Balloon Manufacturing Processes & Technologies

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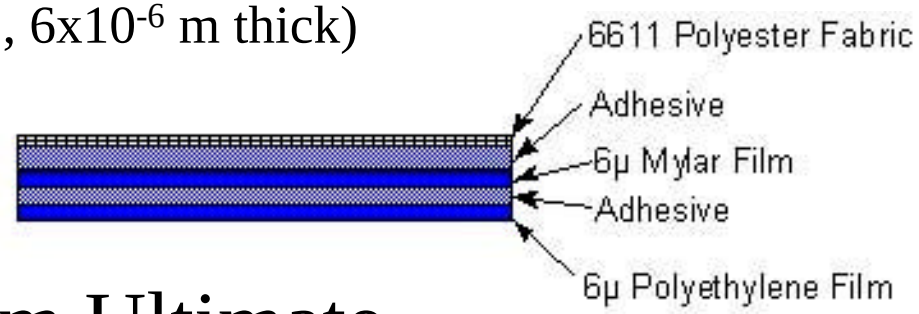
Baseline ULDB Material

- Composite material (62 g/m^2 approximately)
  - Polyester fabric (30 g/m^2)
    - Yarn denier 30g/9000m (warp and fill)
    - Yarn tenacity 6.1g/denier (warp and fill)
    - Yarns per meter 4724/m (warp) and 4252/m (fill)
  - Polyester film (8.8 g/m^2 , 6x10^{-6} m thick)
  - Polyethylene film (5.8 g/m^2 , 6x10^{-6} m thick)
  - Two adhesive layers



- Strength of 7600 N/m Ultimate

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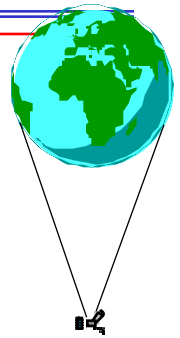
What is needed

- Advances are needed in:
  - Balloon composites & components
  - Seaming techniques
  - Automated manufacturing process
  - Quality control

Today's State of the Art

- Fabric (62 g/m^2)
- Material Strength
  - 7600 N/m Ultimate
  - 2400 N/m "Yield"
- Bi-tape manual seam



Technology Goals

- Decreased composite weight
  - 40 g/m^2 for 2700 kg to 38,000 m
  - Higher Strength/Weight Ratio
- Non degrading at operational altitude
- Uniform, low stress seams
- Consistent high quality seams

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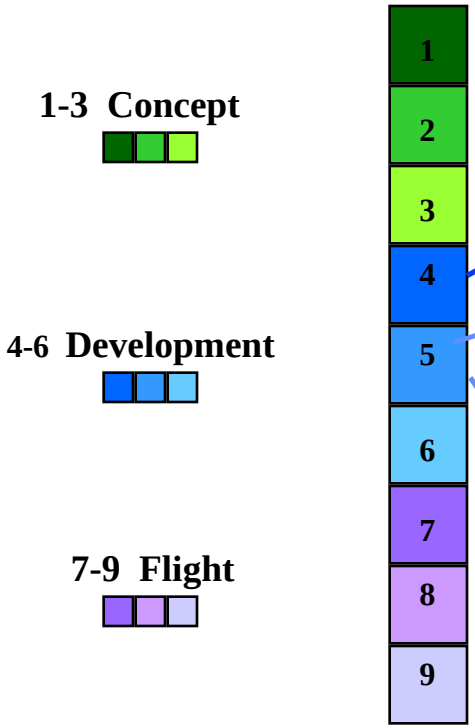
Technology Required "Needed By"



Current Technology Readiness Levels

- Automated Seeming — 2000
- Fabric
  - Light Weight & High Strength able to attain:
    - 100 day flights — 2000
    - 33,500 m (110,000 ft) — 2000
    - Lift 900 kg (2000 lbs) — 2000
    - 1000 day flights — 2005
    - 38,000 m (125,000 ft) — 2005
    - Lift 2700 kg (6000 lbs) — 2005
    - 42500 m (140,000 ft) — 2010
- Quality Control Techniques — 2000