[redacted]

SANDIA CORPORATION
SANDIA BASE, ALBUQUERQUE, N. M.

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July 24, 1968

Mr. George P. Dix, Chief
SEPO Safety Branch
Space Nuclear Systems Division
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mike:

Re: Comparison of SNAP 29 Intact and Burnup Designs

Enclosed are copies of a comparative study we have made on the SNAP 29 looking both at the changes due to intact vs burnup, and the changes due to multiple mission flights rather than single flights.

The doses due to the high-altitude burnup of the fuel have been changed from the data presented on July 18 to reflect the lower numbers that would result from using the "Peterson" air concentrations presented by DBM in the same meeting. These concentrations are approximately 1/50 of the concentrations which I used previously.

I have added a new mode of failure to the burnup designs for those cases where a fuel release would occur below 150,000 feet. These are the pre-orbital aborts between velocities of 16,000 and 20,000 feet per second. In these cases I have assumed that the ground-level doses which I previously had predicted are applicable.

In my own mind I still find the use of either the intact or burnup version of a polonium-fueled SNAP 29 to be unacceptable because of the high-maximum credible accident situation on the launch pad and the high expected man-rem doses. In any event, I find the burnup versions to be two to three times as bad as the intact versions. For comparative purposes, I have estimated that the maximum credible accident and expected man-rem totals for a curium 242 version of the SNAP 29 would be 1/100 as large as the intact polonium version of the same system.

Sincerely yours,

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V. E. Blake, Manager
Aerospace Nuclear Safety

VEB:9510:mw

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Copy to:
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L. A. Hopkins, Jr., 9500
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H. E. Hansen, 9511
S. L. Jeffers, 9512
S. McAlees, Jr., 9513
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SNAP 29 SUMMARY

	SINGLE FLIGHT BASIS		30 FLIGHT BASIS	
	Expected Man-Rem	Max. Credible Accident Man-Rem	Expected Man-Rem	Max. Credible Accident Man-Rem
INTACT	13,364	38,900,000	387,204	38,900,000
BURNUP*	29,881	38,900,000	915,331	38,900,000

* Burnup doses based on Peterson model (1.4×10^{-16} Ci/M^3 peak concentration for multiple flights).

D68-11675

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U
Emilda Selph 10/30/97
PERSON CHANGING MARKING & DATE
W LAWRENCE 11/04/97
PERSON VERIFYING MARKING & DATE

AUTHORITY: W. C. Layne
RECORD ID: 98SN0400
DATED: 10/23/97

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW

1st Review Date: 6/22/97
Authority: ADD
Name: W.H. LAWRENCE
2nd Review Date: 6/23/97
Authority: ADD
Name: W. Layne

Determination (Circle Numbers):
1. Classification Retained
2. Classification Changed to: UNCL
3. Contains No DOE Classified Information
4. Coordinate With:
5. Contains UCAI?
6. Comments:

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SNAP 29 INTACT DESIGN
(Sandia Probabilities)

SINGLE FLIGHT

	Probability	Curies Released	Dose (rem)	No. of People	Total Man-rem	Expected Man-rem
Launch Pad Abort	.01					
1% Fuel Loss	.0004	5,000	>1.5	6,000	30,000	12
10% Fuel Loss	.0003	50,000	>1.5	500,000	3,050,000	915
50% Fuel Loss	.0003	250,000	>1.5	7,000,000	38,900,000	11,670
Short Orbit (30 day)	.02					
Loss of 4 Capsules on Land	.0008	50,000	>1.5	21,000	189,000	150
Loss of 16 Capsules on Land	.00008	200,000	>1.5	90,000	810,000	65
High Altitude Burnup	.00002	400,000	.0000054*	3.39×10^9	18,400	< 1
Long Orbit (144 day)	.9					
Loss of 4 Capsules on Land	.0018	45,000	>1.5	19,500	175,000	315
Loss of 16 Capsules on Land	.00018	150,000	>1.5	70,000	630,000	112
High Altitude Burnup	.0009	300,000	.0000041*	3.39×10^9	138,000	124
						13,364

* Burnup doses based on Peterson model (1.4×10^{-16} Ci/M^3 peak concentration for multiple flights.)

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SNAP 29 INTACT DESIGN
(Sandia Probabilities)

30 FLIGHT BASIS

	Probability Of One Or More Events	Curies Released	Dose (rem)	No. of People	Total Man-Rem	Expected Man-Rem
Launch Pad Abort	.26					
1% Fuel Loss	.012	5,000	>1.5	6,000	30,000	360
10% Fuel Loss	.009	50,000	>1.5	500,000	3,050,000	27,450
50% Fuel Loss	.009	250,000	>1.5	7,000,000	38,900,000	340,100
Short Orbit (30 day)	.46					
Loss of 4 Capsules on Land	.024	50,000	>1.5	21,000	189,000	4,500
Loss of 16 Capsules on Land	.0024	200,000	>1.5	90,000	810,000	1,950
High Altitude Burnup	.0006	400,000	.0000054*	3.39×10^9	18,400	11
Long Orbit (144 day)	~1.0					
Loss of 4 Capsules on Land	.052	45,000	>1.5	19,500	175,000	9,100
Loss of 16 Capsules on Land	.0054	150,000	>1.5	70,000	630,000	3,360
High Altitude Burnup	.027	300,000	.0000041*	3.39×10^9	13,800	373
						387,204

*Burnup doses based on Peterson model (1.4×10^{-16} Ci/M^3 peak concentration for multiple flights).

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SNAP 29 BURNUP DESIGN
(Sandia Probabilities)

SINGLE FLIGHT BASIS

	Probability	Curies Released	Dose (rem)	No. of People	Total Man-Rem	Expected Man-Rem
Launch Pad Abort	.01					
1% Fuel Loss	.00004	5,000	>1.5	6,000	30,000	1
10% Fuel Loss	.00003	50,000	>1.5	500,000	3,050,000	92
50% Fuel Loss	.0003	250,000	>1.5	7,000,000	38,900,000	11,670
Low Altitude Burnup						
Pre-orbit Abort	.005	400,000	.00031	3.39×10^9	1,050,000	5,250
High Altitude Burnup						
Short Orbit (30 day)	.02	400,000	.0000054*	3.39×10^9	18,400	368
Long Orbit (144 day)	.9	300,000	.0000041*	3.39×10^9	13,800	12,500
						29,881

* Burnup doses based on Peterson model (1.4×10^{-16} Ci/M^3 peak concentration for multiple flights).

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SNAP 29 BURNUP DESIGN
(Sandia Probabilities)

30 FLIGHT BASIS

	Probability Of One Or More Events	Curies Released	Dose (rem)	No. of People	Total Man-Rem	Expected Man-Rem
Launch Pad Abort	.26					
1% Fuel Loss	.0012	5,000	>1.5	6,000	30,000	36
10% Fuel Loss	.0009	50,000	>1.5	500,000	3,050,000	2,745
50% Fuel Loss	.009	250,000	>1.5	7,000,000	38,900,000	340,100
Low Altitude Burnup						
Pre-orbit Abort	.14	400,000	.00031	3.39×10^9	1,050,000	147,000
High Altitude Burnup						
Short Orbit (30 day)	.46	400,000	.0000054*	3.39×10^9	18,400	8,450
Long Orbit (144 day)	~1.0	300,000	.000123 *	3.39×10^9	417,000	417,000
						915,331

* Burnup doses based on Peterson model (1.4×10^{-16} Ci/M^3 peak concentration for multiple flights).

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