Paper ID: 57220
student

IAF SPACE PROPULSION SYMPOSIUM (C4)
Virtual Presentations - IAF SPACE PROPULSION SYMPOSIUM (VP)

Author: Mr. Pauli Laine
Finland, pauli.e.laine@jyu.fi

FISSION FRAGMENT ROCKET: FUEL PRODUCTION AND STRUCTURAL CONSIDERATIONS

Abstract

Fission reaction provides about 200 Mev of energy per nuclei. This is very high compared to fusion, e.g. 1.44 Mev in 1H + 1H reaction. Uranium fission releases 81This also requires that fissile material should be very thin or in low density state. This limits usable material to highly fissionable nuclear fuels such as Americium (Am) or Curium (Cm), which are very expensive to produce.

Chapline (1988) proposed idea of using escaping fission fragments as rocket propulsion. Since then, the idea of fission fragment rocket has been developed further (e.g. Clark Sheldon, 2005). However, some fundamental constraints remain to be solved if such rocket engine could be used in space applications. These questions include problems such as how to produce enough Am or Cm fuel, how to solve certain structural and thermal design issues, and how to use nuclear rocket in safe way. This theoretical paper lists these problems, and presents currently known ways to overcome them.

Chapline, G., "Fission fragment rocket concept", Nucl. Instr. and Meth., A271,207-208 (1988).

Clark, R. A., Sheldon, R. B., "Dusty plasma based fragment nuclear reactor", 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference Exhibit (2005).