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JUN 15 1962

Those Listed Below

JDLyman

James D. Lyman
Division of Public Information

SNAP FACT SHEET

We are sending you today copies of the SNAP fact sheet you requested. You may distribute them at any time. We suggest a cover note calling attention to the June 29 anniversary date of the first anniversary of the use of nuclear power in space.

Addressees:
Richard G. Elliott, ALOO
Howard C. Baldwin, CHOO
Neilsen B. O'Rear, GJO
Milton R. Cydell, HANOO
Mack C. Corbett, IDOO
Frank T. Richardson, NYOO
Edwin E. Stokely, OROO
G. O. Robinson, SROO
Henry G. Vermillion, NOO

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4-2-1-5-36 SNAPTRAN Press releases,
FOLDER 6-15-62 fact sheet

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Notified JDL via Ed Willier during Willier-Tierlinsky telecon. [illegible]

Those Listed Below

William E. Hughes, Chief
News Service Branch, DPI

SNAP ANNIVERSARY

DPI:JDL

The first anniversary of the orbiting of a SNAP generator in TRANSIT-4A occurs on June 29. This milestone represents the world's first use of nuclear power in space.

In this connection, we are planning to distribute a public announcement and statement by the Chairman. We will send you copies in advance so that you may issue them simultaneously.

We also plan to distribute copies of the attached SNAP fact sheet. We will be glad to provide you with sufficient copies for local distribution. Please advise us by June 5 as to your requirements.

We suggest that you discuss with your newspapers and radio and television stations appropriate local coverage of the event.

Attachment

Addressees:
Richard G. Elliott, ALOO
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Milton R. Cydell, HANOO
Mack C. Corbett, IDOO
Frank T. Richardson, NYOO
Edwin E. Stokely, OROO
John C. Fleming, PNRO
Rodney L. Southwick, SANOO
G. O. Robinson, SROO
Donald Hamilla, SNRO
Henry G. Vermillion, NOO

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AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

SNAP FACT SHEET

SNAP (Systems for Nuclear Auxiliary Power) is the AEC's program for the development of compact, lightweight, reliable atomic electric devices for space, sea and land uses.

The program includes the development of techniques, materials and equipment required to apply to and advance the technology of atomic auxiliary and propulsive electric power. Under this program, compact atomic-electric power packages (conversion of fission or radioactive-decay heat to electricity) are being developed for use in satellites and space vehicles.

The technologies and resources developed for space power units are also being used in the development of atomic auxiliary power systems for military and civilian land and sea uses. Both radioisotope-powered and reactor-powered systems are under development.*

Development of SNAP Radioisotope Devices

The SNAP radioisotope program has brought forth a whole new technology of the use of radioisotopes as unique sources of compact, long-lived power. The fuel form of the several possible fuel radioisotopes, the advanced energy conversion techniques, the detailed study of generator designs and the radiological safety implications of the uses of these devices all contribute to a significant new technology now available for application to space, as well as to land and sea uses.

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* It may be helpful to keep in mind that the SNAP numbering system uses odd numbers for devices employing radioisotopes (SNAP 1, etc.) and even numbers for devices employing reactors (SNAP 2, etc.)

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In March 1956, the AEC initiated a low level effort with the Nuclear Division of the Martin Company, Baltimore, for the development of a radioisotope-fueled space power unit. After a year of studying the suitability and availability of potential radioisotope fuels -- both waste fission products and, especially, irradiated materials -- cerium-144 was selected for use in the development program. Power plant design specifications of 500 watts electrical for a 60-day mission life were established, and Thompson Products, Cleveland, was chosen under subcontract to the Martin Company to develop mercury turbogenerator equipment. The program was designated SNAP-1, and delivery of the first completed unit was scheduled for September 1959. Subsequently this program was discontinued.

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In addition to the SNAP-1 effort, several subcontracts were let under the basic Martin Company contract to develop advanced thermoelectric and thermionic heat-to-electricity conversion devices that could be used with radioisotope heat sources. This program was designated SNAP-3.

The SNAP-3 program was quick to yield results when the Minnesota Mining and Manufacturing Company delivered a complete thermoelectric generator to the Martin Company in December 1958. The generator was designed to receive polonium 210 fuel capsules to be furnished by AEC's Mound Laboratory, Miamisburg, Ohio. Polonium 210, an alpha-emitter, was used because it was suitable and readily available. The Martin Company assembled and tested the complete generator, and delivered the unit to the Atomic Energy Commission in January 1959. This proof-of-principle demonstration device produced 2.5 watts with a half charge of polonium 210 fuel. It was first introduced to the world by President Eisenhower on January 16, 1959, as the SNAP-3 "atomic battery."

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Four prototype isotopic units fueled with strontium 90, SNAP-7A, B, C and D, are being developed for the Coast Guard and the Navy for use in coast navigational aids and automatic weather stations. SNAP-7A and SNAP-7C are 5-watt systems. The others are 30-watt systems.

SNAP-7A is powering an experimental Coast Guard buoy in Chesapeake Bay, Md. SNAP-7C is powering a Navy automatic weather station in the Antarctic. SNAP-7B will be

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used by the Coast Guard in a land-based navigation light, and SNAP-7D will be used by the Navy in an unmanned floating weather station.

The AEC is also developing a 5-watt, strontium 90-fueled system, designated SNAP-7E to power an experimental navigational beacon for the Navy.

SNAP-7B, D and E will be delivered to the users this summer.

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The AEC is developing SNAP-9A for use in the Navy's operational prototype TRANSIT navigational satellites. SNAP-9A is a plutonium 238-fueled thermoelectric generator with a design lifetime of 5-10 years.

The development of this generator was enhanced by two events in 1961. On June 29, and again on November 15, five-pound, plutonium 238-fueled generators, similar to SNAP-3 type generators, were successfully placed in orbit as power sources in the TRANSIT-4A and 4B satellites respectively. The two events represent the world's first use of nuclear energy in space.

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The AEC is developing SNAP-11 for the National Aeronautics and Space Administration. The generator is intended for use on Project Surveyor, NASA's unmanned soft lunar exploration program. SNAP-11 will be fueled with curium 242, will weigh about 30 pounds and will provide a minimum of 18.6 watts of power continuously for 90-day lunar missions.

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SNAP-13

SNAP-13 is a low-powered cesium-vapor thermionic generator being developed to demonstrate the feasibility of using a radioisotope heat source in such an energy conversion device. The generator will be designed in line with the SURVEYOR power requirement and is expected to be developed into an alternate unit for SNAP-11. Tests will be conducted

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on an electrically heated unit in FY 1962. A fueled SNAP-13 will be completed in FY 1963. Work on an improved thermionic unit will extend through FY 1964.

Development of SNAP Reactors

In the fall of 1955, the AEC asked industry to bid on the development of a space reactor system for the Air Force. A concept by the Atomics International, Canoga Park, California, was chosen in the spring of 1956 and was designated the SNAP-2 program.

The SNAP-2 program for developing a three electrical kilowatt unit has progressed to the point of testing a prototype reactor core at design power and temperature conditions in a special test facility. Mercury vapor turbogenerator conversion equipment is being developed by Thompson-Ramo-Woolridge, Inc., Cleveland, under contract to Atomics International.

An atomic-electric power system that must start up automatically and operate unattended for a long period of time in space must have a completely automatic control system. Insuring the high quality of performance required will be possible only through the conduct of ground tests. The tests for SNAP-2 are to be conducted in an especially constructed $3 million facility called the SNAP Environmental Test Facility (SETF) at Santa Susana, California, completed in 1960. Design of this facility permits flexibility in testing fully automatic SNAP-2 systems. Provision is made for remote manipulations and for removal of all radioactive components, including the reactor fuel elements. Flight tests are planned for 1965.

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Until January 1959, the three electrical kilowatt SNAP-2 unit was the only space atomic reactor auxiliary power system under development by the Atomic Energy Commission. Since that time, two additional space power unit development programs have been started based on the metal hydride reactor technology developed under SNAP-2 -- SNAP-8 to develop a 30 electrical kilowatt propulsive power unit and SNAP-10A to develop a 500 electrical watt atomic auxiliary power unit.

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The SNAP-4 project began in 1959 as a feasibility study on the development of a very compact reactor-turboelectric system with the capability of long unattended life in an underwater or remote land location. Design study and component development began in 1960 for this experimental reactor. The reactor is to use SNAP-2 hydride fuel technology and boiling water as a coolant in a single-loop system. The project would require the development of compact turboelectric generators capable of generating 1,000-4,000 electrical kilowatts.

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SNAP-8 is being developed in conjunction with the National Aeronautics and Space Administration. NASA is developing the power conversion equipment and will accomplish the over-all system integration. The NASA contractor for this program is Aerojet-General Corporation, Azusa, California.

The SNAP-8 program schedule includes the demonstration of a 90-day system life in 1964, and a demonstration of the operation for 10,000 hours of a complete system in 1965.

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Conceptual design of a conduction-cooled 330-pound, 300 electrical watt reactor system using thermoelectric conversion was completed in 1959 under a program designated SNAP-10. In 1960 the program was redirected to develop a more powerful convection-cooled system using the SNAP-2 reactor. This unit, designated SNAP-10A, will be capable of producing 500 watts at a system weight of about 750 pounds. SNAP-10A will be tested in the Air Force SNAPSHOT program. This program is pointing towards flight demonstration in 1963.

Safety Considerations

Plutonium 238 was selected as the fuel for the first SNAP space missions for two basic reasons: (1) it is primarily an "alpha" emitter (the least penetrating of the three types of radiation) so that the generator requires no shielding at all (most of the energy of the alpha particles is used to produce heat within the device); and (2) its relatively long half-life offers maximum advantage over other types of

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power supplies (the polonium 210 used in the SNAP-3 has a half-life of less than five months, so that its power output dropped off rapidly).

Isotopes with very long half-lives do not have a sufficient concentration of alpha-emitting radioactivity to make them practical for lightweight isotopic power sources.

Plutonium 238 is identical chemically to other isotopes of plutonium but its nuclear characteristics are quite different. For example, plutonium 238 cannot support a chain reaction. Even in large masses it presents no danger of atomic explosion. However, all forms of plutonium are poisonous if inhaled or ingested by living organisms.

Description of SNAP Safety Tests

The plutonium 238 fuel capsule for the SNAP device is designed to survive safely launch pad accidents, including fire and explosion; to withstand impact; and to burn up in the atmosphere when it ultimately re-enters from orbit. Various realistic tests have been run to prove out the adequacy of the design features.

Studies of launch pad aborts show that if a fire results, the oxidizer from the booster will vaporize quickly, but a generator located in the wreckage could be subjected to the fire for about 15 minutes. A simulated missile fire test has been conducted in connection with the SNAP generator program at Aberdeen Proving Ground, Maryland. In this test, 8,500 pounds of kerosene and 6,000 pounds of aniline and nitric acid were ignited over a simulated missile structure which held 5 generator assemblies. Initial flash temperature reached 5,100° F. Temperatures varying from 1,200° F. to 2,600° F. were recorded over a 15-minute period. All fuel capsules were retained in the generators and no detrimental effects on the fuel capsule were noted.

An explosion test using 1,650 pounds of TNT subjected SNAP generators and isotope containers to a shock pressure of 1,000 pounds per square inch. The core material was Haynes-25 alloy but similar cores were also constructed from graded aluminum for use in this test. Even the lowest grade aluminum core maintained its mechanical integrity.

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To test the ability of the plutonium 238-fueled SNAP generator to contain its radioisotope fuel if it should fall back to earth at maximum velocity after a launching failure, two complete generators and one bare fuel capsule were impacted at maximum velocity against a granite target. The single bare capsule was preheated in a furnace before impact. The capsules suffered some deformation in this test but did not fracture. A capsule from one of the generators was pressure-tested to 10,000 pounds per square inch after impact to further test its integrity.

Scale models of the complete generator and the fuel core were tested in plasma-arc tunnels at the General Electric Aeroscience Laboratory, Philadelphia, to substantiate that on re-entry from space the generator and fuel core will burn up to very fine particles which will be dispersed harmlessly in the stratosphere.

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