



CULZEAN<sup>®</sup>

INDUSTRIAL & MEDICAL FABRICS

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CASE STUDY -  
SPACE TETHERS

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# CASE STUDY

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Tethers Unlimited develops innovative technologies to enable new capabilities and dramatic cost savings for missions in space, sea, and air.



# PROJECT

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Tethers Unlimited Inc had developed conceptual ideas for two long-life space tethers; a metallic tether for de-orbiting satellites and a high-strength tether for moving payloads around space.

Their greatest impediment to their project was that, after an exhaustive search, they had not found a textile company who could translate their concept into a textile structure. During a normal working day in the factory a fax arrived from one of the Tethers Unlimited Directors, who was on holiday in Scotland and had decided to investigate British textile companies.

*"We're looking for a firm that can knit us a long, thin conducting cable for bringing down broken satellites – can you do it?"*

Our response was **YES**. The out-of-this-world relationship between Culzean and Tethers Unlimited was born! They had finally found a company capable of translating their concept into a textile structure.



# SOLUTION

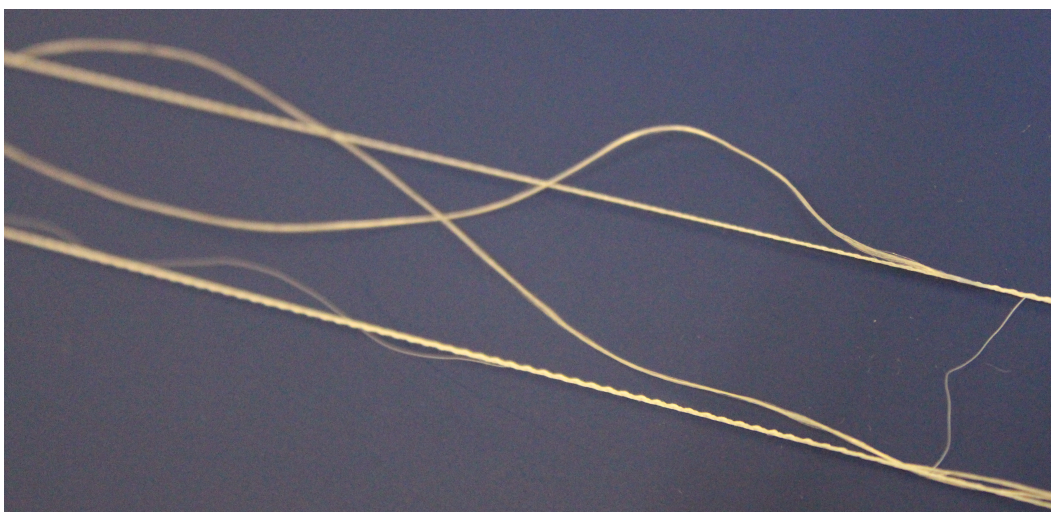
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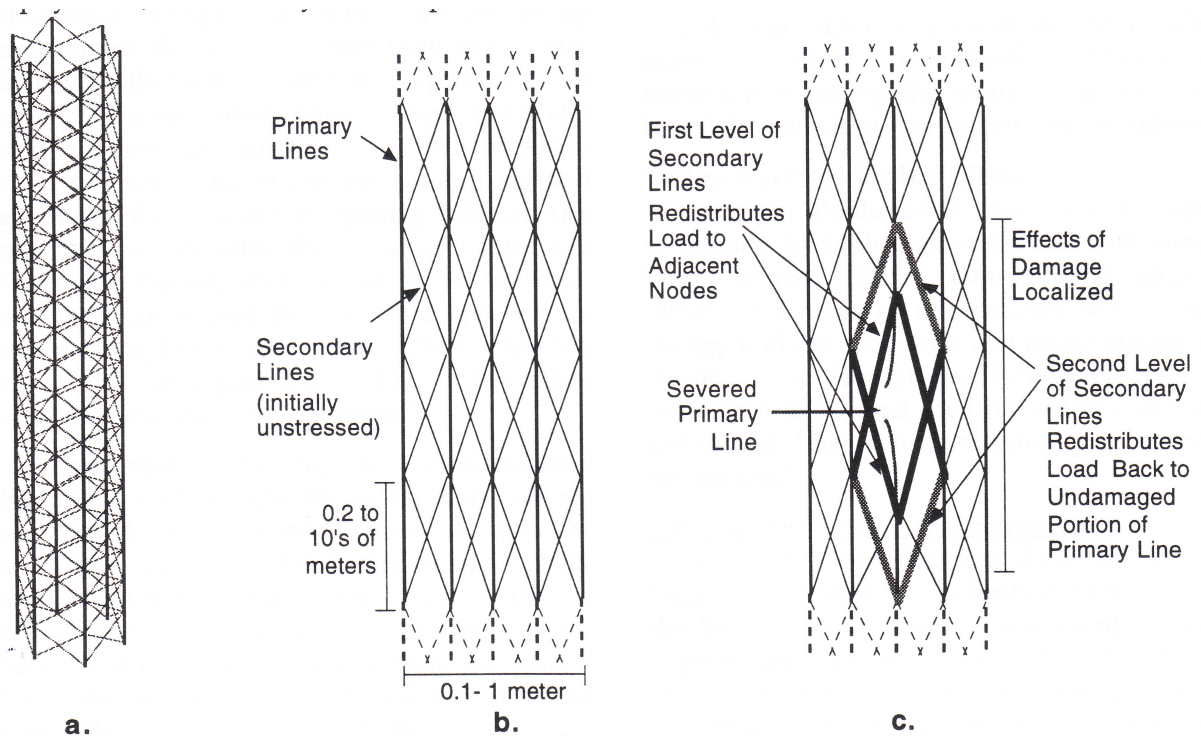
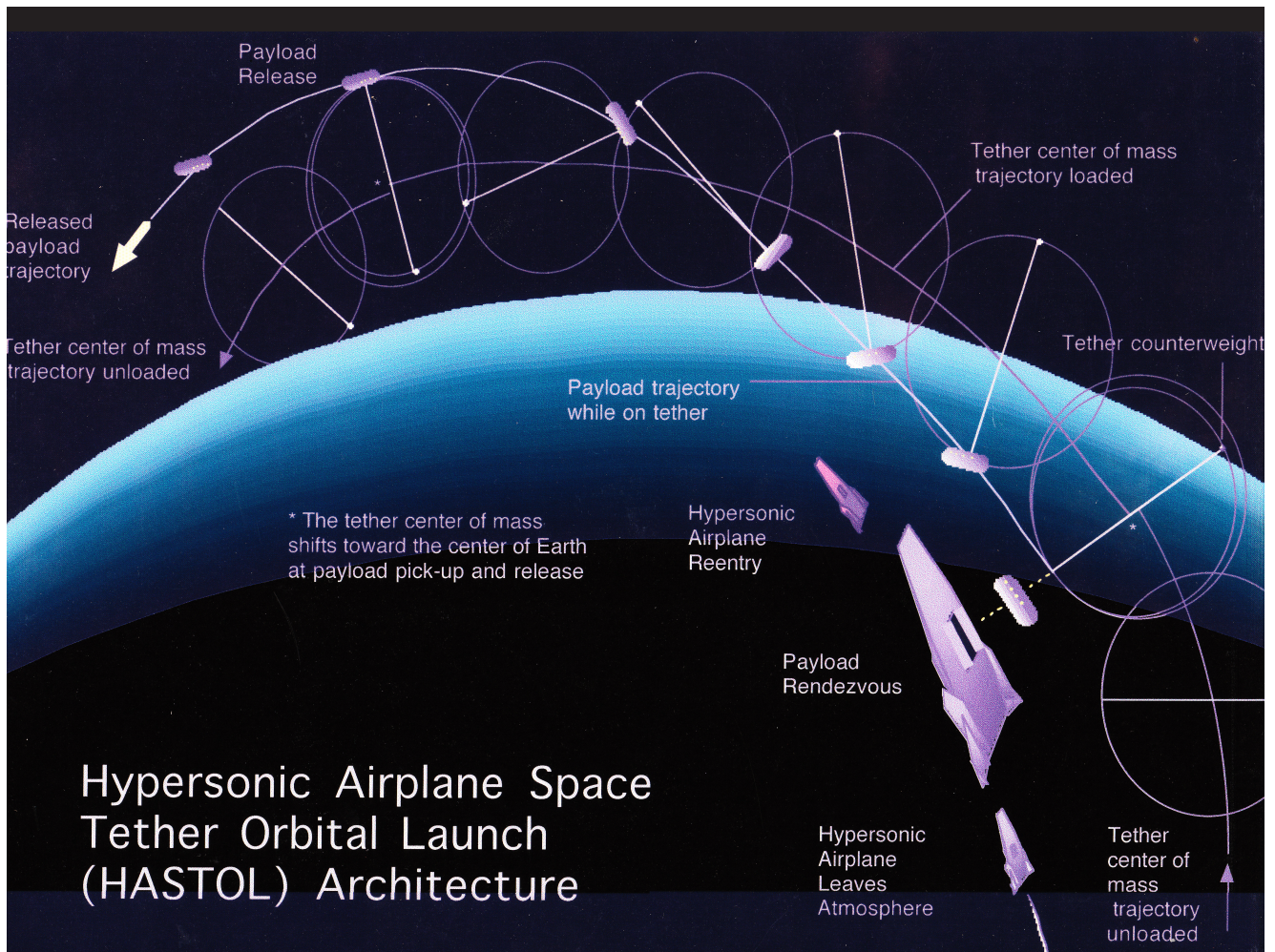
**Culzean** designed, developed and manufactured cosmic dust resistant multi-line warp knitted structures that achieved the design requirements of Tethers Unlimited.

To do this Culzean purchased and modified a computer controlled knitting machine, then began developing the specialist textile structures that are unique to the tethers. Consideration was given to many technical requirements, many of which are not usually associated with the design of textiles, such as selecting a material that has the greatest electrical conductivity per kg weight. Since the initial Textile Solution, Culzean manufactured several tethers at lengths of over 10Km fault-free.

Culzean also became involved in the design and manufacture of a device for winding tethers onto a suitable package that could withstand the forces of a space launch, but then deploy the tether without twist, while using minimal moving components...

**That is another project altogether...**





**Figure 1.** a) Section of a tubular Hoytether ("Hoytube"). b) Schematic of undisturbed tape Hoytether ("Hoytape"). c) Secondary lines redistribute load around a failed primary line without collapsing structure. *Note:* the horizontal scale is expanded relative to the vertical scale; in reality the secondary lines are nearly parallel to the primary lines.



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