

ANNEX D

Spacecraft Power Requirements

In order for a spacecraft to function effectively on orbit, power must be provided to operate both the sensors on board and to maintain "housekeeping" functions, such as command and control and station keeping. There are two power generation technologies that have been applied to spacecraft and that have potential for application to future surveillance spacecraft. They are solar array-battery combinations and nuclear power. Nuclear technology is used to generate prime power in space through the use of radioisotope thermal generators (wherein heat is generated by the radioactive decay of a radioisotope like plutonium) or with compact nuclear reactors that generate heat and convert it to electricity either external to the core (thermoelectric) or internal to the core (thermionic).

The choice of sensor and level of performance required from that sensor determine the level of power that must be generated for a satellite.⁶⁴ It has been estimated that a space based air traffic control radar system employing pulse doppler radar technology to detect airliner size targets would require in the range of 100 KW of prime electrical power.⁶⁵ RADARSAT, an earth imaging satellite to be launched for Canada in 1994 will employ a synthetic aperture radar to detect relatively large targets on the ground and will require prime power in the range of 2.5 KW.⁶⁶ The power required for a radar to detect a range of targets are summarized in Table D-1.

Table D-1
Typical Power Requirements for Space Based Radar

Sea Traffic, Topographical, Weather	0.2 to 5 KW
Treaty Verification, Crisis monitoring, Sea Traffic	1 to 30 KW
Commercial Air Traffic	10 to 300 KW
Military Missiles and Aircraft	100 to 2000 KW

⁶⁴ "Perceived need for nuclear power on satellites," *SIPRI Yearbook, 1983*, London and New York: Taylor and Francis Ltd, 1983, pp. 459 - 463.

⁶⁵ M.S. El-Genk and M.D. Hoover, eds., *Space Nuclear Power Systems 1987*, Malabar, Florida: Orbit Book Company, 1988, p. 25.

⁶⁶ "Team of Canadian U.S. Firms ...," p. 111.