



*Paragon's full-scale test article of a spacecraft external skin designed to carry structural loads and provide spacecraft heat rejection. Patent pending on design.*

## Paragon Integral Radiator

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Paragon Space Development Corporation was contracted by NASA Headquarters and NASA Johnson Space Center (through the SBIR program) to design, build, and test “Integral Radiators” as a next generation thermal control system for exploration vehicles. Paragon’s design integrated a vehicle’s structural and heat rejection subsystems into a dual-function subsystem, allowing for substantially reduced weight. In a typical space vehicle design, the thermal control system and spacecraft size/mass are diametrically opposed major drivers, due to restricted launch capability and anticipated higher power needs. Paragon’s Integral Radiators directly address this issue creating a new class of structures called “crescent radiators”.

The test article displayed here was used to achieve many goals in the research and design effort. The manufacturability of full-scale integral radiators using the crescent design was successfully demonstrated with four half panels. Different methods of attaching the fluid tubes to the special “crescent” geometry were tested. The method selected — a thermal epoxy — underwent several experimental investigations to verify its performance. Individual panel headers and fluid delivery/return headers were designed and built in-house. The final assembly, including the support frame, was also assembled at Paragon. The test article successfully performed as a functional radiator system in a thermal/vacuum test at the NASA Marshall Space Flight Center.