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Item 7 of the provisional agenda*
Use of nuclear power sources in outer space

Prospects for the use of nuclear power sources in outer space

Working document submitted by the Russian Federation

1. The prospects for the use of nuclear power sources in outer space depend on the availability of the required level of electrical capacity on board spacecraft and the resources of space rocket technology assigned to space activities foreseen in both the short and the long term (see table).

Activities	*Nature of activity*	*Required capacity (Kilowatt thermals)*
Short term		
Communications and television, inter-orbital space tugs.	Radar monitoring; communications and data relay; high-capacity communication satellite systems; mobile global communication systems; high-performance information systems; direct television broadcasting, high-definition multi-channel television; use of energy transport modules to decrease carrier rocket dimensions when transporting spacecraft to high orbits.	10-50
Long term Environment, power engineering production in outer space, scientific research.	Global environmental monitoring; removing space debris from circumterrestrial space; protection of spacecraft from space debris; outer space production; distance refuelling of spacecraft and space production centres; pure research, including: (a) earth research from space, asteroids, comets and planets of the solar system; (b) transportation to and from the lunar base; and (c) Mars mission.	50-250 50-500

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2. Where the required electrical capacity on a spacecraft exceeds 50 kilowatt thermals, the use of nuclear power reactor sources would be most effective in two areas:

(a) Nuclear power propulsion units, using nuclear rocket propulsion technology and direct and/or turbo-generator conversion systems, which will provide spacecraft with energy supplies and significant thrust to transport them from low intermediate orbits to high orbits or to interplanetary trajectories, and to manoeuvre spacecraft between orbits;

(b) Nuclear power units to supply spacecraft with power and, in combination with a low-thrust electroreactive (electrorocket) propulsion unit, to transport spacecraft into higher orbits from low intermediate orbits, which can be achieved with existing and future generations of carrier rockets and other space rocket technology.

3. The best course of action, because the technique has proved effective, would be to use thermoemission nuclear power units with a reactor converter comprising transport energy modules in order to launch spacecraft, with the help of electroreactive propulsion units, to high working orbits. Nuclear power units comprising transport energy modules using forced power would feed the nuclear power propulsion unit and in a prolonged nominal regime would provide power for spacecraft equipment.

4. Such a system of using modern carrier rockets and applying the resources of space rocket technology to launch spacecraft into geostationary orbit would make it possible to increase 2 or 3 times the mass of special-purpose equipment on spacecraft and increase on-board power consumption 10 to 20 times.

5. The use of nuclear power units would open up a whole new range of possibilities: 24-hour, all-weather radar monitoring and the creation of global telecommunication systems, including mobile communication systems, as well as various security-related activities.

6. Figures I-IV show model designs for nuclear power propulsion units and nuclear power units for various categories of spacecraft:

(a) Figures I and II show a reactor constructed on the basis of nuclear rocket propulsion technology with a radiation shield (fig. I) and a nuclear power propulsion unit with a turbo-generator conversion system (fig. II), with 40-kilowatt electrical capacity and 500-kilogram thrust;

(b) Figures III and IV show a thermoemission reactor converter with radiation shield (fig. III) and a nuclear power unit (fig. IV) with 50-kilowatt electrical capacity.

7. Figure V shows the layout of the nuclear power unit on a spacecraft intended for radar monitoring, communications and television.

Figure I
Nuclear power propulsion unit (NPPU) reactor and radiation shield

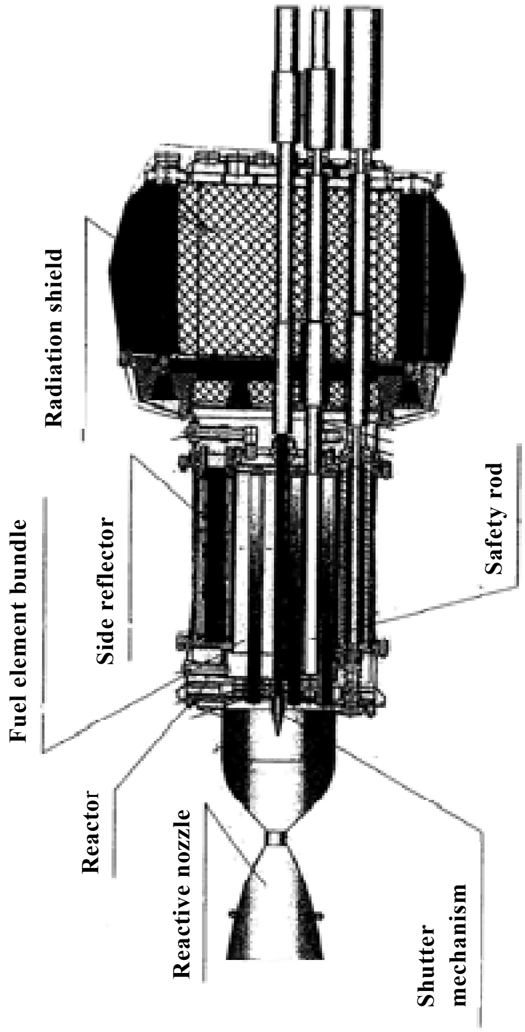

Figure II
Nuclear power propulsion unit

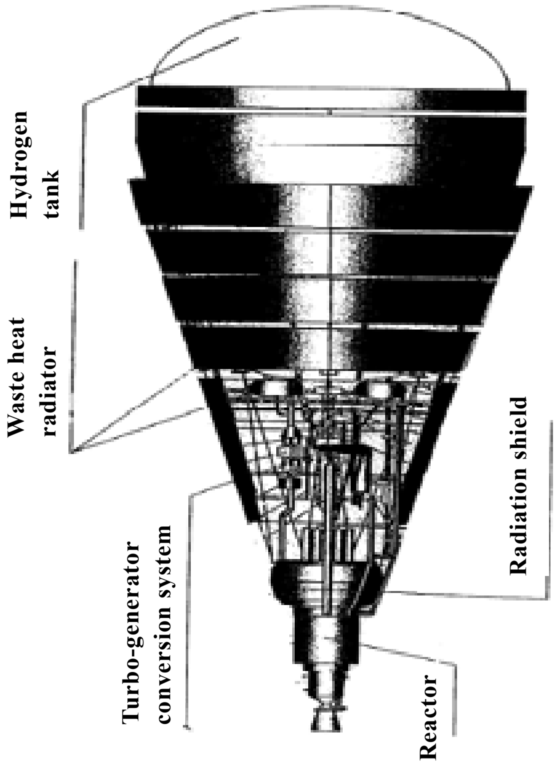

Figure III
Nuclear power unit (NPU) reactor converter and radiation shield

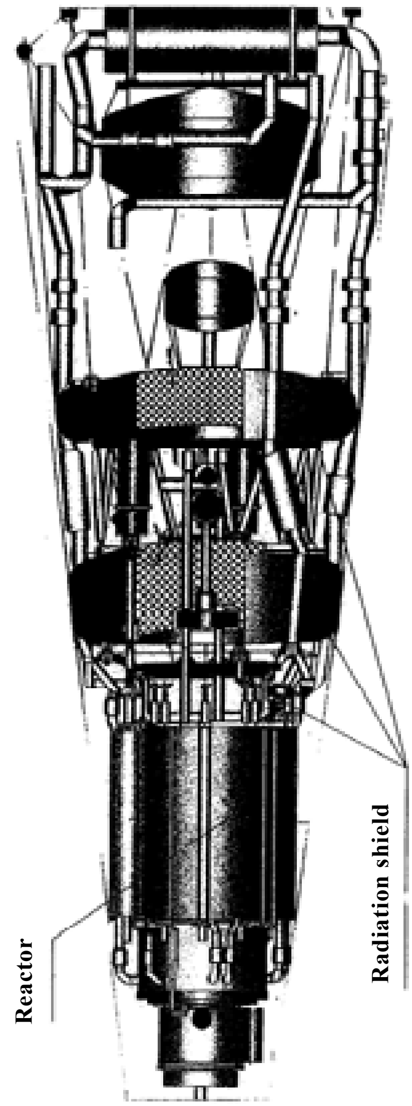

Figure IV
Nuclear power unit in extended form

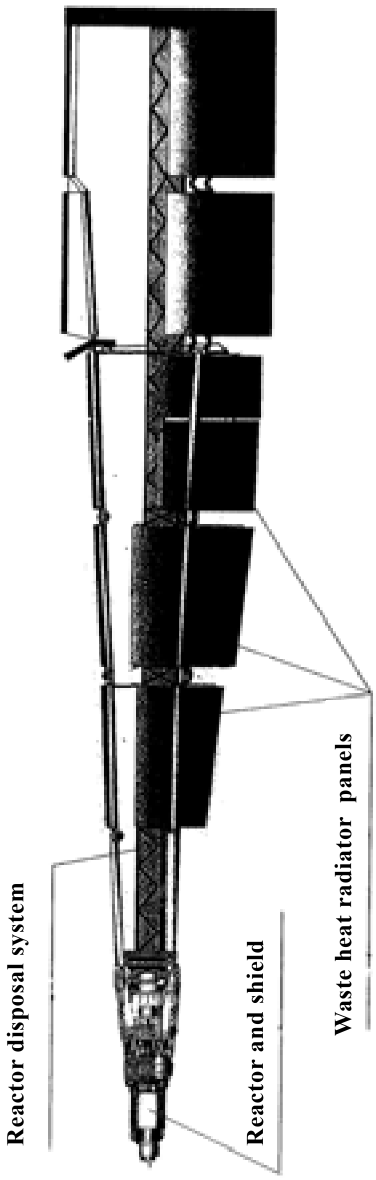

Figure V
Spacecraft with nuclear power unit