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Overview Of Deployable Reflector Antennas For Satellites

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Introduction

Satellites are crucial for modern society, but high launch costs lead to demand for smaller designs. Reflector antennas, a widely used component in satellites, need to have large apertures for current missions. Therefore, deployable mechanisms are implemented, so as to enable efficient packing while supporting large apertures in space.

Different reflector configurations depending on the type of the reflective surface:

Rigid Reflectors: The reflective surface is formed by solid sections/panels, hinged to the hub.

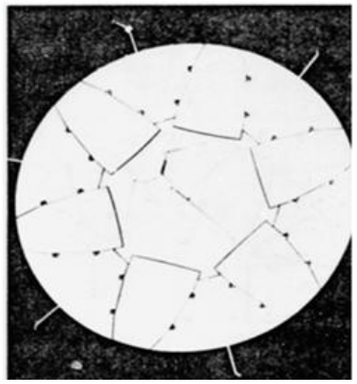
Semi-Rigid Reflectors: Composed of a flexible thin walled surface with a circumferential stiffening hoop.

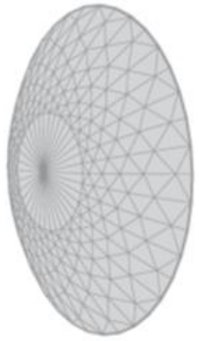
Inflatable Reflectors: Constructed from thin, elastic membranes with an RF-reflective coating, which forms its shape when inflated with an inert gas at low pressure.

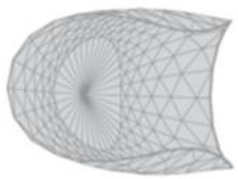
Mesh reflectors: Consists of a metallic mesh, tensioned by a support structure, whose design varies.

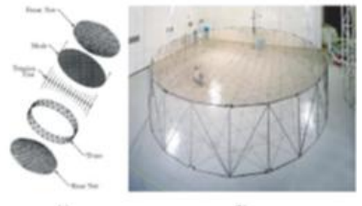
Choosing the most suitable type for the desired application is an important design decision:

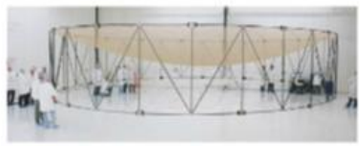
Rigid	Semi-Rigid	Inflatable	Mesh
(+) Very high surface accuracy	**(+)** Can fit a second reflector in the same volume	**(+)** Lightweight	**(+)** High TRL
(+) Good mechanical properties	**(+)** Self-deploying	**(+)**Excellent packing ratio	**(+)** Lightweight
(+) Permanent working capacity	**(-)** Poor stowing efficiency	**(+)** Low cost	**(+)** Low cost
(-) Complex Deployment	**(-)** Challenging stiffness tuning	**(+)** Reliable Deployment	**(+)** Good stowing efficiency
(-) Increased weight	**(-)** Difficult manufacturing	**(+)** High surface accuracy	**(+)** High surface accuracy
(-) Poor stowing efficiency		**(-)** Accuracy loss due to gas leakage	**(-)** RF losses
(-) Increased manufacturing cost		**(-)** Requires supply of gas	
(-) Difficult to scale up			



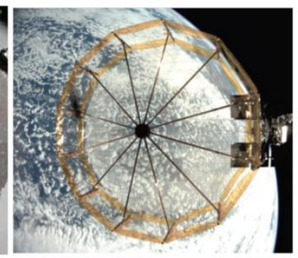


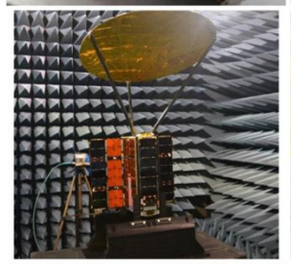


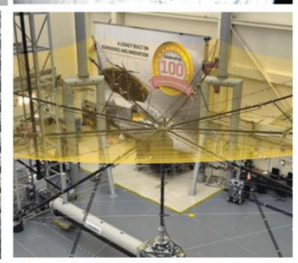


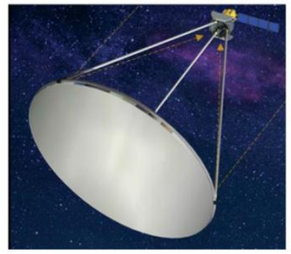


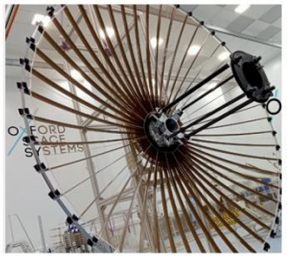
New concepts are being developed.











Conclusions

Each category of reflector antennas has unique advantages and drawbacks, making mission-specific selection crucial. Ongoing research continues to advance these designs, with new models being developed for various applications and new literature being published. Among every type, mesh reflectors are attracting the most interest. Meanwhile, the growing Earth Observation market, driven by advancements in satellite and imaging technology, is further accelerating innovation in reflector antennas and related technologies.