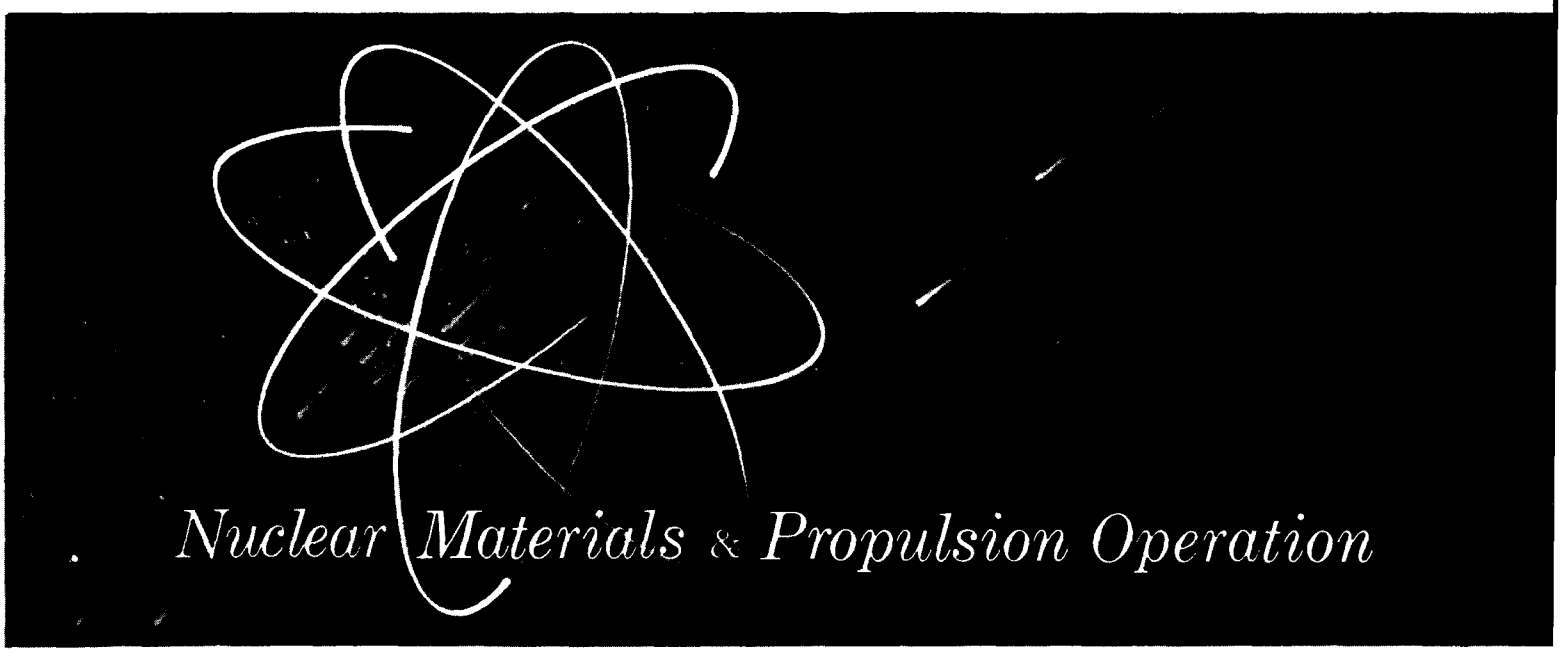
UNCLASSIFIED

[redacted]

TM 64-11-24
This document consists of 6 Pages
No. 4 of 6 Series A



ADVANCEMENTS IN NUCLEAR PROPULSION FOR AERONAUTICAL SYSTEMS

E. B. Delson
APPLICATIONS OPERATION

November 20, 1964

[redacted]

10-106

[redacted]

ADVANCED TECHNOLOGY SERVICES

GENERAL ELECTRIC

UNCLASSIFIED

"PRELIMINARY REPORT"

This report is preliminary and informal in nature and was prepared for use at the Nuclear Materials and Propulsion Operation, General Electric Company in the course of work under AEC contract AT(40-1)-2847. Views, opinions, conclusions or proposals expressed in the report are those of the author(s) only. This report is subject to revision upon further evaluation or availability of additional data.

DISCLAIMER

DISTRIBUTION

R. C. Miller, LJED, Bldg. 500 (original)
W. H. Long (1)
E. B. Delson (1)
Reports Library (3)

[redacted]

UNCLASSIFIED

[redacted]

ADVANCEMENTS IN NUCLEAR PROPULSION
FOR AERONAUTICAL SYSTEMS

November 20, 1964

R. C. Miller, Manager
Nuclear Gas Turbine Developments
Large Jet Engine Department

In accordance with the letter of November 9, 1964, on this subject from D. F. Jamison, the attached document, GV-814, has been reviewed and NMPO comments are presented below:

1. Under item 5.b., it is suggested that the sentence read: "To consider latest technology in defining capabilities of advanced nuclear propulsion systems, including such approaches as lithium-cooled, solid fueled, gas cooled, and circulating fuel reactors, of both moderated and unmoderated types." Item 5.b., as written in the referenced document, not only does not include gas-cooled reactors which it should, but in addition confuses identification by coolant type and by spectrum. Reactors utilising the coolants presented could be either moderated or fast spectrum.

2. Under item 6., Justification. The ANP Program was cancelled in 1961, not in 1956 as stated. The second sentence in the first paragraph should read: "Considerable effort has been applied by the Atomic Energy Commission, U. S. Navy, and U. S. Army to applications of nuclear reactors to ships, submarines, and ground supply units, as well as to the development of reactor technology well beyond that available at the close of the ANP Program. In addition, Air Force and contractor advanced development in the area of higher temperature turbomachinery makes it possible to utilize higher reactor coolant outlet temperatures than was previously possible."

3. Under item 7., Approach. Section c.(2) should be modified in the same manner as suggested for 5.b. above.

UNCLASSIFIED

[redacted]

[redacted]

UNCLASSIFIED

November 20, 1964

4. Under item 10., Background History and Progress. The following information should be added in the first paragraph: "Since the cancellation of the ANP Program, the General Electric Company has continued work on high-temperature materials for use in gas-cooled systems utilizing both oxidizing and non-oxidizing gases. This work has resulted in the availability of metallic fuel element materials having capabilities well beyond those available at the close of the ANP Program. In addition, General Electric has under development for the AEC a high-temperature, gas-cooled, refractory-metal, fast-spectrum reactor called the 710. This small, high power density reactor will deliver gas at temperatures compatible with the best modern turbomachinery and has the potential of considerably higher temperatures. The 710 test reactor, which is planned to operate in 1968, has the objective of delivering 3500°F gas for 1000 hours. The reactor has a potential of 5000 to 10,000 hours life at this temperature and considerably longer at lower temperatures."

   It may be pointed out, although it need not be included in the document, that the 710 reactor will go to test at about the same time, or possibly sooner, than the SNAP-50 reactor.

The types of application considered for this study by the Air Force appear to be much more practical for nuclear propulsion than the very high performance systems required during the former program. Previous studies of large, medium air speed aircraft indicated that the requirements could have been met by the technology then at hand. It is most likely that only closed-cycle systems would be considered at the present time. The technology which has been developed since 1961 in the high-temperature gas system area has the potential of providing power plants which should satisfy the mission requirements under consideration and should definitely be included in the study.

Unless the Air Force wishes to make a decision before the study is granted, they are again faced with the problem of two propulsion contractors being required in order to properly cover the gas and liquid-metal spectrums. We

[redacted]

UNCLASSIFIED

November 20, 1964

do not believe that Pratt & Whitney could properly or impartially evaluate the gas systems, and admit that we would probably be prejudiced and would require data, which we do not have at hand, in order to evaluate the liquid-metal systems. On this basis, if they desire a full evaluation, it probably should be done by two propulsion contractors.

General Electric has done no work in the aircraft area since the close of the ANP Program. We cannot propose or in any way suggest such an activity. However, if an official request is received from the Air Force for such a study, we would be pleased to respond to it.

Would you please review the above, add your comments, if any, and forward the package to Mr. Jamison.

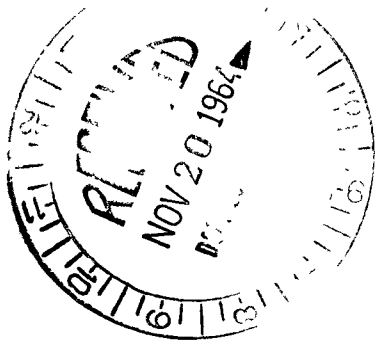
Original signed By
E. B. DELSON

E. B. Delson, Manager
Applications Operation

EBD:pfd

[redacted]

UNCLASSIFIED



ADVANCED TECHNOLOGY SERVICES

GENERAL ELECTRIC

UNCLASSIFIED

[redacted]