

IN-STEP INFLATABLE ANTENNA EXPERIMENT

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NASA/DOD
Flight Experiments
Technical Interchange Meeting
October 5-9, 1992/Monterey, California

N93-28701

159205

52-18

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IN-STEP INFLATABLE ANTENNA EXPERIMENT POTENTIAL SPACE ANTENNA APPLICATIONS

<u>APPLICATION</u>	<u>APERTURE SIZE RANGE (M)</u>	<u>RF RANGE (GHz)</u>	<u>INFLATABLE ANTENNA APPLICATION POTENTIAL*</u>
MOBILE COMMUNICATIONS	10 — 20	1.5	VERY HIGH
MOBILE COMMUNICATIONS	4 — 8	20 — 30	MODERATE
EARTH OBSERVATION RADIOMETRY	20 — 40	6 — 60	MODERATE
ACTIVE MICROWAVE SENSING	0.4 × 2 & 4 × 16	1 — 94	MODERATE
OVLBI	20 — 25	0.3 — 90	MODERATE
DOD SPACE BASED RADAR	20 — 30	1.5 — 2.5	VERY HIGH

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| *
APPLICATION
CRITERIA | • LOW COST | • HIGH PRECISION | • DYNAMICS CHARACTERISTICS |
| | • LOW WEIGHT | • PACKAGING EFFICIENCY | • CONCEPT GROWTH POTENTIAL |
| | • HIGH RELIABILITY | • DIMENSIONAL STABILITY | |

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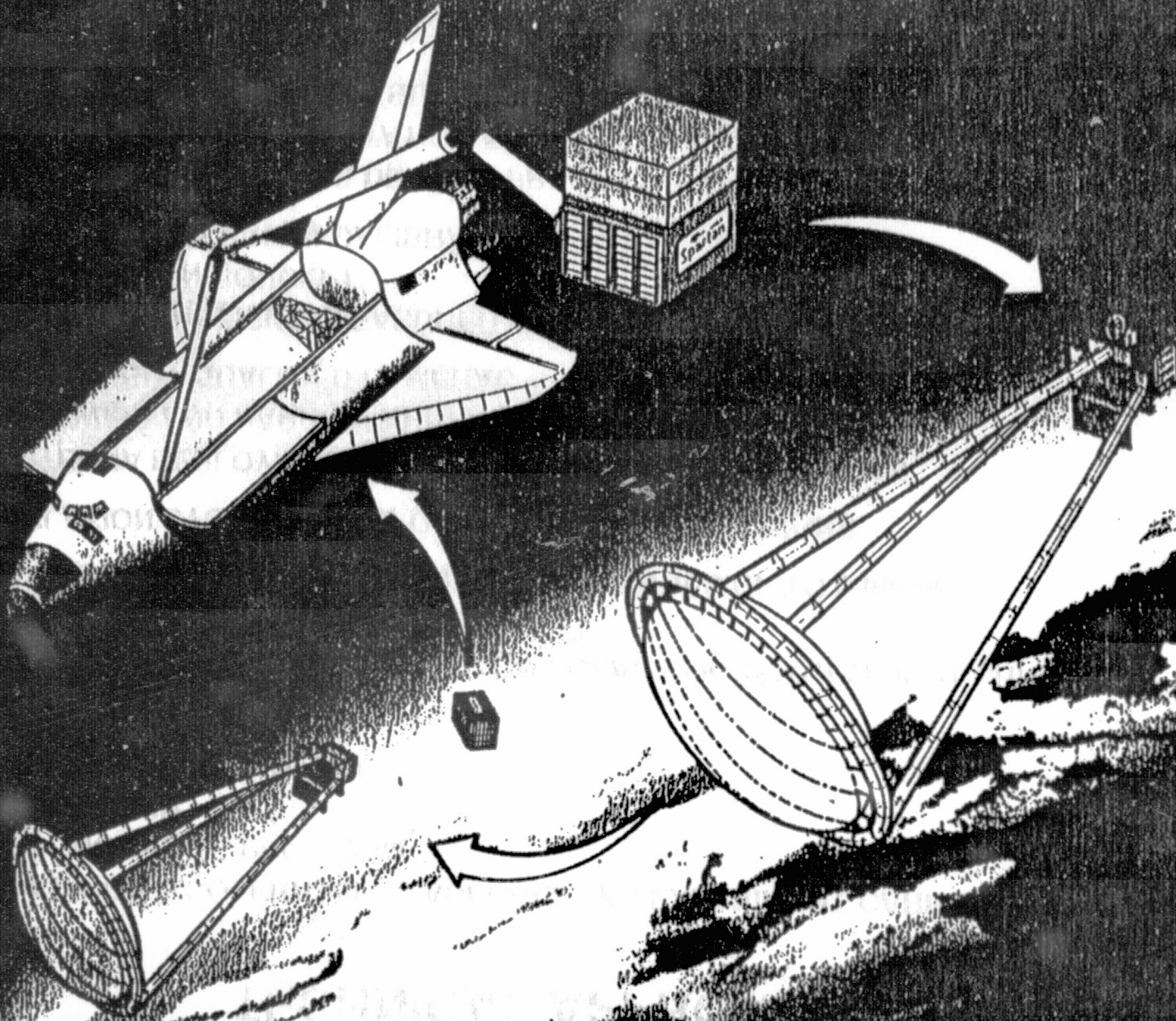
EXPERIMENT OBJECTIVES

- **VALIDATE THE DEPLOYMENT OF A 14 METER INFLATABLE PARABOLIC REFLECTOR STRUCTURE IN A ZERO GRAVITY ENVIRONMENT**
 - **INFLATABLE ELEMENT DEPLOYMENT SEQUENCE**
 - **DEPLOYMENT RATES**
- **MEASURE THE REFLECTOR SURFACE ACCURACY UNDER ORBITAL MECHANICAL AND THERMAL LOADING CONDITIONS**
 - **FIVE SUN ANGLES**
 - **THREE REFLECTOR/CANOPY PRESSURES**
- **INVESTIGATE REFLECTOR STRUCTURE DAMPING CHARACTERISTICS UNDER ORBITAL OPERATIONAL CONDITIONS**
 - **EXCITE FUNDAMENTAL NODES**
 - **MEASURE AMPLITUDE DECAY**

IN-STEP INFLATABLE ANTENNA EXPERIMENT TECHNICAL APPROACH

- **SPARTAN RECOVERABLE SPACECRAFT AS EXPERIMENT CARRIER**
 - MOUNTING PLATFORM
 - POWER
 - ATTITUDE CONTROL
 - DATA RECORDING
- **REFLECTOR STRUCTURE BASED ON SOLAR CONCENTRATOR TECHNOLOGY**
 - CONFIGURATION IDENTICAL
 - CONCEPT DEVELOPMENT OF STRUCTURES UP TO 9 meters
- **INFLATION SYSTEM BASED ON FLIGHT PROVEN DESIGNS**
- **ANTENNA DEPLOYMENT MONITORED WITH VIDEO CAMERAS**
 - WIDE AND NARROW ANGLE CAMERAS
 - FLIGHT QUALIFIED CAMERAS
- **SURFACE PRECISION MEASURED WITH DIGITAL IMAGING RADIOMETER**
 - PROVEN CONCEPT
 - GROUND BASED CALIBRATION
- **STRUCTURAL DAMPING DERIVED FROM MOTION DECAY PLOTS**
 - STRUCTURAL EXCITATION PROVIDED BY SPARTAN CONTROL SYSTEM
 - MOTION DECAY MEASURED WITH TRANSDUCERS

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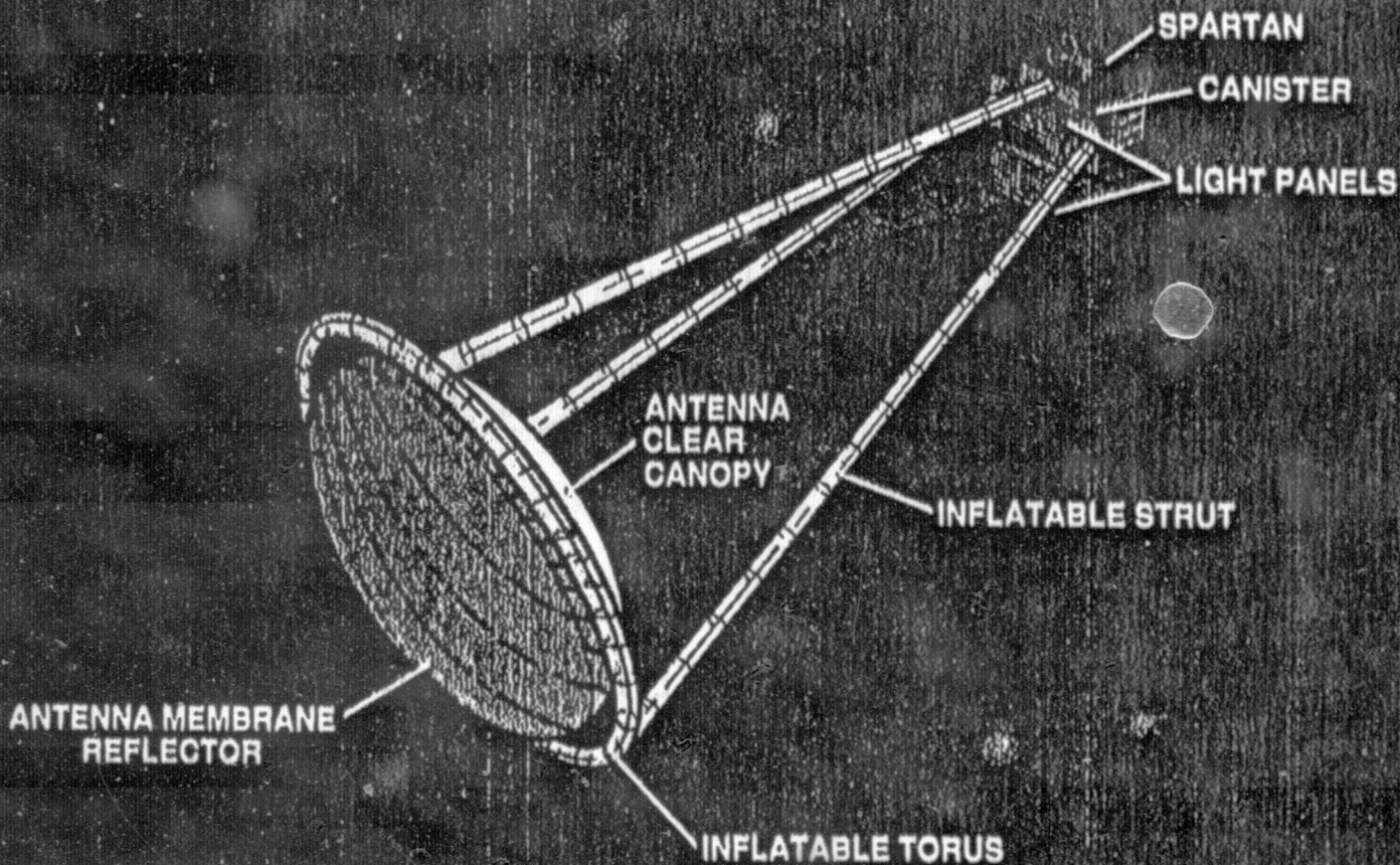


IN-STEP INFLATABLE ANTENNA EXPERIMENT SPARTAN SERVICES

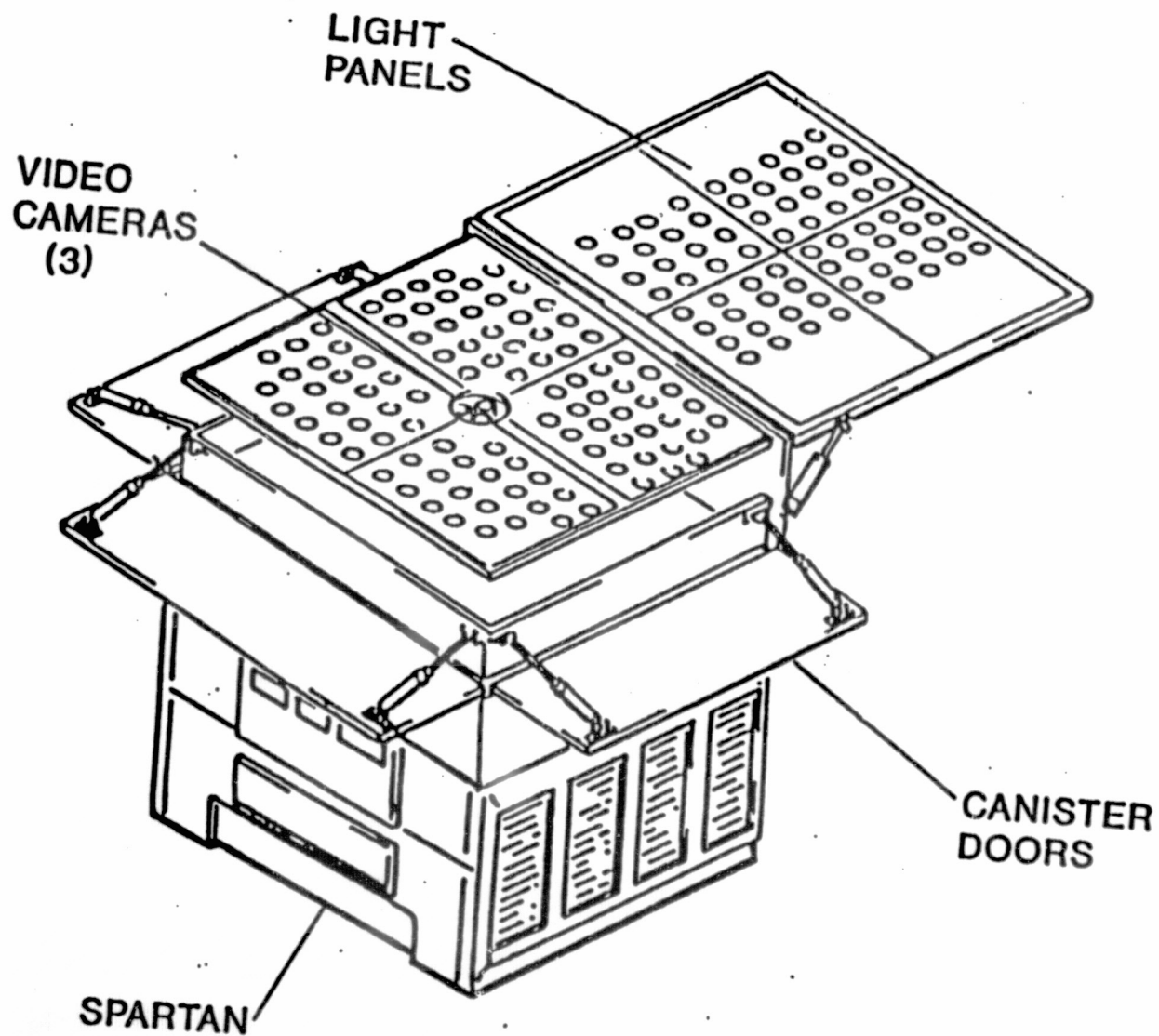
- **EXPERIMENT CARRIER**
- **EXPERIMENT INTERFACE WITH STS**
- **THERMAL CONTROL (PRIOR TO DEPLOYMENT)**
- **ATTITUDE CONTROL**
- **ELECTRICAL POWER**
- **DATA RECORDING**
- **ORBIT POSITION AND ATTITUDE VS. TIME DATA**
- **EXPERIMENT INITIATION SIGNAL (TWO FAULT TOLERANT)**
- **EXPERIMENT/SPARTAN SEPARATION SYSTEM**

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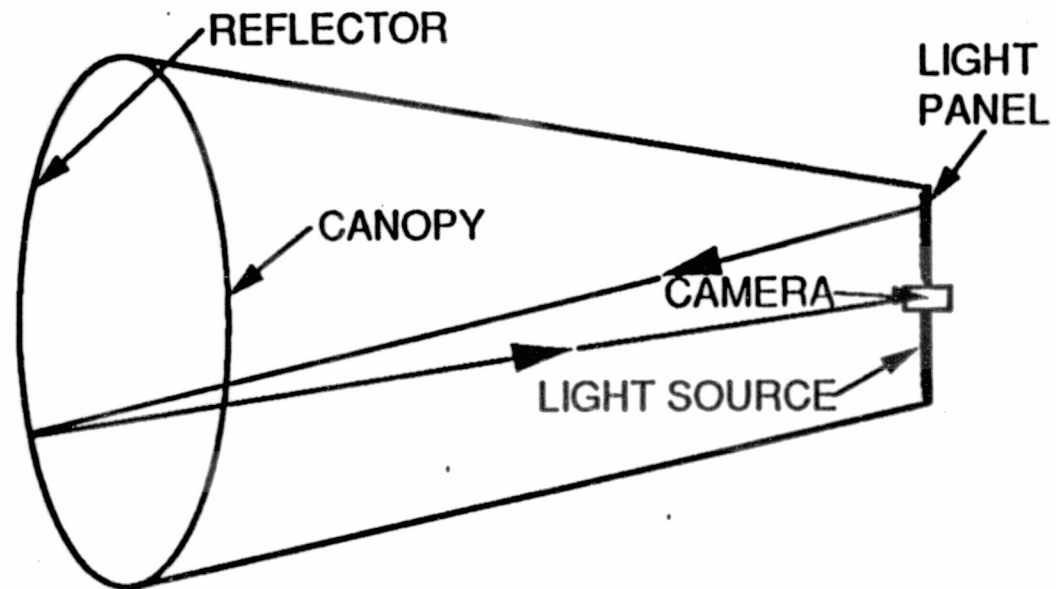
EXPERIMENT ORBITAL CONFIGURATION



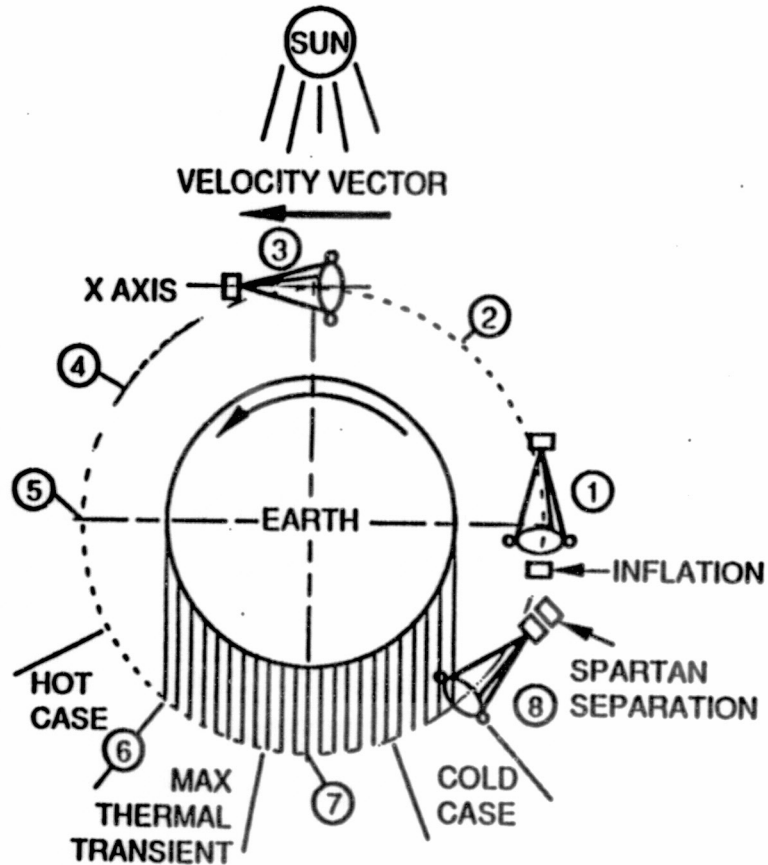
IN-STEP INFLATABLE ANTENNA EXPERIMENT CANISTER AND SPARTAN



IN-STEP INFLATABLE ANTENNA EXPERIMENT SURFACE MEASUREMENT SYSTEM CONFIGURATION



IN-STEP INFLATABLE ANTENNA EXPERIMENT ORBITAL FUNCTIONAL SEQUENCES



ORBITAL FUNCTIONS

- EXPERIMENT INITIATION COMMAND FROM SPARTAN
- CANISTER DOOR DEPLOYMENT
- REFLECTOR STRUCTURE DEPLOYMENT BY INFLATION
- VIDEO COVERAGE OF REFLECTOR DEPLOYMENT
- SURFACE MEASUREMENT AS FUNCTION OF
 - SUN ANGLE: ORBITAL POSITIONS 1-5
 - CANOPY PRESSURE: ORBITAL POSITION 6-8
- ANTENNA STRUCTURE EXCITATION PROVIDED BY SPARTAN
- MEASUREMENT OF STRUCTURE AMPLITUDE DECAY
- ANTENNA/SPARTAN SEPARATION

IN-STEP INFLATABLE ANTENNA EXPERIMENT SUMMARY

- **PROGRAM STATUS**

- **PRELIMINARY DESIGN COMPLETE**
- **CONCEPTUAL DESIGN REVIEW ACCOMPLISHED**
- **CARRIER INTERFACE ESTABLISHED**
- **PHASE 0 SAFETY REVIEW IN PROCESS**
- **PHASE C/D PROGRAM PLANNING COMPLETE**

- **EXPERIMENT RESULTS**

- **DEPLOYMENT RELIABILITY VALIDATED BY EXPERIMENT**
- **LOW WEIGHT AND VOLUME DEMONSTRATED BY FABRICATION OF LARGE SIZE STRUCTURE**
- **LOW STRUCTURE COST VERIFIED BY LOW COST EXPERIMENT**
- **USER POTENTIAL DETERMINED BY RESULTS OF SURFACE MEASUREMENT**
- **ESTABLISH CONCEPT TECHNOLOGY DATA BASE**
- **PROJECTIONS OF PERFORMANCE FOR DIFFERENT APPLICATIONS**