



DEPARTMENT OF DEFENSE
STRATEGIC DEFENSE INITIATIVE ORGANIZATION
WASHINGTON, DC 20301-7100

December 24, 1990

Mr. Ronald Hauber
Assistant Director, International Affairs
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Hauber:

I am writing you to inform you of the Strategic Defense Initiative Organization (SDIO) plans to sponsor an exhibit reflecting Soviet space nuclear technology and components at the 8th Symposium on Space Nuclear Power Systems at Albuquerque, New Mexico on January 6-10, 1991.

SDIO has an ongoing interest in the development of survivable and long-lived space nuclear power sources, and to this end has been a major participant with NASA and DOE in the SP-100 Thermoelectric Space Nuclear Power Source program and with DOE in the Thermionic Fuel Element (TFE) verification program. Recent encouraging results from the TFE program, and an emerging interest by the U.S. Air Force in development of space nuclear power reactors using thermionic power conversion have engendered additional SDIO support for thermionic development. This support consists of funding an Air Force program which is studying thermionic systems concepts and developing components for a nuclear thermionic space reactor power system.

The USSR has had recent successful flight experience in testing TOPAZ class thermionic reactors in orbit. After discussions with senior officials from Kurchatov Institute, we have initiated discussions toward DOD purchase of unfueled TOPAZ reactor thermionic testbeds, components, and supporting technical services. If we are successful in this endeavor, DOD plans to begin electrically heated testing in early 1991.

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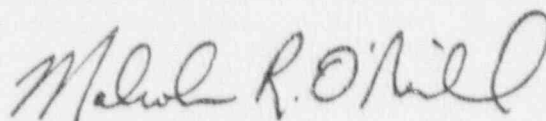
To further dissemination and technical transfer of TOPAZ reactor system information for the benefit of the U.S. scientific and engine ring community, SDIO is sponsoring an exhibit of TOPAZ-related equipment at the 5th Space Nuclear Power Symposium in Albuquerque on January 6-10, 1991. A significant item of this exhibition is an inoperative model of a TOPAZ reactor system from which all moderator material and coolant have been removed. The exhibit is presently enroute to New York for transshipment under seal to Albuquerque, New Mexico where it is planned to be presented to U.S. Customs Officials for entry and subsequent SDIO sponsored exhibition at the meeting.

At all times while in the United States the exhibit will be securely monitored under DOD auspices in an inoperative condition with no fuel or moderator or coolant installed. Indeed, the zirconium hydride moderator plates -- which will not be included in the exhibit but are essential to operation -- are unique. They are produced by a process known only in the Soviet Union, and are not available in the United States.

SDIO would very much appreciate whatever prompt assistance the NRC can provide to assure that this equipment can be placed on display at the Symposium by January 6, 1991.

A description of the TOPAZ space nuclear power system from which this exhibit has been derived is attached. Further information covering the exhibit can be obtained by calling Mr. Richard Verga of my staff at 703-693-1655 or in his absence Mr. Robert Wiley of W.J. Schafer Associates Inc. at 703-558-7900. We will be pleased to meet with you or other representatives of NRC should you deem it necessary.

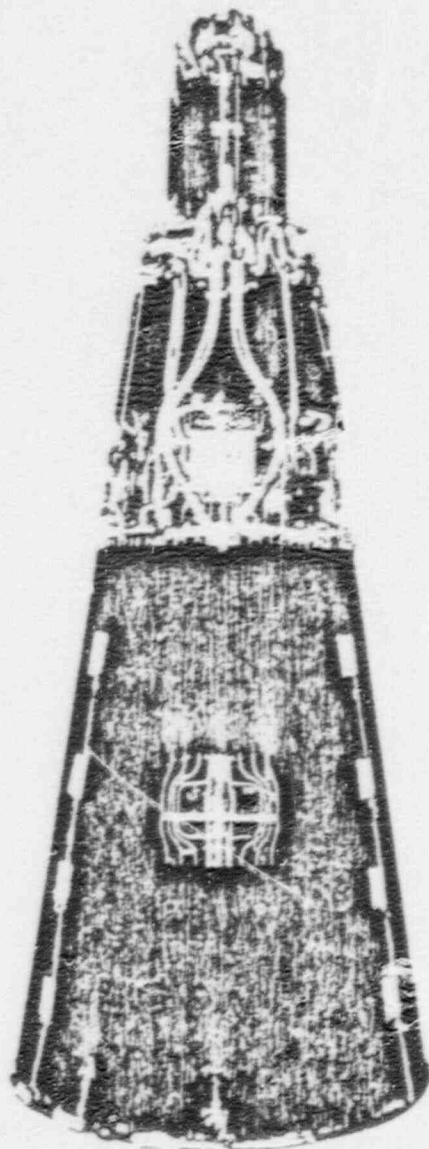
Sincerely,



MALCOLM R. O'NEILL
Major General, USA
Deputy Director

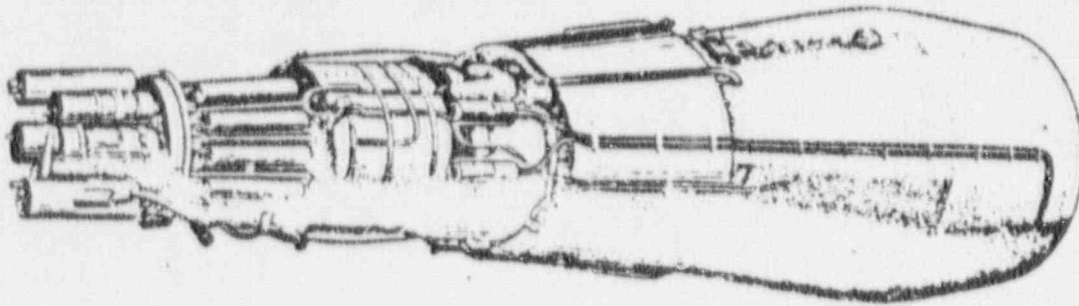
Att: TOPAZ Exhibit Features

TOPAZ EXHIBIT FEATURES



System Length	3.9 m
Maximum Diameter	1.4 m
Mass	1000 kg
Construction	Stainless Steel
Power	NONE (Inoperative)
Conversion	Incore Thermionic
TFE	Single Cell - No Fuel
Number TFES	34 (payload) 3 (pump)
TFE Diameter	~ 2.3 cm
Emitter	Single Crystal Mo/W
Cesium Supply	Common, Static
Core	
Height	37.5 cm
Diameter	26.0 cm
Moderator	NONE (Inoperative)
Reflector	Be

Provided to NRC during
meeting on 12/21/90 with
Sam Bassett



The Space Nuclear Power System SNPS "Topaz" is assigned for spacecraft equipment electric power feeding. Flight tests of two experimental prototypes were carried out on board spacecrafts "Cosmos" series. "Cosmos-1818" and "Cosmos-1867" in 1987 - 1988.

In the SNPS "Topaz" the direct (non-machine) energy conversion is realized in in-core thermionic miniature heat nuclear reactor.

Nuclear and radiation protection is guaranteed by the nuclear reactor construction. In case of any accidents, including the hypothetical ones with the space booster when launching and while putting into orbit, the nuclear reactor remains undercritical. The starting-up of the reactor before reaching the operating orbit is impossible due to block-systems. Block systems are switched out on radio command from Earth, but only after corroboration of putting the system into the calculated orbit by direct trajectory measurements. The orbit altitude is chosen from the condition that the spacecraft after seasing life-time, mind any accidents, is enough for fission products to decay to safe level. This time exceeds 350 years.

Thus, the guaranteed safety of Earth population, when such installations are being used, is ensured.

The nuclear power station consists of:

- the thermionic reactor-generator with zirconium hydride moderator and berillium reflector, in the side reflector there are installed the rotation control systems;
- the reactor-generator service systems: control systems gears, the electric current generating channel working body (Cs) supply systems arranged in a unit, placed in front of reactor-generator;
- the Lithium-hydride shade radiation protection, providing nuclear reactor radioactive irradiation attenuation to spacecraft equipment specified level;
- the reactor extra heat removal system, consisting of electromagnetic pump, electrically feeded from the reactor-generator special section, of refrigerator-irradiator for heat removal into the space and other units.

Specifications

SNPS (electric) power, kW	- 5
SNPS (heat) power, kW	- 150
Max. coolant temperature, °C	- 610
Mass, kg	- 980
^{235}U mass, kg	- 11,5
Resource, year	- 1