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Large Flexible Solar Arrays

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The majority of existing large solar arrays are designed against the requirements imposed by communcations satellites in geostationary orbits. For example, high launcher costs per kilogramme of satellite mass dictate an ecomomic preference for lightweight array designs, and with no method of satellite retrieval from GEO, array deployment can use simple 'one shot' devices. This is not true for low earth orbit missions.

However, the introduction of the Space Shuttle and the manned space station programme, including Columbus has caused a change of emphasis in array design. Stowage volume rather than mass is now the cost criterion. Furthermore, to fully use the Shuttle attributes and the Space Station design philosophy the ability to retract the array and restow for return to earth has also become a design driver. These factors lead to a more complex, but inherently more flexible array than its geostationary counterpart.

Part of the European contribution to the Hubble Space Telescope has been the design and development of the solar array which has dealt with these novel aspects, including the requirements for astronaut intervention. This work is regarded as a significant European contribution to Space technology.

There are other differences emerging from the use of LEO. More frequent array encounters with earth eclipse and the more complex nature of payloads and carriers delivered to this orbit are quickly leading to a sharp increase in array power requirements. These factors impose additional complications on spacecraft, array design and costs.

This paper describes a study that has addressed these new aspects of array design and indicates an approach to the solution of some of the key problems.