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DISRUPTIVE TECHNOLOGIES FOR POWER AND PROPULSION (DIPOP) FISSION NUCLEAR OPTIONS

Abstract

The Disruptive Technologies for Power and Propulsion (DiPoP) Study reviewed advanced space technologies for large interplanetary missions of interest to Europe taking account of European industry capabilities. These included surface power generation, high power instruments, large robotic missions to outer planets, asteroid deflection missions and longer term interplanetary manned missions. The propulsion applications involve high speed increments, generally beyond the capability of chemical propulsion (except if gravitational swing-by can be used). For missions beyond Mars orbit fission nuclear energy sources become competitive with solar panels.

Both fission nuclear thermal (NTP) and nuclear electric propulsion (NEP) were considered. NTP high thrust levels may offer the only means of asteroid deflection by direct impact following late detection. However with sufficient advanced warning the greater control from NEP relatively low thrust deflection over a period of time is a lower risk option.

For NEP two electrical power levels have been considered: 30 kW and 200 kW. The lowest power level (30 kW) is more suited to surface energy source (Moon or Mars manned base) or to relatively small automatic platforms. The 200 kW power level is more suited to heavy robotic missions, including asteroid deflection.

The public acceptance of these new technologies has been analysed, showing the necessity to provide safe ground testing facilities as well as a mission scenario excluding re-entry of an activated space nuclear reactor.

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