Team Goals

Design, Fabricate, and Analyze a Structure that will Support the Payload

- Space Allocation of All Teams' Components
- Data/Power Cable Routing

EDUCATE STUDENTS

- Programs, and Techniques used in Industry
- Hands-on Experience

Initial Criteria

- Volume and Mass Constraints
  - Hitch-Hiker Specifications
    - As close to mass limit as possible to maximize orbital life-time
- Constraints Imposed by Other Sub-Systems
  - Science (C.T.E.)
  - G.N.C. (Bending/Stiffness)
  - Other Teams (Temperature)

Hitch-Hiker Specifications

Maximum spacecraft weight	68 kg	⟺	150 lb
Maximum spacecraft height	52 cm	⟺	20.5 in
Maximum spacecraft diameter	48 cm	⟺	19 in
Canister inside diameter	50 cm	⟺	20 in
Maximum CG location	1.27 cm	⟺	0.5 in
Maximum CG location	26 cm	⟺	10.25 in
Ejection Velocity	0.6 - 1.2 mps	⟺	2 - 4 fps

To Be Determined

- Maximum rotational impulse
- Minimum payload resonant frequency

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HITCHHIKER EJECTION SYSTEM
PAYLOAD ENEVELOPE

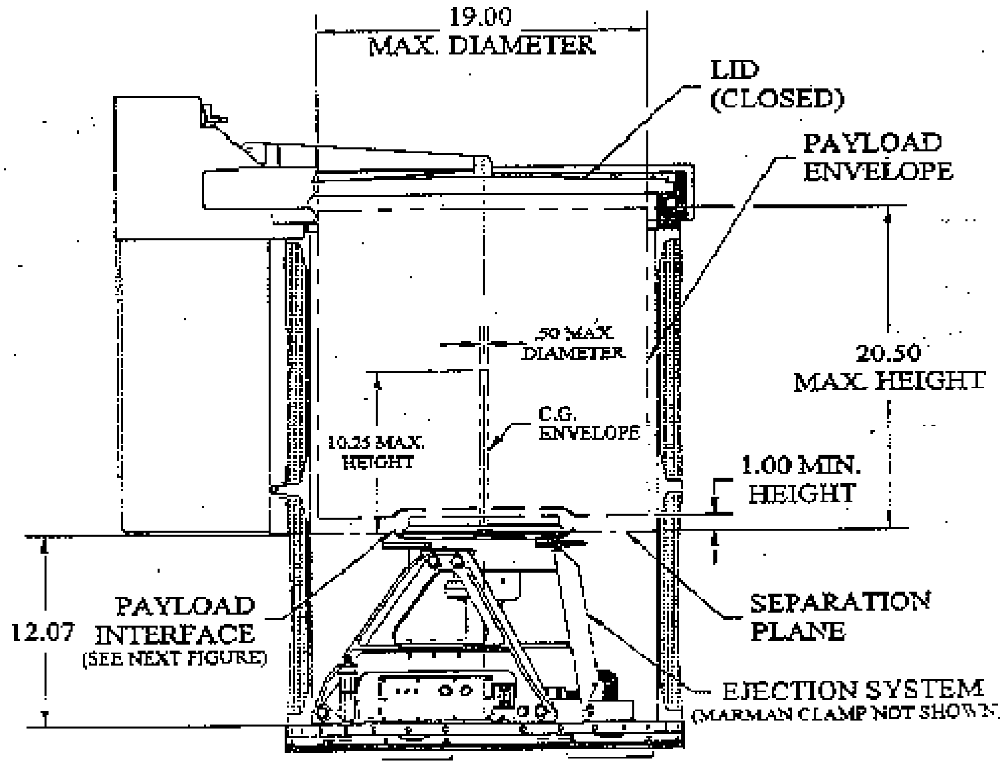

Figure 2.72

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from *N.A.S.A. Shuttle Small Payloads Project*

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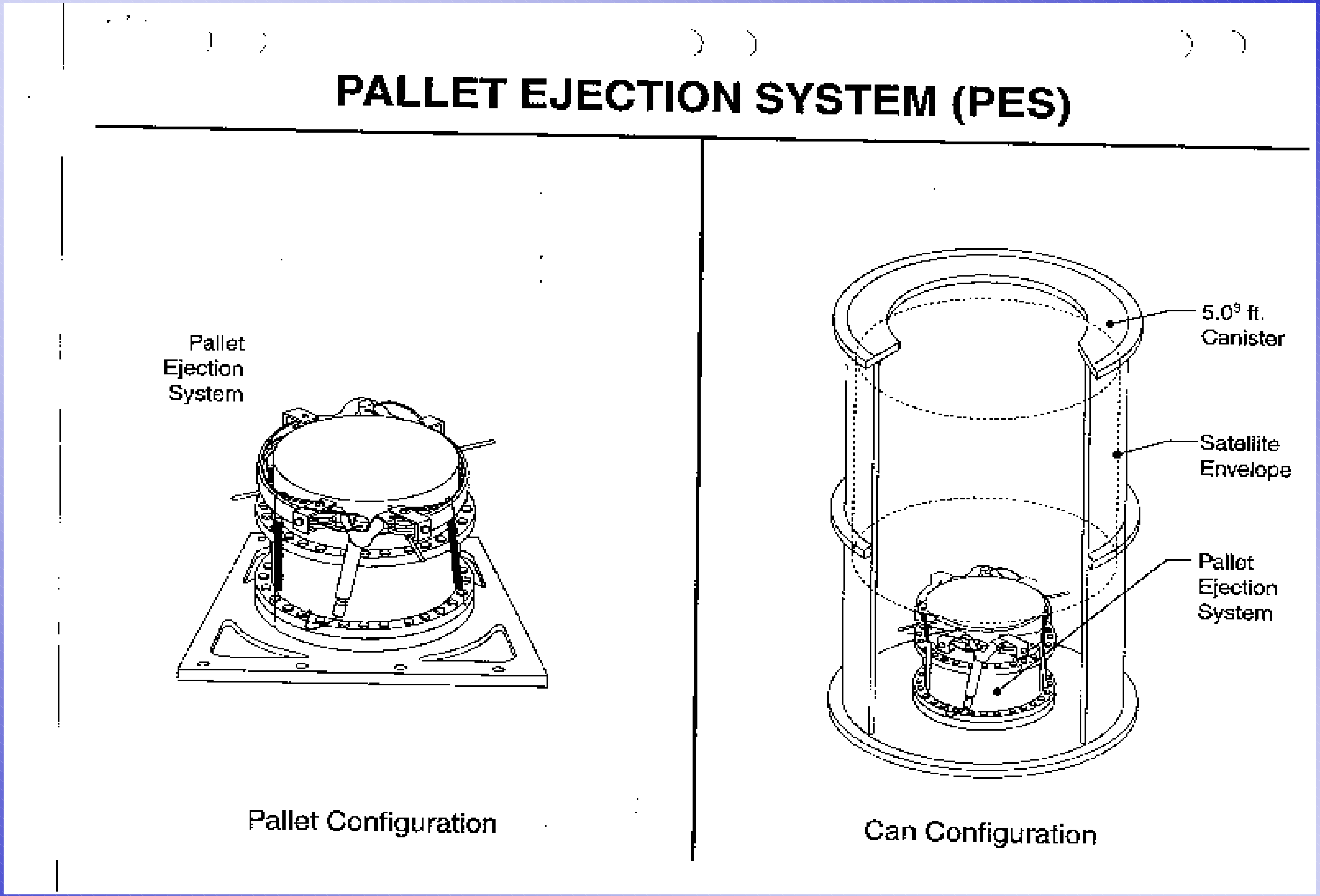

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PRO/E DRAWING OF MARMON PLATE

Component/ Subsystem	**Operating Temperature ∫C**	**Survival Temperature ∫C**
Digital Electronics	0 , 50	-20 , 70
Analog Electronics	0 , 40	-20 , 70
Batteries	10 , 20	0 , 35
Infrared detectors	-269 , -173	-269 , 35
Momentum wheels, motors	0 , 50	-20 , 70
Solar Panels	-100 , 125	-100 , 125

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Double Cylindrical Design

Inner Telescope Tube (I.T.T.)

- ñ Main Load Bearing Structure
  - Marmon Plate Attachment
- ñ Optical Structure
  - Light Baffles

Outer Solar Structure (O.S.S.)

- ñ Large Surface Area for Solar-Foil
- ñ Supports Solar Electronics

Launch-Interface End

- ñ Support Outer Structure
- ñ May be more complex design than the Aperture End

Aperture End

- ñ Supports Outer Structure

Simple Design

Minimize number of parts

Use proven methods

Good reason for added complexity

Materials used must survive ground, launch, on-orbit environment, and help control the temperature

Control Loads and Vibrations Passively

Strategically use highly damped materials

Make natural frequency much different from driving frequency

Mount sensitive components in regions of the structure with low response

Mount actuators in areas that cause little structural excitation

Vibration must not interfere with launch vehicles control system, or itís own control system in deployed configuration

Dynamics and Loads

- Predict natural frequencies, modes, damping
- Predict responces to forces and vibrations as function of time

Stress

- Predict member loads and stresses to withstand
  - Strength: single load
  - Life: cyclic and sustained loading

Stiffness

Documentation

- Requirements
- How requirements and designs evolved
- Verification Criteria
- Deployment Plan
- Product Configuration
- Manufacturing Process
- How Requirements Verified
- Critical Data and Math Models
- Key decisions, problem resolutions, and rationale
- Lessons Learned