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# BALLISTIC MISSILE LAUNCH CAPABILITY

BRIEFING TO  
 NATIONAL RESEARCH COUNCIL  
 COMMITTEE ON STRATEGIC ASSESSMENT OF  
 EARTH - TO - ORBIT PROPULSION OPTIONS

BY

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# AGENDA

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SUMMARY

# OVERVIEW

REENTRY SYSTEMS LAUNCH PROGRAM (RSLP)  
SUBORBITAL LAUNCH SERVICES FOR DOD PROGRAMS FOR 30 YEARS  
TARGETS FOR BALLISTIC MISSILE DEFENSE  
TEST BED FOR BALLISTIC MISSILE DEVELOPMENT

CONCEPT:

- UTILIZE DEACTIVATED MISSILES AS ECONOMIC VEHICLES
- PROCURE NEW HARDWARE TO MEET UNIQUE REQUIREMENTS
- LAUNCH FROM MODIFIED SILOS AT WESTERN TEST RANGE
- OTHER SITES FOR SOUNDING ROCKETS

MINUTEMAN II UTILIZATION

- LARGE NUMBER OF MISSILES BEING DEACTIVATED AND STORED
- REPLENISH SCARCE ROCKET MOTORS FOR SUBORBITAL LAUNCHES
- PLANNED SUBORBITAL FACILITY AT EASTERN TEST RANGE
- REACTIVATE ABOVE GROUND MINUTEMAN SITE

MULTISERVICE LAUNCH SYSTEM (MSLS) CONTRACT IN PROCUREMENT

# Minuteman II Drawdown

## Rocket Motors Excess to Strategic Offense

	FY	92	93	94	95	96	97	TOTAL
Retired Boosters	80	89	110	87	38	46	46	450
Available Boosters Broken Down into Rocket Motor Stages								
Stage I	*0	89	110	87	38	46	46	370
Stage II	*50	*54	110	87	38	46	46	385
Stage III	**120	89	110	87	38	46	46	490

\* MMIII spares taken from MMII drawdown

\*\* Includes motors released from MMII spares

Storage Required Regardless of Disposition

# MULTISERVICE LAUNCH SYSTEM IN PROCUREMENT

INTEGRATED SYSTEM CONCEPT FOR R&D FLIGHTS

HARDWARE

INTEGRATION

LAUNCH SERVICES

MODULAR FRONT SECTION WITH COMMON BASIC COMPONENTS

MISSILE GUIDANCE

RANGE SAFETY

TEST STRUCTURES AND DEPLOYMENT MECHANISMS

FOR A VARIETY OF CONFIGURATIONS AND VEHICLES

SOUNDING ROCKETS

ICBM CLASS R&D SUBORBITAL TEST FLIGHTS AND TARGETS

SIMPLE OR COMPLEX DEPLOYMENTS

OPTIONAL ORBITAL LAUNCH VEHICLES

USES MMII/III HARDWARE

# ORBITAL LAUNCH APPLICATIONS

## MMII DERIVATIVES

CAPABILITY FOR LOW COST SPACE LAUNCH VEHICLE

BOOSTER IS SUNK DOD COST (\$7M SUBSTITUTION VALUE)  
OPERATIONAL AND SUBORBITAL VEHICLES

GOVERNMENT REFURB AT \$50K PER MISSILE STAGE  
SHARE PROCESSING AND LAUNCH FACILITIES

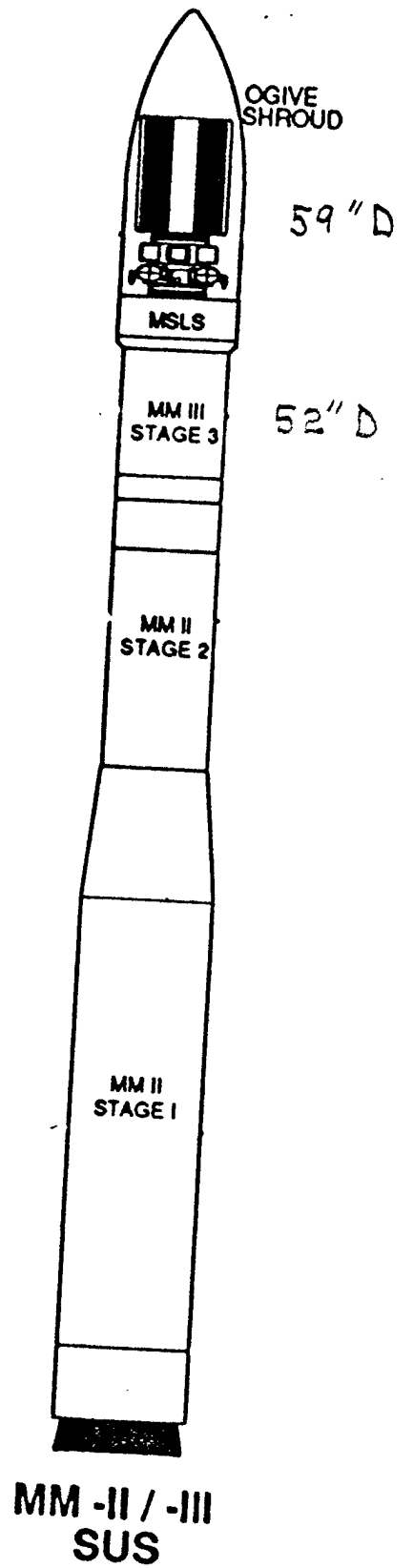
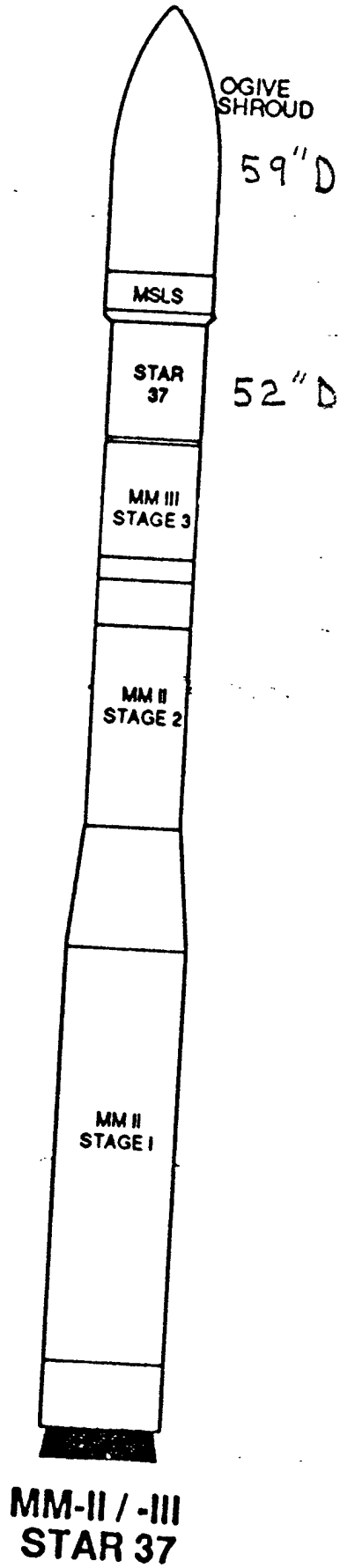
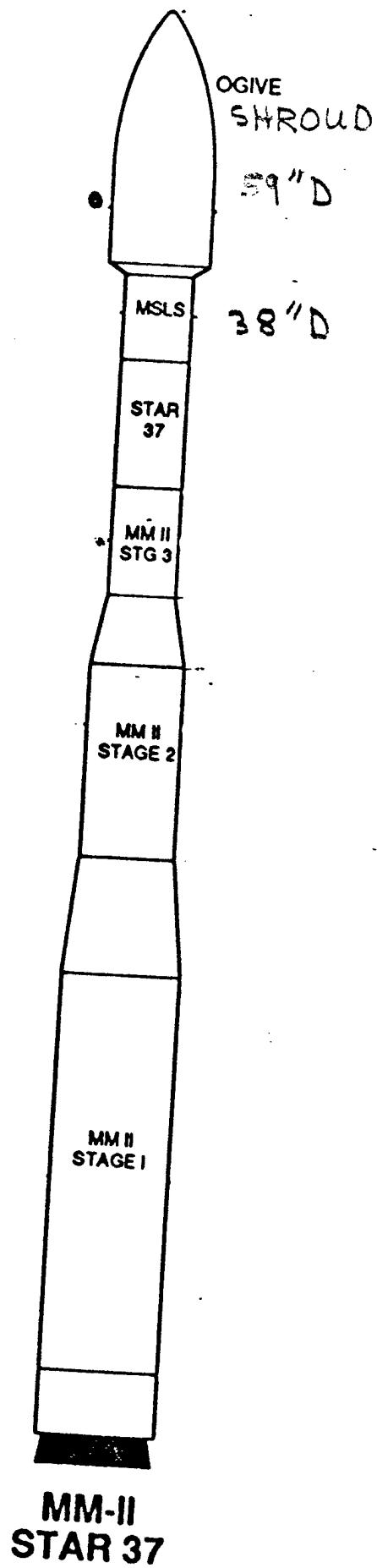
COMMON MSLS SUBSYSTEMS WITH SUBORBITAL VEHICLES

UPGRADED CONFIGURATIONS PART OF MULTISERVICE LAUNCH SYSTEM  
MINUTEMAN III STAGE III

LIMITED NUMBER AVAILABLE FOR DOD USE

STAR 37, OR STAR 48 4th (KICK) STAGE

SMALL UPPER STAGE (SUS) TRANSFER VEHICLE





# FEASIBILITY STUDY

CONFIGURATION SELECTED FOR ANALYSIS: MMII/III WITH STAR 37

PAYLOAD CHARACTERISTICS: DIAMETER 56", WEIGHT 800 lbs  
NOMINAL TRAJECTORY: 28.5 DEG, 350 NM ORBIT CIRCULARIZED  
WITH A KICK STAGE

CONCEPTUAL DESIGN

STRUCTURES, AERODYNAMICS, MASS PROPERTIES

TRAJECTORY SHAPING

LOAD ANALYSIS

HEATING

AERODYNAMIC AND STRUCTURAL MARGINS

CONTROL ANALYSIS

BENDING MODES AND LINEAR STABILITY ANALYSIS

# FEASIBILITY STUDY RESULTS

MM-II/III WITH STAR 37

MINIMAL BUFFETING CONCERNS

ADEQUATE STRUCTURAL MARGINS

ADEQUATE STABILITY MARGINS

MINUTEMAN-II WITH STAR 37 MORE STRESSING DUE TO HAMMERHEAD  
BUFFETING

STRUCTURAL CAPABILITY

PERFORMANCE

SMALL PAYLOAD CAPABILITY TO LOW EARTH ORBIT

CONCLUSION:

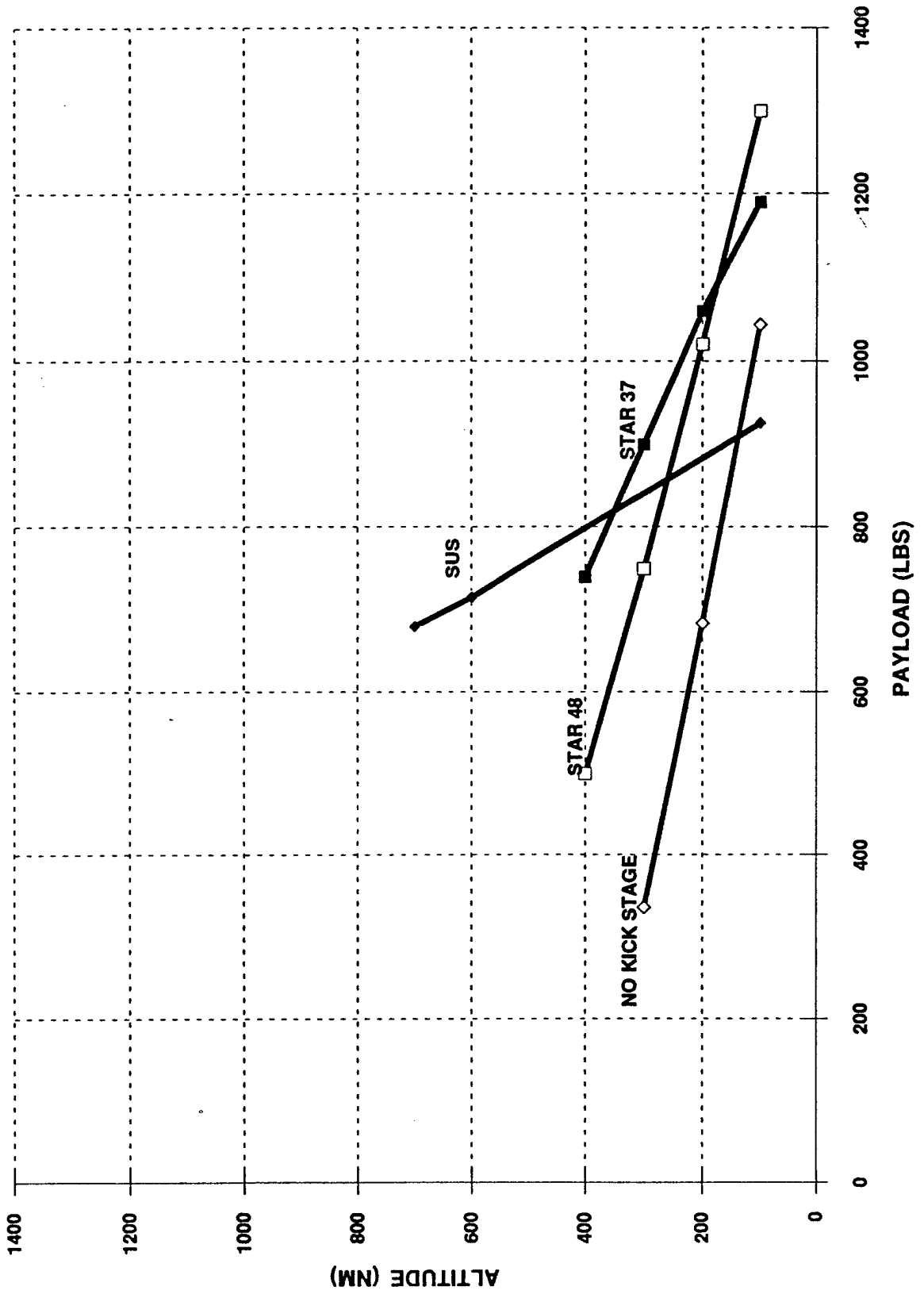
MINUTEMAN WITH STAR 37 FEASIBLE

MORE ANALYSIS REQUIRED FOR OTHER CONFIGURATIONS

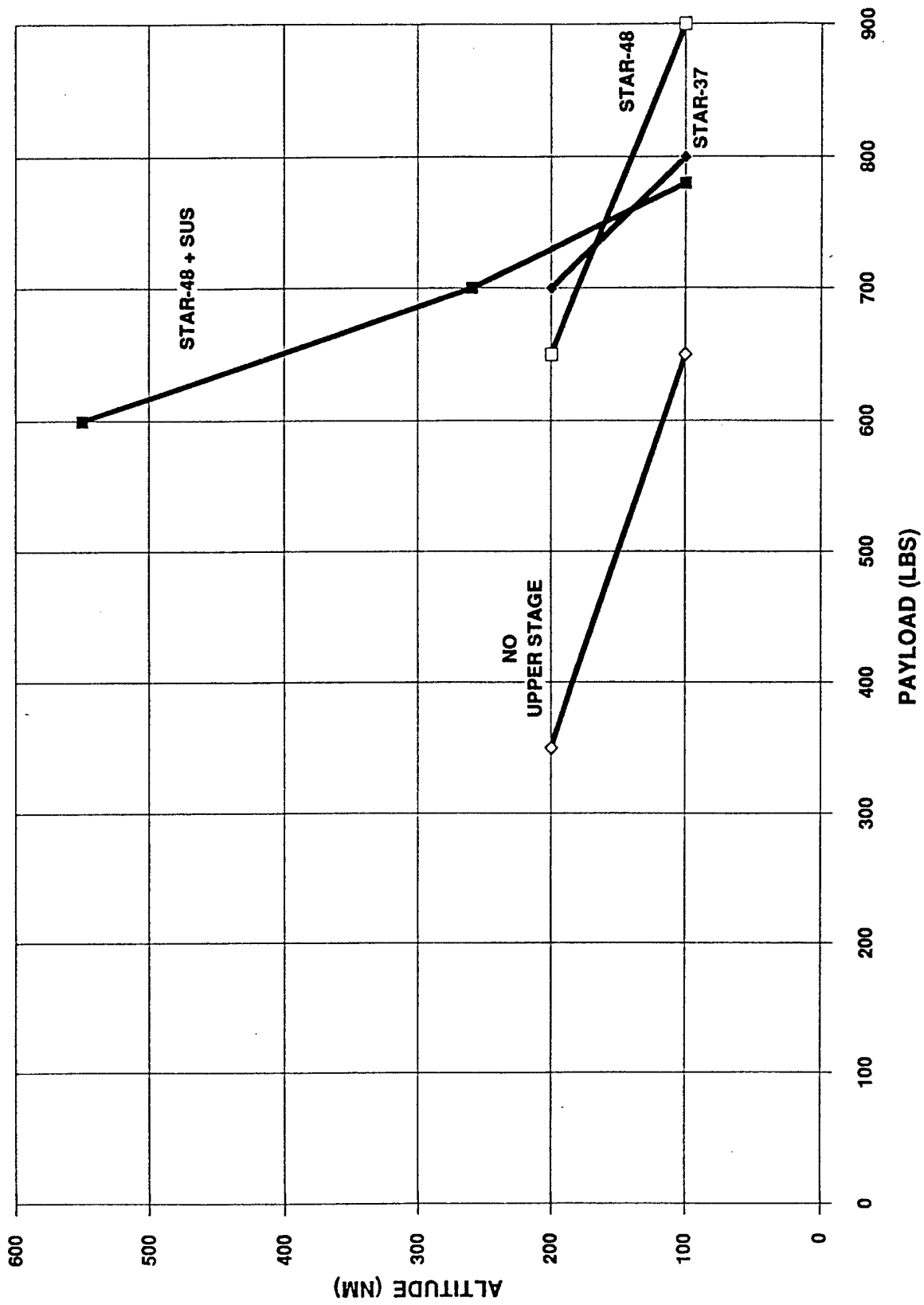
## SPACE VEHICLE-RELATIVE ENVIRONMENTS

CONFIGURATION	PAYLOAD WEIGHT	ACCELERATION		VIBRATION		SHOCK MAX	ACOUSTIC
		AXIAL	SECTION	COMPONENT	MAX		
MINUTEMAN - SILO	1000 LB	9 Gs	8.4 GRMS	17.8 GRMS	<500 Gs	155 DB	
MINUTEMAN - PAD SPACE LAUNCH	400-1200 LB	8 Gs	7.0 GRMS	10.0 GRMS	<500 Gs	140 DB	
SCOUT	400 LB	9.2 Gs	5.8 GRMS	8.6 GRMS	200 Gs	137 DB	
TITAN II	3000-5000 LB	10 Gs	10.6 GRMS	14.1 GRMS	200 Gs	140 DB	
TITAN III	21K-33K LB	6 Gs	8.4 GRMS	-	4100 Gs	142 DB	
TITAN IV	29K-39K LB	5.6 Gs	7.8 GRMS	-	-	-	
ATLAS I	4500 LB	5.5 Gs	5.3 GRMS	-	2000 Gs	138 DB	
DELTA II	4200 LB	6.3 Gs	8.7 GRMS	-	5500 Gs	144 DB	
PEGASUS	600 LB	8.5 Gs	5.6 GRMS	-	600 Gs	-	
ARIAN	-	5.0 Gs	7.3 GRMS	-	2000 Gs	142 DB	
AMROC	1500 LB	8.0 Gs	5.5 GRMS	-	7000 Gs	144 DB	

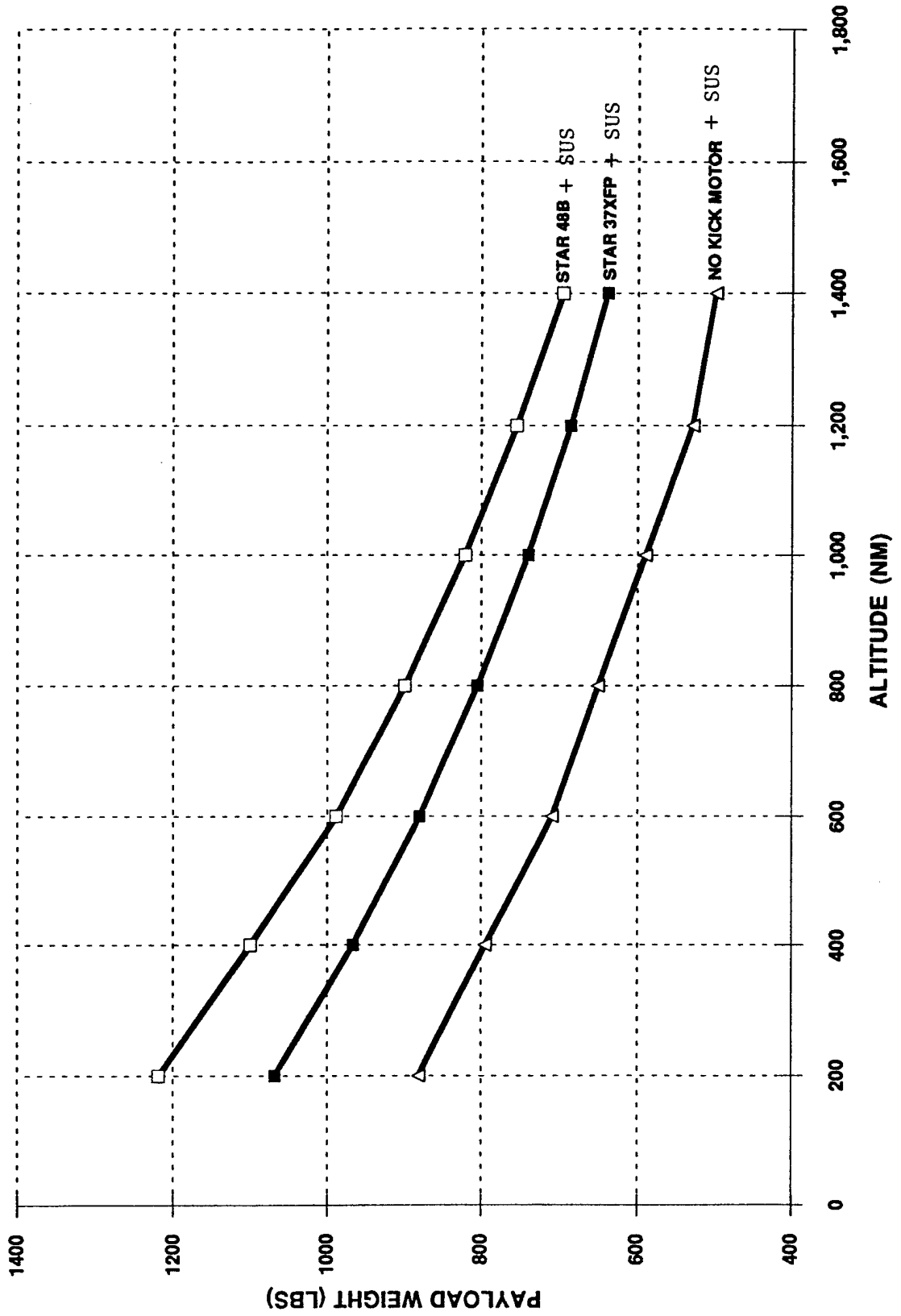
MM II/III DERIVATIVES  
ETR LAUNCHES 28.5° INCLINATION



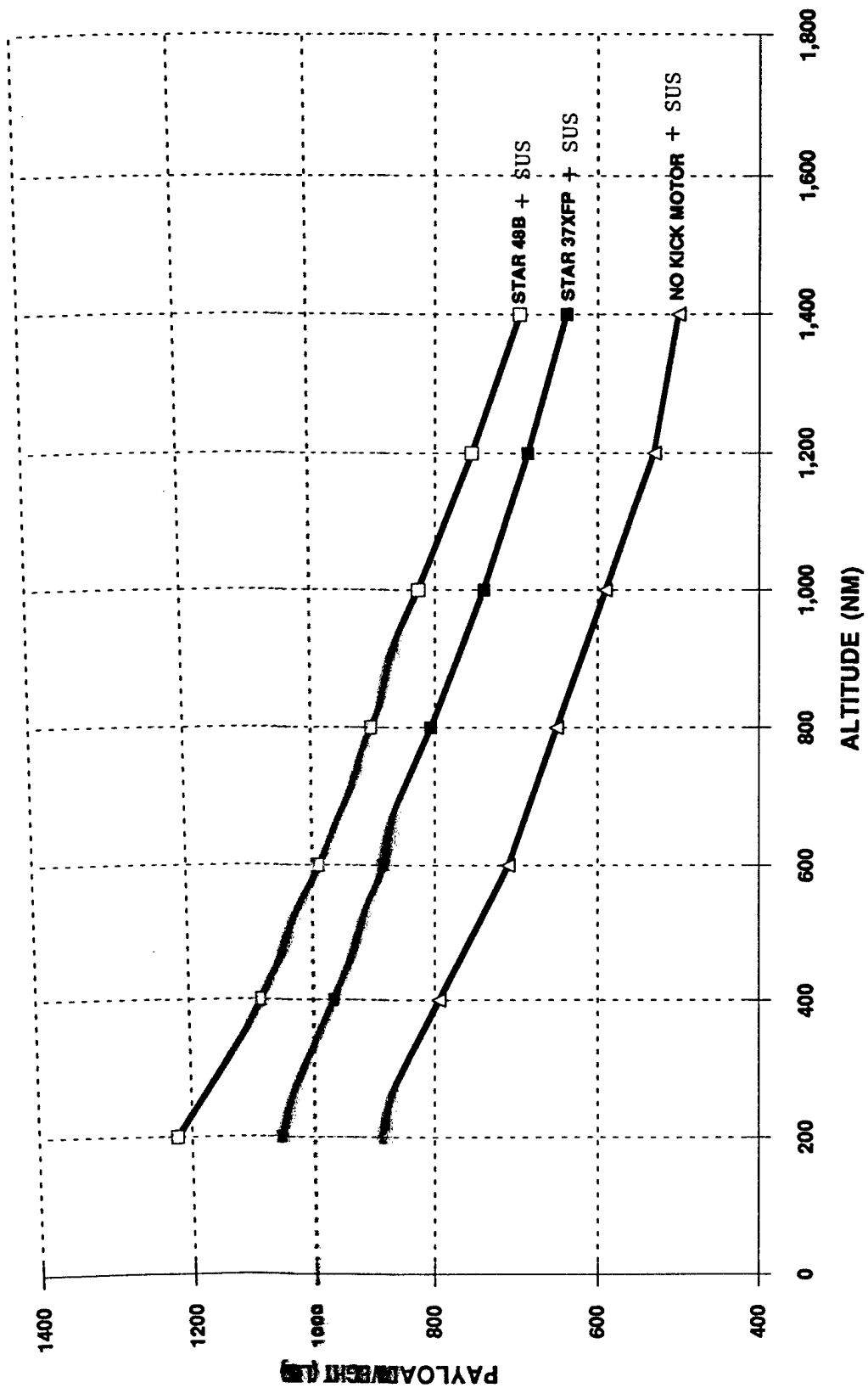
MM II/III DERIVATIVES  
WTR LAUNCHES (90° INCLINATION)



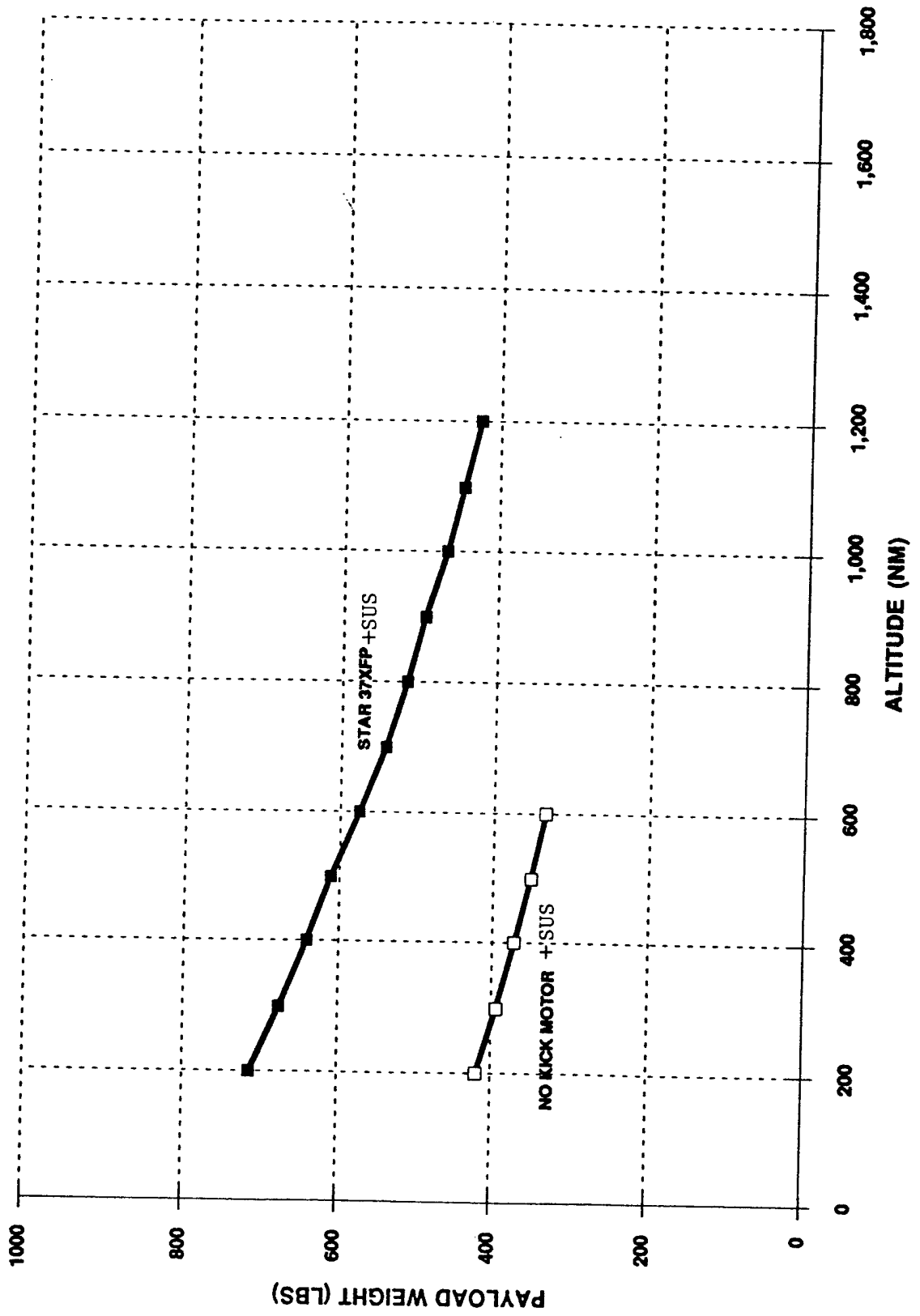
**MMII WITH MMIII STAGE 3  
Boost Into 100nm Parking Orbit  
SUS Motor for Hohmann Transfer and Circularize**



**MMIII WITH MMIII STAGE 3**  
**Boost Into 100nm Parking Orbit**  
**SUS Motor for Hohmann Transfer and Circularize**

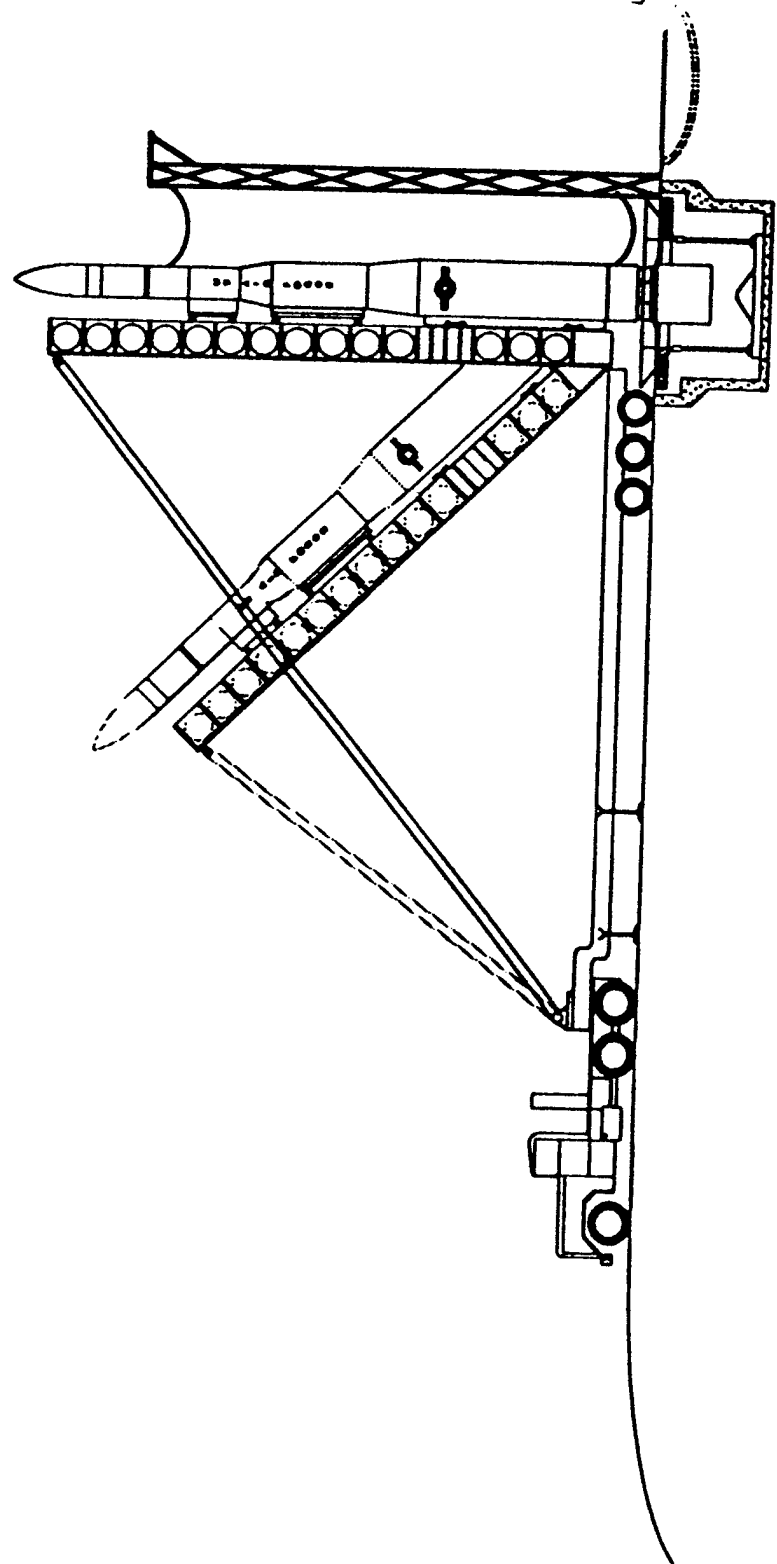


**MMII BOOST INTO 100nm PARKING ORBIT  
SUS Motor for Hohmann Transfer  
and Circularize**





**MMII BOOSTER EMPLACEMENT  
ETR LAUNCH COMPLEX**



**ORBITAL APPLICATIONS  
PEACEKEEPER DERIVATIVES**

**CONFIGURATIONS CONSIDERED**

**BASIC PEACEKEEPER 3-STAGE MISSILE WITH UPPER STAGE(S)**

**EXISTING SPACE QUALIFIED UPPER STAGES**

**OPTIMIZED UPPER STAGE**

**PEACEKEEPER/MINUTEMAN DERIVATIVE**

**PK STAGE 1, MMII STAGE 1 & 2, MMIII STAGE 3**

# PEACEKEEPER DERIVATIVES ORBITAL PERFORMANCE

## MODIFIED PEACEKEEPER

### LOW ALTITUDE CIRCULAR ORBITS

4000-7000 LBS AT 100-600 NM

### HIGH ALTITUDE CIRCULAR ORBITS

UP TO 1800 LBS HALF GEOSYNCHRONOUS

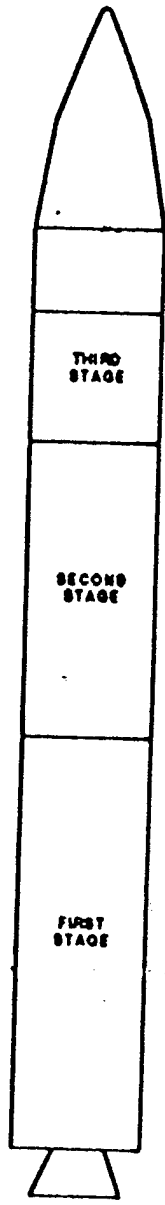
UP TO 1100 LBS TO GEOSYNCHRONOUS

## PEACEKEEPER/MINUTEMAN HYBRID

### CIRCULAR ORBITS AT 28.5 DEG INCLINATION

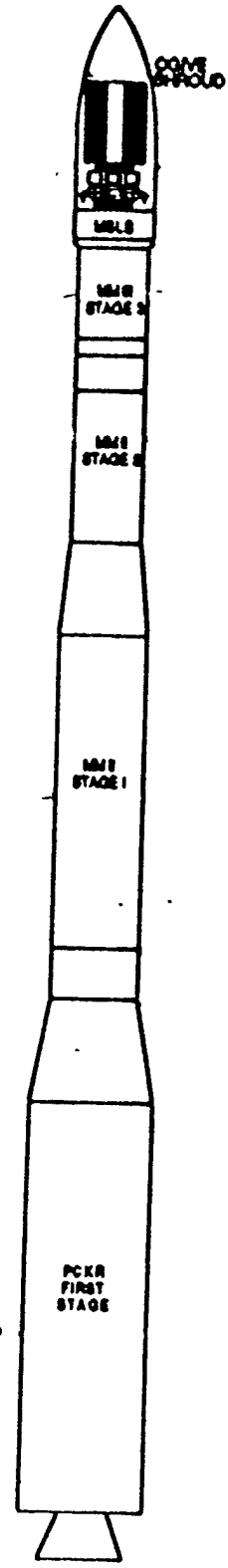
500-4000 LBS AT 500-10,000 NM

875 LBS TO MOLNIYA ORBIT



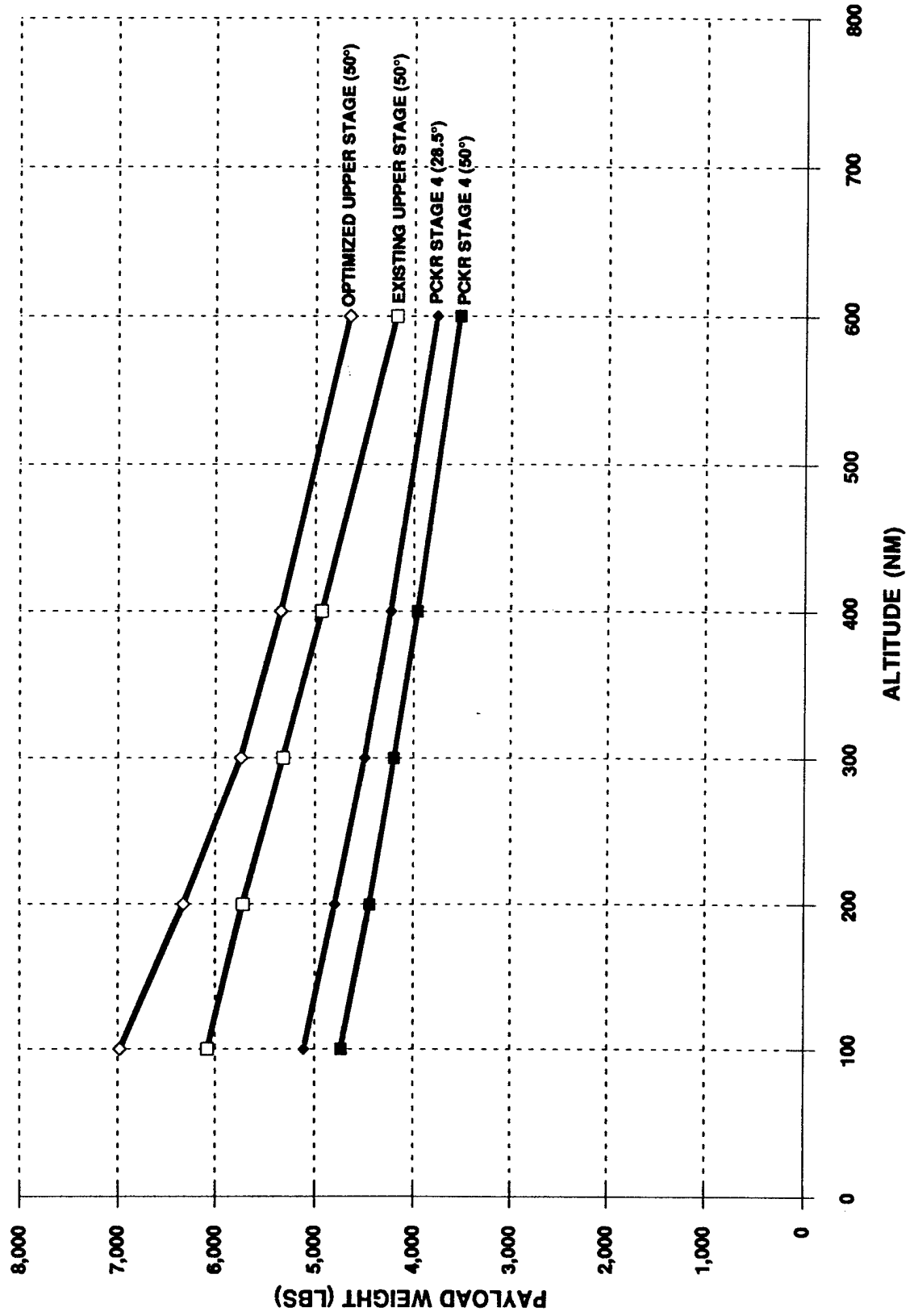
PCKR MISSILE

98" D

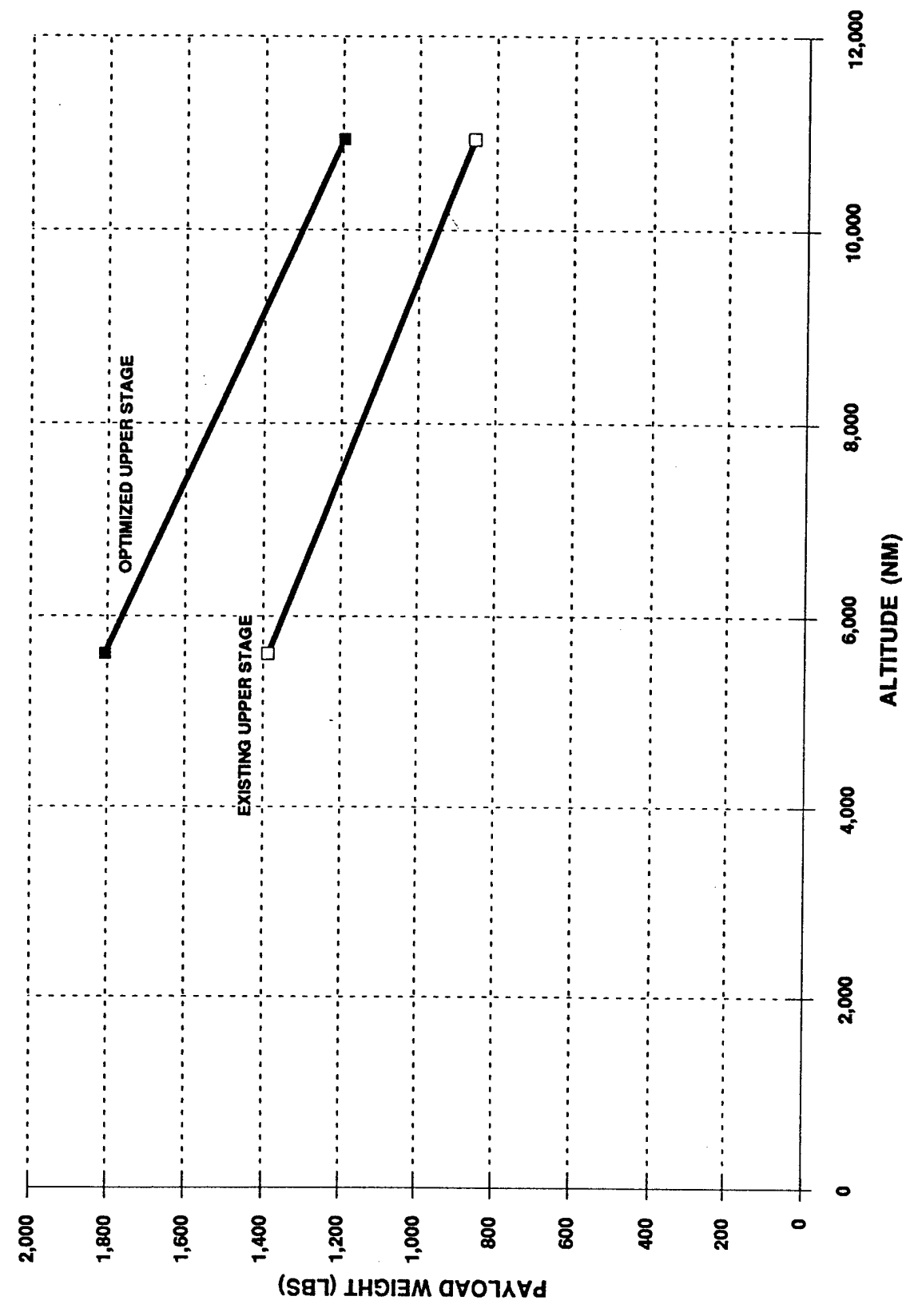


PCKR / MM-II STAGE 1  
MM-II STAGE 2 / MM-III STAGE 3

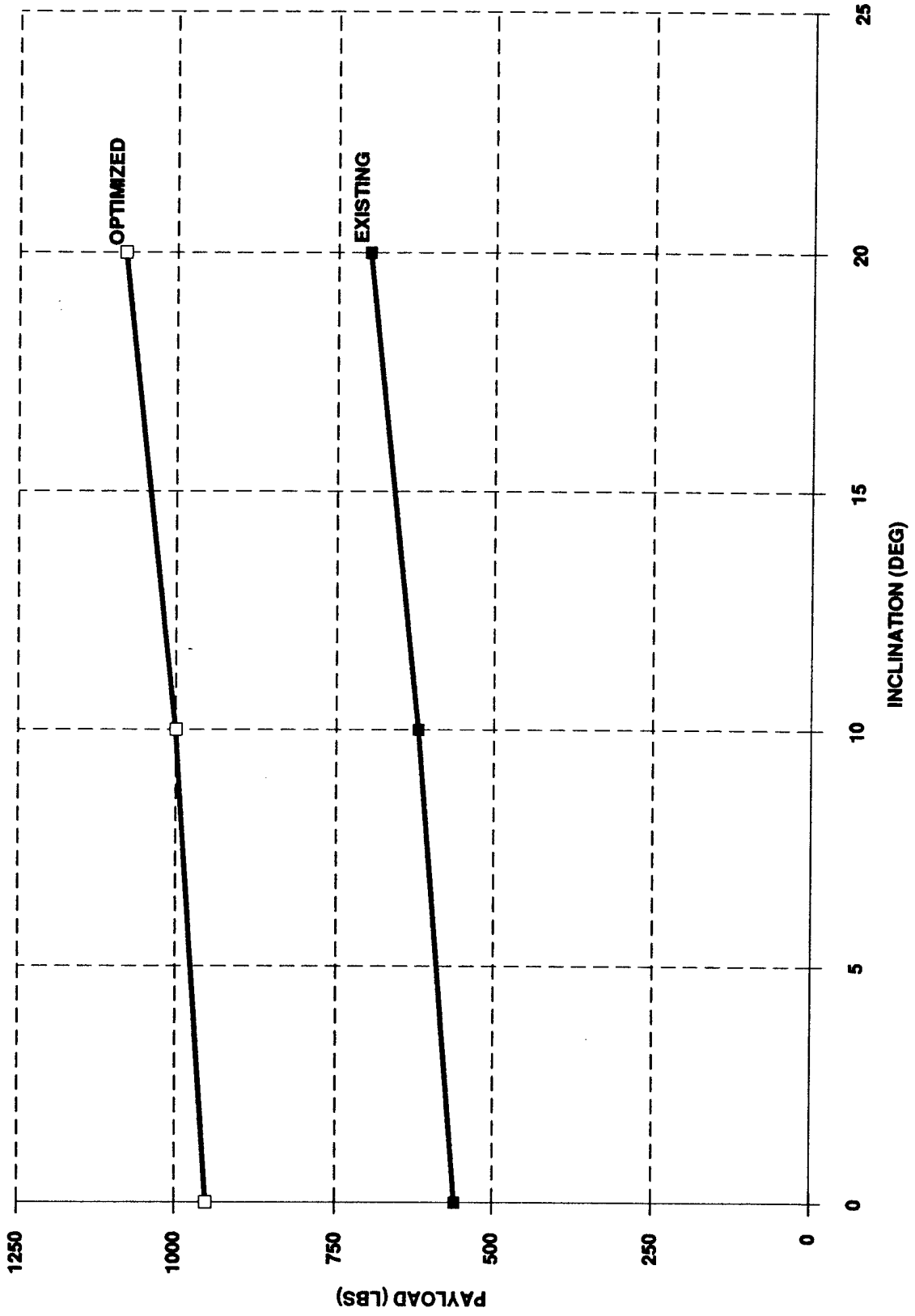
**PEACEKEEPER ORBITAL PERFORMANCE**  
**Low Altitude 50° And 28.5° Inclination**



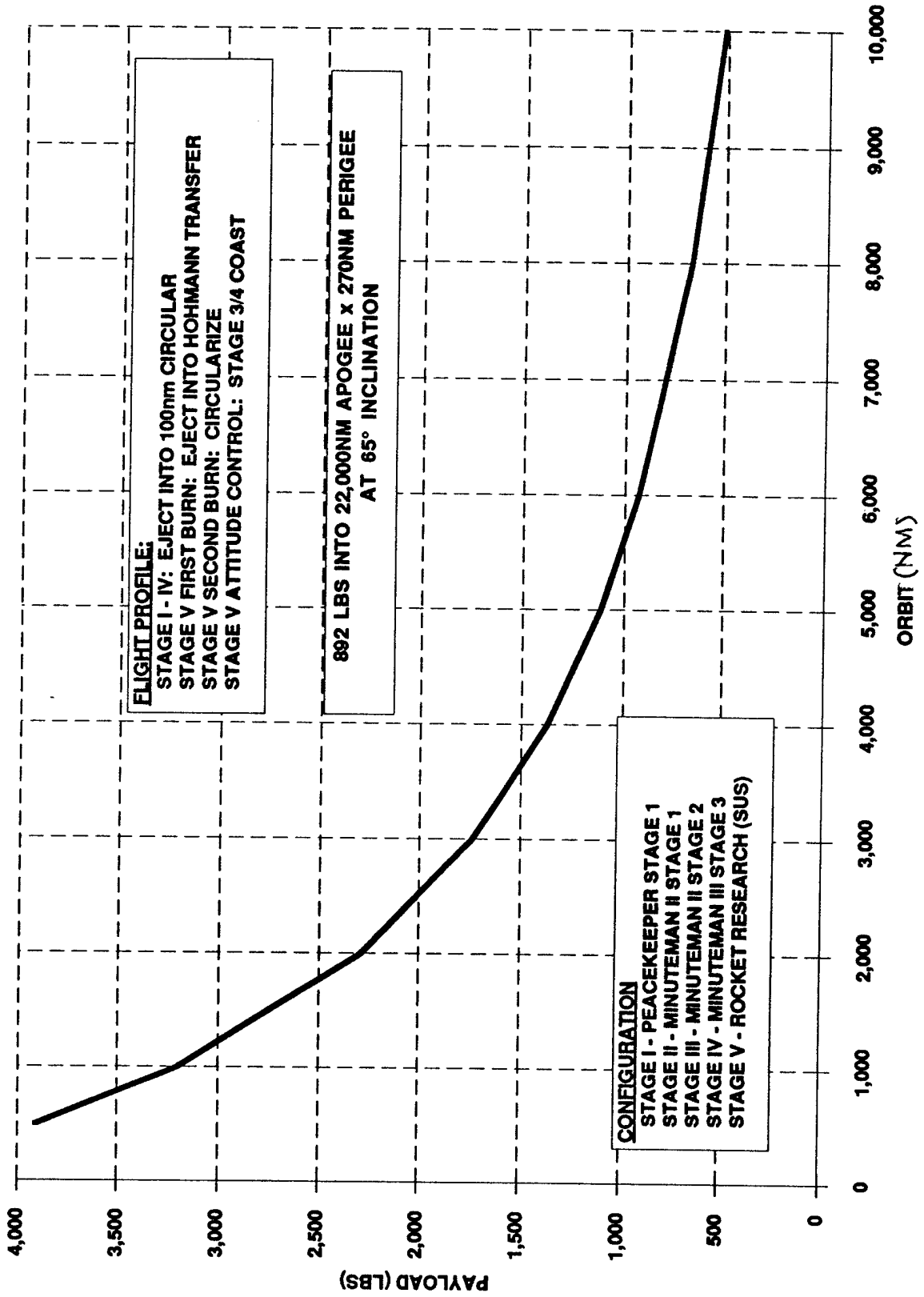
# PEACEKEEPER ORBITAL PERFORMANCE High Altitude 40° Inclination



**PEACEKEEPER GEOSYNCHRONOUS ORBIT CAPABILITY**  
Circular Orbit at 19,369 NM



# PEACEKEEPER / MM III ORBITAL PERFORMANCE





## OTHER CONSIDERATIONS

MINUTEMAN II AGE AND RELIABILITY - NOT A PROBLEM

ON-GOING AGING SURVEILLANCE PROGRAM FOR MINUTEMAN I,  
II, AND III

INSPECT AND REFURBISH TO RSLP REQUIREMENTS

98% MISSION SUCCESS FOR MINUTEMAN I LAUNCHES

HIGH RELIABILITY FOR 30 YEAR OLD MINUTEMAN I STAGES

NO SIGNIFICANT DEGRADATION ON MINUTEMAN I STAGE I & II

SECURITY - IS A PROBLEM FOR NON-DOD USE

CLASSIFIED HARDWARE THROUGHOUT

COMMON WITH OPERATIONAL SYSTEMS

START TREATY - LAUNCH SITE CONSTRAINTS

ALLOWS USE FOR SPACE LAUNCH

NATIONAL POLICY FOR SPACE LAUNCH - BEING DEVELOPED

## SUMMARY

MINUTEMAN & PEACEKEEPER ORBITAL CAPABLE

USING EXISTING STAGES

PERFORMANCE ENHANCED WITH UPGRADES

RSLP TO CONTINUE MINUTEMAN DOD SUBORBITAL R&D TEST VEHICLES

FOCUSES DOD RESOURCES ON R&D RATHER THAN ON TEST VEHICLE

ORBITAL/SUBORBITAL COMMONALITY

FACILITIES, RESOURCES AND HARDWARE

SIGNIFICANT SUNK DOD INVESTMENT IN THESE ASSETS