NYO 10689

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Bibliography

on

Radioisotope Power Supplies

August, 1963

Daniel M. Axelrod

&

Joseph P. Novarro

Reactor Development Division

UNITED STATES ATOMIC ENERGY COMMISSION
NEW YORK OPERATIONS OFFICE

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BIBLIOGRAPHY

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Project Engineer

and

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FOREWORD

This Bibliography on Radioisotope Power Supplies (RIPS) was prepared as a supporting attachment to "Recommendations for a Program Development Plan for Radioisotope Power Supplies, FY 1964-FY 1968" (NYO 10609, August, 1963). The emphasis in this listing is on reports issued under AEC Division of Reactor Development RIPS systems development contracts. However, selected additional references of interest in the RIPS development program have also been included. Since timeliness was a more important consideration than completeness in issuing this Bibliography, it should not be considered a complete listing of all reports in this field.

In addition to its use by the Atomic Energy Commission and AEC RIPS contractors, the bibliography should be useful to potential RIPS users and firms interested in performing work for the Commission in this field.

TABLE OF CONTENTS

INTRODUCTION AND EXPLANATORY NOTES

This list represents a selected bibliography of AEC-sponsored reports pertaining to radioisotope power supplies, with emphasis on systems development reports.

Distribution

Because of security classification and the nature of the program, the distribution of these were categorized into the following:

Limited --- Atomic Energy Commission Offices
(copies not available for distribution

Special --- (Government and industry installations as
UC-33 (prescribed by the cognizant AEC Operations
C-92A (Office
(Obtain from DTIE, Oak Ridge)

Classification

UNCL	-	Unclassified
CDI	-	Confidential - Defense Information
CRD	-	Confidential - Restricted Data
SDI	-	Secret - Defense Information
SRD	-	Secret - Restricted Data

Author

MWD	-	Martin Company, Nuclear Division
TRW	-	Thompson-Ramo-Wooldridge Co.
GI	-	General Instrument Corp.

OBTAINING AEC-SPONSORED REPORTS

AEC Contractors

AEC Contractors may obtain the reports they require for performance of their contract free of charge. Form OR-540, Official Report Request, (shown on the next page), should be completed to obtain any of the following AEC reports. Those reports which are determined to be applicable to the work of the contractor by the Division of Technical Information Extension (DTIE), Oak Ridge, will be trnas-mitted. In the case of classified reports, a statement of the ap-plicability of the report to the work being performed will expedite the review, particularly when new projects are initiated.

Other Organizations

Firms who do not hold AEC contracts but wish to obtain reports should contact DTIE, Oak Ridge. Access to classified reports will require appropriate clearances and establishing a need-to-know.

For furtherinformation consult the following references (available free from DTIE):

TID 485 - Technical Information Services of the USAEC - comprehensive descriptions of all the services available to the contractor at DTIE.

NYO 2834 - Guide to AEC Report Preparation and Dissemination - fully describes report format requirements and services of DTIE.

Availability of AEC Technical Information - Glossary of terms describing procedures for acquiring reports.

OR 540 (copy)

OFFICIAL REPORT REQUEST (Not to be used for reports required under an access permit)

For U. S. Atomic Energy Commission
Office of Technical Information Extension
P. O. Box 62
Oak Ridge, Tenn.

Report No.	No. of copies	Classification of report	☐ Yes ☐ No Request is for additional copies	Date of request

PLEASE NOTE: Use only for specifically identified reports. Submit separate forms for each item requested. Submit in triplicate. Staple together the three forms for each request.

If report is classified, outside the categories which you are authorized to receive, please furnish justification with this request.

The Office of Technical Information Extension can frequently supply unclassified reports only on loan in full-size copy or for retention in microcard form. In order to expedite the filling of your request, please indicate your preference should OTI Extension stock of full-size copies be depleted. ☐ Loan in full-size copy ☐ Microcard retention

If report number is not known or if report is not an AEC series, include the information requested below.

Send to: (enter complete mailing address)

Title _____

Author(s) _____

Originating organization _____

Date of report _____

Contract number of report _____

This report is required in connection with work for the U. S. Government under contract No. _____

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FORM OR-540(REV 7-60)

(Front)

☐ 1. Report not in OTI Extension. We are attempting to obtain it.

☐ 2. Not yet available. You will receive the report automatically when distribution is made.

☐ 3. Report is available in _____

_____

☐ 4. Cannot be identified from the information furnished. Furnish additional information such as author, issuing organization, contract number, and source of reference.

☐ 5. No available copies. Additional copies have been requested from issuing office.

☐ 6. Copy has been furnished previously on the date indicated._____. ☐ Additional copies are not available. ☐ Are additional copies needed?

☐ 7. The report has not been issued to date. Per _____.

☐ 8. See letter from OTI Extension dated _____.

☐ 9. We have been informed by the issuing organization that this report received internal distribution only.

☐ 10. Report is ☐ obsolete; ☐ superseded by _____.

☐ 11. Not an AEC publication. Suggested source is noted below.

☐ 12. Other

USAEC Office of Technical Information Extension, Oak Ridge, Tennessee

I. BIBLIOGRAPHIES, SUMMARY REPORTS, AND KEY ADMINISTRATIVE DOCUMENTS

Bibliographies

1. Bibliography of SNAP Reports, MND-P-2413, Aug. 1960
   Lists reports prepared under Contract AT(30-3)-217. (Uncl)
   (Many of the references listed have been included in this bibliography).

2. Sidney F. Lanier & Henry D. Raleigh, Direct Energy Conversion and Systems for Nuclear Auxiliary Power (SNAP), A Literature Search TID-3561 (Rev. 3) January 1963 (Uncl.)

3. Smith, E. H. and W. Bowes, Isotopic Power Sources ... A Compendium: Property and Processes Review MND-P-2581
   June 1961 (contract AT(30-3)-217)

   Volume I - List of References (Uncl)
   Volume II - Abstracts of Key References (S-RD)
   Volume III- Abstracts of Key References (Uncl)

4. U. S. Naval Rsch. Lab, Direct Energy Conversion Literature Abstracts, Compiled in the library Branch, Tech. Info. Div., U. S. Naval Rsch. Lab., Dec. 1962. (Available from O. T. S.)

Summary Reports

1. J. G. Morse, "RIPS - Radioisotope-Fueled Power Supplies: Lecture Presented at University of California," Los Angeles, California, July 1961, The Martin Co., Baltimore, Md. (Uncl)

2. Radioisotope-Fueled Generator Compendium and Parametric Study. C. Fink & T. Bustard, June 1963 MND-2994 (C-RD)

Key Administrative Documents

1. Recommendations for a Program Development Plan for Radioisotope Power Supplies, FY1964-FY1968, NYO-10609 Reactor Development Division, NYOpns Office, August, 1963 (Limited Distribution) (C-RD)

2. Present and Potential Annual Availability of Isotopic Power Fuels, Div. of Isotopes Development, April 1962

3. Classification Guide for the Isotopic Power Program - CG-RIP-1 AEC Division of Classification, May 1962, C-DI

II.

SNAP Development Programs - General Reports-CONTRACT AT(30-)-217

Report No.	Title	Date	Distribution	Author	Classification
MND-1001	Power from Radioisotopes Survey Report	10/56	Special	F. Hittman	SRD
MND-1002	Power from Radioisotopes Conceptual Design Report	1/57	Special	K. Johnson	SRD
MND-1138	Interim Hazards Analysis Report	8/57	Special	S. Clark	SRD
MND-1086	Radioisotope Fueled Auxiliary Power Unit Quarterly Progress Report No. 1	5/57	Special	C. Silverstein R. Behmer	SRD
MND-1123	Report No. 2	8/57	Special	K. Johnson	SRD
MND-P-1175	Report No. 3	10/57	"	K. Johnson	SRD
MND-P-3001	Report No. 4	2/58	"	K. Johnson	SDI
MND-P-3002	Report No. 5	5/58	"	K. Johnson	SDI
MND-P-3003	Report No. 6	9/58	"	K. Johnson	SDI
MND-P-3004	Report No. 7	11/58	"	K. Johnson	SDI
MND-P-3005	Report No. 8	2/59	"	K. Johnson	SDI
MND-P-3006	Report No. 9	6/59	"	D. Harvey	SDI
MND-P-3007	Report No. 10	10/59	"	D. Harvey	SDI
MND-P-3008	Report No. 11	11/59	"	D. Harvey	SDI
MND-P-3009	SNAP Programs Quarterly Report No. 12 (Classified Section)	3/59	Special	D. Harvey	SDI

SNAP Development Programs - General Reports - CONTRACT AT(30-3)-217 (Cont'd)

Report No.	Title	Date	Distribution	Author	Classification
MND-P-3009-1	SNAP Programs Quarterly Report No. 1 (Unclassified Section)	5/60	Special	J. Morse	UNCL
MND-P- 3010	SNAP Programs Quarterly Report No. 2	7/60	Special	D. Harvey	UNCL
MND-P-3011	SNAP Programs Quarterly Report No. 3	8/60	Special	D. Harvey	UNCL
MND-P-2047	Hazards Summary Report - Three-Watt Polonium-210 Fueled Thermoelectric Generator	6/59	Limited	W. Crane	SDI
MND-P-2048	Hazards Summary Report for Two-Watt Strontium-90 Fueled Thermoelectric Generator	6/59	Limited	W. Crane	SDI
MND-P-2049	Hazards Summary Report for Two-Watt Promethium-147 Fueled Thermoelectric Generator	6/59	Limited	W. Crane	SDI
MND-P-2148	Ten Watt Radioisotope Thermoelectric Power Supply for Project Transit Satellite	1/60		D. J. Knight	UNCL
MND-P-2333	Summary Report of Americium Process to be Performed by Martin Company	3/60	Limited	G. Dix	UNCL
MND-P-2347	Final Hazards Summary Report of Americium Process to be Performed by Martin Co.	5/60	Special	J. Watcher	UNCL
MND-P-2354	Nuclear 1.0-Watt Power Supply for Space Applications	6/60	Special	D. Knighton	UNCL

SNAP Development Programs - General Reports - CONTRACT AT(30-3)-217 (Cont'd)

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2355	Advance Thermoelectric Power System Final Report	6/60	Limited	R. Harvey	UNCL
MND-P-2356	Preliminary Operational Safety Report for Thermoelectric Generator	5/60	Special	D. Knighton	UNCL
MND-P-2363	Preliminary Safety Analysis Low Power Ce-144 Generator	6/60	Special	G. Dix	UNCL
MND-P-2364	Final Safety Analysis on Polonium Fueled Generator	6/60	Special	C. Riggs	UNCL
MND-P-2366	Preliminary Safety Analysis Report Curium Fueled Generator for Lunar and Satellite Missions	6/60	Special	C. Riggs	UNCL
MND-P-2372	Thermoelement Optimization Code	6/60	Special	T. Bustard W. Lyon	UNCL
MND-P-2373	13-Watt Curium Fueled Thermoelectric Generator for Six-Month Space Mission	7/60	Special	J. Bloom	UNCL
MND-P-2374	Final Report on 13-Watt Curium Fueled Thermoelectric Generator for Hard Lunar Impact Mission	8/60	Special	J. Bloom	UNCL
MND-FILM-P-2144	Nuclear Field Loading Mock-up	9/59	Limited	-	SDI
MND-FILM-P-2146	Isotopic-Power Testing for Space Use	3/60	Limited	-	UNCL

IIIA.

SNAP-I- CONTRACT AT(30-3)-217 TASK 1

Report No.	Title	Date	Distribution	Author	Classification
MND-P-1229	Hazards Summary Report, SNAP I	1/58	Special	S. Clark	SRD
MND-P-1519	SNAP I Re-Entry Evaluation Study	9/58	Limited	G. Dix	SDI
MND-P-1957	Test Program and Cell Requirement for SNAP I	5/59	Limited	W. Crane D. Harvey	SDI
MND-P-2128	SNAP I Dynamic Mercury Loop Tests of Selected Material	4/60	Special	J. McGrew	UNCL
MND-P-2309	Mercury Boiler Development Report SNAP I	6/60	Special	J. Jicha J. Keenan	UNCL
MND-P-2350	SNAP I Radioisotope Fueled Turboelectric Power Conversion System Summary	6/60	Special	P. Dick	UNCL
MND-P-2375	SNAP I Power Conversion-System Development	6/60	Special	Thompson-Ramo Wooldridge	UNCL
MND-P-2376	SNAP I Power Conversion-Turbine Development	6/60	"	"	"
MND-P-2377	SNAP I Power Conversion-Alternator Development	6/60	"	"	"
MND-P-2378	SNAP I Power Conversion-Pump Development	6/60	"	"	"
MND-P-2379	SNAP I Power Conversion-Bearing Development	6/60	"	"	"
MND-P-2380	SNAP I Power Conversion-Controls Development	6/60	"	"	"

SNAP-I CONTRACT AT(30-3)-217 TASK I -(Cont.)

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2381	SNAP I Power Conversion-Condensor-Radiator Development	6/60	Special	Thompson-Ramo Wooldridge	UNCL
MND-P-2382	SNAP-I Power Conversion-Materials Development	6/60	"	"	"
MND-FILM-P-1655	Space Nuclear Auxiliary Power (color 9 min) SNAP I-First Progress Report	12/58	Limited	-	SDI
MND-FILM-P-1736	SNAP I Hazards Test	2/59	Limited	-	SDI
MND-FILM-P-2042	SNAP I Corrosion Test Loops	5/59	Limited	-	SDI
MND-FILM-P-2293	SNAP I Burst Test	12/59	Limited	-	SDI

IIIB.

SNAP-1A CONTRACT AT(30-3)-217 Task 2

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2042-1	Marriage of APU and Nose Cone	6/59	Limited	-	SDI
MND-P-2042-2	Field Loading of APU	6/59	"	-	CDI
MND-P-2042-3	Quick Change Field Loading Isotope Cask	6/59	"	-	UNC
MND-P-2042-4	Field Loading Arrangement	6/59	"	-	SDI
MND-P-2042-5	Operating Characteristics	6/59	"	-	SRD
MND-P-2042-6	Energy Characteristics	6/59	"	-	SRD
MND-P-2042-7	SNAP 1A Thermoelectric Generator	6/59	"	-	SDI
MND-P-2042-8	Transportation Dolly	6/59	"	-	CDI
	NOTE: MND-P-2042-1 through 8 includes slide and glossy print lecture cards for each title and commentary on slide set.				
MND-P-2184	SNAP 1A Preliminary Operational Hazards Summary Report for Task 2 Thermoelectric Generator	2/60	Special	G. Dix	SDI
MND-P-2291	Summary Report, Aerodynamic Re-entry Analysis, Task 2 Thermoelectric Generator	2/60	Special	R. Oehrli	SDI
MND-P-2335	Interim Report on Safety Procedures for Task 2 Thermoelectric Generator	6/60	Special	L. Klein	UNC
MND-P-2352	Final Report on SNAP 1A Hazards	6/60	Special	G. Dix	UNC

SNAP III CONTRACT AT(30-3)-217 Task III

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2101-I Vol. 1	SNAP III Thermoelectric Environmental Tests	8/59	Special	L. Gross	UNC
MND-P-2101-II Vol. 2	SNAP III Thermoelectric Environmental Tests	10/59	Limited	L. Gross	SDI
MND-P-2101-III Vol. 3	SNAP III Thermoelectric Environmental Tests	1/60	Special	L. Gross E. Schramm	UNC
MND-P-2322	SNAP III Topical Report	2/60	Special	R. Harvey	UNC
MND-P-2358	Nuclear Safety Test Report for the SNAP III Generator	6/60	Special	T. Dobry	UNC
MND-P-2368	Operational Testing of SNAP III Generator	6/60	Special	R. Wilson	UNC
MND-P-2369	Conceptual Design of a SNAP III Generator Fueled with Ce-144	6/60	Special	R. Wilson	UNC
MND-P-2370	Conceptual Design of a SNAP III Type Generator Fueled with Po-210	6/60	Special	R. Wilson	UNC

IIID.

SNAP-9A CONTRACT AT(30-1)-2871

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2700-1	SNAP 9A Radioisotope Fueled Thermoelectric Power Conversion System Development. Quarterly Progress Report No. 1	11/61	Special	Paul J. Dick	CRD
MND-P-2700-2	Quarterly Progress Report No. 2	2/62	"	Paul J. Dick	CRD
MND-P-2700-3	Quarterly Progress Report No. 3	5/62	"	Charles R. Fink	CRD
MND-P-2725	Specification for Thermal Environment Test SNAP 9A-SNAP 11	2/62	"	T. J. Dobry	CRD
MND-P-2775	Preliminary Safety Analysis SNAP 9A Transit Mission	4/62	"	T. J. Young	CRD
MND-P-2775-2	SNAP 9A Radioisotope-Fueled Generator Final Safety Analysis for Transit Mission	3/63	C-92A	T. J. Dobry	SRD
MND-P-2809	Instructional Manual - SNAP 9A Electric Generation System	3/63	C-92A	MND	CRD
MND-P-2874	Feasibility Report No. 8 for Transfer and Test of SNAP 9A Units at Johns Hopkins Applied Physics Laboratory	2/63	C-92A	MND	UNC

SNAP 11 - CONTRACT AT(30-1)-2952

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2811-1	SNAP 11-Surveyor Program Quarterly Progress Reports	4/62	C-92A	MND	CDI
MND-P-2811-2	" " "	7/62	"	"	"
MND-P-2811-3	" " "	10/62	"	"	"
MND-P-2811-4	" " "	1/63	"	"	"

IIIF.

IMP - CONTRACT AT(30-1)-3169

REPORT NO.	TITLE	DATE	DISTRIBUTION	AUTHOR	CLASSIFICATION
MND-P-2989-1	Radioisotope Power Supply For The Interplanetary Monitoring Probe Satellite Program. Quarterly Progress Report No. 1	5/63	C-92A	MND	C.R.D.

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2483-2	SNAP-7 Programs - Strontium 90 Fueled Thermoelectric Generator Development Quarterly Progress Report	4/61	Special	W. West	UNCL
MND-P-2483-3	" " "	7/61	Special	W. West	"
MND-P-2483-4	" " "	10/61	Special	W. West	"
MND-P-2483-5	" " "	1/62	Special	W. A. McDonald	"
MND-P-2483-6	" " "	4/62	Special	W. A. McDonald	"
MND-P-2483-7	" " "	7/62	Special	W. A. McDonald	"
MND-P-2613	SNAP-7A Final Safety Analysis-Ten Watt Strontium-90 Fueled Generator for an Unattended Light Buoy	1/62	Special	MND	"
MND-P-2720	SNAP-7A Strontium-90 Fueled Thermoelectric Generator Power Source for Five-Watt U. S. Coast Guard Light Buoy Final Report	2/62	Special	MND	"
MND-P-2661	Instructional Manual-SNAP-7A Electric Generation Station	1/62	Special	MND	"
MND-P-2614	SNAP-7C Final Analysis-Ten Watt Strontium-90 Fueled Generator for an Unattended Meterological Station	5/61	Special	MND	"
MND-P-2707	SNAP-7C Strontium-90 Fueled Thermoelectric Generator Power Source Five-Watt U.S. Navy Weather Station - Final Report	8/61	Special	MND	"

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2640	Instruction Manual SNAP-7C Electric Generation System	10/61	Special	MND	UNCL
MND-P-2762	SNAP-7B Final Safety Evaluation of a Sixty Watt Strontium -90 Fueled Generator for a U. S. Coast Guard Automatic Light Station	4/62	Special	V. G. Kelly H. N. Berkow	"
MND-P-2836	SNAP-7B Strontium-90 Fueled Thermoelectric Generator Power Source - Thirty Watt U. S. Coast Guard Automatic Light Station	4/63	Special	C. N. Young	"
MND-P-2834	Instruction Manual - SNAP-7B Electric Gneeration System	3/63	Special	MND	"
MND-P-2664A	SNAP-7D Final Safety Evaluation of a Sixty Watt Strontium -90 Fueled Generator for a U. S. Navy Boat Type Weather Station	5/62	Special	V. G. Kelly H. N. Berkow	"
MND-P-2835	SNAP-7D Strontium-90 Fueled Thermoelectric Generator Power Source. Thirty-Watt U. S. Navy Floating Weather Station	3/63	Special	C. N. Young	"
MND-P-2786	Instruction Manual Snap-7D Electric Generation System	3/63	Special	MND	"

IVB.

SNAP 7E - CONTRACT AT(30-1)-2958

REPORT NO.	TITLE	DATE	DISTRIBUTION	AUTHOR	CLASSIFICATION
MND-2821	Instruction Manual SNAP-7E Electric Generation System	6/62	Special	MND	UNCL
MND-P-2761	Final Safety Evaluation of a Ten Watt Strontium-90 Fueled Generator For A Deep Sea Application	5/62	Special	H.N. Berkow, V.G. Kelly	UNCL
MND-P-2837	SNAP 7E Sr-90 - Fueled Thermoelectric Generator for an Undersea Beacon - Final Report	7/62	Special	MND	UNCL

IVC. CESIUM-137 GENERATOR

Report No.	Title	Date	Distribution	Author	Classification
RRC-Cs-0100	Cs-137 Fueled Generator	?	?	Royal Research Corp.	?

IVD.

MFP - CONTRACT AT(30-1)-2605

Report No.	Title	Date	Distribution	Author	Classification
N.Y.O. 9699	Phase I Report of Development Techniques for Power Production from Mixed Fission Products	2/61	UC-23	G.I.	Unc.
N.Y.O. 9783	Power Flattening Studies for Radioisotope Fueled Thermoelectric Converters	4/62	UC-23	R. Rush	Unc.
N.Y.O. 10463	Phase II Final Report Development Techniques for Power Production from Mixed Fission Products	6/63	UC-23	G.I.	Unc.
N.Y.O. 10462	Final Report - Economic Factors of M.F.P. Thermoelectric Generators	5/63	UC-23	E.J. Lemanski	Unc.
N.Y.O. 10464	Phase III Mid-term Report	7/63	UC-23	E.J. Lemanski	Unc.

VA.

Advanced SNAP Technology - CONTRACT AT(30-3)-217 TASK V and SNAP-13 Contract AT(30-1)-3060

Report No.	Title	Date	Distribution	Author	Classification
MND-P-3015 II	SNAP Programs - Task 5 Thermionic Isotope Power Systems - Quarterly Progress Reports	6/61	Standard	MND	UNC
MND-P-3016 II	" " "	9/61	"	"	CDI
MND-P-3017 II	SNAP Programs - Task 5 Thermionic Development Program Quarterly Progress Reports	12/61	C-92A	W. E. Kortier	CDI
MND-P-3018 II	" " "	3/62		" "	CDI
MND-P-3019 II	" " "	6/62	"	" "	"
MND-P-2890 I	" " "	9/62	"	" "	"
MND-P-2890 II	" " "	12/62	"	" "	"
MND-P-2890 III	" " "	3/63	"	" "	"
	"SNAP 13"				
MND-P-2679	Final Summary Report Thermionic Isotopic Power System: Through Sept. 30, 1961"		Special	W. E. Kortier T. S. Bustard	

VA.

Barium Vapor Filled Thermionic Plasma Energy Converters - CONTRACT AT(30-1)-2933

Report No.	Title	Date	Distribution	Author	Classification
MND-2812	Research & Development on Barium Vapor-Filled Thermionic Plasma Energy Converters (Quarterly Reports)	5/62	C-92A	Dr. A.J. Kennedy Dr. M.E. Talaat	CDI
MND-2812-2	" " "	10/62	C-92A	"	CRD
MND-2812-3	" " "	1/63	Limited	"	CDI
MND-2812-4	" " "	5/63	C-93b	"	CDI
MND-2963	Technical Report Barium Vapor-Filled Thermionic Plasma Energy Converters	4/63	Limited	Dr. M.E. Talaat	CDI

VB. OTHER RESEARCH AND DEVELOPMENT REPORTS

Report No.	Title	Date	Distribution	Author	Classification
MND-P-2801	SNAP Programs Final Summary Report Task 6 Fuel Technology Development Program	7/62	C-92A	MND	CRD
MND-P-2953	SNAP Programs Upper Atmosphere Experimental Re-entry Study - Final Summary Report	4/63	C-92A	William Hagis	CRD
H.W. 71319 Rev.	Special Radioisotopes for Power	10/16/61	?	C. A. Rohrmann	?
H.W. 76323	Radioisotopic Heat Sources	2/1/63	UC-2	C. A. Rohrmann	UNCL

APPENDIX I

SELECTED ADDITIONAL REFERENCES IN THE UNCLASSIFIED LITERATURE

1. Space Nuclear Power Applications - Hearings before the Subcommittee on Research, Development, and Radiation of the Joint Committee on Atomic Energy, Congress of the U. S.
   U. S. Government Printing Office, Washington, Sept. 1962

2. Radionuclide Power for Space:

   a. Davis, H. - "Part I: Isotope Cost and Availability," Nucleonics 21-3, 61-65, Mar. '63

   b. Harvey, D. G., P. J. Dick and C. R. Fink, "Part II - Isotope Generator Reliability and Safety", Nucleonics, 21-4, 56-59, Apr. 63

3. Nuclear Energy in Space - Nucleonics, 19-4, 54-100; Apr. 61
   Comprehensive review of Nuclear space programs including:

   a. Harvey, D. and J. G. Morse - "Electric Power Sources": Radionuclide Power for Space Mission", pages 69-72

   b. Branch, I. L. and J. A. Connor, Jr. - "Nuclear Safety in Space", pages 64-68

4. American Rocket Society, Progress in Astronautics and Rocketry series

   Snyder, N. W., Ed., Vol 4: SPACE POWER SYSTEMS, 1961, 632 pages
   Series of Technical Papers on Solar, Nuclear, and Chemical Systems and Power Requirements, including:

   a. Bloom, J. L. and Wedell, J. B., "Thirteen Watt Isotope Powered Thermoelectric Generators for Space and Lunar Impact Missions," pp 485-517

   b. Greenfield, H. H., "Optimized SNAP III Power Generator Design for Spacecraft," pp 519-546

   c. Dick, P. J., "Safety Analyses and Tests of a Radioisotope Powered Thermoelectric Generator," pp 547-561

5. Other Published Journal Articles

   a. Morse, J. G., "Energy for Remote Areas," Science, 139-3560, 1175-1180, Mar. 22, 1963

   b. Corliss, W. R., "Power Sources for Nuclear Space Instruments," Nucleonics, 20-10, 61-63, Nov. 62

APPENDIX I - 2

c. Kershaw, W. L., "Radioisotope Fueled Thermoelectric Generators," Electro Technology, July 1962

d. Harvey, D. G., "Integrating Isotopic Power Systems," Astronautics, May 1962

e. Morse, J. G., and Harvey, D. G., "Nuclear Energy in Space - Radioisotope Auxiliary Power Systems, "Aerospace Engineering, November 1961

f. Crompton, C. E., "Isotopic Power,", Industrial Research, October 1961

g. Morse, J. G., "Isotopic Power, "The Military Engineer, January-February, 1961

h. Huffman, F. N., and Gross, L. W., "Performance Data and Environment Test Results of SNAP III," Ballistic Missiles and Space Technology, Vol. II, 1961

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6. Forecasts of Space Isotopic Power Requirements

a. "NASA Increases Estimate of Isotopic Power Needs," Forum Memo, Atomic Industrial Forum, Inc., NY, June 1963

b. "Space Applications of Nuclear - Electric Power", Radio Corporation of America N. Y., AED-P5013, March 1963

c. "Nucleonics in Space," Nucleonics Markets, Vol. 5, No. 2, Oct/Dec. 62 (McGraw-Hill)

APPENDIX II Summary of Radioisotope Power Supplies

System Name	Generator Specifications (1) (2) Energy Conv.	Power Watts(e)	Weight lb.	Length in.	Diam. in.	Fuel kind	Half Life	System Design Life	Status as of August 1963	Mission Remarks
Space Applications:										
1. SNAP 1	Hg.vapor					Po 210	138 da.	60 da.	Cancelled 1959	Demonstration Hq-Tech. used in SNAP-2
2. SNAP 1A	Pb-Te	125	175	34	24	Ce 144	285 da.	1 yr.	Cancelled 1959	A-F Satellite
3. SNAP-3	Pb-Te	3	4	5.5	4.75	Po 210	138 da.	90 da.	Demons. 1959	Proof of Principle
4. SNAP-3 (Pu238-Fuel)	Pb-Te	2.7	4.6	5.5	4.8	Pu 238	86 yr.	5 yr.	Launched 1961	Navy Transit IVA & B
5. SNAP-9A	Pb-Te	25	27	9.5	20(3)	Pu 238	86 yr.	6 yr.	Flight qualified	Space application
6. SNAP-11	Pb-Te	25	30	9	6	Cm 242	162 da.	1/4yr.	Prototype Testing	Surveyor - has power flattening system
7. IMP	Pb-Te	22	17+	10.6	22.2(3)	Pu 238	86 yr.	3 yr.	Eng.Des. complete	IMP Satellite
8. SNAP-13	Cs-Vapor emitter	12	4	4	2.5	Cm 242	162 da.	1/4yr.	Prototype Testing	Proof of Principle
Terrestrial Applications:										
1. Sentry	Pb-Te	4.5	1680(4)	20	18	Sr 90	28 yr.	2+ yr.	Operational-1961	Arctic Weather Sta.
2. SNAP-7A-C	Pb-Te	10	1870(4)	21	20	Sr 90	28 yr.	10 yr.	Oper. 1962; 1961 7A-Post-oper.Study	7A-Buoy 7C-Arctic Wea. Sta.
3. SNAP-7B-D	Pb-Te	60	4600(4)	34.5	22	Sr 90	28 yr.	10 yr.	Oper. 1964	7B-Fixed Light 7D-Barge Wea. Sta.
4. SNAP-7E	Pb-Te	6.5	8000(5)	56	30	Sr 90	28 yr.	10 yr.	Oper. 1964	Undersea Beacon
5. Cesium Generator	Pb-Te	5	550			Cs 137	27 yr.			Undersea Seismograph
6. Mixed Fission Products Generator	Bi_2Te_3	10	20,000(4)	76	65	MFP	--	5 yr.	Concept. Design	Demonstration

(1) Specifications apply to single generator. Design Power is generator output. Voltage converter efficiency (typically 75-80%) not included.

(2) SNAP-1 used a mercury vapor cycle; SNAP 13 is a thermionic device; all others are thermoelectric.

(3) Including fins on generator.

(4) Includes weight of shield. SNAP 7A, C shield weight - 1726 lb.

(5) Includes special pressure vessel for deep sea application.

APPENDIX III - SAMPLE LIST OF SPECIFICATIONS AND DRAWINGS FOR A RADIOISOTOPE POWER SUPPLY

(RIPS FOR INTERPLANETARY MONITORING PROBE)

SPECIFICATIONS

MN-10073, Rev. 1 June 6, 1963	"Specification for a Radioisotope Fueled Power Supply for Interplanetary Monitoring Probe Satellites" (C-DI)
MN-10074, Rev. 1 June 7, 1963	"Specification for Environmental Conditions and Environmental Tests for a Radioisotope-Fueled Power Supply for Interplanetary Monitoring Probe Satellites"
MN-10075, Rev. 1 June 10, 1963	"Specification for an Electric Converter/Regulator for a Radioisotope-Fueled Power Supply for the IMP-C Satellite"
MN-10076, Rev. 1 June 11, 1963	"Specification for a Safety Program for a Radioisotope-Fueled Generator for Interplanetary Monitoring Probe Satellites"
To be developed	Specification for Fuel Capsules for A Radioisotope-Fueled Power Supply for Interplanetary Monitoring Probe Satellites
To be developed	Quality Control Procedures

DRAWINGS

Master Assembly Drawings

439 A 1110000	Generator Assembly Drawing (C-RD)
439 A 1110001	Generator External installation
To be released	Generator Assembly Torquing Instructions

Heat Source Items

To be released	Fuel capsule (C-RD)
NSK - 89	Graphite Block Assembly (fueled units)
439 A 1110151	Mica Sheet
439 A 1110153	Capsule end support (fueled units)
439 A 1110157	Stainless Steel Disc Load Distributor (fueled units)

Energy Conversion Items

439 A 111 0200	Module Assembly
" 0201	Couple Assembly
" 0250	Shoe, Hot Junction
" 0251	Thermoelectric Element
" 0252	Shoe, Cold Junction
" 0253	Insulation, Module Strip

DRAWINGS (Continued)

Energy Conversion Items

439 A 111 0254	Lug, Terminal (2 sheets)
" 0255	Piston and Button (Alignment Details)
" 0256	Module Bar
" 0258	Insulation Header Blocks (fueled units)

Heat Rejection and Containment Items

439 A 111 0300	Housing Assembly
" 0301	Cover, Upper
" 0350	Body, Housing
" 0351	Fin
" 0353	Bolt, Extension
" 0354	Connector Holddown Ring and Shim
" 0355	Cover, Bottom (fueled units)
PN 8100 000	Hermetically Sealed Electrical Connector
To be released	Generator Finish Specification

Other Items

439 A 111 0400	Wiring Diagram Schematic
" 0500	Installation Tool (3 sheets)
To be released	DC-DC Converter Drawings

Additional or Substitute Drawings for Prototype Units Only

PN 6400 000	Heater Cartridge (Fire rod)
439 A 111 0150	Adapter Electric Heater
" 0152	Stainless Steel Disc Load Distributor
" 0156	Disc, mica
" 0257	Insulation Header Blocks
" 0352	Cover, Bottom

Note: Additional drawings are required for such items as mockup, test fixtures, conceptual and alternate design studies.