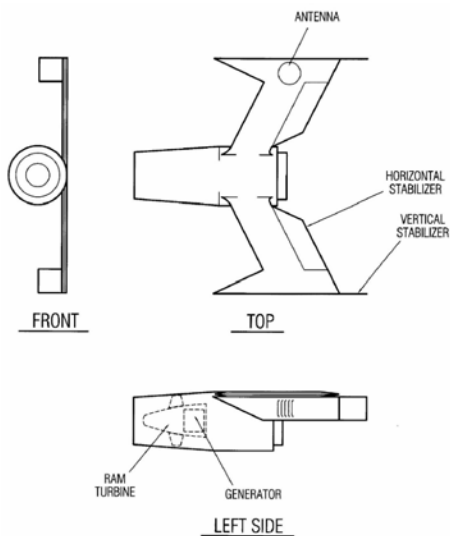
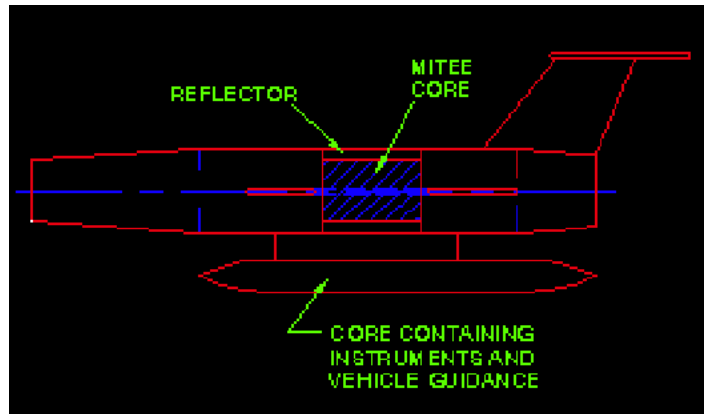


Exploration of Jovian Atmosphere Using Nuclear Ramjet Flyer

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We propose continued investigation of the design, operation, and data gathering possibilities of a nuclear-powered ramjet flyer in the Jovian atmosphere. The MITEE nuclear rocket engine can be modified to operate as a ramjet in planetary atmospheres. (Note: MITEE is a compact, ultra-light-weight thermal nuclear rocket which uses hydrogen as the propellant.) To operate as a ramjet, MITEE requires a suitable inlet and diffuser to substitute for the propellant that is pumped from the supply tanks in a nuclear rocket engine. Such a ramjet would fly in the upper Jovian atmosphere, mapping in detail temperatures, pressures, compositions, lightning activity, and wind speeds. The nuclear ramjet could operate for months because: 1) the Jovian atmosphere has unlimited propellant, 2) the MITEE nuclear reactor is a (nearly) unlimited power source, and 3) with few moving parts, mechanical wear should be minimal. During Phase I of this project, we developed a conceptual design of a ramjet flyer and its nuclear engine. The flyer incorporates a swept-wing design with instruments located in the twin wing-tip pods (away from the radiation source and readily shielded). The vehicle is 2 meters long with a 2 meter wingspan. Its mass is 220 kg, and its nominal flight Mach number is 1.5. Based on combined neutronic and thermal/hydraulic analyses, we calculated that the ambient pressure range over which the flyer can operate to be from about 0.04 to 4 (terrestrial) atmospheres. This altitude range encompasses the three uppermost cloud layers in the Jovian atmosphere: 1) the entire uppermost visible NH_3 ice cloud layer [where lightning has been observed], 2) the entire NH_4HS ice cloud layer, and 3) the upper portion of the H_2O ice cloud layer. To continue the validation of the ramjet flyer concept, additional work is required in several areas. These include a detailed study of radiation effects on instruments, flight stability of the vehicle in the highly turbulent Jovian atmosphere, data storage and transmission.



MITEE Nuclear Engine

