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STRATEGIC SYSTEMS TEST SUPPORT STUDY (SSTSS)

Final Report
Volume III
Appendices (U)

November 1981

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Menlo Park, California 94025

for

The SSTSS Ad Hoc Executive Committee
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
(U) The Strategic Systems Test Support Study (SSTSS) (November 1979-September 1981) was performed by a tri-service ad hoc committee to deal with questions facing DoD concerning the future of terminal area test support resources. The study analyzed future requirements of strategic weapon testing and examined existing terminal area support resources. These resources included Kwajalein Missile Range (KMR) and mobile instrumentation aircraft and ships. Deficiencies and shortfalls were identified, and various alternatives were studied to arrive at (1) a contingency island location if political stresses force evacuation of KMR, (2) an

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20 ABSTRACT (Continued)

economically and operationally improved support aircraft resource posture, (3) a plan for reduced terminal area support ships, and (4) supplemental land-based instrumentation concepts to reduce the cost of broad ocean area test support provided by CONUS-based instrumentation aircraft. An implementation plan and budgetary requirements were also developed.

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GLOSSARY (U)

ABRES	Advanced Ballistic Reentry Systems
ALCM	air-launched cruise missile
ALCOR	ARPA-Lincoln C-band Observables Radar
ANT	Antigua (Island)
AOS	Army Optical Station
ARIA	advanced range instrumentation aircraft
ARIS	advanced range instrumentation ship
ASC	Ascension (Island)
ATA	adjunct terminal area
BMD	Ballistic Missile Defense (program)
BMO	Ballistic Missile Organization
BOA	broad ocean area
CHAT	Chatham (Island)
D^3	deploy, detect, and destroy
(D)ARPA	(Defense) Advanced Research Projects Agency
DASO	demonstration and shakeout
DOT	Designating Optical Tracker
DRSS	downrange support ship
DT&E	development testing and evaluation
ENNK	endoatmospheric non-nuclear kill
ER	extended range (now called BOA-3)
ERCS	Emergency Rocket Communications System

GLOSSARY (Continued) (U)

ESMC	Eastern Space and Missile Center (Cape Canaveral)
ETR	Eastern Test Range
FBM	Fleet Ballistic Missile (program)
FOV	field of view
GBI	Grand Bahama Islands
GLCM	ground-launched cruise missile
GPS-MAE	Global Positioning System Missile Accuracy Evaluator
HEL	high-energy laser
H&K	home and kill
HOE	Homing Overlay Experiments
IFSS-AVE	Instrumentation Flight Safety System-Airborne Vehicle Equipment
IOC	initial operating capability
IOT&E	initial operational test and evaluation
IP	impact point
IR	infrared
IRIG	Inter-range Instrumentation Group
ITA	instrumented terminal area
KMMS	Kwajalein Multistatic Measurement System
KMR(N)	Kwajalein Missile Range (North)
KREMS	Kiernan Reentry Measurements System
LASS	launch area support ship
LITE	laser infrared tracking equipment
LoAD	Low-Altitude Defense (program)
LOS	line of sight

GLOSSARY (Continued) (U)

LP	launch point
LWIR	long-wave infrared
MMW	millimeter wave
MX	Missile-X
NASA	National Aeronautics and Space Administration
NFL	new foreign launches
NNK	non-nuclear kill
OA	Optics Adjunct (program)
OT	operational test
OUSDRE	Office of the Undersecretary for Defense Research and Engineering
PBV	post-boost vehicle
PD	probability of detection
PENAIDS	penetration aids
PMR	Pacific Missile Range
PRD	Program Requirements Document
RB	reentry body (Navy)
RCS	radar cross-section
R&D	research and development
RF	radio frequency
RV	reentry vehicle (Army and Air Force)
SAC	Strategic Air Command
SIOP	Strategic Integrated Operations Plan
SLBM	surface-launched ballistic missile
SLTA	Supplemental Land-Based Terminal Area (Antigua in this appendix)

GLOSSARY (Concluded) (U)

SMILS	Sonobuoy Missile Impact Location System
SPADATS	Space Detection and Tracking System
SSTS(S)	Strategic System Test Support (Study)
TASS	terminal area support ship
TOO	target of opportunity
VAFB	Vandenberg Air Force Base
WSMC	Western Space and Missile Center
WTR	Western Test Range

PREFACE

(U) These appendices to the Strategic Systems Test Support Study (SSTSS) Final Report summarize the test range support requirements for downrange and terminal areas of the principal Air Force and Navy ballistic missile programs and Army Ballistic Missile Defense (BMD) programs. Since these support requirements were used as a basis for the SSTSS analysis, it was necessary to freeze them about mid-way through the study. These requirements are based on user-provided material, were reviewed by the respective program offices, and therefore represent the best estimate of user needs as of December 1980. In referring to these requirements, the reader should recognize that some programs needs are still evolving (particularly the Air Force MX and Navy Advanced TRIDENT) and may currently be different from the requirements as stated herein.

Appendix A

U.S. AIR FORCE BALLISTIC MISSILE TEST SUPPORT REQUIREMENTS (U)

(U) This appendix describes in detail the test support requirements for the following Air Force ballistic missile programs:

- (U) MX Flight Tests (DT&E and IOT&E)
- (U) MX Post-IOC (OT&E)
- (U) MINUTEMAN II OT&E
- (U) MINUTEMAN III OT&E
- (U) ABRES R&D.

(U) Launch area support requirements are not included here because the scope of the SSTSS was constrained to downrange and terminal area test support. Technical parameters that are not provided were either not available at the time of this study or were not considered a driving requirement for the SSTSS and were not pursued.

(U) Requirements for the MX, particularly OT&E, are still undergoing refinement; however, it was necessary that they be frozen (December 1980) for purposes of defining SSTSS support alternatives and resource workloads.

(U) References are listed following the test support requirements for each missile program.

(U) Table A-1 shows the locations of the Pacific terminal areas to be used for the MX program.

MX Flight Tests (DT&E and IOT&E) (Continued) (U)

- Technical requirements (Continued)

- Radar signature	Not required
- Optics	Not required
- Meteorology	Not required

- Radar signature	Not currently required, but may be required if PENAIDS developed
Simple RF	Required for PENAIDS
Complex RF	Required for PENAIDS
- Optics	Streak photography, 7 km to impact
- Recovery	Not required

MX Flight Tests (DT&E and IOT&E) (Continued) (U)

- ITA technical requirements[1] (Continued)

- Radar signature	Not required
- Optics	Simple streak photography, 7 km to impact
- Recovery	Not required

* (U) See Figure A-2 for appropriate antenna gain profiles.

FIGURE A-2 MX MK-12A RV ANTENNA GAIN PROFILE

MX Flight Tests (DT&E and IOT&E) (Continued) (U)

- BOA technical requirements (continued)

- Meteorology	Desired if available
Maximum altitude	Rawinsonde
Characteristics	Rawinsonde
Cloud characterization	Rawinsonde
- Data relay	Not required (desired if cost effective)

(U) Summary of SSTSS Driving Requirements

- Long ranges (minimum V-γ greater than range to Phoenix Island)
- Multiple BOAs required (BOA-1, -2, and -3)
- Requirement for simultaneous terminal areas: BOA-1 and -2.

(U) Testing Restrictions and Flexibility

- Range safety restriction will not permit use of KMR until MDPS is operational.
- SLTA may be used in lieu of BOA-1 and BOA-2 on some flight tests when available.
- Chatham Island may be used instead of BOA-1.
- MX testing constrained to Pacific due to extreme cost of launch-head relocation.

REFERENCE (U)

(1) SSTSS Requirements Profile, 18 April 1980

2. MX Post-IOC (OT&E) (U)

(U) Mission/Test Objectives[1]

- Evaluate weapon system accuracy
- Evaluate weapon system reliability

(U) Test Area

- Pacific test range
- Targets are still being negotiated but will include areas of BOA-1, BOA-2, KMR, and possibly BOA-3 as proposed for MX Flight Tests.

MX Post-IOC (OT&E) (Continued) (U)

(U) Midcourse Support

- Telemetry will be required in midcourse to support missile accuracy tests only if GPS-MAE* is developed.
- Technical requirements[2]

- Metric	Not required
- Telemetry	Not required unless GPS-MAE used

* (U) GPS-MAE is the Global Positioning System Missile Accuracy Evaluator being investigated by the Air Force. This program was recently discontinued.

MX Post-IOC (OT&E) (Continued) (U)

- ITA technical requirements* (Continued)

Characteristics	Standard rawinsonde
Cloud characterization	Not required
- Data relay	Desired if cost-effective
• BOA technical requirements	
- Number of simultaneous terminal areas	Up to 2 (BOA-1, -2)
- Metric	Not required

* (U) See Figure A-2 for appropriate antenna gain profiles.

MX Post-IOC (OT&E) (Continued) (U)

- BOA technical requirements (Continued)

Scoring aids Scoring area	None
- Radar signature	Not required
- Optics	Streak photographic for RV integrity, 7 km to impact
- Recovery	Not required
- Meteorology	Not required
- Data relay	Desired if cost-effective

* (U) See Figure A-2 for appropriate antenna gain profiles.

MX Post-IOC (OT&E) (Concluded) (U)

- Terminal area usage[3] (Continued)
  - Mission design distribution of IRVs

BOA-1 or BOA-2	55% of launches into single BOA
BOA-1 and BOA-2	30% of launches into dual BOAs
KMR	15% of launches
BOA-3	0% of launches (unless requirements evolve)

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS User Program Requirements Summary

(3) Communication with OPR: HQSAC/XPQ representative, 28 August 1980

3. MINUTEMAN II OT&E (U)

(U) Mission/Test Objectives[1]

- In accord with JCS guidance, obtain flight test data to determine accuracy and reliability of the operational weapon system for use in SIOP targeting.
- Identify weapon system deficiencies/degrades; ensure that the weapon system continues to meet specifications.
- Flight test system hardware and software.

MINUTEMAN II OT&E (Continued) (U)

(U) Test Area[1]

- All missiles are selected from the operational force, shipped to VAFB, outfitted with necessary test instrumentation, and repostured to alert configuration in a Vandenburg launch facility of the same weapon system configuration as the operational base. (There are two different weapon system configurations which use the MINUTEMAN II missile.)
- MINUTEMAN II launches are of two major types: those with Mark-11C test RVs targeted for the Kwajalein Lagoon, and those with Emergency Rocket Communications System (ERCS) payloads targeted for the BOA (primary purpose is to test the ERCS transmitter in a flight environment). Normally, one Mark-11C launch per year will use penetration aids.
- Since the Mark-11C test RVs are not instrumented (no transponder or telemetry package), the Vandenburg-to-Kwajalein trajectory is ideal. It allows midrange tracking with AMOS and the WSMC FPQ-14 radar. (Midrange trajectory data obtained is used with down-range skin track and photo/video metric data to obtain accurate pierce point.) It allows use of KREMS radar for downrange skin tracking. The shallow lagoon allows recovery of the recorder package after impact.

(U) Midcourse Support[1]

- Midcourse metric data are acquired when available for accuracy assessment Mark-11C RVs. These data are presently provided by Hawaii-based systems.
- Technical requirements

- Telemetry	Not required
- Radar signature	Required only for PENAIDs
- Optics	Not required
- Meteorology	Not required
- Data relay	Not required

MINUTEMAN II OT&E (Continued) (U)

(U) Summary of SSTSS Driving Requirements

- Recovery of RV instrumentation package (requires shallow water).
- Occasional PENAIDS signature measurements (complex radars).
- Booster range/throwweight (limits maximum range to mid-Pacific ITAs).

REFERENCES (U)

(1) SAC Working Paper extracting PRD A1A02, PTR: HQ SAC/XPQO

(2) SSTSS Meeting Minutes, 17-21 March 1980

4. MINUTEMAN III OT&E (U)

(U) Mission/Test Objective

- Continuing tests to verify operational readiness and data bases of MINUTEMAN III forces.

(U) Test Area

- All missiles are selected from the operational force, shipped to VAFB, outfitted with necessary test instrumentation, and repostured to alert configuration in a Vandenburg launch facility of the same weapon system configuration as the operational base.

(U) Midcourse Support

- No requirements have been identified.

(U) Terminal Area Support[1]

- One ITA is required.

MINUTEMAN III OT&E (Continued) (U)

- Shallow-water recovery is required for bottom clean-up.
- Land impact is required for some tests of fusing.
- ITA technical requirements.

- Radar signature	
Simple RF	Not required
Complex RF	Required on PENAID launches
- Optics	Metric to 50 mrad, still photographic documentary of land impact
- Recovery	Not required (clean up only)

MINUTEMAN III OT&E (Concluded) (U)

- ITA technical requirements (Continued)
  - Meteorology

Characteristics	Pressure, temperature, relative humidity, density, and wind
Cloud Characterization	
- Data relay	None indicated
• BOA technical requirements	None

(U) Test Schedule[2,3]

FY	MK-12	MK-12A	Total
1980	6	2	8
1981	2	5	7
1982	3	4	7
1983	3	4	7

Seven missions estimated per year after 1984.

(U) Summary of SSTSS Driving Requirements

- Land impact required for fusing
- Multiple object scoring, telemetry, and metrics
- Occasional PENAIDS signature (complex radar data)
- Operational realism
- Booster range/throwweight.

(U) Testing Restrictions and Flexibility

- ITA required
- No BOA requirements
- Land impact for fusing.

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Meeting Minutes, 17-21 March 1980

(3) SAC MMIII PRD HIHOS, 25 October 1979

5. **ABRES R&D** (U)

(U) Mission/Test Objectives[1]

- Evaluate functional performance of new fusing, maneuvering, inertial guidance, and terrain mapping subsystem components.
- Evaluate aerothermodynamic behavior of new nosetip, heat shield, and antenna window materials used to survive the reentry environment.
- Demonstrate preprototype design concepts for potential new reentry vehicles.
- Evaluate potential reentry discriminates and evaluate penetration aids countermeasures.

(U) Midcourse Support

- Telemetry reception of the deployment functions is desired at midcourse. Telemetry reception based on Hawaii should be sufficient for all launches terminating in the Pacific.
- Technical requirements[1]

- Metric	
Number of objects	0 to 14
Coverage	AOS to LOS
Radar cross-section	
Position accuracy	
Pierce point	
- Telemetry	Not required
- Radar signature	
Simple RF	Target discrimination
Complex RF	

ABRES R&D (Continued) (U)

- Technical requirements[1] (Continued)

- Optics	AMOS on "HAVE" Project
- Meteorology	From AMOS
- Data relay	From Hawaii to KMR

(U) Terminal Area Support[1]

- The ABRES payloads are projected to normally be targeted east of the Kwajalein Lagoon within the range safety corridor. In specific instances, it is sometimes necessary to target a payload into the lagoon (recovery) or north of Roi Namur to the desired observation aspect angle with respect to a particular sensor.
- ITA technical requirements[1]

Characteristics	Winds, temperature, humidity, moisture content, pressure
Cloud Characteristics	Yes
- Data relay	Desired if cost-effective

ABRES R&D (Concluded) (U)

• BOA technical requirements	BOA impact confirmation for RVs carrying radioactive materials

ABRES continued RV technology development through FY 2000 not budgeted.

(U) Summary of SSTSS Driving Requirements[2]

- Complex terminal signature data
- Detailed meteorological data
- Booster range/throwweight
- Future terminal guidance.

(U) Testing Restrictions and Flexibility

- ABRES serves as TOO for BMD programs.

REFERENCES (U)

(1) SSTSS Requirement Profile, 18 April 1980

(2) SSTSS Phase 1 Briefing, June 1980

Appendix B

U.S. ARMY BALLISTIC MISSILE DEFENSE TEST SUPPORT REQUIREMENTS (U)

(U) This appendix contains detailed descriptions of the test support requirements for the following Army Ballistic Missile Defense (BMD) test programs:

- (U) Designating Optical Tracker (DOT)
- (U) Ground-Based Optics
- (U) Shuttle Experiments
- (U) Low-Altitude Discrimination
- (U) ALCOR MMW Augmentation
- (U) Multistatic Discrimination
- (U) Optical Aircraft Measurements
- (U) Homing Overlay Experiments (HOE)
- (U) Optics Adjunct (OA)
- (U) Signature Measurement Radar
- (U) Low-Altitude Defense (LoAD)
- (U) Endoatmospheric Non-Nuclear Kill (ENNK) Technology Development
- (U) Rapid Deployment
- (U) PERSHING II
- (U) Space Detection and Tracking System (SPADATS).

(U) Technical parameters that are not provided in these summaries were either not available at the time of this study or were not considered a driving requirement for the SSTSS and were not pursued.

1. Designating Optical Tracker (DOT) (U)

(U) Mission/Test Objectives[1]

- The DOT missions between 1976 and 1981 or 1982 are to obtain data fundamental to LWIR EXO BMD functions, including designation and tracking with realistic conditions (target, geometry, and environment).

(U) Test Area[1]

- DOT probes have been scheduled for launch from Roi Namur (KMR) toward targets of opportunity (TOO) provided by other test programs entering the KMR terminal area.

(U) Midcourse Support

- Midcourse tracking of the TOO is required to provide pointing data (IRV).
- Technical requirements[2]

Bit-error rate	
Modulation	PCM/FM
Frequency	
Bit rate	
Transmitter power	
- Radar signature	Not required
- Optics	Not required
- Meteorology	Not required
- Data relay	IRV and deployment functions

(U) Terminal Area Support

- Complex signature data required
- TOO required

Designating Optical Tracker (DOT) (Continued) (U)

- ITA technical requirements[2]
  - Metric

Characteristics	Winds for LCHR setting
Cloud characterization	Satellite data under entire TOO trajectory
- Data relay	Target radar tracking
• BOA technical requirements	Recovery of sensor

Designating Optical Tracker (DOT) (Concluded) (U)

(U) Summary of SSTSS Driving Requirements

- Complex radar signature data
- Operational realism requires extended terminal area geometries
- Computational hardware and software to provide real-time position and status of TOO and sensor.

(U) Testing Restrictions and Flexibility

- Requires TOOs from other programs
- Real-time flight safety for Flight 5 (FY81), command from KMR.

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS User Program Requirements Summary Data Sheet

2. Ground Based Optics (U)

(U) Mission/Test Objectives[1]

- Obtain IR and laser data bases
- Demonstrate sensor functions.

(U) Test Area[2]

- Test missions can be conducted at ranges providing TOO
- KMR currently used.

(U) Midcourse Support

- Midcourse tracking data on TOO required for sensor pointing (handover)
- Technical requirements[1]
  - Metric

- Telemetry	Not required
- Radar signature	Not required
- Optics	Not required

Ground-Based Optics (Continued) (U)

- Technical requirements[1] (continued)
  - Meteorology — Not required
  - Data relay — Pointing and handover data

(U) Terminal Area Support[1,2]

- Present--Army Optical Station (AOS)
  - Target trajectory (KREMS radar) — Pre-mission, real-time, post-mission
  - Computer — Pointing, handover, etc.
  - Communications lines — Voice, IRIG time, high-speed data
  - Meteorological — Weather balloons (rawinsonde), rockets
  - Maintenance — Laboratory, spare parts
  - Base support — Personnel facilities, security, publications, calibration, photo processing, surveying, cryogenics, power, safety
- Near term--Laser Infrared Tracking Equipment (LITE)
  - Basically the same support requirements as at present
  - Voice/computer nets for advanced optics technology experiments
  - Special electronics and optics test equipment spares and facilities
  - Special targets
- Far term
  - Basically the same support requirements as at present
  - Portable/mobile platforms for collecting data at ground level (for installation at other islands)
- ITA technical requirements

  - Telemetry — Not required
  - Scoring — Not required

Ground-Based Optics (Concluded) (U)

- ITA technical requirements (continued)
  - Radar signature — Not required
  - Data relay — Pointing, handover data

(U) Test Schedule[2]

(U) Summary of SSTSS Driving Requirements

- Requires targets of opportunity
- Operational realism.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs.

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Meeting Minutes, 17-21 March 1980

3. Shuttle Experiments (U)

(U) Mission/Test Objectives[1,2]

- Obtain statistical optical data base under a wide variety of conditions on a wide variety of targets.
- Evaluate the effectiveness of exoatmospheric optics in BMD.

(U) Test Area

- Can operate in any test area providing TOO visible from sensor's orbit.

Shuttle Experiments (Concluded) (U)

(U) Technical Support Requirements[2,3]

- Only technical requirement is for reception of spacecraft downlink for command verification of housekeeping and sensor data.
- Metric — Not required
- Telemetry

  Data span
  Bit-error rate
  Modulation
  Frequency

  Transmitter power
- Scoring — Not required
- Radar signature — Not required
- Optics — Not required
- Recovery — Not required
- Meteorology — Not required
- Data relay — Not required

(U) Summary of SSTSS Driving Requirements

- None

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

X (2) SSTSS User Program Requirements, Summary Data Sheet

(3) SSTSS Phase 1 Briefing, June 1980

4. <u>Low-Altitude Discrimination</u> (U)

(U) Mission/Test Objectives[1]

- Determine metric and EM target signatures at low altitude
- Develop discrimination algorithms
- Evaluate discrimination effectiveness.

(U) Test Area

- To be used where TOO available
- Close-in targets with various aspect angles.

(U) Midcourse Support

- No technical requirements

(U) Terminal Area Support[1,2,3]

- Electromagnetic observables (body, wake)
- Metric observables
- Decoy studies
- Clutter and propagation effects
- Signature effects
  - Look-angle variation
  - RV construction details may affect signatures
  - Boundary layer and wake understanding
- ITA technical requirements
  - Metric

  - Telemetry
    - Number of objects TOO downlink
    - Data span
    - Bit-error rate
    - Modulation
    - Frequency
    - Bit rate
    - Transmitter power

Low-Altitude Discrimination (Continued) (U)

- ITA technical requirements (continued)
  - Scoring — Not required
  - Radar signature
  - Data relay
- BOA technical requirements — None

(U) Test Schedule[1]

Start FY80	DELCO range firings
FY80 on	Simulation of X-band signatures
FY80 on	Interpolation from L- and C-bands
February 1981	SMR data base
1982 (or later)	High-quality X-band base

(U) Summary of SSTSS Driving Requirements

- Complex terminal radar signature data
- Targets of opportunity
- Variable (including low) aspect angles that necessitate close-in targeting and therefore remote sensors at unpopulated locations.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Safety restraints on sensor locations.

Low-Altitude Discrimination (Concluded) (U)

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980
(2) SSTSS User Program Requirements Summary Data Sheet
(3) SSTSS Phase 1 Briefing, June 1980

5. ALCOR MMW Augmentation (U)

(U) Mission/Test Objectives[1]

(U) Test Area

- Installation has been proposed for KMR ALCOR

(U) Midcourse Support

- None required

(U) Terminal Area Support[1,2,3]

- ALCOR to serve as acquisition source and processor
- Needs TOO to collect data base
- ITA technical requirements

ALCOR MMW Augmentation (Continued) (U)

- ITA technical requirements (continued)
  - Metric

Number of objects	One (TOO)
Coverage	
Radar cross-section	TOO
Position accuracy	
On-board tracking aids	TOO
Pierce point	Required

- ITA technical requirements (Continued)

- Telemetry	Not required
- Radar signature	
Simple RF	Required of TOO
Complex RF	Required of TOO
- Optics	Required of TOO
- Recovery	Not required
- Meteorology	
Maximum altitude	
Characteristics	Rawinsonde (real-time)
Cloud Characterization	
- Data relay	Acquisition from ALCOR
• BOA technical requirements	None

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- Requires TOO from other programs
- Colocation with ALCOR.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Colocation with ALCOR.

ALCOR MMW Augmentation (Concluded) (U)

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS User Program Requirements Summary Data Sheet

(3) SSTSS Phase 1 Briefing, June 1980

6. Multistatic Discrimination (U)

(U) Mission/Test Objectives[1,2]

- Improved measurement accuracy
- Multistatic discrimination data base
- Candidate non-nuclear kill testbed.

(U) Test Area[1]

- Ongoing at KMR (Figures B-1 and B-2)

(U) Midcourse Support

- No requirements

(U) Terminal Area Support[1,2,3]

- Requires metric, signature, and meteorology data
- ITA technical requirements

- Metric	
Number of objects	One (TOO)
Coverage	Pierce point to 0 km
Radar cross-section	TOO
Position accuracy	
Pierce point	
- Telemetry	Not required
- Scoring	Not required
- Radar signature	
Simple RF	Required of TOO
Complex RF	Required of TOO
- Optics	Required of TOO
- Recovery	Not required
- Meteorology	Standard soundings
- Data relay	From other KMR assets

- BOA technical requirements: None

Multistatic Discrimination (Concluded) (U)

(U) Test Schedule[2]

- Continuing from 1980

(U) Summary of SSTSS Driving Requirements

- Requires TOO from other programs
- Close in targeting and variable aspect angles
- Large test complex geometry to accommodate long base-lines for accuracy.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Requires data from other test range assets.

REFERENCES

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS User Program Requirements Summary Data Sheet

(3) SSTSS Phase 1 Briefing, June 1980

7. Optical Aircraft Measurements (U)

(U) Test Area[1]

Currently planned to be supported by Cobra Judy and KMR assets, such as Low-Altitude Discrimination, MMW, and Multistatic Discrimination.

(U) Midcourse Support[1,2,3]

- TOO pointing and handover data are required
- Technical requirements

  - Metric

Number of objects	One (TOO)
Coverage	
Radar cross-section	TOO
Position accuracy	
On-board tracking aids	TOO

Optical Aircraft Measurements (Continued) (U)

- Technical requirements (continued)

- Telemetry	Not required
- Radar signature	Not required
- Optics	Not required
- Meteorology	Not required
- Data relay	Pointing and handover

(U) Terminal Area Support[1,2,3]

- Requires pointing data and signature data.
- ITA Technical Requirements

- Telemetry	Not required
- Scoring	Not required
- Radar signature	
Simple RF	Required of TOO
Complex RF	Required of TOO
- Optics	High resolution of TOO
- Recovery	Not required
- Meteorology	Not required

- BOA technical requirements — None

(U) Test Schedule[1]

(U) Summary of SSTSS Driving Requirements

- Requires TOO from other programs
- Coordination with other range assets.

Optical Aircraft Measurements (Concluded) (U)

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Coordination with other range assets.

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS User Program Requirements Summary Data Sheet

(3) SSTSS Phase 1 Briefing, June 1980

8. Homing Overlay Experiments (HOE) (U)

(U) Mission/Test Objectives[1]

- Develop Exo-NNK capability
- Assess NNK lethality.

(U) Test Area[2]

- Launch from Meck and VAFB (Figures B-3 and B-4).

(U) Midcourse Support[1,2]

- Requires pointing data at midcourse to be relayed to terminal area.
- Technical requirements[1,2]

On-board tracking aids	TOO
Pierce point	
- Telemetry	
Number of objects	TOO
Data span	
Bit-error rate	
Modulation	TOO

Homing Overlay Experiments (Continued) (U)

- Technical requirements[1,2] (continued)
  - Telemetry (continued)

Frequency	TOO
Bit rate	TOO
Transmitter power	TOO

- Radar signature	Not required
- Optics	Not required
- Meteorology	Not required
- Data relay	Pointing data

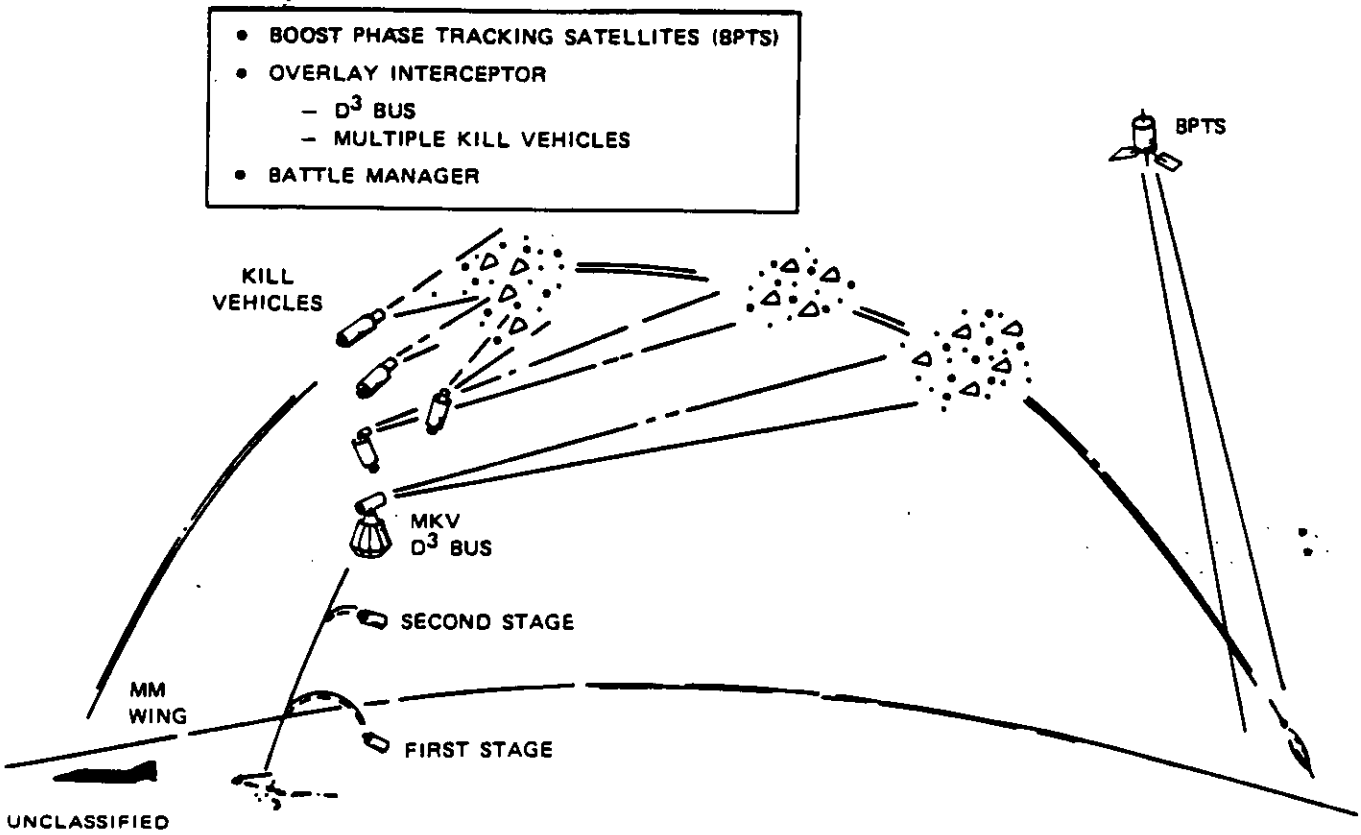

FIGURE B-3 (U) OVERLAY DEFENSE

Homing Overlay Experiments (Concluded) (U)

- ITA technical requirements (continued)
  - Data relay — Pointing data from midcourse and other assets
- BOA technicalBOA may be required in the future; requirements currently not scheduled or funded

(U) Summary of SSTSS Driving Requirements

- Targets of opportunity
- Interceptor flight te · and safety constraints
- Geometric diversity sensor and kill assessment
- Midcourse metrics and target deployment verification
- Operational realism requires large island-complex geometries.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs (MINUTEMAN I PBV employed)
- May require BOA in future (not scheduled or funded).

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Meeting Minutes, 17-21 March 1980

9. Optics Adjunct (OA) (U)

(U) Mission/Test Objectives[1]

- Atmosphere and earth limb measurement flights
  - Characterize the background for various times of the day/year, weather conditions, and viewing elevations/azimuth.
  - Observe, analyze, and compensate for platform-induced sensor degradation (vibration and optics contamination).
  - Collect data in CONUS as well as KMR (desirable).

Optics Adjunct (OA) (continued) (U)

- Search and acquisition flights
  - Demonstrate capability to acquire targets.
  - Utilize radar track data as backup acquisition mode.
  - Demonstrate scan-to-scan correlation
  - Observe, analyze, and compensate for platform-induced sensor degradation (near-field effects).
  - Record radar track data to assess sensor-stable platform and aircraft contributions to position estimate error.
- Discrimination and tracking flights
  - Demonstrate discrimination capability (exo and high-endo).
  - Characterize target signatures (RV and threat elements).
  - Assess angle-only track capability (correlate with radar track data).
  - Successive flights should observe an increasing number, type, and sophistication of PENAIDS.
- Handover flights
  - Record OA handover data and radar data (OA pre-flight directed) for post-flight, non-real-time, low-altitude handover assessment.
  - Conduct real-time, low-altitude handover.
  - Record OA handover data and STR data (ADSP waveforms slaved to KREMS radar for object track) for post-flight, non-real-time, high-altitude handover assessment.

(U) Test Area[1]

- Proposes to use TOO into KMR, as shown in Figure B-5

(U) Midcourse Support

- No requirements

(U) Terminal Area Support

- ITA technical requirements[2,3]
  - Metric

Number of objects	One (aircraft track)
Coverage	
Radar cross-section	TF-33 P11
Position accuracy	
On-board tracking aids	
Pierce point	Not required

Optics Adjunct (OA) (Continued) (U)

- ITA technical requirements[2,3] (continued)
  - Telemetry
    - Data span
    - Bit-error rate
    - Modulation
    - Frequency
    - Transmitter power
  - Scoring — Not required
  - Radar signature — Not required
  - Optics — Not required
  - Recovery — Not required
  - Meteorology
    - Maximum altitude
    - Characteristics
    - Cloud characterization
  - Data relay — Data from other KMR assets
- BOA technical requirements — None

(U) Test Schedule

(U) Summary of SSTSS Driving Requirements

- Targets of opportunity
- Close-in targeting and variable aspect angles
- Interceptor flight test and safety constraints
- Geometric diversity
- Operational realism.

(U) Testing Restrictions and Flexibility[1]

- Requires TOO from other programs
- Needs loading pit for installation and removal of OA sensor (one CONUS, one KMR planned).
- Safety restrictions due to close-in targeting.

Optics Adjunct (OA) (Concluded) (U)

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS Phase 1 Briefing, June 1980

(3) SSTSS Program Requirements Summary Data Sheet

10. Signature Measurement Radar (U)

(U) Mission/Test Objectives[1]

- To gather a database for development of radar discrimination scheme in support of LoAD.
- Objectives
  - Wavelength and velocity measurements at low-altitude and low-aspect angles
  - Body measurements
  - Low-altitude discriminants
  - LoAD design support

(U) Test Area[1]

- Meck, Legan, Illeginni considered as potential sites

(U) Midcourse support

- No requirements

(U) Terminal Area Support

- Requires TOO (MK-11, MK-12, ABRES)
- ITA technical requirements[1,2,3]
  - Metric

Number of objects	TOO
Coverage	Endoatmosphere
Radar cross-section	TOO
Position accuracy	Pointing
On-board tracking aids	TOO
Pierce point	Not required

  - Telemetry — Not required
  - Scoring — Not required

Signature Measurement Radar (Concluded) (U)

- ITA technical requirements[1,2,3] (continued)
  - Radar signature
    - Simple RF — For comparisons
    - Complex RF — For comparisons
  - Optics — For comparisons
  - Recovery — Not required
- ITA technical requirements[1,2,3] (continued)
  - Meteorology
    - Maximum altitude Characteristics — Forecasts and standard soundings
    - Cloud characterization — Not required
  - Data relay — Handover data
- BOA technical requirements — None

(U) Test Schedule[3]

- Scheduled to be operational in FY81
- Frequency determined by TOO.

(U) Summary of SSTSS Driving Requirements

- Requires TOO from other programs
- Requires low-aspect angle targets (population safety constraints)
- Operational realism.

(U) Testing Restrictions and Flexibility

- See Driving Requirements (above).

REFERENCES (U)

(1) SSTSS Meeting Minutes, 17-21 March 1980

(2) SSTSS Phase 1 Briefing, June 1980

(3) SSTSS User Program Requirements Summary Data Sheet

11. Low-Altitude Defense (LoAD) (U)

(U) Mission/Test Objectives[1]

- Develop and test low-altitude interceptor/radar

Low-Altitude Defense (LoAD) (Continued)

- Develop and test at WSMR and KMR

(U) Test Area[2]

- Scheduled for WSMR and KMR

(U) Midcourse Support

- Telemetry — Not required
- Technical requirements
  - Metric
    - Number of objects — Interceptor and target vehicles
    - Coverage
    - Radar cross-section
    - Position accuracy
    - On-board tracking aids
  - Telemetry
    - Number of objects — Interceptor and target vehicles
    - Data span
    - Bit-error rate
    - Modulation
    - Frequency
    - Bit rate
    - Transmitter power
  - Radar signature — Not required
  - Optics — Not required
  - Meteorology — Not required
  - Data relay — Metric data

(U) Terminal Area Support

- ITA Technical Requirements
  - Metric
    - Coverage
    - Radar cross-section
    - On-board tracking aids
    - Pierce point

Low-Altitude Defense (LoAD) (Continued) (U)

- ITA technical requirements (continued)
  - Telemetry
    - Number of objects — Interceptor and target vehicles
    - Data span
    - Bit-error rate
    - Modulation
    - Frequency
    - Bit rate
    - Transmitter power
  - Scoring — MDM/debris data
  - Radar signature — Not required
  - Optics — Documentary optics
  - Recovery — Interceptor/debris/target (WSMR only)
  - Meteorology
    - Cloud characterization
  - Data relay — Handover data
- BOA technical requirements — None

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(U) Summary of SSTSS Driving Req ..ments

- Requires TOO
- Low-angle targeting and variable aspect angles
- Interceptor flight test and safety constraints
- Geometric diversity and sensor kill assessment
- Midcourse metrics and target deployment verification
- Operational realism.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Schedule for KMR
- Safety restrictions for close-in targeting.

Low-Altitude Defense (LoAD) (Concluded) (U)

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Meeting Minutes, 17-21 March 1980

(3) SSTSS Phase 1 Briefing, June 1980

12. Endoatmospheric Non-Nuclear Kill (ENNK) Technology Development Program (U)

(U) Mission/Test Objectives[1]

- Technology development to intercept RV with nonnuclear warheads
- Develop technology base and flight demonstration.

(U) Test Area[2]

- Considering Holloman AFB, White Sands Missile Range, and KMR

(U) Midcourse Support

- No requirements

(U) Terminal Area Support[1,2,3]

- ITA technical requirements
  - Metric
    - Number of objects
    - Radar cross-section
    - On-board tracking aids
    - Pierce point
  - Telemetry
    - Number of objects
    - Data span
    - Bit-error rate
    - Modulation
    - Frequency
    - Bit rate
    - Transmitter power
  - Scoring — Miss distance, IP prediction
  - Radar signature — Not required
  - Optics — Documentary
  - Recovery — Debris recovery during development

Endoatmospheric Non-Nuclear Kill (ENNK) Technology Development Program (Concluded) (U)

- ITA technical requirements (continued)
  - Meteorology
    - Maximum altitude Characteristics — Winds for LCHR setting
    - Cloud characterization
  - Data relay
- BOA technical requirements — None

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(U) Summary of SSTSS Driving Requirements

- Targets of opportunity
- Interceptor flight test and safety constraints
- Close-in targeting
- Operational realism.

(U) Testing Restrictions and Flexibility

- Requires TOO from other programs
- Safety restrictions due to close-in targeting.

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

X (2) SSTSS Meeting Minutes, 17-21 March 1980

(3) SSTSS Phase 1 Briefing, June 1980

13. Rapid Deployment (U)

(U) Mission/Test Objective[1]

- Develop close-in rapid deployment launch and interceptor system

(U) Test Area[1]

- Targets will be Pershing from Green River to WSMR
- Demonstration tests at KMR.

Rapid Deployment (Continued) (U)

(U) Midcourse Support

- No requirements

(U) Terminal Area Support[1,2]

- ITA technical requirements
  - Metric
    Number of objects
  - Recovery — Interceptor/target if malfunction or not live warhead
  - Meteorology — Not required
  - Data relay
- BOA technical — None

(U) Summary of SSTSS Driving Requirements

- Requires targets of opportunity
- Interceptor flight tests and safety constraints
- Close-in targeting
- Live warhead requires flight safety control
- Operational realism.

Rapid Deployment (Concluded) (U)

(U) Testing Restrictions and Flexibility

- Requires TOO
- Live warhead interceptors; safety for close-in kill.

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Phase 1 Briefing, June 1980

14. PERSHING II (U)

(U) Mission/Test Objective[1]

- Verification of flight trajectory

[redacted]

[redacted]

PERSHING II (Concluded) (U)

(U) Terminal Area Support[1,2]

(U) Summary of SSTSS Driving Requirements

- None

(U) Testing Restrictions and Flexibility

- Current test support can be provided by land-based assets.

REFERENCES (U)

(1) SSTSS User Program Requirements Summary Data Sheet

(2) SSTSS Phase 1 Briefing, June 1980

15. <u>Space Detection and Tracking System (SPADATS)</u> (U)

(U) Mission/Test Objectives

- Detection and track of new foreign launches (NFL)
- Acquisition and track of deep-space objects
- Space object identification
- Satellite catalog maintenance.

(U) Test Area

- Currently planned at [redacted]

(U) Midcourse Support

- No requirements

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* (U) The search scan will be based on a time biased derived orbital trajectory with a coverage rate of 86 sq deg/hr along the derived trajectory.

† (U) Elevation angle at stated accuracies will be greater than 10°.

Space Detection and Tracking System (SPADATS) (Concluded) (U)

(U) Testing Restrictions and Flexibility

- See Driving Requirements above.

REFERENCE (U)

(1) Memorandum of Agreement, Department of the Air Force, Headquarters, Electronic Systems Division (AFSC), Hanscom Air Force Base, MA, and Department of the Army, Ballistic Missile Defense Systems Command, P.O. Box 1500, Huntsville, Alabama (U), SECRET.

Appendix C

U.S. NAVY FLEET BALLISTIC MISSILE PROGRAM (U)

- (U) POSEIDON (C-3) Flight Tests, Demonstration and Shake Out (DASO)
- (U) POSEIDON (C-3) Operational Tests (OT)
- (U) TRIDENT (C-4) DASO Flight Tests
- (U) TRIDENT (C-4) OT--Atlantic
- (U) TRIDENT (C-4) OT--Pacific
- (U) TRIDENT II (D-5), DASO/OT
- (U) MK-500 DASO.

(U) Technical parameters that are not provided in these summaries were either not available at the time of this study or were not considered as a driving requirement for the SSTSS and were not pursued.

(U) D-5 requirements are still evolving, and in some cases, could only be estimated for SSTSS purposes.

(U) Tables C-1 and C-2 show the locations of the Navy launch and impact points for both the Atlantic and Pacific Oceans.

1. POSEIDON (C-3) Flight Tests, Demonstration, and Shake Out (DASO) (U)

(U) Mission/Test Objectives

- Demonstration and shakeout
  - Demonstrate missile functional performance
  - Evaluate missile systems
    Capabilities
    Characteristics
  - Evaluate weapon system operational performance.

(U) Test Areas

- Flight tests will be conducted in the Atlantic Ocean from two launch areas, 1400+ nmi, into four impact areas that provide 20-40° azimuth diversity.
- All launch and impact areas are at sea, launch instrumentation support by a LASS, with impact monitored by one ARIA and one P-3/SMILS.
- Launch areas
  - Two launch areas, D1 and D4, will be used in the C-3 DASO tests.
  - Multiple missile ranges and azimuths are expected.
- Terminal areas
  - Four terminal areas are used; Antigua,* C11A, C12, and C15 E/W.
  - Miscellaneous ranges and azimuths are expected for this series.

POSEIDON (C-3) DASO Tests (Concluded) (U)

(U) Summary of SSTSS Driving Requirements

- Operational realism
- Safety constraints
- Multiple launch azimuths
- Multiple missile ranges
- Multiple objects
- Mobile Instrumentation support in BOA.

REFERENCE (U)

(1) SSTSS Meeting Minutes, 17 March 1980

2. POSEIDON (C-3) Operational Tests (OT) (U)

(U) Mission/Test Objective

- Operational tests of missile system

(U) Test Areas

- Flights will be conducted in the Atlantic Ocean from four launch points into four impact areas, one ITA and three BOAs. Launch instrumentation provided by LASS and DRSS with terminal instrumentation by P-3 SMILS and ARIA TM plus Ascension.
- Launch areas

  LP1, LP2, LP3, and LP4 will be used in C-3 operational tests to provide realistic missile ranges and launch azimuths.