

X-38 TPS SEAL STATUS

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# X -38 TPS Seal Status

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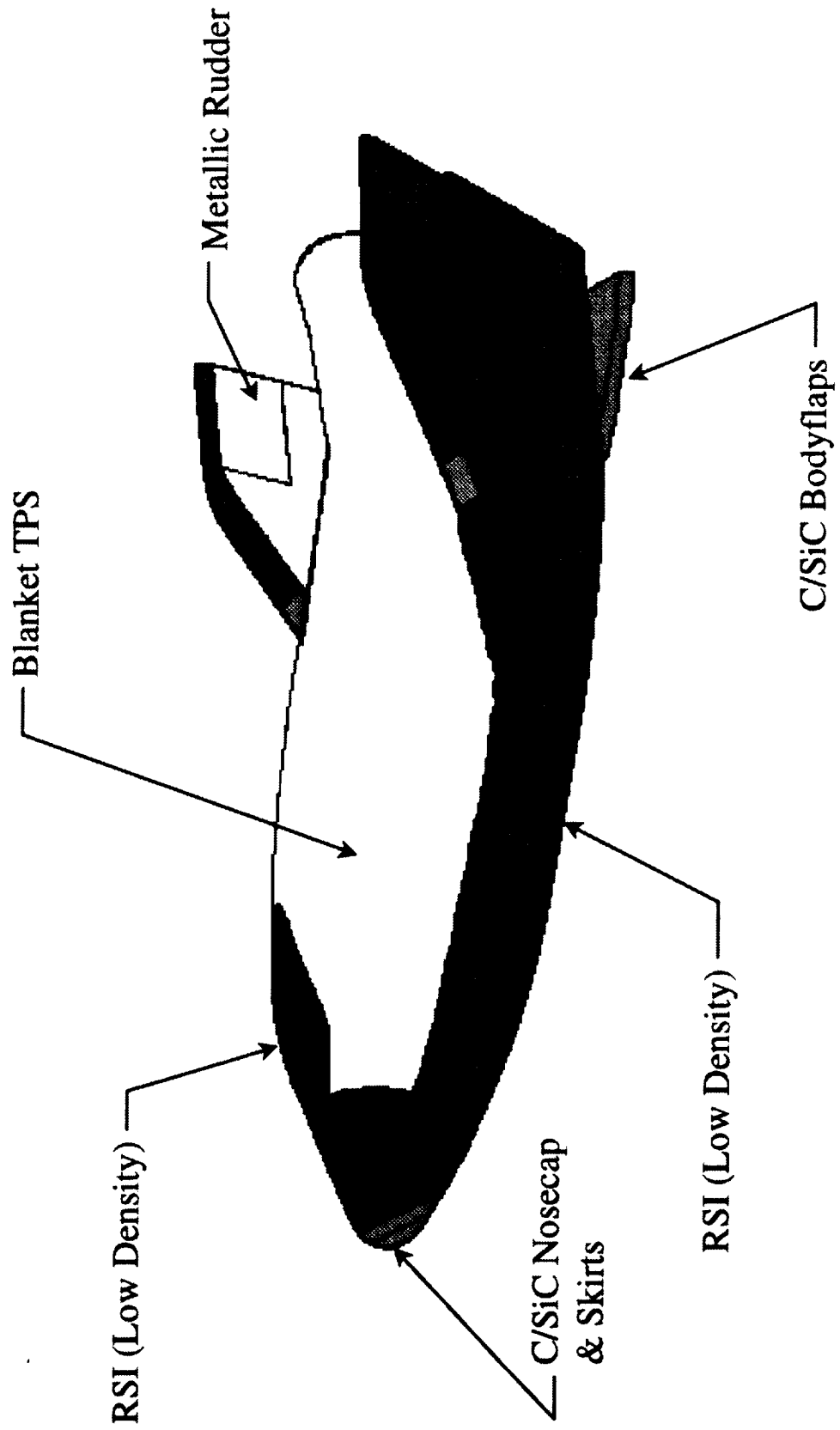
## **X38 - Crew Return Vehicle**

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- **An element of the International Space Station (ISS)**
- **Three Scenarios**
  - ISS catastrophe
  - Emergency medical evacuation
  - Period of Space Shuttle unavailability
- **X-38 Program Purpose:**
  - To greatly reduce the costs and schedule for the development of Crew Return Vehicles (CRV's) and Crew Transfer Vehicles (CTV's) through the use of the rapid development methodology associated with an X-project
    - **Ground Testing**
    - **Atmospheric Testing**
    - **Space Flight Testing**

# X-38 TPS Configuration

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## **X38 - TPS Seals**

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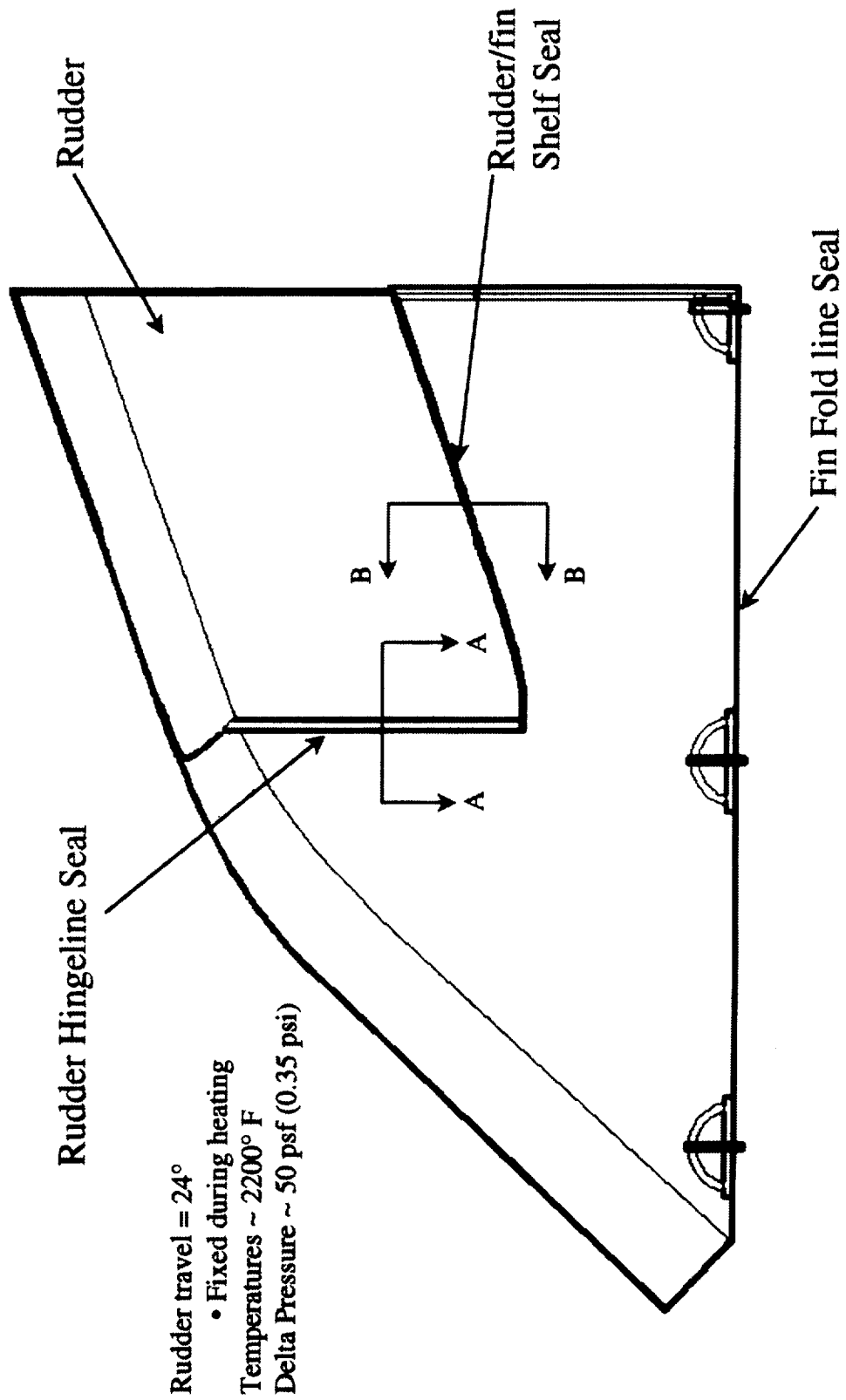
### **General Seal Requirements**

- 1) Single Flight Capability
- 2) High Temperature, Oxidative Environment
- 3) Combined Convective and Radiation Heating
- 4) Different Thermal Expansion of Seal Parts
- 5) Mechanical Load Plus Vibration/acoustic Loads
- 6) Component Movement and Rotation
- 7) Wear Resistant
- 8) Low Pressure Environment (at Peak Heating)
- 9) Low Permeability to Minimize Leakage

### **Specific X -38 Design Considerations**

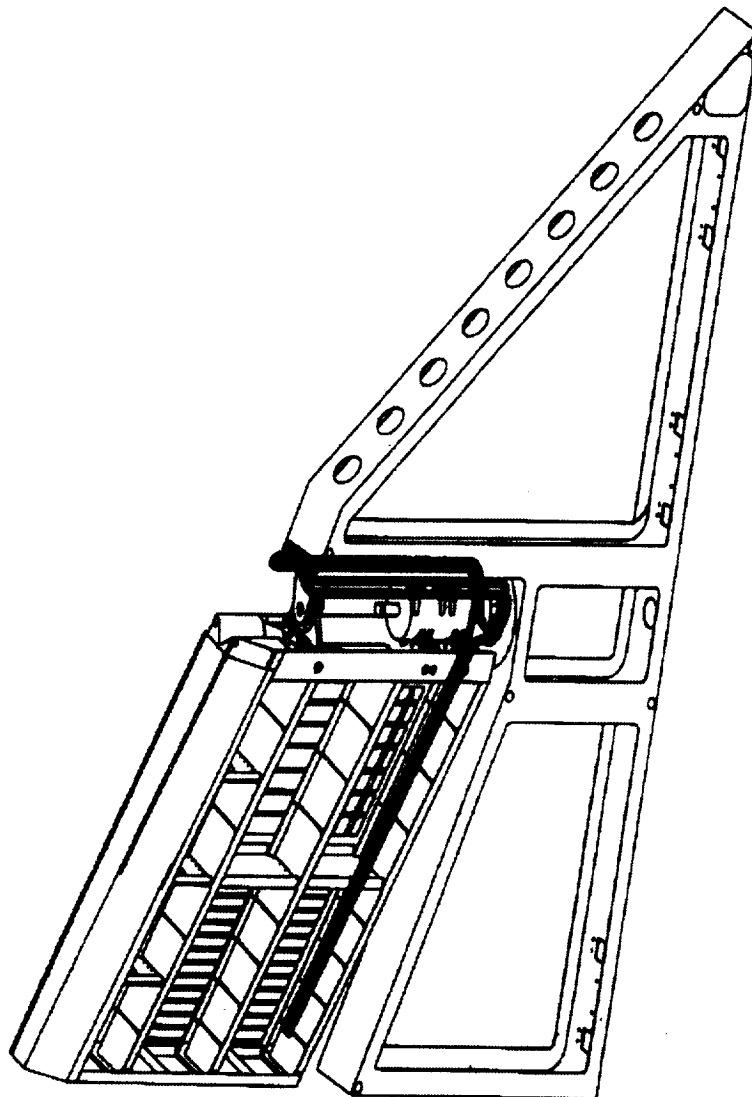
- 1) Use a Seal With Flight Heritage (Orbiter)
- 2) Operational Temperature - 1500 - 3000°F
- 3) Permeability -  $1 \times 10^{-10}$  -  $1 \times 10^{-11}$  Sq. M
- 4) Coefficient of Friction - 1.09 - 1.17
- 5) Installation Force Limit of 3 LB/in (Installed With 20-30% Seal Deflection)
- 6) Differential Pressures of 350 - 450 PSF During Peak Heating

# Fin & Rudder Seals

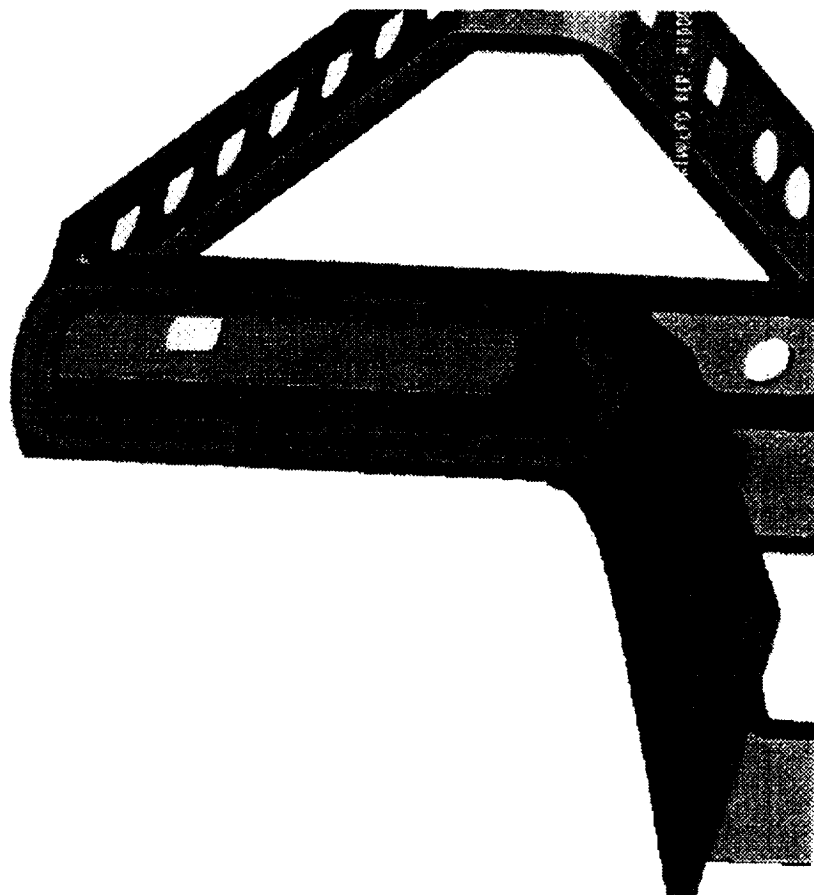


## Rudder - Fin Structure Seal Routing

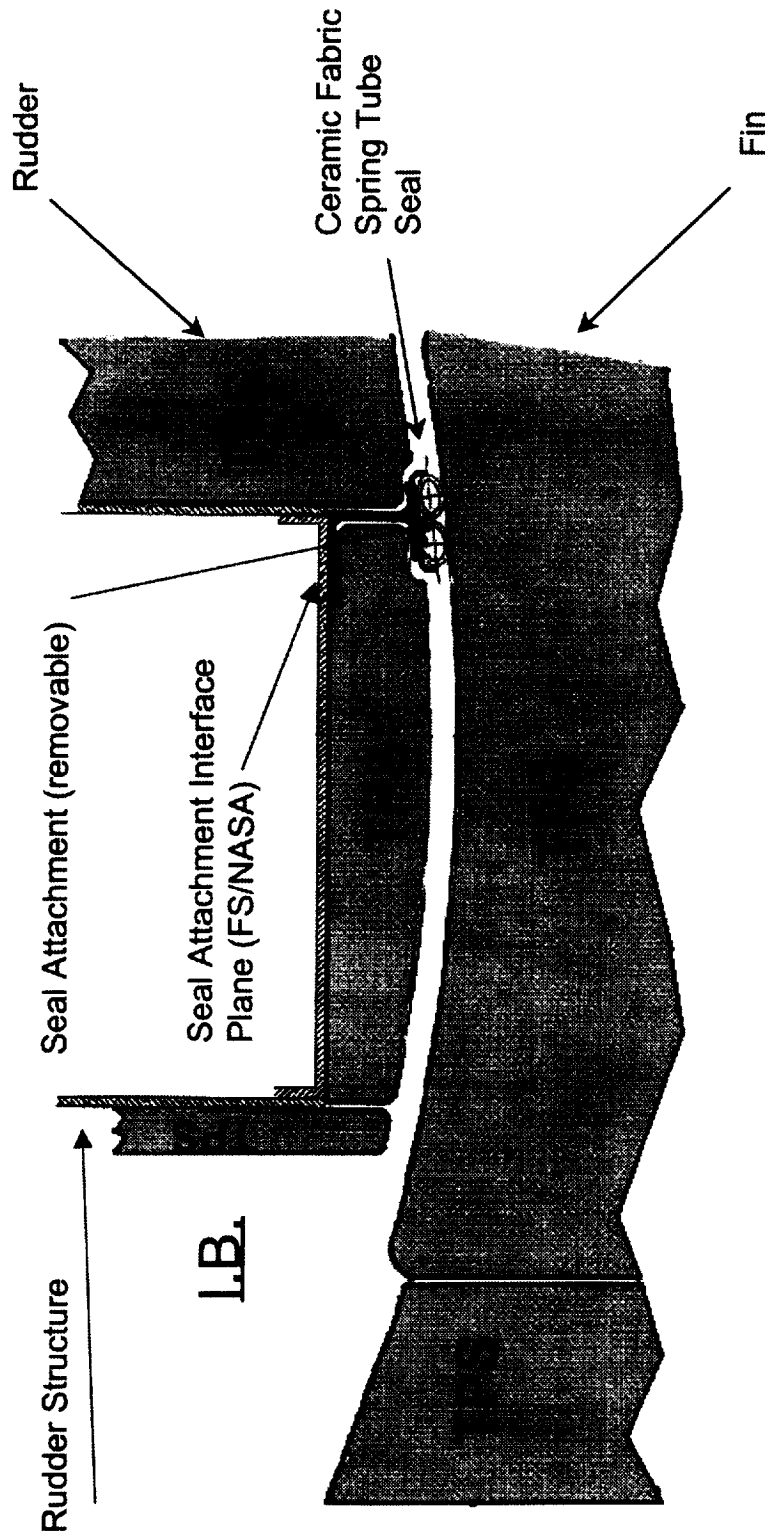
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# Fin/Rudder Seal



# Rudder/Fin Shelf Seal

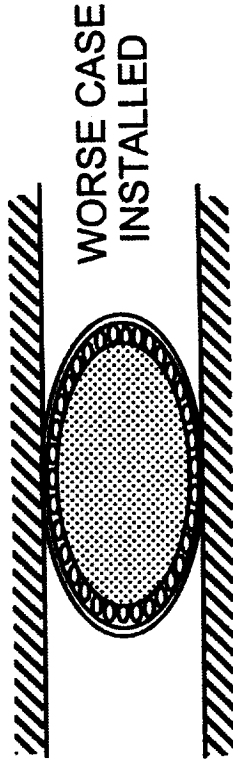
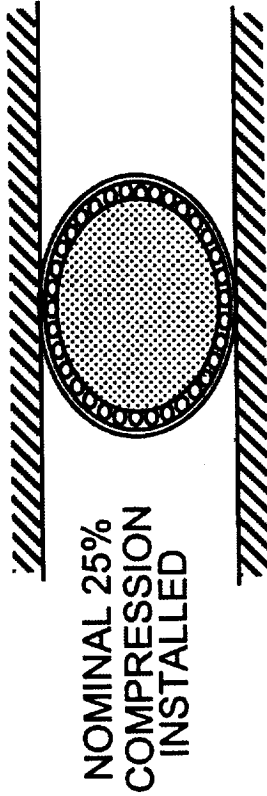
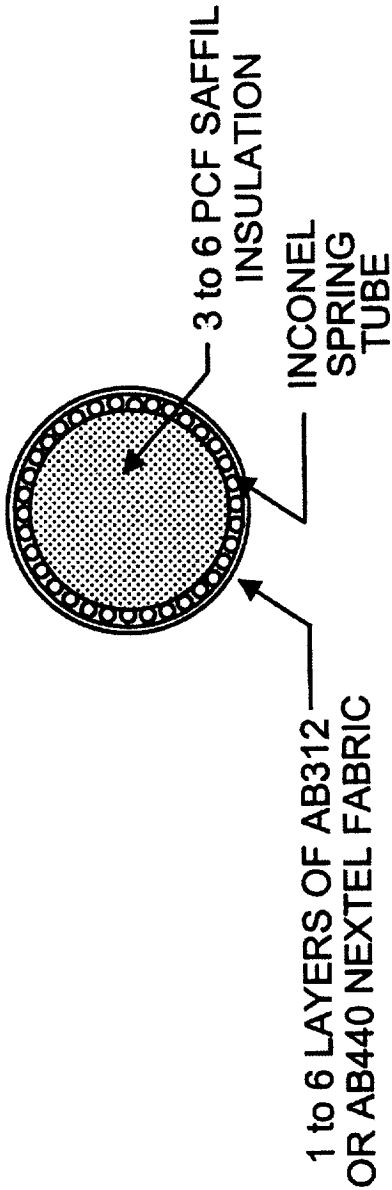


Section B-B

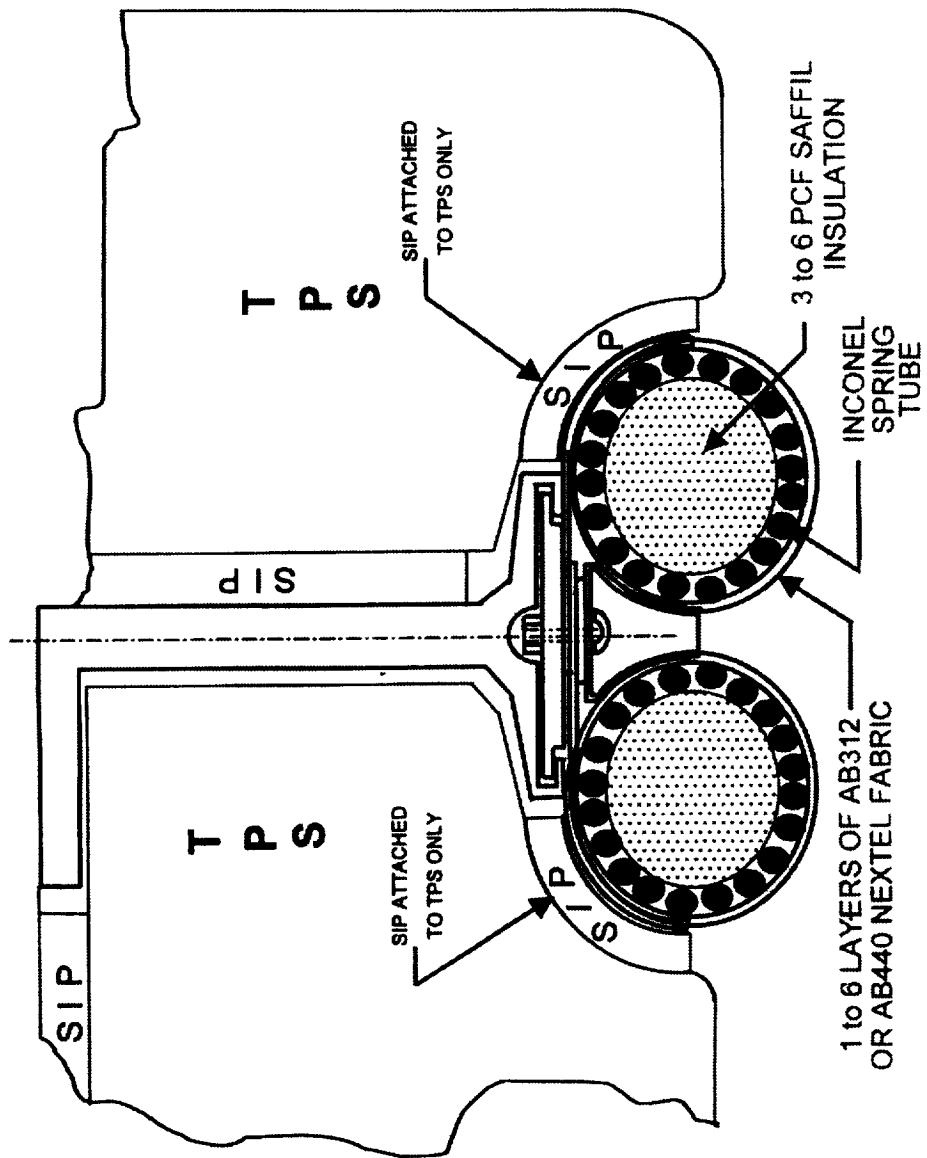


# X-38 TYPICAL SPRING TUBE SEAL

AS FABRICATED

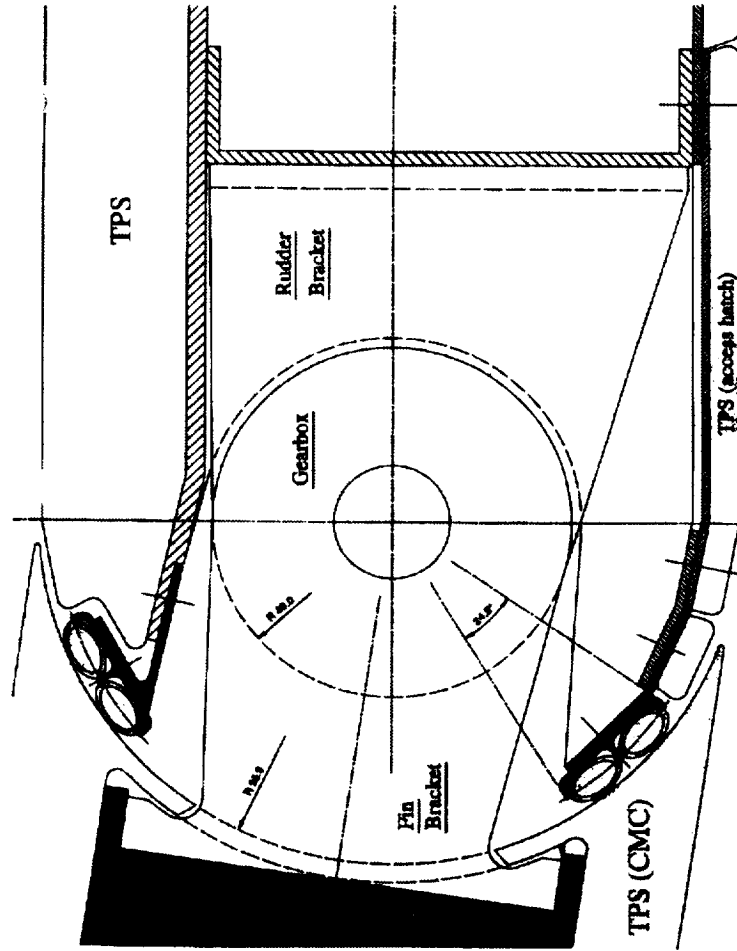


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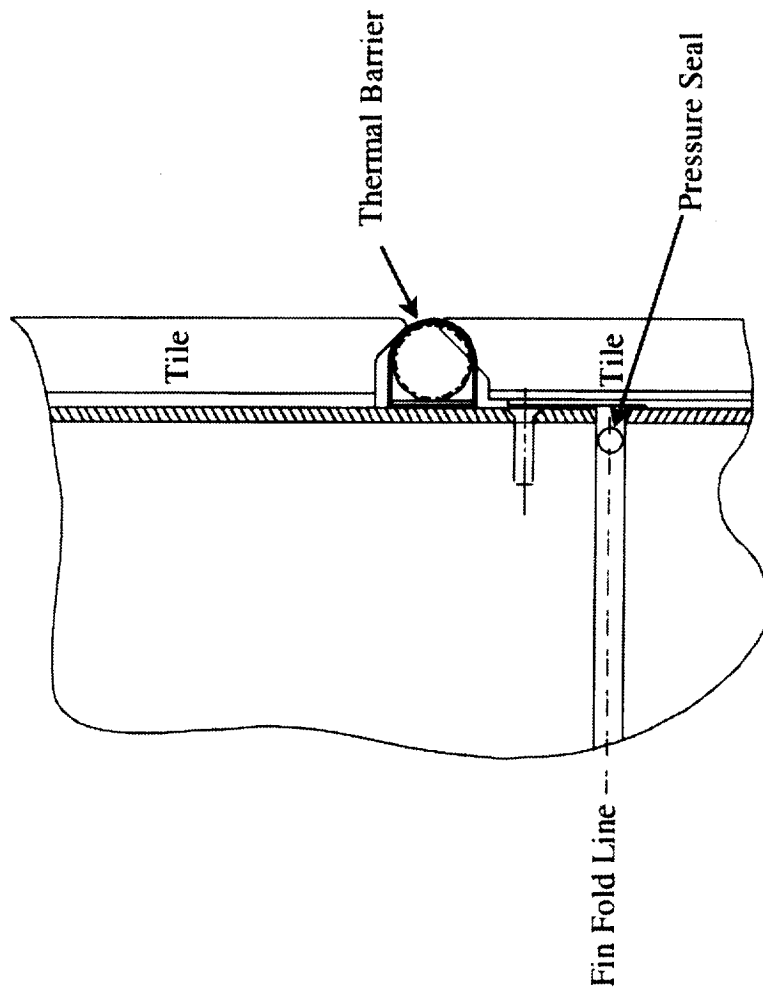
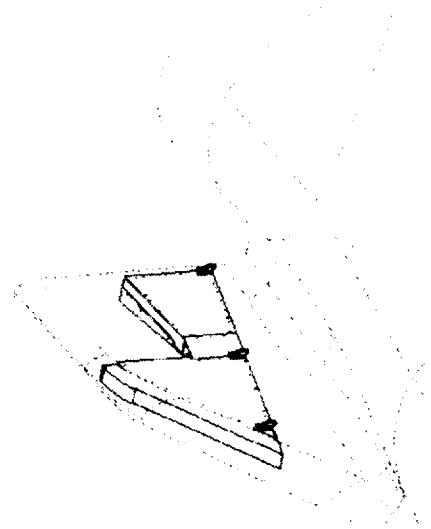
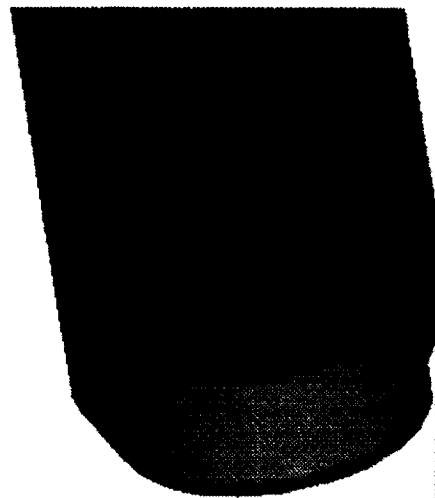
10/22/99

# Rudder Hingeline Seal

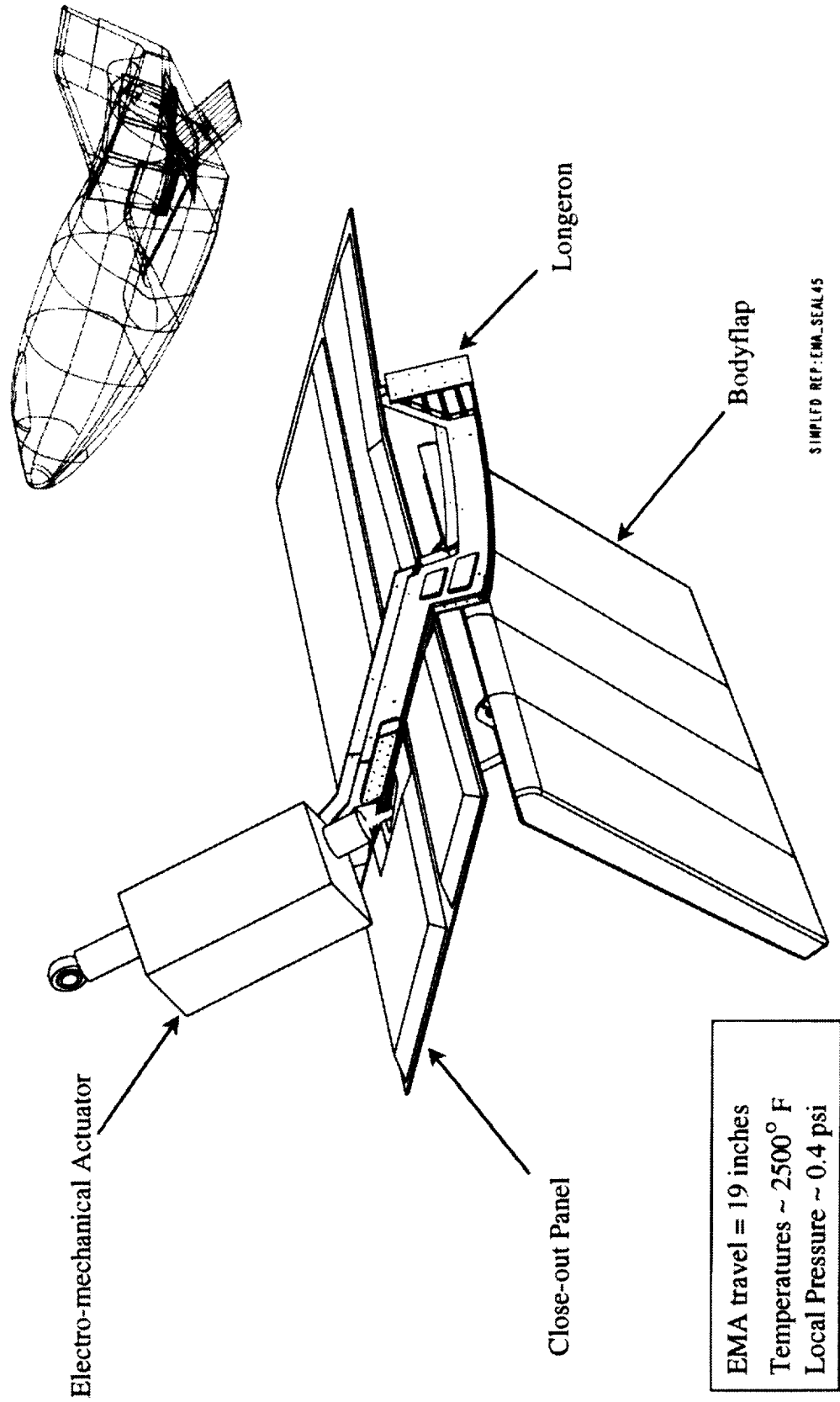


Section A-A

# Folding Fin



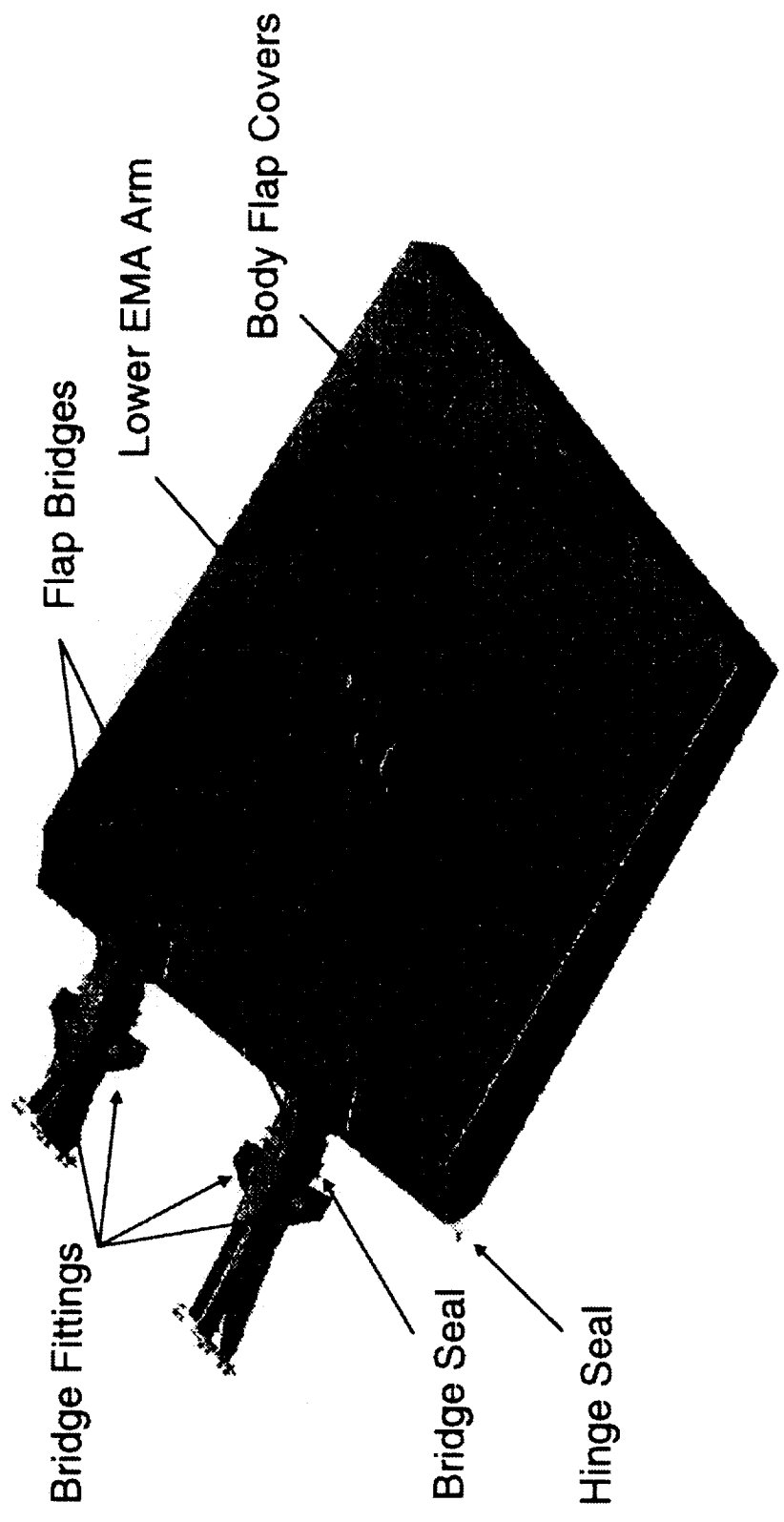
# Bodyflap Configuration



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# X - 38 Bodyflap

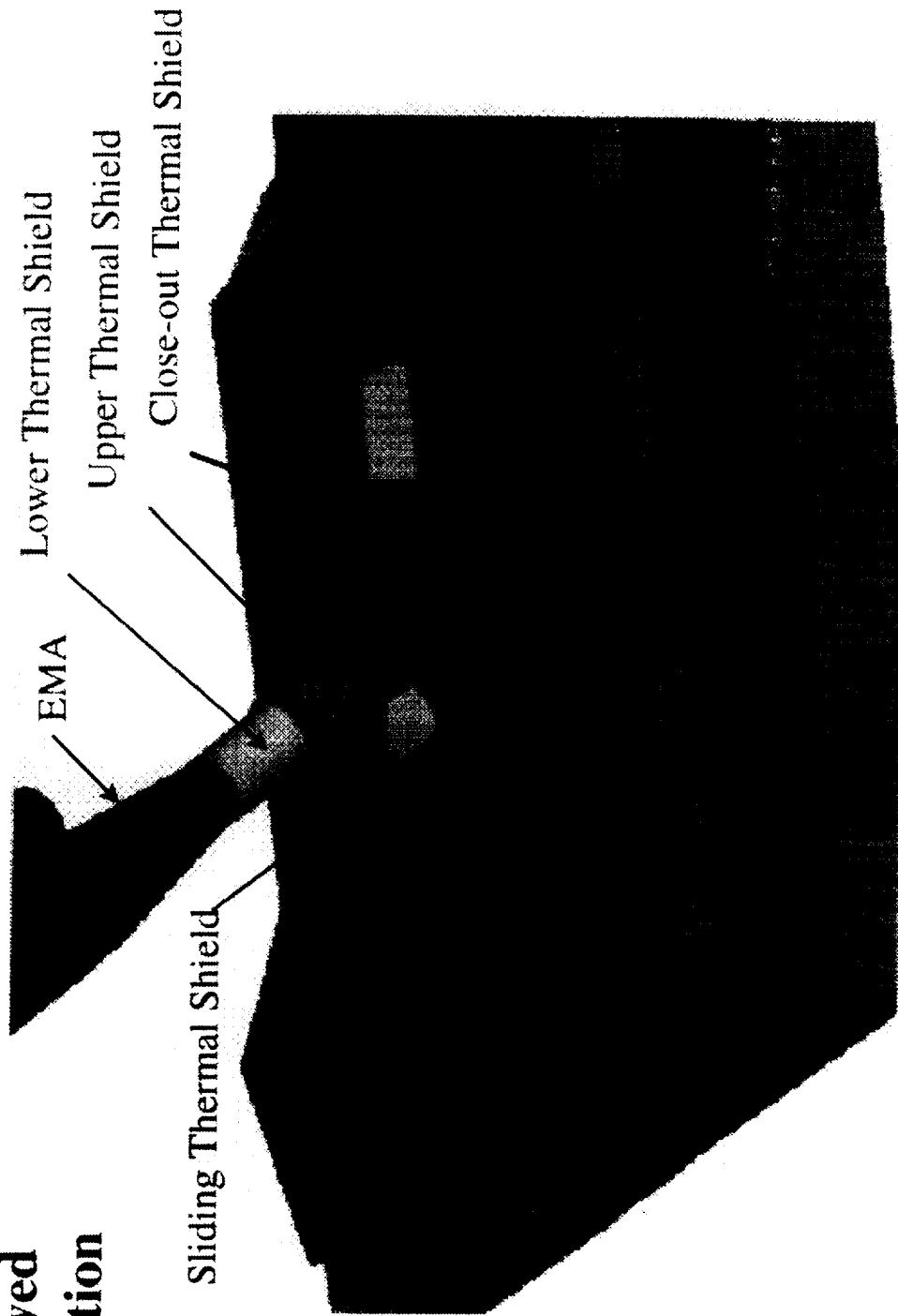
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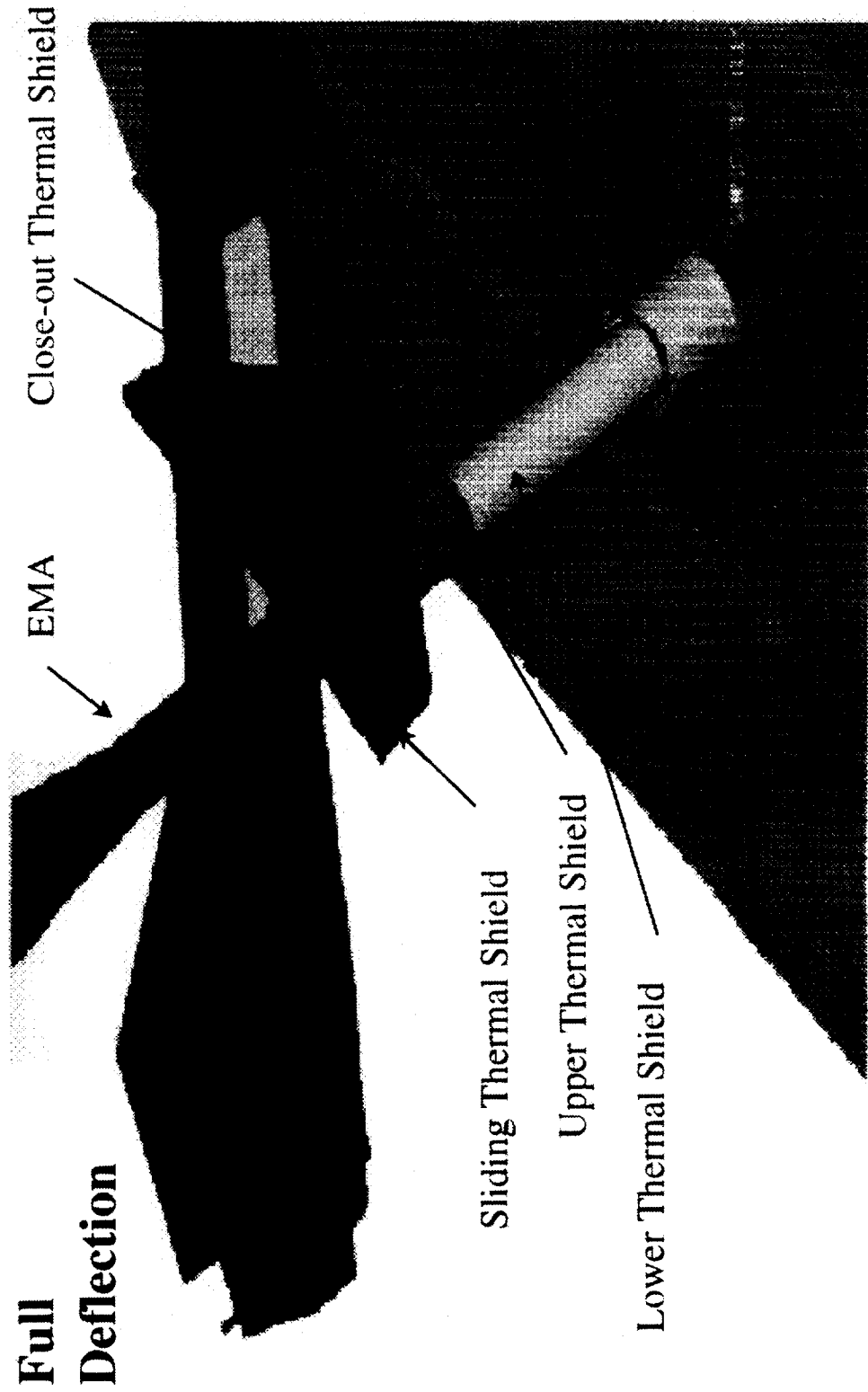
## Bodyflap - Undelected

**Stowed  
Position**





## Body Flap - Full Deflection

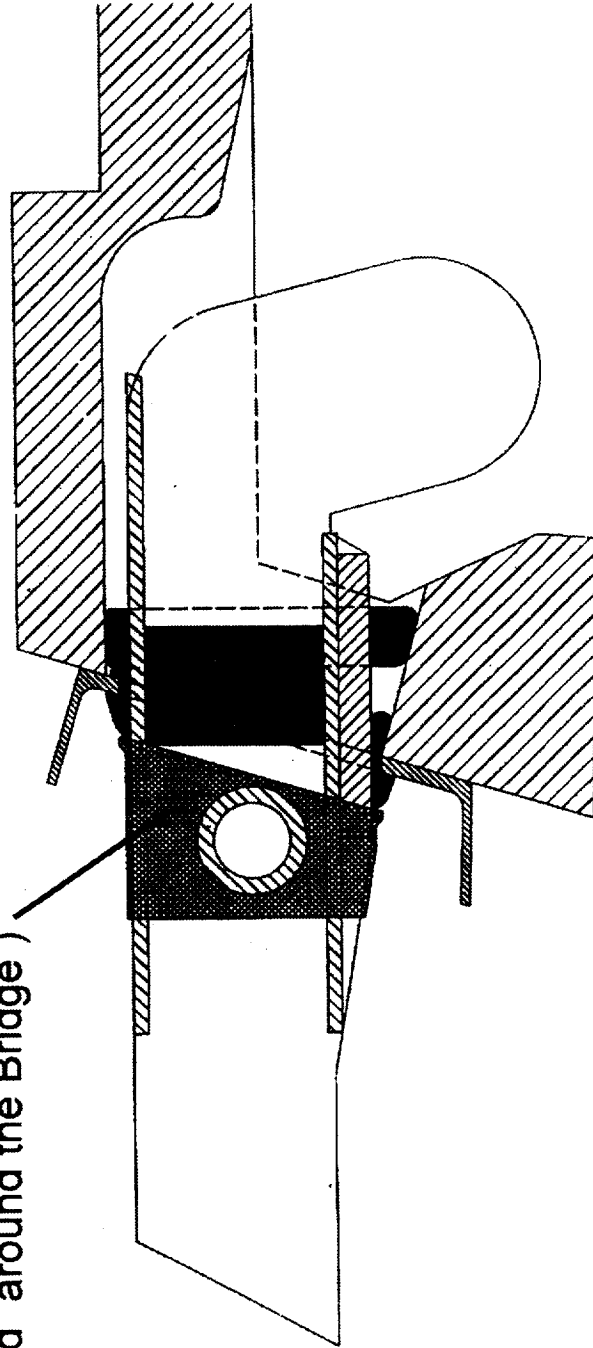


## Body Flap Bridge Beam Seal

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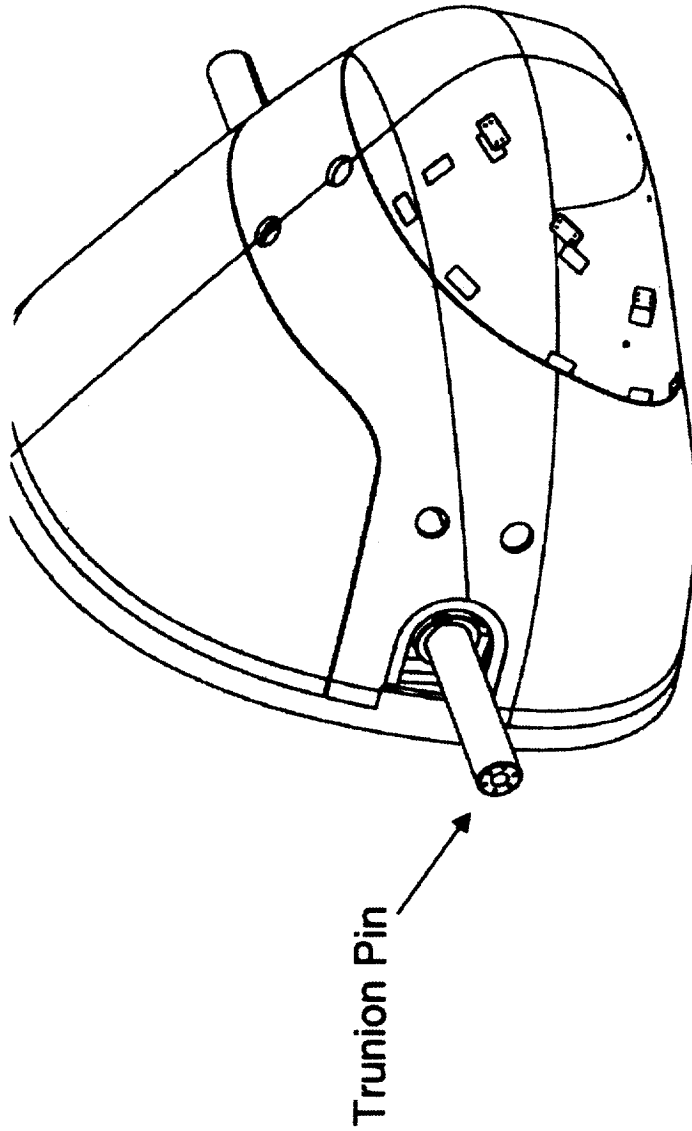
3M Nextel 440

( wrapped around the Bridge )

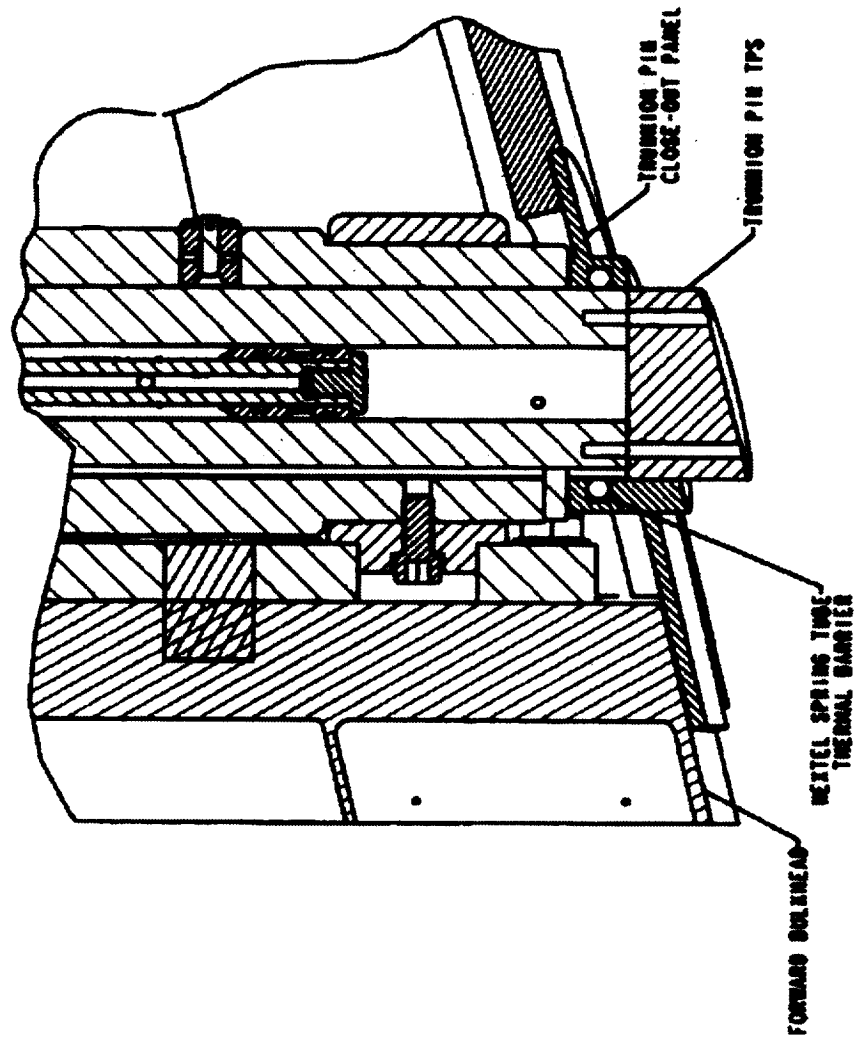


# Forward Trunion Pin

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# X-38 Forward Trunion Pin Retracted Showing Seal

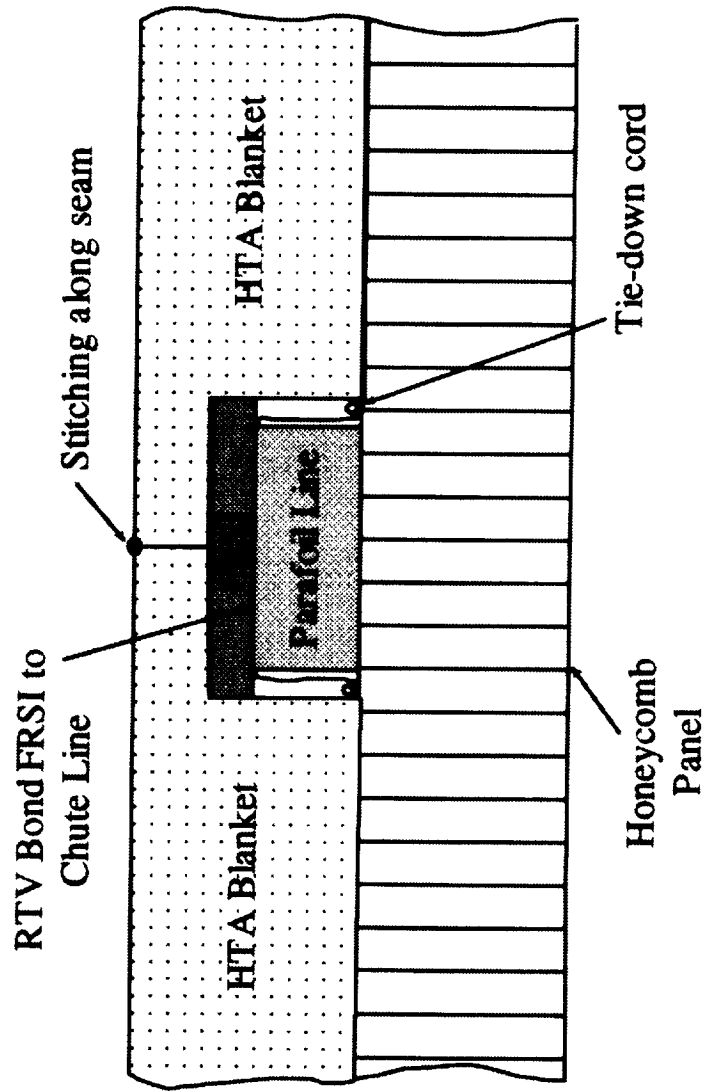


# **Backup Charts Showing Additional Seal Locations**

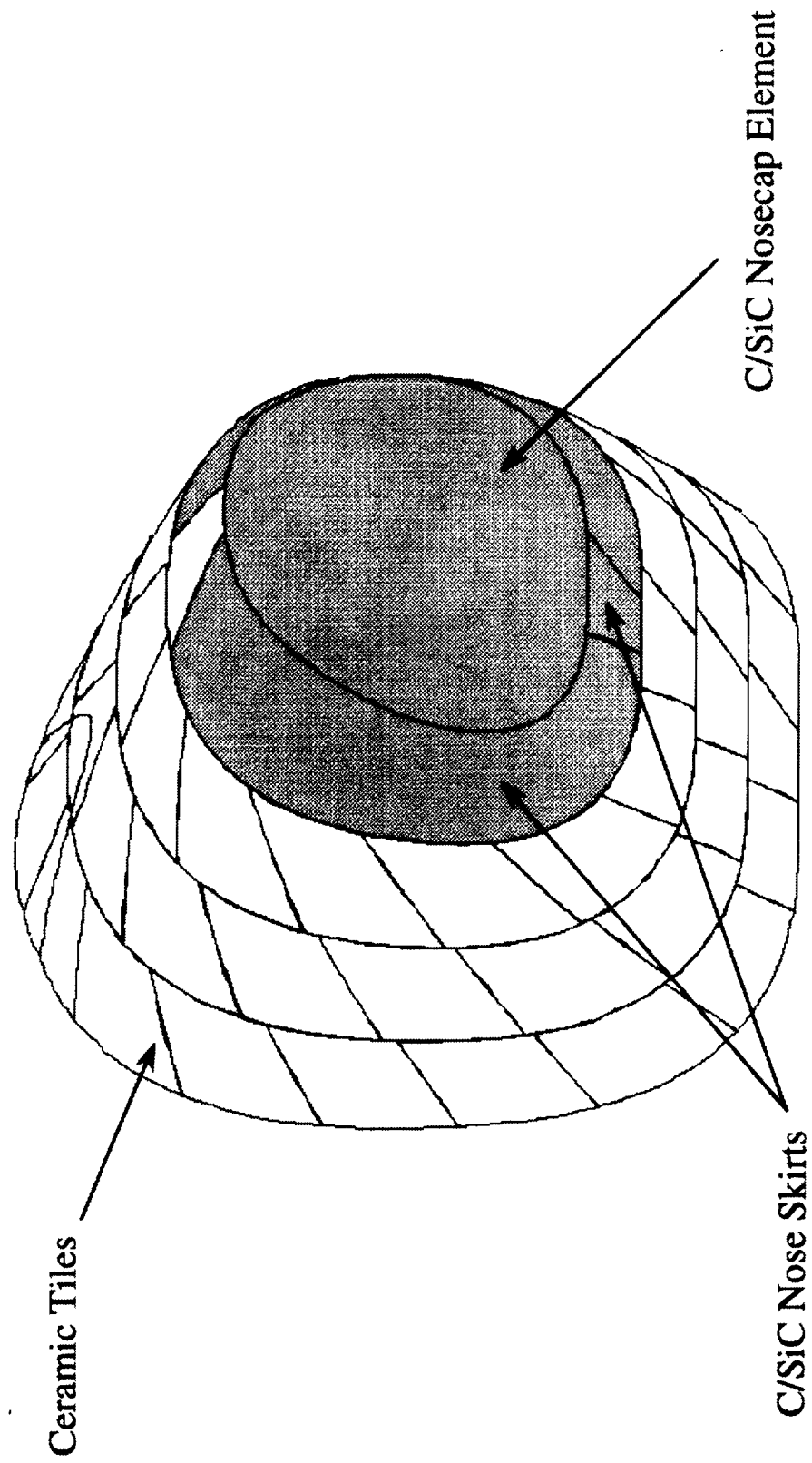
## Seal Design

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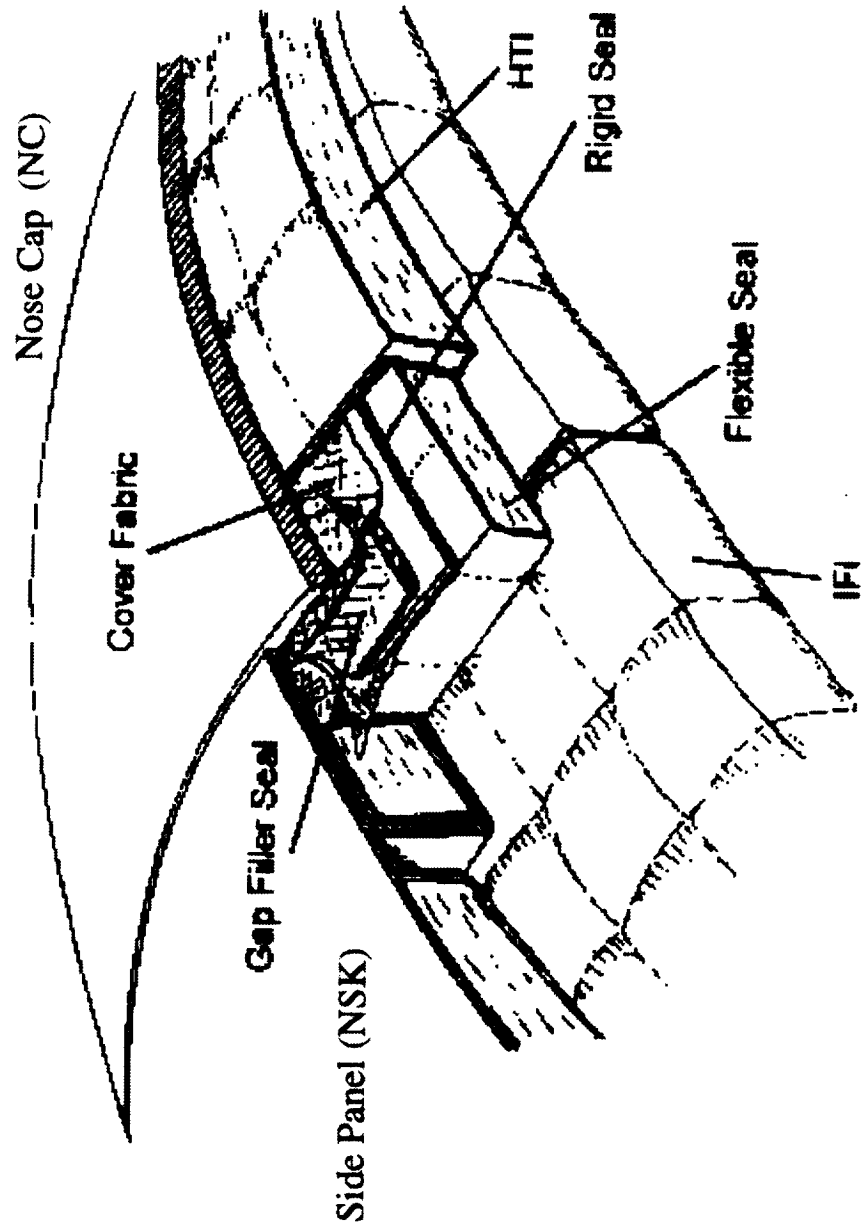
- **Chute line TPS**
  - To protect for blanket failure, a redundant system is incorporated to protect the parachute lines



# Nosecap TPS



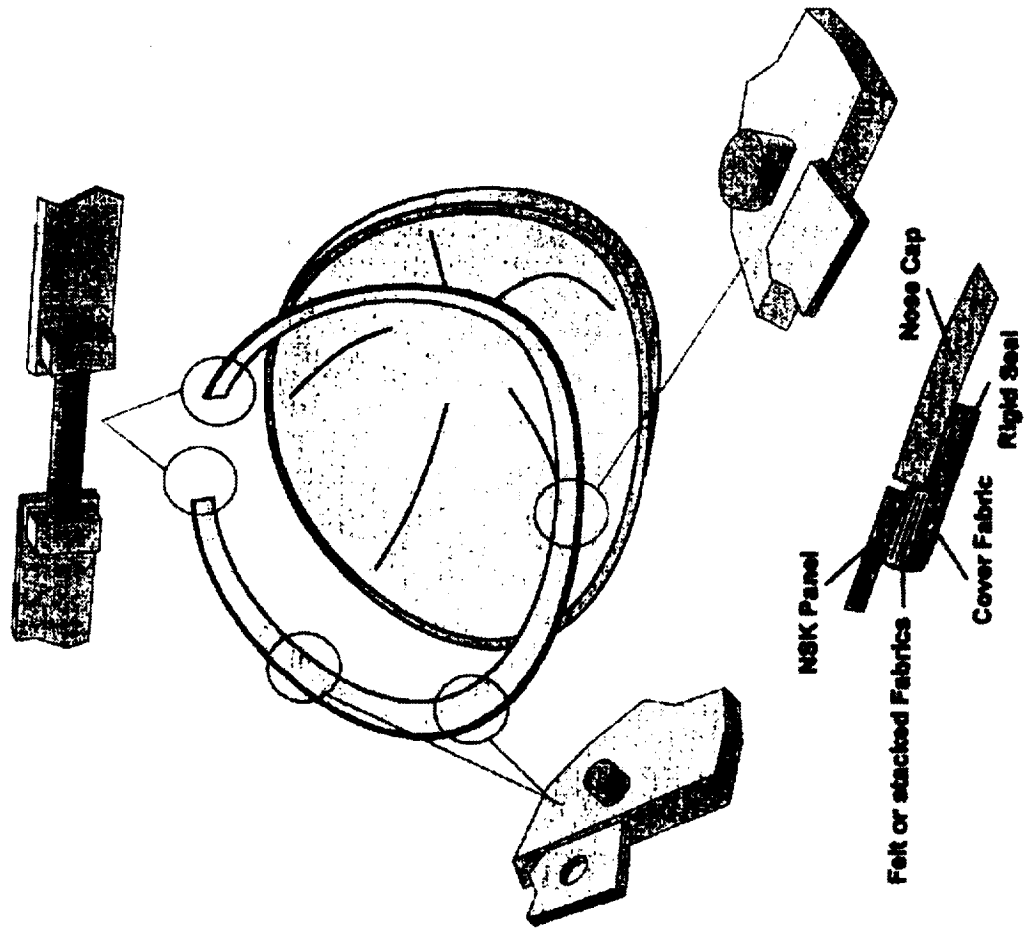
# Interface Between Nose Cap and Nose Skirt With Rigid and Flexible Seal



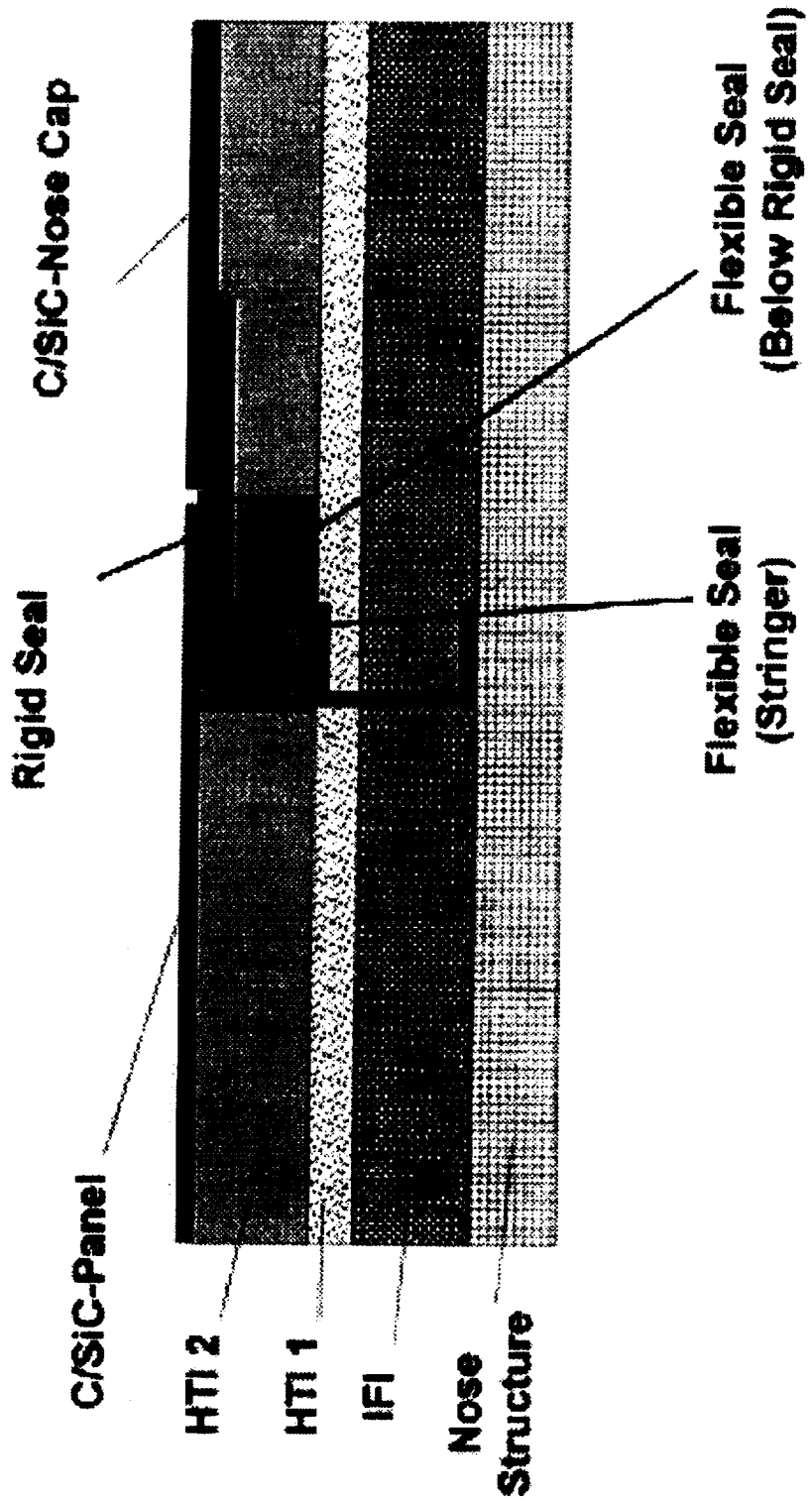


# Fixation Concept of the Rigid Seal Between NC and NSK

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# Chin Panel / Slide Panel



# I/F NSK/Thruster Tile

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