

generated. A long string of trailers (referred to as the circus train) carried the air conditioning for the spacecraft and its RTGs whenever they were moved at Cape Kennedy.³¹

LES 8/9 also carried a new generation of RTGs into space. The MHW (Multi-Hundred Watt) RTG, more high powered than previous RTGs, had been under development by General Electric for several years. The basic generator was a 130-watt modular unit; the two generators on an LES were designed to provide over 260 watts of power continuously for five years.³² Higher levels of power were achieved by using multiple units. Fuel for the MHW was in the form of a plutonium dioxide sphere, with each RTG containing 24 of those spheres "protectively packed into a cylindrical graphite [re-entry] aeroshell... in turn encased in a metallic clad."³³ Thus, new precautions for safety were taken because the MHW-RTGs would carry 146,000 curies compared to 80,000 on Pioneer and 41,200 on Viking.³⁴ Instead of lead telluride thermocouples the MHW used silicon germanium thermocouples, which could operate at higher temperatures to produce more watts per pound.³⁵

Pitrolo recalled how some of the changes came about in the MHW. He had moved to the MHW program and worked closely with Lincoln Laboratory in early development work for LES 8/9. The AEC state-of-the-art had progressed from the microsphere fuel form to plutonia-molybdenum cermet. According to Pitrolo, his team at General Electric insisted on a solid fuel form. "I went to Los Alamos and asked a guy to press me a solid oxide ball," he recalled. Then, because molybdenum was degrading the fuel form, a search began to find a material that could survive re-entry and be compatible with the fuel form and the graphite in the container cask. A search of the literature revealed that the iridium could be used instead of molybdenum. So the developers of the MHW learned to weld and work with iridium.³⁶

The LES 8/9 mission met a basic Air Force requirement for development work on communications satellites, but did not lead to other DOD contracts or missions for the RTGs, although the mission contributed to the state-of-the-art for military use of RTG power in satellites. In addition to exploring and extending military applications of RTGs, the LES mission made contributions to the development of RTG technology. Lessons learned in developing the MHW were applied on the Voyager space probes, which also used the MHWs. Developers of Voyager sat in on LES safety meetings, observed operations,