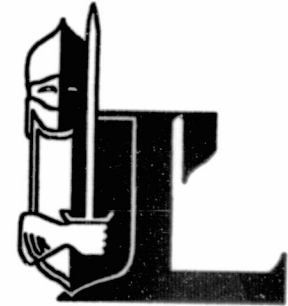


**DEVELOPING AN INFLATABLE
SOLAR ARRAY**



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Laboratory/VTPN**

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Dr. George J. Vendura, Jr., SUMM Associates

Presented By: Patrick K. Malone

October 6, 1992

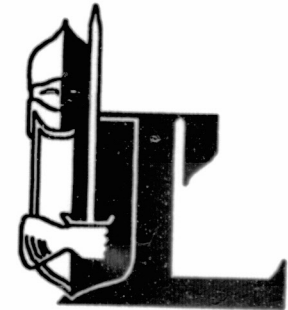
NASA/DOD Flight Experiments Interchange Meeting

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DEVELOPING AN INFLATABLE SOLAR ARRAY

ITSAT Design Goals



- 90 - 100 W/Kg Array System (200 W Wing)
- Design Orbit: 600 - 800 Km (Worst Case Inclination)
- 3 Year Life (200 W EOL)
- Scalability of design to 1000 Watt Wing
- Low Recurring Costs

SPACE POWER

LEI

SPACE
POWER

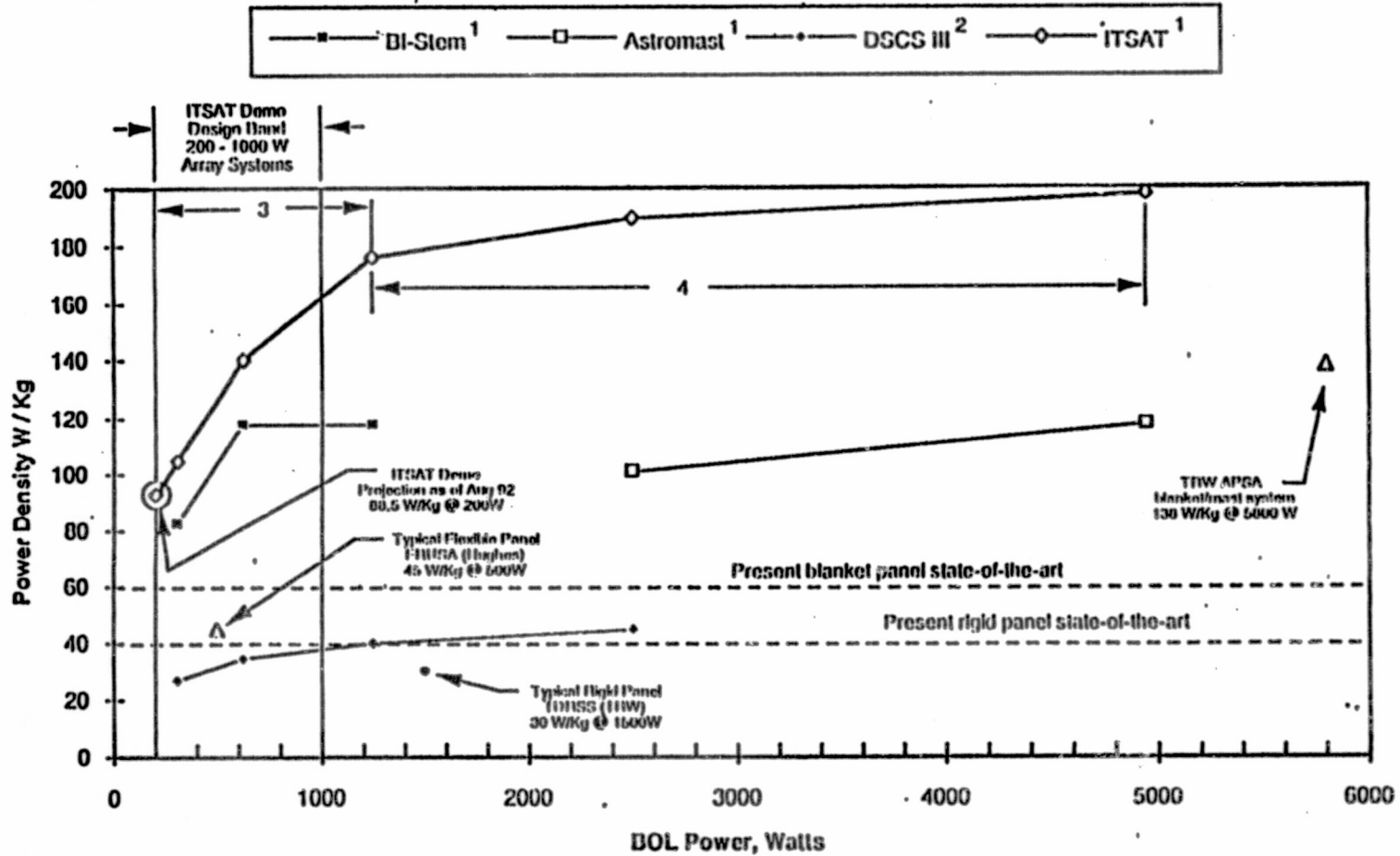
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DEPLOYMENT COMPARISON

ITSAT vs Bi-Stem vs Astromast DSCS III

(BOL/GEO/Crystal-Si)



1. L'Gardo ITSAT with crystalline silicon cells on flexible blanket.
2. Rigid panel design.
3. ITSAT based on aluminum laminate.
4. ITSAT based on U-V cured resin structure.

VU-92-GW-022b

DEVELOPING AN INFLATABLE SOLAR ARRAY

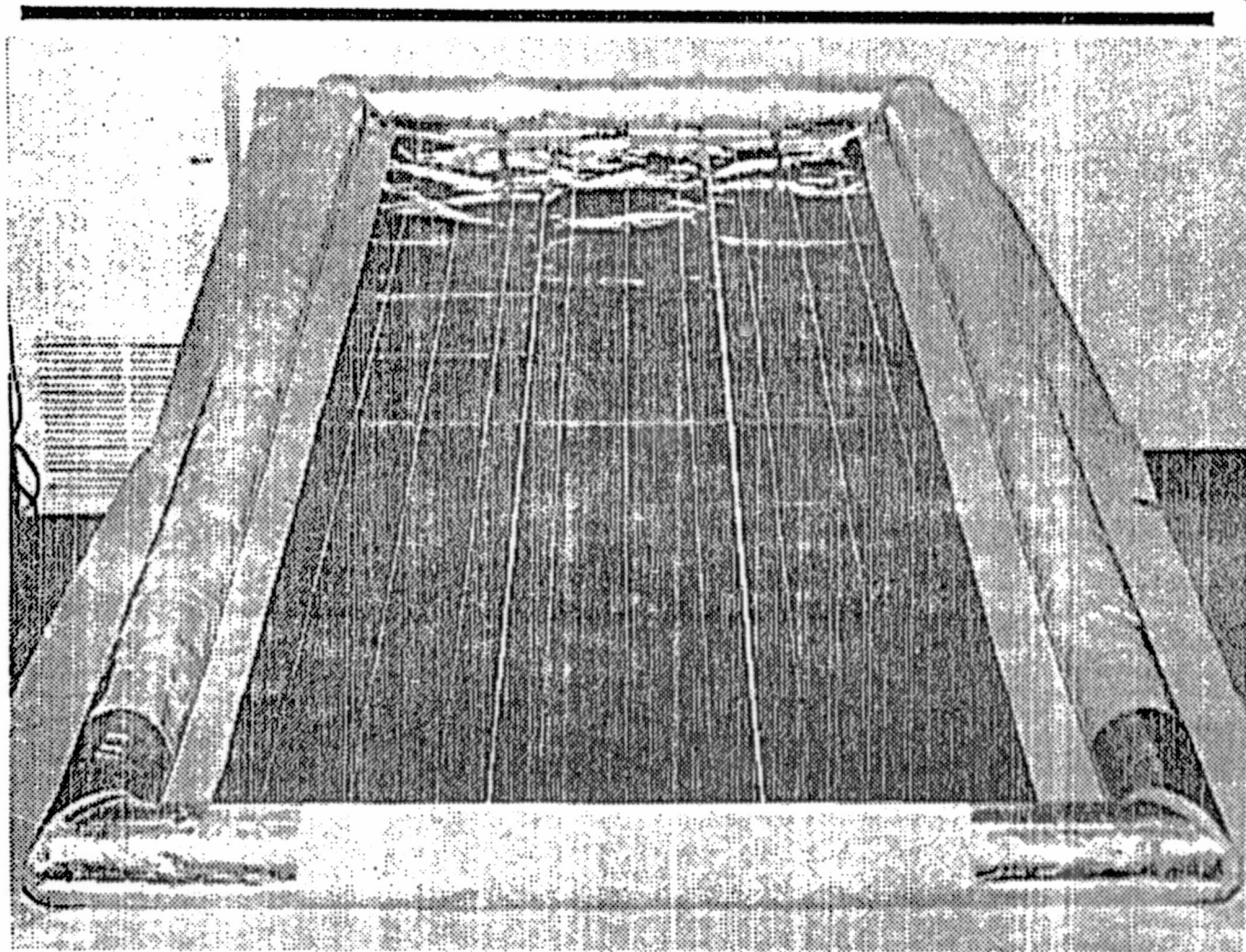
Program Phases



- Three Phases
- Phase 1 Feasibility and Proof of Concept
- Phase 2 Update Ph 1 Design and Fabricate a Flight Qualified System
- Phase 3 Refurbish Ph 2 System and Conduct a flight test

(Program status: approximately mid-term of phase 2)

PROTO TYPE UNIT

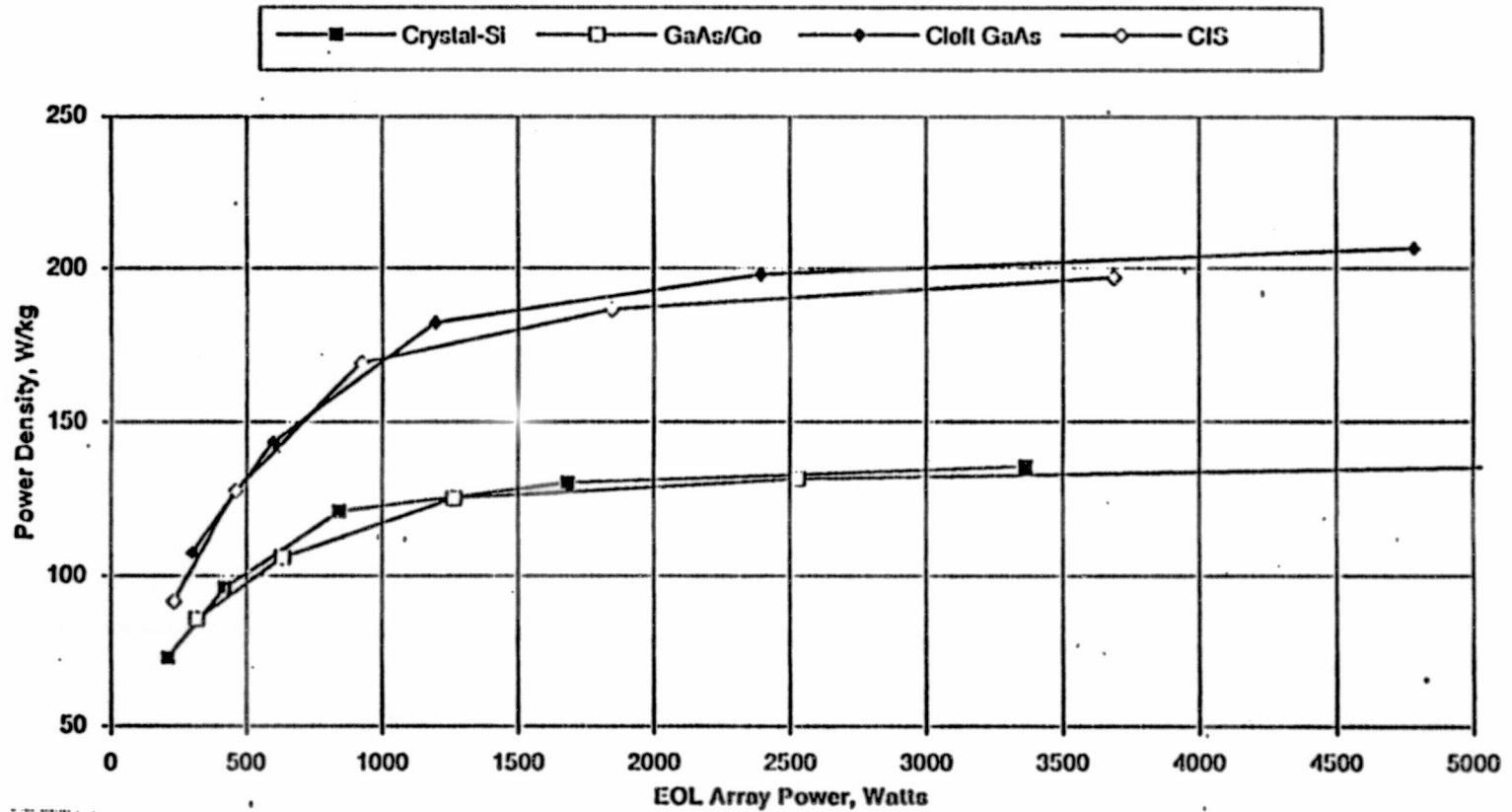


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EOL POWER DENSITY vs DEPLOYED ARRAY POWER

APSA-Type Flexible Blanket/Torus Deployed

3 Year LEO



DEVELOPING AN INFLATABLE SOLAR ARRAY

Major Sub-Systems



- Housing/Cover
- Tube Booms
- Inflation System
- Solar Blanket Assembly

ITSAT SOLAR ARRAY

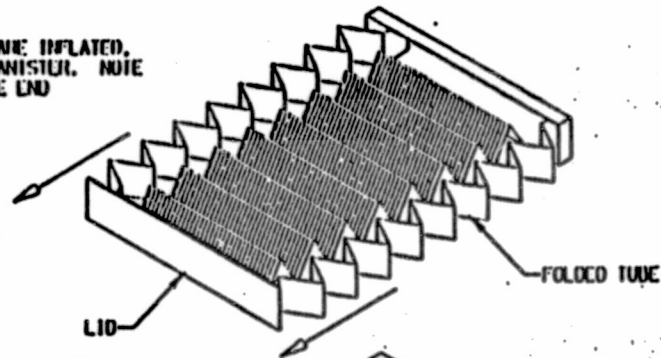
PH2 Design



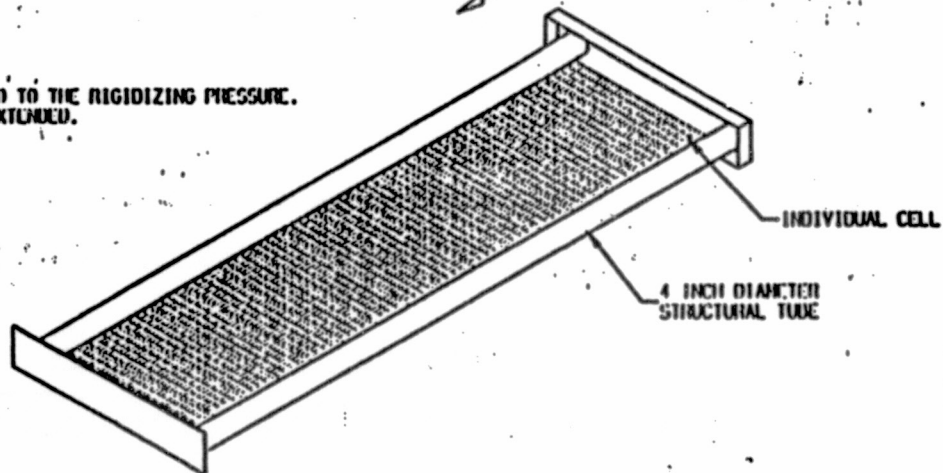
1. SOLAR ARRAY IN PACKAGED CANISTER.



2. CANISTER LID RELEASES. TUBES ARE INFLATED, PULLING THE ARRAY OUT OF THE CANISTER. NOTE THAT THE CANISTER LID FORMS ONE END OF THE STRUCTURE.



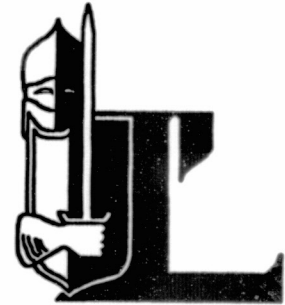
3. TUBES INFLATED TO THE RIGIDIZING PRESSURE. ARRAY FULLY EXTENDED.



VU-92-QW-0229

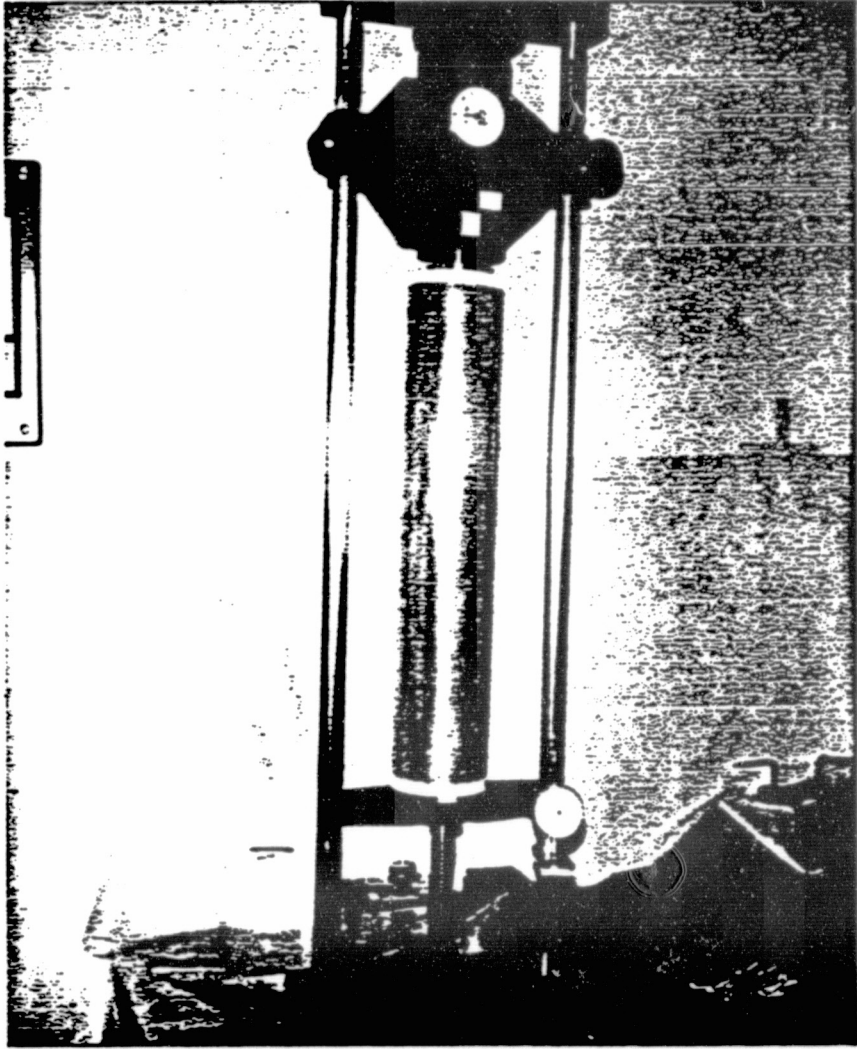
DEVELOPING AN INFLATABLE SOLAR ARRAY

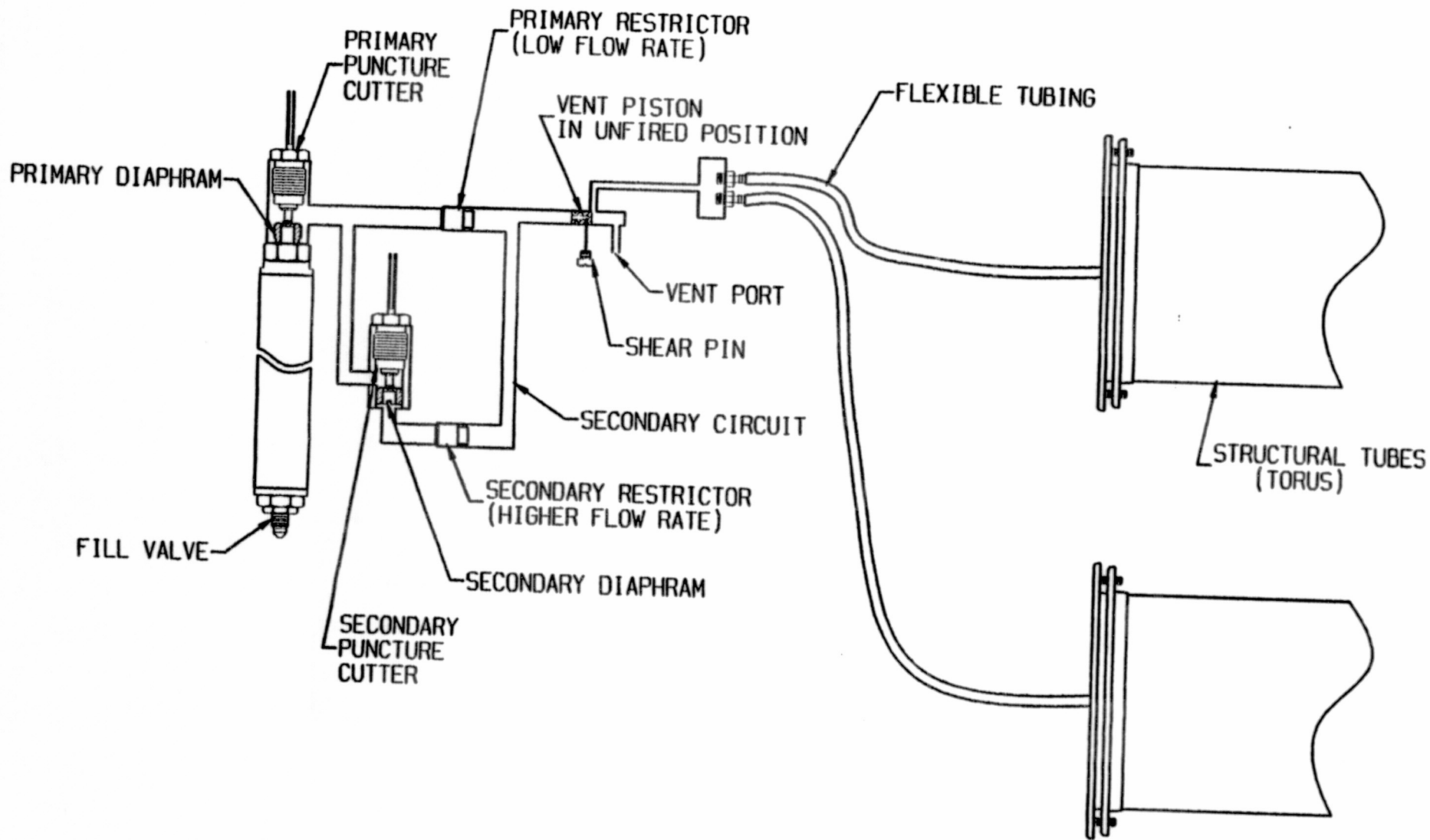
Rigidizable Tube Design



- 3-ply Kapton-Aluminum-Kapton Laminate
- 4.0 inch Diameter
- Compression Loading Requirements 12 lbs
- Rigidization Pressure 22 psi
- Current Design Margin is Approximately 2.5

This data is from actual test results



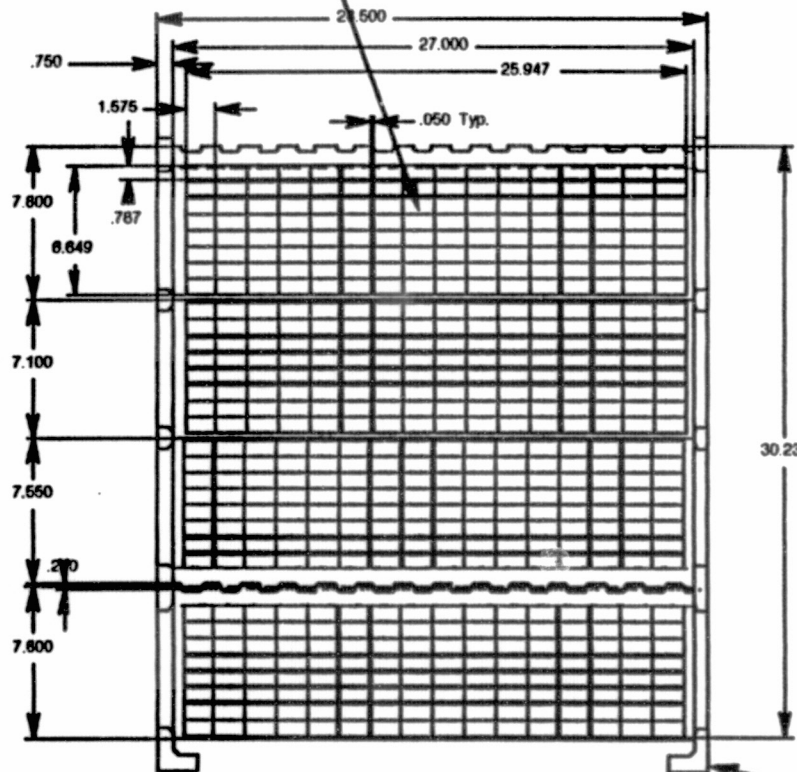


ITSAT SOLAR ARRAY

Typical Blanket Segment



Solar Cells W/Coverglass



Blanket Substrate

Hinges

Wiring Harness

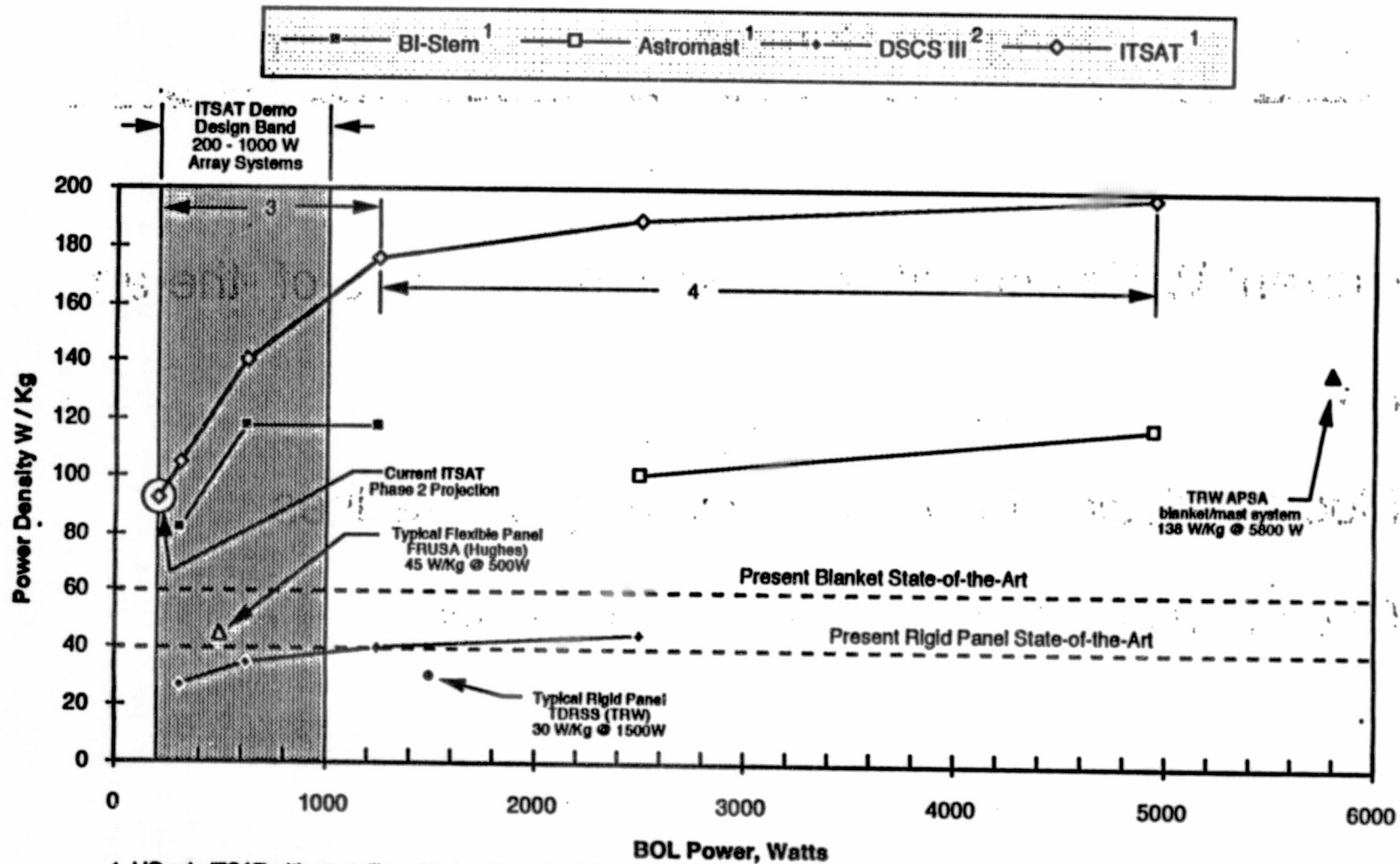
DEVELOPING AN INFLATABLE SOLAR ARRAY

Program Summary



- Current W/Kg estimates are well above State-of -the-art
- A variety of cell types can be used
- Modular design to adapt to a variety of satellites
- Recurring costs are anticipated to be low

Deployment Comparison: ITSAT vs Bi-Stem vs Astromast vs DSCS III (BOL/GEO/Crystal-Si)



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2. Rigid panel design.
3. ITSAT based on aluminum-kapton laminate.
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