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SANDIA LABORATORIES

ALBUQUERQUE, NEW MEXICO; LIVERMORE, CALIFORNIA; TONOPAH, NEVADA

TO : S. A. Upson, Director
C & TI Division, ALO

DATE: July 17, 1970

A. J. Clark, Jr.

FROM : A. J. Clark, Jr., Manager
Aerospace Nuclear Safety Department

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date 10/21/97
Authority ☐ ADC ☑ ADD
Name W. H. LAWRENCE
2nd Review Date 10/23/97
Authority ADD
Name W. Layne
Determination (Circle Number)
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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SUBJECT: Classification of SNAP 27 Hardware

On June 30, 1970 A. A. Pitrolo, GE, sent to you his comments on the existing SNAP 27 classification guidance and on July 2, 1970 he sent additional classified comments on the same subject. The two pieces of correspondence we feel admirably support their request for a removal of present classification on the generator. We too would like to offer our comments concerning the present SNAP 27 classification guidance as it exists today and our rationale for why we too encourage the removal of the SNAP 27 classification.

It is our opinion that the success of the SNAP 27 hardware is the end product of excellent quality control and successful engineering application. As a matter of historical record, the converter retained a classification of Confidential-DI for protection by means of the "Keystone Concept" (Ltr, Cotton to Marshall, dtd 6/24/68). It should be realized the generator is classically simple in concept. The primary design goal of the generator is to efficiently assure that the heat from the fuel capsule assembly to the radiator (outer case) passes through the thermoelectric legs. By maintaining close machining tolerances and proper choice of materials one can, and indeed General Electric did, obtain this goal. In arriving at this goal, no breakthroughs or significant advances, which are not already in the public domain, were used. The thermoelectric elements were available as a commercial product from 3M; the use of springs, followers, hot shoes, cold strap soldering, etc., are typical of such a design to attain a good heat transfer goal along with the use of cold and hot frames to attain a smearing of heat for efficient operation. We do not feel any of these concepts, designs or fabrication techniques require protection either for the "Keystone Concept" or for protection of a significant advance or for a breakthrough.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
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CLASSIFICATION CHANGED TO: U
Emelda Selph 11/3/97
PERSON CHANGING MARKING & DATE
W. LAWRENCE 11/04/97
PERSON VERIFYING MARKING & DATE
AUTHORITY: W.C. Layne
RECORD ID: 98SN0410
DATED: 10/23/97

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Another concept in question on the SNAP 27 is the sealing and penetration of the sealed thermopile. The thermoelectric lead telluride legs used in the SNAP systems are subject to degradation both from oxidation in the atmosphere and sublimation when in space vacuum. To protect the legs from these degradation mechanisms and to assure the generator's operation over its mission life, one must provide a means for minimizing these phenomena. Sealing the thermopile in an inert atmosphere is the means by which this is accomplished. For heat transfer reasons, argon was chosen with a trace of helium for leak detection. The converter is basically a can which is heated and flushed to remove, to the greatest extent possible, the oxygen therein leaving a positive pressure of argon to reduce sublimation. The can is fabricated by normal brazing techniques. The final sealing technique is no more than the pinching and soldering of the fill tubes on the can. The electrical penetrations are similar to those used in vacuum technology, information on which is in the public domain. The structural materials of the can were selected on the basis of the heat transfer goal and included brazing of dissimilar metals in a sophisticated process successfully performed by Solar on the SNAP 27, but this does not in our estimation constitute a significant advance in this technology.

The times and temperatures of the brazing process to bond the beryllium fins to the beryllium outer case are simply, in our estimation, a means for fabricating the design. This is no more than an example of finding a braze material which will bond the two pieces while providing the mechanical strength necessary to assure that the assembly will withstand the launch environment and the operational temperature environments. All the techniques involved for performing this braze are accommodated to the material and material thicknesses involved and do not constitute anything other than good commercial engineering practice.

We feel the performance capability and the success of the SNAP 27 system is the result of judicious choice of materials and processes to meet the design and performance goals of the mission. We do not feel that there have been any breakthroughs or significant technology advances which justify the classification of the SNAP 27. We suggest the SNAP 27 classification guidance be modified to that which we feel is reasonable and proper, unclassified.

AES:9521:meb

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