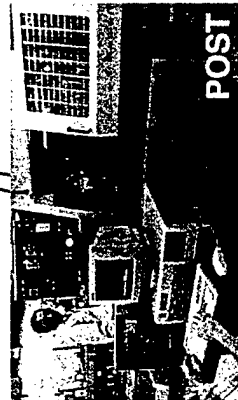


GSEL

Baltimore, MD
Navy



Huntsville, AL
Army

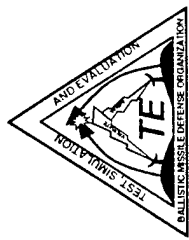


Tucson, AZ

Tullahoma, TN
Air Force

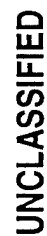


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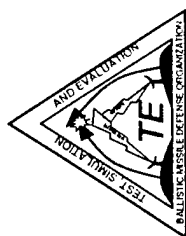


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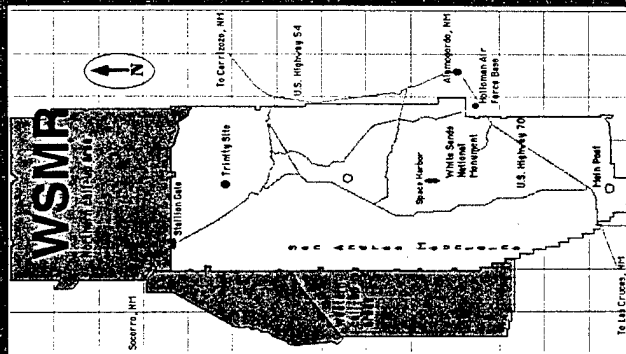
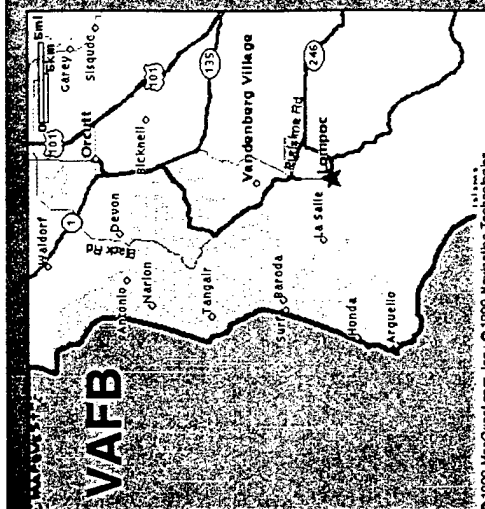
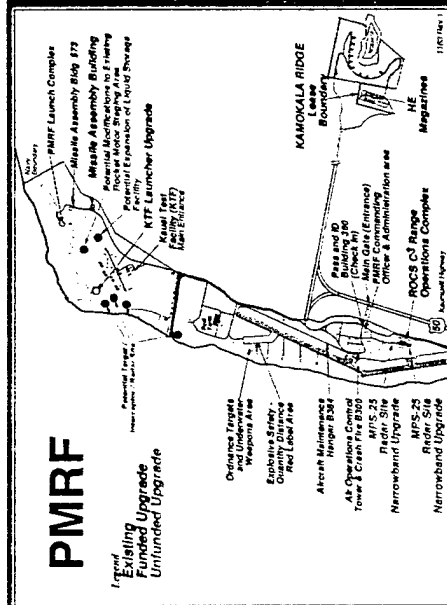
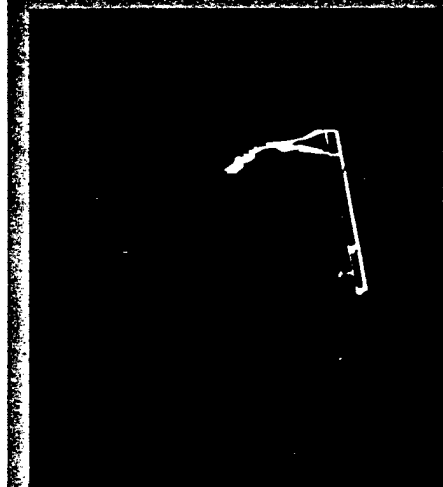
This chart shows the 6 main Ranges that BMDO uses and funds



BMDO Test Ranges & Launch Facilities

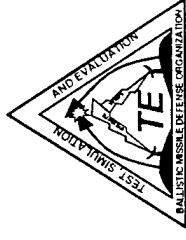


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This chart shows the four main BMDO funded auxiliary assets used within the BMDO test infrastructure:

HALO, AST, NP-3, and SLBD

Halo and AST are multi-wavelength optical collection platforms that can collect data from the visible to the LWIR bands.

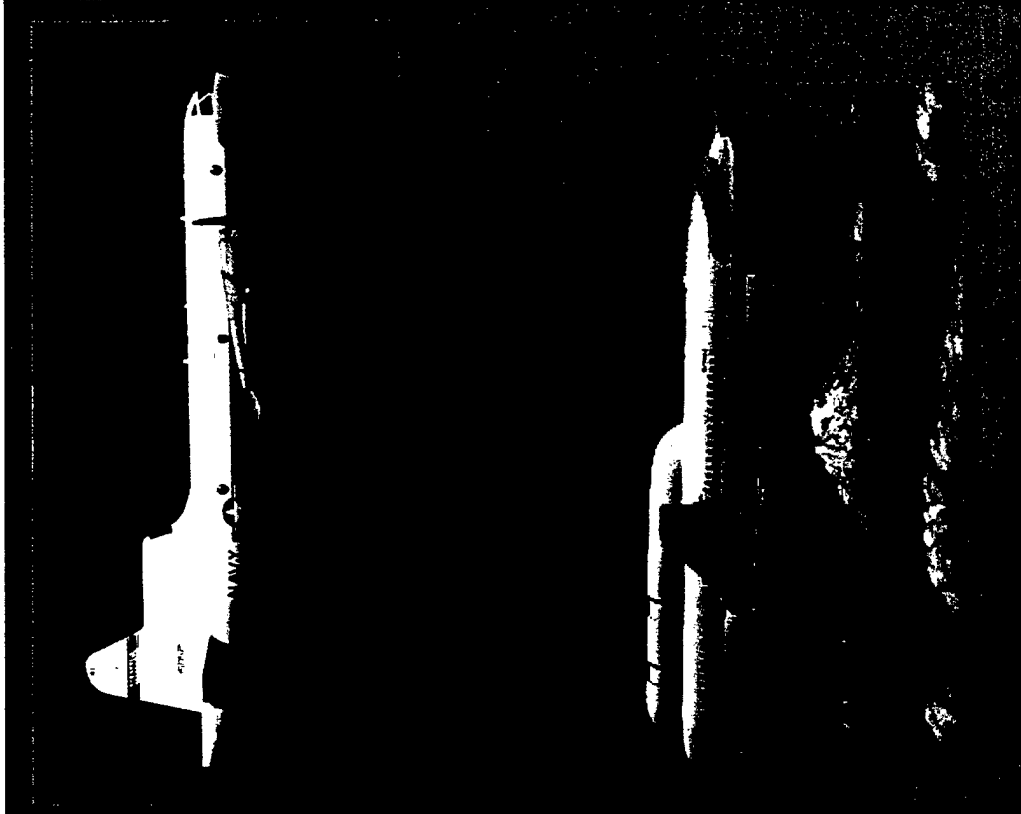
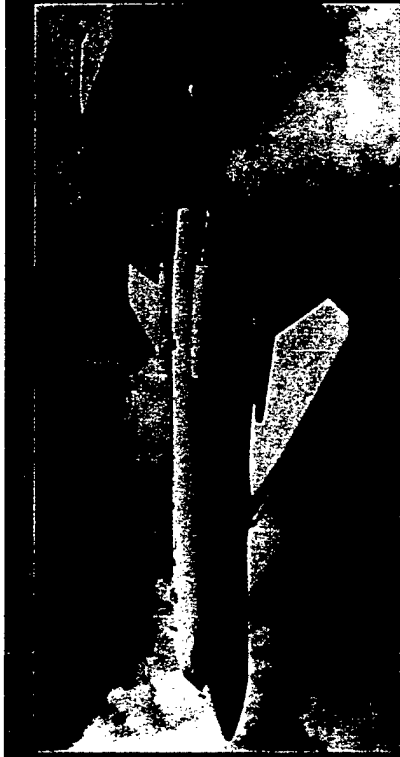
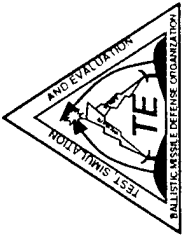
NP-3 is a range safety and telemetry collection platform. SLBD is an optical system used at WSMR



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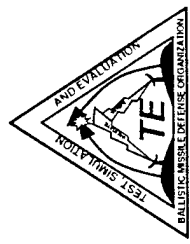
BMDO Auxiliary Assets

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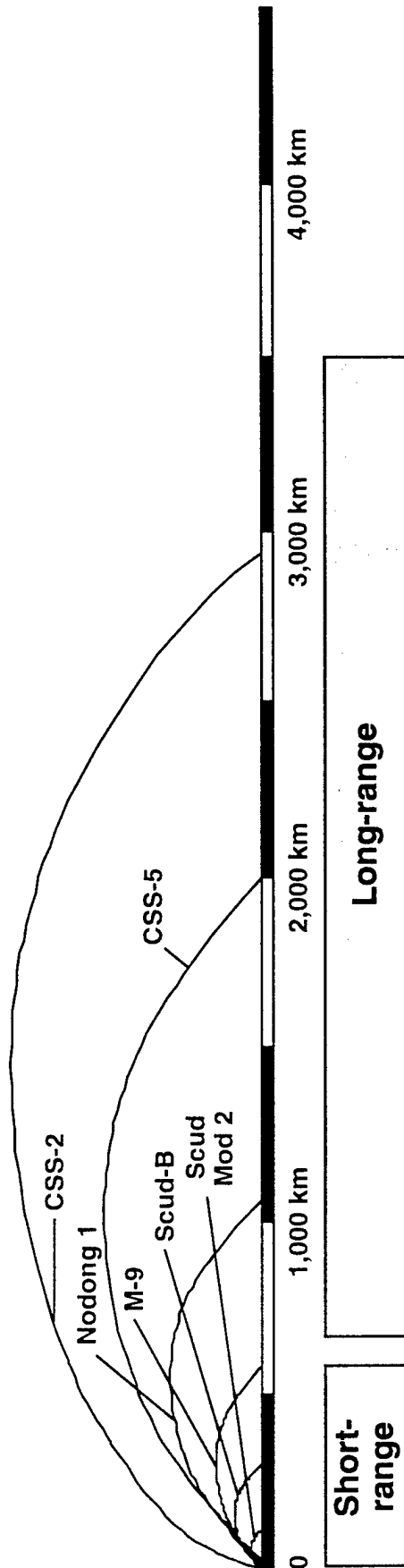
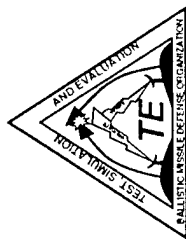
BMDO is DOD's Reliance head for all ballistic missile targets. This chart shows various targets types along the bottom and their associated range.



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Available Target / Threat Range Comparisons

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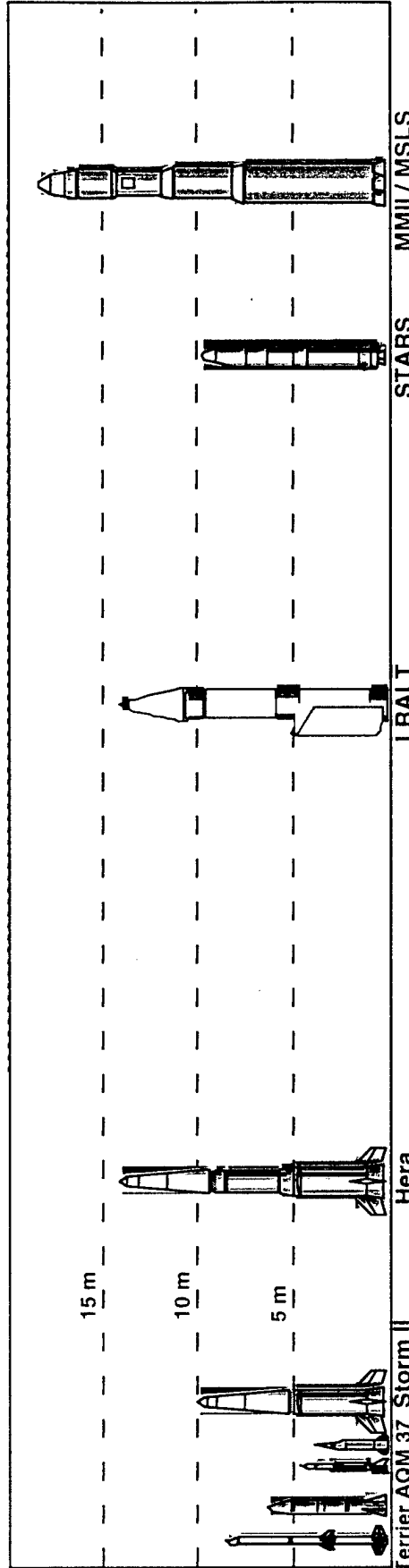


20 m

15 m

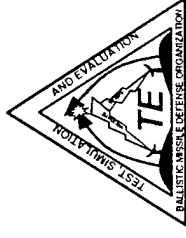
10 m

5 m





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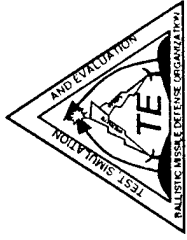


BMDOTHER

This chart shows the targets which are currently new developments within BMDO. The mobile targets (LRALT and SRALT) will allow BMDO to test scenarios which are not tied to specific ground launch locations and launch azimuths. The liquid fueled target will be used for BPI and ABL testing



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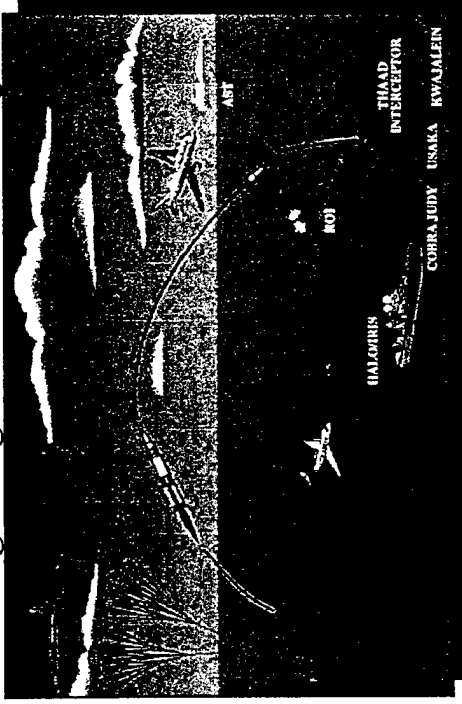


Emerging Target Requirements

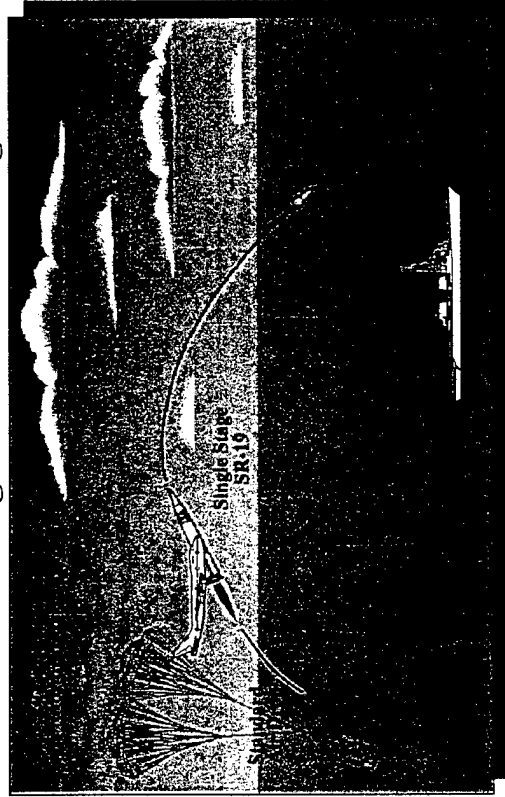
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- **Short Range Air Launch Target**
 - Single Stage Threat Representative Target (SR-19)
 - Air Dropped From C-130
- **Long Range Air Launch Target**
 - 2 Stage Threat Representative Target (SR-19)
 - Air Dropped From C-17
- **Liquid Fueled Target**
 - New 3-year Target Development / Demonstration
 - Threat Representative Boost / Ascent Phase

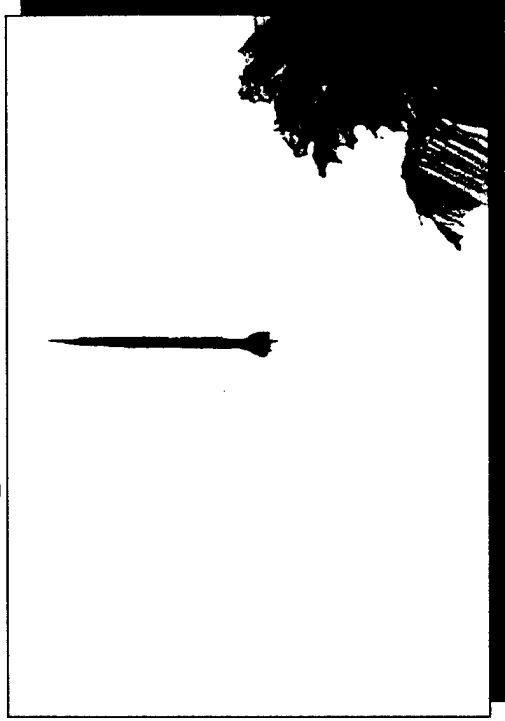
Long Range Air Launch Target



Short Range Air Launch Target

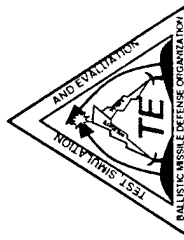


Liquid Fueled Target





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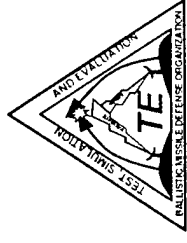


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This chart lists some of the key test infrastructure issues that BMDO is currently wrestling with.



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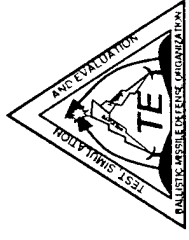
BMD Test Infrastructure Issues

BMDO/TER

- Targets
 - Liquid Fueled Targets
 - Long Range Air-Launched Targets
 - Countermeasures
- Ground Test Facilities
 - ENDO Atmospheric Intercepts
 - 2&3 Color Seekers
 - Nuclear Weapons Effects Testing
 - High Velocity Impacts (+10 Mach)
- Ranges
 - L-Band Telemetry
 - NMD VS TMD
 - Exo-Atmospheric Intercepts
 - Debris Models
- Ranges
 - X-Band Radars
 - IR Data Collection & Captive Carry
- SIL/HWIL
 - Model fidelity
 - Hardware/Software interface
- Environmental
 - Environmental Assessments
 - Environmental conditions
- Corporate Test Program
 - FoS Testing
 - Future TCMP/SIT



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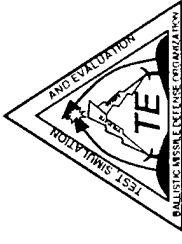


BMDOTER

In Summary, the BMDOTER Program is structured to support the MDAP test programs, conduct FoS testing at the Corporate level, and fund a common use test infrastructure to get the biggest bang from our test bucks



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Summary

BMDO/TER

- Given MDAP Needs and Interoperability Requirements, We Strive to Develop and Maintain a Tailored and Appropriate Test, Simulation, and Evaluation Strategy Which:
 - Provides Adequate Data Management and Collection Capabilities
 - Coordinates the Right Mix of Events (Flight Tests, Ground Tests, SITs, M&S, HWILTS, Etc...)
 - Assures Required Resources Are Available

**Ensure each dollar spent on testing
is a dollar spent for success**



2
1
1
1

Government Disclosure Authorization Form

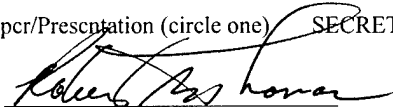
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PART I

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