# AD NUMBER

### AD328081

# CLASSIFICATION CHANGES

TO:

UNCLASSIFIED

FROM:

CONFIDENTIAL

LIMITATION CHANGES

## TO:

Approved for public release; distribution is unlimited.

# FROM:

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 28 FEB 1958. Other requests shall be referred to Harry Diamond Laboraties, Washington, DC.

# AUTHORITY

HDL/DA ltr, 3 Apr 1979; HDL/DA ltr, 3 Apr 1979

# THIS PAGE IS UNCLASSIFIED



THIS PAGE IS UNCLASSIFIED

UNCLASSIFIED CLASSIFICATION CHANGED TO UNCLASSIFIED FROMCONFIDENTIAL FROMCONFI AUTHORIT :D/A /tr, 3 Apr 79



# DEFENSE DOCUMENTATION CENTER

AD

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA

DOWNGRADED AT 12 YEAR INTERVALS: NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10



NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.



DIAMOND ORDNANCE FUZE LABORATORIES

ORDNANCE CORPS WASHINGTON 25, D. C.

Ordnance Corps DIALY D UNDHANCE FUZE LABORATOTTE: LIDRARY APR 2 3 1958

# THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE

#### FOR ANTIMISSILE MISSILES (S)

TN3-9109 DA506-01-010 DOFL Proj 22421 28 February 1958 by TR-579 38 pages Copy No.

Philip Krupen

FOR THE COMMANDER: Approved by:

P. E. Landis

Acting Chief, Laboratory 20



Reproduction of this document, in whole or in part, is prohibited except with permission of the Diamond Ordnance Fuse Laboratories. Further distribution will be made only to authorized Department of Defense agéncies, and the Diamond Ordnance Fuze Laboratories will be notified of such action.

This document is not to be distributed to NATO governments.

When need for this document no longer exists, it should be returned to the Commanding Officer, Diamond Ordnance Fuse Laboratories, Washington 25, D. C.; Attention: Technical Reference Section.

Requests for additional copies of this document should be addressed to Commanding Officer, Diamond Ordnance Fuse Laboratorica, Washington 25, D.C.; Attention: Technical Reference Section.

This document contains information affecting the national defense of the United States within the DOMADED AT 12 YEAR 18 U. S. C., 793 and 794. Its transmission or the revelation of its contents in any manner to an unautor the states of the United States within the DOMADED AT 12 YEAR INTERVALOF TO DOMADED AT 12 YEAR

#### ABSTRACT

The small permissible: error in the instant of detonation of an antimissile missile imposes a stringent accuracy requirement on any proximity fuze proposed for this application. A study was made that indicates a passive electrostatic fuze would be feasible for the purpose. Proper operation of such a fuze depends on the target's being electrically charged and is independent of the angle or speed of closing between the Ztwo missiles. Computations were made which show that functioning would occur at about the point of closest approach even for miss distances greater than 1000 ft. Although available evidence indicates that ballistic missiles are highly charged, it is recommended that a substantiating investigation be undertaken prior to any electrostatic fuze program. Subsequent design and construction of an electrostatic fuze is expected to be relatively simple. (S)

The

3

#### 1. INTRODUCTION

The destruction of an ICBM or IRBM by means of an antimissile missile(AMM) involves the problems of early detection of the enemy missile, rapid calculation of its trajectory, associated selection of an intercept trajectory for the antimissile missile, reliable launching and guidance of its flight, and finally precise detonation of its warhead to defeat the enemy mission. The feasibility of a passive electrostatic fuze (PEF) for initiating the detonation at the proper time was studied.

Proper operation of the proposed electrostatic fuze would be independent of the approach aspect and closing velocity between the attacking and target missiles. Since it would not be necessary to gather and store information over an extended period of time prior to operation, this fuze could be simple, small, and light. It need not be integrated with the guidance and control systems of the antimissile missile, which should further reduce the complexity of the over-all systems; however, the arming signal could be supplied by the ground AMM control system.

It is expected that missile encounters will occur at altitudes above 100,000 ft so that free-space conditions will prevail. The AMM will probably contain a nuclear warhead with an omnidirectional blast pattern and a large effective range, on the order of 1000 ft. Since the flight control system will have to bring the AMM within this effective range before the PEF operates, the optimum location for operation will be near the point of closest approach (PCA). It will be shown that the electrostatic fuze will not only indicate the PCA but will also anticipate its occurrence.

TR-579

#### 2. DESCRIPTION OF SYSTEM

#### 2.1 General Principles

4

The signal for a passive electrostatic fuze is the potential difference developed between two probes on the destroying round when it enters the electrostatic field of its target. Consider, for example, the case of an antimissile missile 10 ft long and 1 1/2 ft in diameter constructed so as to create two probes, one 3 1/2 ft long and the other 6 1/2 ft long (Figure 1). As such a missile approaches a charged ICBM, a large voltage is developed between the probes. Figure 2 shows qualitatively how this signal will vary with time for six different conditions of encounter. Detailed characteristics of the signal depend on the actual velocities and the separation distances and will be calculated below for the first two cases.

In Figure 2, it can be seen that the signal increases when the AMM starts approaching the ICBM. In cases A, C, and E, where impact occurs, the slope of the signal is always positive. In the three passing cases (B, D, and F,) the signal changes from positive during the approach phase to negative during the receding phase. The signal has a negative slope during that period when the two missiles are in closest proximity. The duration of the negative slope corresponds to a small change in the distance between the missiles. The optimum time for operation is therefore at or shortly after the instant of maximum signal. For those rare cases of impact, when no maximum occurs, the fuze would be set to function when the signal level or its rate-of-change reaches a large preset value. The tactical situation usually expected (Case B) is that wherein the antimissile missile encounters the missile on a course which is essentially head-on but not colliding. In this case, the warhead should detonate so that its blast and fragments would stream into the nose of the oncoming missile. If the approach aspect is essentially perpendicular (Case D, another rare case), detonation of the warhead should occur at the point of closest approach. In the case of an antimissile missile overtaking the target missile (Case F, which will probably never arise), the warhead would detonate as the antimissile missile approaches close to the target so that the blast would overtake the missile. Practically all tactical situations are expected to fall between those illustrated by Cases B and D, so the optimum time for operation of the fuze coincides with the short negative slope of the signal.

**TR-579** 

#### SECRET

This document contains information affecting the national defense of the United States within the meaning of the espionage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized persoa is prohibited by law.

#### 2.2 Charge Considerations

The polarity, magnitude, and rate-of change of the electrostatic fuze signal depend on several factors, which include the charge on the ICBM, the size and shape of the fuze probes, and the closing velocity, angle, and range between the missiles. The major unknown factor is the magnitude of the electric charge on a target missile. Polarity is not critical because a fuze may be designed to respond to both positive and negative charge.

Evidence exists which indicates that missiles are charged considerably, although further investigation should be made before an electrostatic fuze program is undertaken. Walter Dornberger, formerly commanding Officer of the Peenemunde Rocket Research Institute, reported that electrostatic charging was suspected to occur on the missiles flown there. (1) T. R. Burnight and J. F. Clark of the Naval Research Laboratory said (in private discussion) that a field strength of 10,000 v/m has been measured at the midpoint of an Aerobee rocket, which corresponded to a rocket potential of about 25,000 volts. C. G. Stergis and his co-workers reported that their stratosphere ballon may have carried an electrostatic charge which affected their instruments even though the instruments were suspended several hundred feet below the balloon. (2) Tests recently completed by DOFL also indicate that aircraft and rockets are normally charged to high potentials. Preliminary results indicate that the following charges and potentials exist:

B-26 Bomber (Propeller): 0.5 microcoulombs, 1050 volts F-86 Fighter (Jet): 186 microcoulombs, 744,000 volts Rocket (HVAR): 0.46 microcoulombs, 9000 volts.

Such data indicate not only that these airborne bodies should make excellent electrostatic targets but also that high-altitude missiles may be similarly carrying a charge during their 30-minute life.

2.3 Signal Characteristics

Calculations were made to determine the characteristics of the PEF signal for the two encounters corresponding to A and B of Figure 2.

1. All References listed on page 13.

TR-579

## SECRET

This document contains information affecting the national defense of the United Status within the meaning of the espionage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revolution of its contents in any manner to an unsytherized perceg is prohibited by law.

5

Consider first the tactical situation illustrated in Figure 1 with 0 = 0, for which the missiles are going to collide head-on. The equation for the ... PEF signal is

 $V = -\frac{QG}{2\beta^2 rC} \left( \frac{1}{\beta^2} - \frac{1}{\beta^2} - e^{t} P \right)$ 

where

6

V = PEF signal, volts

Q = electric charge on the target ICBM, coulombs

G = geometric factor determined by the length and diameter of the AMM and the length of its probe, ft<sup>2</sup>

- I = another geometric factor determined by the length and diameter of the AMM, dimensionless
- C = Capacitance between the probes, farads

 $p = h/\beta$ 

h = distance between the missiles, ft

 $f^3 = vRC$ , ft

v = closing velocity between the missiles, ft/sec

R = resistance between the probes, ohms

 $=\int_{m}^{p}\frac{e^{-n}}{n}dn$ 

(exponential integral, tabulated in Reference 3)

TR-579

(1)

u = variable of integration.

The basis for Equation 1 was derived for an active electrostatic fuze in Reference 4 and experimental verification was given in Reference 5. A derivation of the equation for the passive electrostatic fuze is given in  $\frac{1}{2}$ . Appendix A, page 27. The equation shows that the signal V increases as the length-to-diameter ratio a/b increases. The signal also varies with the probe size ratio c/a and is a maximum at c:=a.

In order to compute the signal V as a function of the separation distance h, the following assumptions were made:

Q = - 30 microcoulombs R = 10,000 megohms C = 30 μμf v = 25,000 ft/sec.

The values of R and C were selected on the basis of previous experience with electrostatic fuzes. The values of Q and v were selected as being reasonable. (The Q value represents a potential of about 175,000 volts

This document contains information affecting the national defense of the United States within the meaning of the espionage laws, title, 18 U. S. C., 793 and 794. Its transmission of the revelation of its contents in any manner to an unautherized person is prohibited by law.

on a 10-ft sphere.) With other factors constant, V is directly proportional to Q and is not affected appreciably by v as long as the product vRC is appreciably larger than the effective range of the warhead. In this example, vRC = 7500 ft.

The geometric factors G and  $\checkmark$  were computed for and elplipsoid from the AMM dimensions given in Figure 1, so that

> a = 5.0 ft (semimajor axis) b = 0.75 ft (semiminor axis) c = 3.5 ft (probe length) f =  $\sqrt{a^2 - b^2}$  = 4.94 ft m = f/a = 0.989 G = m\_3^3 c (2a-c) = 21.99 ft <sup>2</sup>  $\gamma$  = ln  $\frac{1+m}{1-m}$  - 2m = 3.19

The PEF signals computed from Equation 1 for different values of h are given in Table 1 and shown graphically in Figure 3 (collision trajectory). It can be seen that the signal increases more rapidly than  $1/h^2$  as the separation between the missiles decreases. The magnitude of the signal is 1 volt at a separation of about 1700 ft and approaches 100,000 volts on impact. The rate of rise of the signal, shown in Figure 4, follows approximately a  $1/h^3$  law in the range indicated.

The size and shape of the ICBM are immaterial since it may be considered as a point source of charge for the distances under consideration. The centroid of the electric charge on the ICBM is the origin of the electrostatic field that influences the fuze. The larger the ICBM, the larger is its capacitance and the larger is the quantity of electric charge it can maintain for a given potential.

Let us now consider the case in which the AMM misses the ICBM by 1000 ft (Figure 2, Case B). Equation 1 must be modified to introduce the effect of the angle 0 between the trajectory of the AMM and a line drawn from the AMM to the ICBM (Figure 1).  $\beta$  is replaced by  $\beta \cos \theta$ , since the effective closing velocity is now v  $\cos \theta$ . In addition, the signal V is reduced by a factor of cos0 because the effective component of the electrostatic field is that which is parallel to the axis of the AMM. The substitutions yield

TR-579

# SECRET

This document contains information affecting the national defense of the United States within the meaning of the explanage laws, title, 18 U. S. C., 703 and 794. Its transmission or the revelation of its contants in any manner to an unauthorized percent is prohibited by law.

$$I = -\frac{QG}{2\beta^2 r C \cos \theta} \left( \frac{1}{p_i^2} - \frac{1}{p_i} - e^{p_i} P \right)$$

where  $p_1 = h/\beta \cos \theta$ .

8

The PEF signal was computed from Equation 2 for a trajectory with a miss-distance of 1000 ft and with all the other factors unchanged from the collision trajectory. The results are shown in Table 2 and in Figure 3. The PEF signal reaches a maximum value of 1090 mv at a separation distance of 1240 ft. (The look-forward angle  $\theta$  is 54° at this range, for which vRC cos $\theta$  = 4400 ft.) The signal then drops very rapidly toward zero at the PCA, after which the polarity reverses. Thus, the distance between the two missiles varies from 1240 ft to 1000 ft while the signal changes from its peak value to zero. The rate of change of the signal is given in Table 2 and in Figure 4. The AMM warhead can be detonated at the peak value of the PEF signal or shortly thereafter so that the resulting blast envelops the oncoming ICBM.

#### 3. INTERFERENCE CONSIDERATIONS

It has been shown that the PEF signal should be large, over 80 mv, for ranges up to a mile from the target and for the assumed value of charge on the target. The signal, which should not be altered significantly by other reasonable choices of the attack parameters, size of the antimissile missile, or magnitude of the fuze parameters, will now be compared with possible unwanted signals from various sources.

One source of interference is microphonic noise. This includes the thermal and vibration noise from the tube elements, electronic components, and power supply. Considerable past experience with proximity fuzes indicates that it should be possible to maintain such microphonic noise amplitudes below 10 mv, which is far below ...that of the expected PEF signal.

The excellent CCM capability of electrostatic fuzes has been demonstrated repeatedly. Three organizations, Airborne Instruments Laboratory, Norden-Ketay Corporation, and Melpar, Inc have had contracts with the Signal Corps for the development of suitable countermeasures against electrostatic fuzes. Each company suggested a v

**TR-579** 

### SECRET

This document contains information affecting the national defense of the United States within the meaning of the espienage laws, title, 18 U. S. C., 763 and 794. Its transmission or the revolution of its contents in any manner to an unsytherized person is prohibited by law.

variant of the same basic technique - create a false target far enough ahead of the real target to cause the electrostatic fuze to operate prematurely. (6, 7, 8) The tactical difficulty of such a procedure in connection with missiles presents an enormous problem.

Little can be said about the possible effects of atmospheric noise sources because of the lack of sufficient data on high-altitude conditions. No interference is expected from rain or clouds because they are practically nonexistent at altitudes over 50,000 ft. Concentrations of electric charge that might act as false targets would have to be comparable with that. assumed to be, on the ICBM and are highly improbable. For example, if the enemy missile is assumed to be a sphere 10 ft in diameter, a charge of 30 microcoulombs  $v_{--}$ uniformly distributed throughout the volume of the sphere corresponds to a uniform charge density of 0.8 X 10<sup>-9</sup> coul/cc. (Of course, the charge is actually distributed on the surface of the body.) The maximum free charge densities for the ionosphere layers are as follows: <sup>(9)</sup>

Ionosphere	Altitude	Maximum Elec	tron Density
Layer	(Km)	electrons/cc	coul/cc
.E	100	$1.5 \times 10^{5}$	$2.4 \times 10^{-14}$
F,	200	$2.5 \times 10^{5}$	$4.0 \times 10^{-14}$
F <sup>1</sup> <sub>2</sub>	300	$1.5 \times 10^{6}$	2.4 X 10 <sup>-13</sup>

The largest of these densities is some 30,000 times less than the assumed charge concentration on the ICBM. It will still be necessary to determine whether the ionosphere could interfere with the operation of the fuze, despite this much lower charge density.

Nothing significant is expected to happen to the PEF signal when the antimissile missile is itself charged, even to the same potential as the ICBM. The passive fuze would then be subjected to an additional signal equivalent to that caused by an active electrostatic fuze, which may be additive or subtractive, depending on the relative polarities of the charges on each missile. In any case, since the electrostatic image of the AMM in the ICBM is very weak, and the image is located at twice the distance to the target (reducing its intensity by a factor of 4), the active signal would be orders of magnitude smaller than the passive signal and so would be insignificant.

9

**TR-579** 

### CERT

This document contains information affecting the national defense of the United States within the meaning of the explorage laws, this, 18 U. S. G., 763 and 764. Its transmission or the revelation of its contants in any manager to an unauthorized person is archibited by law.

A passive electrostatic fuze may conceivably be affected by the earth's electrostatic potential gradient. This gradient, obtained from 'various sources, is as follows;

Altitude (ft)	Potential Gradient (v/cm)
Sea Level	1.30
5,000	0.50
10,000	0.25
15,000	0.13
20,000	0.10
30,000	0.07
50,000	0.06

Data for altitudes over 50,000 ft could not be found. The gradient due to the IGBM at a range of 700 ft is 0.06 v/cm; thus the earth's electric field may be the largest interfering signal. However, it should be recognized that the earth gradient is probably smaller at the altitudes of interest. Since the effect of the earth's field is known and can be easily attenuated, (because it is a steady state or, at most, a slowly varying condition), it should not affect the operation of the fuze.

The possibility has recently been raised that high-altitude missiles create an ionized trail which might affect the electric charge on an ICBM. <sup>(10)</sup> Furthermore, the AMM may be surrounded by an ion sheath which may conceivably attenuate any electric signals. These factors would have to be investigated. The effects of meteors, cosmic rays, and other extraterrestrial phenomena would also have to be investigated, as with any other fuze system. The associated concentrations of charge are expected to be significantly lower than that of the ICBM. The probability of occurrence must also be considered.

#### 4. FUZE DESIGN

The design and assembly procedures for a passive electrostatic fuze are not materially different from those of other types of proximity fuzes. Details will depend on the limitations imposed by the size, shape, temperature, and other requirements of a particular application. No

10

TR-579

#### SECRET

This document contains information affecting the national defense of the United States within the meaning of the explorage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revolution of its contents in any manner to an unauthorized person is prohibited by law.

'unusual difficulties are anticipated. Satisfactory electrostatic fuzes have been designed, built, and tested successfully in large quantities on bombs and mortar shells. (11,12) Practically all this work has been done in connection with active proximity fuzes, for which the requirements are far more severe than they are for passive fuzes.

Two basic circuits have been developed for electrostatic fuzes, Onerequires a single, cold-cathode, gas-discharge tube specially developed to serve as both the detecting and triggering element. Another, more sensitive circuit uses two standard fuze tubes, a pentode and a thyratron, to perform the same functions. Both systems require some care in handling in order to maintain a high input impedance (>1000 megohms). These circuits were developed to meet the difficult requirements associated with the performance of mortar shells: simplicity, low cost, ruggedness, small volume. These requirements should be ameliorated in the antimissile missile application which would permit the development of entirely new and improved circuits.

Two problems associated with previous electrostatic fuzing developments are eliminated entirely in the AMM application. The first is that of charging the round; this feature becomes unnecessary for a passive fuze. The second is that of including precautions so that the round will not malfunction in rain. This feature would no longer be necessary because the missile encounters take place in the upper atmosphere where rain does not occur and also because the AMM does not have to be electrostatically charged.

The power-supply requirements for electrostatic fuzes have always been simple. The power consumed is so low that it may be supplied by a charged capacitor for the one-tube circuit. The two-tube circuit would require the addition of a low-drain A supply, and perhaps a C battery. The total power does not exceed 0.1 watt.

The design of the safety and arming system would be determined by the AMM requirements. The PEF might require that the detonator be kept out-of-line until the AMM altitude exceeds 50,000 ft in order to obviate any malfunctions due to clouds. The fuze circuit could be warming up during this period so that the PEF will be ready to operate any time afterward.

TR-579

# 11

#### SECRET

This document contains information affecting the national defense of the United States within the meaning of the espienage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revelation of its contents in any manner to an unautherized person is architeted by law.

Work may be required in order to design the probes to be compatible with the airframe of the antimissile missile. The construction of the "Explorer" with a Fiberglas insulator at its midsection would be entirely satisfactory. If necessary, the forward probe could be a dummy nose overlapping the rearward probe; there is no need for the insulator to be 'visible. Any deleterious effect of temperature on the insulating material will also have to be considered. However, this should not be significant inasmuch as atmospheric density decreases with altitude as the speed of the AMM increases, and there is no re-entry problem.

#### 5. CONCLUSION

12

It appears possible to build a passive electrostatic fuze for an antimissile missile. Such a fuze would initiate detonation of the warhead at or shortly before the point of closest approach to the enemy missile so that the blast or fireball destroys the target. The fuze would be simple, would perform its function without requiring auxiliary information, and would be immune to any foreseeable sources of malfunction or countermeasures.

Operation of the PEF depends on the target's carrying an electric charge. Although evidence exists which indicates that an ICBM is probably highly charged during its flight, there is no certainty that this is the case. The existence of ionized sheaths about both attacking and defending missiles in another possibility. Accordingly, it is recommended that a measurements program be undertaken immediately to determine the electric. charges to be expected on and around long-range missiles.

TR-579

### SECRET

This document contains information affecting the national defense of the United States within the meaning of the explanage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

#### REFERENCES

1. Walter Dornberger, V-2, Viking Press, 1954

- 2. C. G. Stergis, et al, <u>Conductivity Measurements in the Stratosphere</u>, Journal of Atmospheric and Terrestrial Physics, 1955, vol. 6, p. 240.
- 3. E. Jahnke and F. Emde, <u>Tables of Functions</u>, Dover Publications, 1945, p.1.
- 4. P. Krupen, Factors Determining the Signal in an Electrostatic ... Proximity Fuze, NBS Report 13.6-127R, June 28, 1950.
- 5a. James W Burn, Jr. <u>Blossom Foint</u> Drop Tests, University of Virginia Report UVE-57, part II, Nov 1954.
- 5b. P. Krupen, <u>Signal Voltages of T202 VT Fuzes</u>, DOFL Report TR-201, 25 August 1955.
- R. F. Simons and K. C. Speh, <u>Final Engineering Report on Electrostatic</u> <u>VT Fuze Countermeasures</u>, Airborne Instruments Laboratory Report No. 2038-1, August 1953.
- H. Philip Hovnanian, et al, <u>Study of Specialized Countermeasure</u> <u>Techniques</u>, <u>Final Report</u>, Contract No. DA-36-0399sc#64539, Norden-Ketay Corporation, n.d.
- 8. A. L. Fullerton, et al, <u>Development of Jamming Equipment</u>, Final Report, Contract No. DA-36-039-sc-64251, Melpar, Inc, 15 August 1956
- 9. American Institute of Physics Handbook, Table 5k-2, McGraw-Hill Book Company, 1957.
- 10a. J. D. Kraus and J. S. Albus, <u>A Note on Some Signal Characteristics</u> of Sputnik I

TR-579

13

### SECRET

This document contains information affecting the national defense of the United States within the meaning of the espionage laws, title, 18 U. S. C., 793 and 794. Its transmission of the revelation of its sentents in any manner to the yespitedized arrang is architected by law.

- 10b. J. D. Kraus, <u>Detection of Sputniks I and II by CW Reflection</u>, Proc. I. R. E. March 1958, vol. 46, p. 610.
- <sup>\*</sup> 11. P. Krupen, Fuze, VT, T202 Summary Report, NBS Report 1A-270., December 1952.
  - 12. P. Krupen, Status of Electrostatic Fuzing Program, DOFL Report TR-341, 15 March 1956.
  - 13. E. Weber, <u>Electromagnetic Fields</u>, Volume 1, John Wiley & Sons, . . . 1950, p. 106.

14

< 1

iter as State, she and a

49.000 (20.000 (0.000) (20.000) (20.000) (20.000)

TR-579

1999 - 2014 Mar 18 490

### SECRET

This document contains information affecting the national defense of the United States within the meaning of the espionage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revelation of its contents in any manner to an unsutherized person is arbhitted by law.

Separation (ft)	Signal (my)	Rate-of-Rise
(**)	(*** * )	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
75	607,000	
150	150,000	
225	66, 200	.9120
300	36,900	5380
375	. 23,400	3010
450	16,100	1810
525	11,800	1150
.600	8,900	790
675	7,000	590
750	5,600	435
900	3,850	241
1050	2,790	121
1200	2,110	92
1350	1,550	60
1500	<b>1</b> , 320	34
2250	550	
3000	290	
3750	180	
4500	120	
5250	83	
6000	61	
6750	47	
7500	37	2 <sup>1</sup>

TABLE 1. PEF Signal vs Separation Distance for a Collision Trajectory

TR-579

15

## SECRET

This does ment contains information affecting the national defence of the United States within the regionage laws, title, 18 U.S. C., 793 and 794. Its transmission or the revealed of its contents in gry digmast them anaptication percent or its revealed by laws.

•		Miss Distance of 1000 ±t	
•	,	т. 1	
	Separation	Signal	Rate-of-Rise
	(ft)	(m y)	(v/sec)
	1000	0	-759
	1009	274	
	1011	311	-93.3
	1015	. 363	4
	1019	425	· ·
	1023	473	· ·
	1027	523	
	1033	578	
		645	61 C
	1053	723	-51.2
	1070	. 821	•
-	1102	942	-25.18
:	11972	1060	-17.44
	1240	1000	0_00
	1240	1070	6.17
	1515	008	7 44
	1040	700	
•	1919	645	5.50
	2384	435	4.03
	2803	. 314	2.46
	3202	238	1.72
	3606	186	1,22
	3994	149	0.88
	4379	123	•
	4771	101	
•	5148	85	
	5935	62	
•	6687	477	
	7561	37	й. Ti
	TR-57	9	

 TABLE 2. PEF Signal vs Separation Distance for a Trajectory with

 Miss Distance of 100041

## SECRET

This document contains information affecting the national defence of the United States within the magning of the quantum term, term, as U. S. G., 703 and 794. Its transmission of the revolution of its contents in any manner to an unsutherized perces, to graduated by law.

17









#### APPENDIX A

#### DERIVATION OF EQUATION 1

The equipotential surfaces around a charged conducting ellipsoid of revolution (I, Figure I) in free space are confocal ellipsoids (II, Figure I). (13) The electrostatic field is identical with that which exists around a line charge uniformly distributed between the foci, + f and - f. If the line charge density is

$$\lambda = \frac{Q}{2f}$$

 $\phi_{2} = \frac{1}{4\pi\epsilon_{0}} \frac{Q}{2f} ln \frac{a+f}{a-f} ,$ 

then the potential of an equipotential surface is

where Q is the total charge on the body and a is the semimajor axis of the

surface. The electrostatic field intensity parallel to the major axis is

$$E_{s_{\chi}} = -\frac{\partial \varphi_{z}}{\partial x} = -\frac{\varphi}{4\pi\epsilon_{e}} \frac{\alpha_{\chi}}{\alpha^{e} - \epsilon^{2} x^{2}}$$
(A3)

At the tip of the surface, for example, x = a so that

$$E_{s_{\alpha}} = -\frac{1}{4\pi\epsilon_{0}} \frac{Q}{a^{2}-f^{2}}$$
 (A4)

The field configuration surrounding an uncharged ellipsoid subjected to a constant electrostatic field parallel to its major axis can be computed in an analagous manner. The field resulting from the redistribution of charge on the ellipsoid will be assumed to be identical with that of a line charge having a density

TR-579

### SECRET

This document contains information affecting the national defence of the United States within the magning of the coolenage laws, title, 18 U. S. C., 793 and 794. Its transmission or the revolution of its contents in any manner to an unsytherized percest is granibiled by law.

(A2)

(A1)

27

$$\lambda = \propto \omega^{-1} \qquad (A5)$$

where  $-f \leq \omega \leq +f$  and  $\ll$  is a constant to be determined later. The associated potential field is given by

$$\phi_{L} = \frac{\alpha \chi}{4\pi\epsilon_{o}} \left( ln \frac{a+f}{a-f} - 2\frac{f}{a} \right)$$
 (A6)

and the associated field intensity in the x-direction is

$$E_{L_{\chi}} = -\frac{\partial \phi_{L}}{\partial \chi} = -\frac{\omega}{4\pi\epsilon_{0}} \left[ l_{n} \frac{a+f}{a-f} - 2\frac{f}{a} \left( 1 + \frac{a^{2}\chi^{2}}{a^{4} - f^{2}\chi^{2}} \right) \right] \quad (A7)$$

Specifically, when  $\mathcal{H} = a$ ,

28

$$E_{\mathbf{k}a} = -\frac{\alpha}{4\pi\epsilon_0} \left[ lm \frac{a+f}{a-f} - 2\frac{f}{a} \left( \frac{1+a^2}{a^2-f^2} \right) \right]$$
(A8)

The factor  $\ll$  may now be evaluated. The potential  $\oint$  in the vicinity of ellipsoid I is obtained by superposition of three potentials; that due to the free ellipsoid ( $\emptyset_0$ ), that due to the inducing field E, and that due to the induced line charge ( $\emptyset_{\underline{I}}$ ). The field E is essentially constant and parallel to the x-axis over the short distance involved so its field is Ex. Therefore,

$$\phi = \phi_0 + E_X - \phi_L$$

$$= \phi_0 + \left[ E - \frac{\alpha}{4\pi\epsilon_0} \left( l_m \frac{a+f}{a-f} - 2\frac{f}{a} \right) \right] \chi \qquad (A9)$$

At the surface of the ellipsoidal object,  $a = a_0$  and  $\emptyset = \emptyset_0$ , so the expression within the brackets must vanish, giving

**TR-579** 

### SECRET

This decument centrains information affecting the notional defease of the United States within the meaning of the sectionary laws, title, 18 U. S. C., 798 and 794. In transmission or the revelation of the protocols of the section is any median to an unsubscient and a section in the section of the section

![](_page_27_Figure_0.jpeg)

where  $m = f/a_0$ , the eccentricity of the object

and 
$$y = ln \frac{1+m}{1-m} - 2$$
.

6

Thus,  $\ll$  is directly proportional to E and the constant of proportionality is  $4\pi\epsilon_0/\kappa$ , which depends an the eccentricity of the object.

Substituting Equation A10 into Equation A9 gives

$$\phi - \phi_0 = \left( 1 - \frac{\ln \frac{a+t}{a \cdot f} - 2\frac{t}{a}}{\gamma} \right) E \chi . \quad (A11)$$

The density of the induced charge on the surface of the ellipsoid is  $\lambda(\phi-\phi_{-})$ 

$$= - \epsilon_{o} \frac{\partial (\phi - \phi_{o})}{\partial m} \Big|_{a=a_{o}}$$

$$= - \frac{2\epsilon_{o} E f^{3} \chi}{\chi a_{o} b_{o} \sqrt{a_{o}^{4} - f^{2} \chi^{2}}}, \quad (A12)$$

10

29

The charge on an annular ring of width ds and radius  $\gamma$  is

$$l_{g} = \sigma 2\pi y dv$$

$$= \frac{4\pi \epsilon_{0} E f^{2} \chi y}{8 \alpha_{0} \alpha_{0} \nabla \alpha_{0}^{2} - f^{2} \chi^{2}} dv \qquad (A13)$$

TR-579

# SECRET

This document contains information affecting the national defence of the United Status vision an unauthorized percent is prehibited when is U.S.C., 703 and 734. Its transmission of the revolution of its contents in any manner to an unauthorized percent is prehibited when

$$du = dx \sqrt{\frac{a^{4} - f^{2} x^{2}}{a^{4} - a^{2} x^{2}}}$$

and

Since

$$dq = -\frac{4\pi\epsilon_{o} E f^{3}\chi}{8a_{o}^{3}}d\mu \qquad (A14)$$

The charge accumulated on one side of an imaginary plane perpendicular to the imajor axis and at a distance c from the positive end is

$$Q_{i} = \int \frac{dq}{dq} = - \frac{4\pi\epsilon_{o}E^{+}}{\chi a_{o}^{3}} \int \frac{\chi d\chi}{\chi d\chi}$$

 $\frac{4}{b_0} = \sqrt{1 - \frac{\chi^2}{a_s^2}}$ 

$$= - \frac{2\pi\epsilon_{o} Ef^{3}}{Va_{o}^{3}} c \left(2\epsilon_{o} - c\right)$$

$$= - \frac{2\pi\epsilon_{o}GE}{\gamma}$$

where G =

The field due to the charge on the target is

 $m^{3} c (2a_{0} - c).$ 

$$E = \frac{Q}{4\pi\epsilon_h}$$

(A16)

TR-579

(A15)

and h = distance between the missiles.

30

.

## SECRET

This decument contains information affecting the national defence of the United States within the meaning of the explanage laws, this, 18 U. B. G., 783 and 784. He transmission or the revelation of its contents in any meanor to an unsytherized perces is prohibited by law.

where Q = charge on the ICBM

and h = distance between the missiles.

Hence,

gives

$$Q_{1} = -\frac{QG}{28h^{2}}$$

The signal voltage V which builds up between the probes of the antimissile missile must satisfy the differential equation

$$\frac{dQ_i}{dt} = \frac{V}{R} + C \frac{dV}{dt}$$
(A18)

where R = resistance across the gap C = capacitance across the gap t = time.

Substituting Equation (A17) into Equation (A18) and re-arranging terms

$$\frac{dV}{dt} + \frac{V}{Rc} = -\frac{q_{5}}{2rc} \frac{d}{dt} \left(\frac{1}{h^{2}}\right)$$
$$= \frac{Q_{5}}{rch^{3}} \frac{dh}{dt} \qquad (A19)$$

After multiplying through by the integrating factor  $e^{t/RC}$ , Equation A19 can be integrated formally.

![](_page_29_Figure_11.jpeg)

(A20)

31

(A17)

TR-579

### SECRET

This decument contains information effecting the national defence of the United States within the meaning of the captering laws, this, In U. S. C. 793 and 794. Its transmission of the revelation of the captering in new manner to an unauthorized percent is archibited to face.

where  $\mathcal{C} = a$  selected time. The left side is equal to

if  $V_{\alpha} = 0$ .

To solve the right side of equation A 20, let

$$h_{t} = h_{0} - v t \qquad (A22)$$

where  $h_{0}$  = some initially large distance for which  $V_{0} = 0$ v' = velocity of approach, assumed constant.

 $t = time of flight from position h_o$ .

Substituting Equations A22 and A21 into Equation A20 gives

 $V_{e} e^{\frac{h_{e} - h_{e}}{vRC}} = \frac{QG}{rC} \int_{h}^{h_{e}} e^{\frac{h_{e} - h_{e}}{h^{o}}} \frac{dh}{h^{o}}$ (A23)

On setting  $\beta = \sqrt{RC}$  and  $\phi = h/\beta$ ,

Equation 23 becomes

32

Vare = QG por char de

(A24)

(A21)

Solving for  $V_{\mathcal{T}}$  and allowing  $p_0 \rightarrow \infty$ ,

$$V_{z} = \frac{QG}{2\beta^{2}rC} \left( \frac{-1}{\beta^{2}} + \frac{1}{\beta^{2}} + e^{\frac{\pi}{2}P} \right).$$
 (A25)  
SECRET

This decument contains information articling the

# P is an exponential integral defined by

 $P_{e} = \int_{\infty}^{p} \frac{e^{-p}}{p} dp$ 

(A26)

(1)

A table of P values may be found in Reference 3.

Dropping the subscript  $\mathcal{C}$  yields the equation given in the text of the report:

 $V = -\frac{QG}{2\beta^2 \gamma C} \left( \frac{1}{\beta^2} - \frac{1}{\beta} - e^{\frac{1}{\beta}} P \right).$ 

TR-579

# SECRET

This desumpnt contains information affecting the national defense of the United States which the interiord person is providented by law, (8 U. S. C., 793 and 794. Its transmission of the revolution of its cantoms in gay manner to an unauthorized person is providented by law.

33

![](_page_32_Figure_0.jpeg)

#### DISTRIBUTION

Copy No.

3

Office of the Chief of Ordnance Department of the Army Washington 25, D. C. Attn: ORDTB - Lt Col Ostrom ORDTN - Lt Col Entwhistle ORDTU - Col Clark

Commanding General Redstone Arsenal Redstone Arsenal, Alabama

Commanding General Army Ballistic Missile Ageny Huntsville, Alabama Attn: Dr Quarles

Office of Ordnance Research U S Army . Box CM, Duke Station Durham, No. Carolina Attn: Dr S. Githens

•

University of Florida 1104 Seagle Building Gainesville, Florida Attn: Dr H. Sommer

University of Virginia Engineering Experiment Station Thornton Hall Charlottesville, Virginia Attn: Dr O. R. Harris

#### TR-579

37.

7

8

### **DISTRIBUTION** (Cont

				,	,	
Hinman/Ulrich	01	- A. B		5 A.A. (2013)		9 ( )
Guarino/Landis	20					10
Rotkin	30					11
Lab 40 Library						12
.Kalmus/Van Tru	1mp 50				4	13
Williams, D.	21.0		54000		21	14
Ravitsky	21.5		,			15
Krupen	21.5					16
Hoff	24.0		,			17
Fitzgerald	25.0					18
Mead	44.1	•		·		19
Pepper	44.3			÷		20
Kohler	20.0	• **	,			21
Vorkink	20.02		5			22-31
Technical Refer	ence Section					32
DOFL Library				,		33-34
Technical Inform	nation 'Br. (Rec	ord				35
Technical Inform	nation Br (Supp	oly)		-	·	36-38

### TWO PAGES OF ABSTRACT CARDS FOLLOW

38

67T1.11

{

TR-579

Copy No.

.

:

.

٠

Removal of each card will be noted on inside back cover, and removed eards will be treated as required by their security classification.

Ster.

ppendices 2. Proximity TR-579, 28 Feb 58, 10 pp text, tables, illus., appendices fuses DA Proj 506-01-010 ORD Proj TN3-9109 3. DOFL Proj 22421 SECRET Report DOFL Proj 22421
---

.....

..

![](_page_36_Picture_0.jpeg)

: ι. .,

.

. . .

Removal of each card will be noted on inside back cover, and removed eards will be treated as required by their security classification.

5

Numerican         Answerican         Answeric	Accusion No.     Accusion No.     ACUAT     Accusion No.     Accusion No.     Accusion No.       a Probability United States of Face Processing Properties     and Properties     an					THE REPORT OF
Numerican         Answerican         Answeric	Accuration No.     RECENT     RECENT     RECENT     RECENT     RECENT     Resent to the product of the PLL for the product of the	ŕ	REGRADING DATA CANNOT BE FREDELEROLINE		THE INC ANNOT BE PREDETERNINED	I tables any electrons
number         Numer         Numer         Numer <td>Account No.     Account No.     Acco</td> <td></td> <td>taking any electrostatic fuse program. (3)</td> <td></td> <td>Monthesis and Management and State</td> <td>  charge on balliotic =</td>	Account No.     Acco		taking any electrostatic fuse program. (3)		Monthesis and Management and State	charge on balliotic =
No.         Answerier         Answ	Account No.     Account No.     Account No.       and Ordnamer For Laboratories, Washington 25 D. C. Services and permission to the permission of the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of demonstrate and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission to the spectra for the instant of the spectra and permission the insthe instant of the spectr and permission the insthe instan		charge on ballistic missiles be investigated before under-		it is recommended that the under-	I get. Consequently.
No.         Average No.         No. <th< td=""><td>Account Number Production Number Producting Number Producting Number Producting Number Producting</td><td></td><td>get. Consequently, it is recommended that the electrical</td><td>All and a</td><td>pends on the electrical charge and the</td><td>and velocity, but de</td></th<>	Account Number Production Number Producting Number Producting Number Producting Number Producting		get. Consequently, it is recommended that the electrical	All and a	pends on the electrical charge and the	and velocity, but de
No.         Average Re         SECURT         SECURT         SECURT         SECURATION         SECURATION <t< td=""><td>Accession New     BUCKET     Accession New     BUCKET     Accession New     Accession New     Accession New       27, 28 769 30, 100     010 Proj 100, 100, 100, 100, 100, 100, 100, 100</td><td>~</td><td>and velocity, but depends on the electrical charge on the tar-</td><td></td><td>use is independent of the approximation</td><td>  of the electrostatic f</td></t<>	Accession New     BUCKET     Accession New     BUCKET     Accession New     Accession New     Accession New       27, 28 769 30, 100     010 Proj 100, 100, 100, 100, 100, 100, 100, 100	~	and velocity, but depends on the electrical charge on the tar-		use is independent of the approximation	of the electrostatic f
Nome         Averages 25, D. C.	Accession Ne.     SECRET     Accession Ne.     SECRET     Accession Ne.     Accession Ne.     Accession Ne.       registering     DA Post SP, 10 up teat, uslas, fluen, upper     Dame of Accession Ne.     Dame of		of the electrostatic fuze is independent of the approach angle		even for distances over 1000 IL. Operation	I of closest approach,
Nome         Average No.         Strat           Press         Press <t< td=""><td>Accession No.     SECRET     Accession No.     SECRET     Accession No.     Accession No.     Accession No.       and Ordenace Proc. Laboratories, Washington 33, D. C. ANTINUSSILE MISSILES (6) - P. Kreyes     Insc.     SecRET     Proc.     Pro.     Proc.     Proc.     Proc.&lt;</td><td></td><td>of closest approach, even for distances over 1000 ft. Operation</td><td></td><td>roper function should occur about the point</td><td>bis reedrement. P</td></t<>	Accession No.     SECRET     Accession No.     SECRET     Accession No.     Accession No.     Accession No.       and Ordenace Proc. Laboratories, Washington 33, D. C. ANTINUSSILE MISSILES (6) - P. Kreyes     Insc.     SecRET     Proc.     Pro.     Proc.     Proc.     Proc.<		of closest approach, even for distances over 1000 ft. Operation		roper function should occur about the point	bis reedrement. P
No.     Average No.     Average No.       Improvement No.     No.     No.       <	Accession No.     SECART     Accession No.     Accession No.     Accession No.       and Ordnamer Daw Laboretories, Vanlagen 25, D. C. ANTINGENLE MASSING ELECTROSTATIC FUE ANTINGENLE MASSING ELECTROSTATIC FUE ANTINGENLE MASSING ELECTROSTATIC FUE ANTINGENLE MASSING ELECTROSTATIC FUE Antional manufacture and a static registering data and access to program.     Intel Pressing Accession Accession Accession and accession for a static data and a static registering from the data and accession accession registering from the data accession accession from the data accession from the data accession accession registering from the data accession accession registering from the data accession accession registering from the dato accession accession registe		this reestrement. Proper function should occur about the point	Guided mussue	ple, passive electrostatic fuse would satisfy	tobat a relatively simp
No.         Average Re.         NUME         NUME         Number of the second seco	Accession No.       SCANT       And Antimative No.       SCANT       Antimative No.       SCANT       Antimative No.       Scand Ordinance The Laboratories, Washington 25, D. C.       Scandary       <	Q	that a relatively simple. passive electrostatic fuse would satisfy		y fuse. A study was made which indicates	to provimit
Automa No.     Automa No. <td>Accession No.     Accession No.     SECART     Accession No.     Accession N</td> <td>•</td> <td>an annuaceur annual fune. A study was made which indicates</td> <td></td> <td>le imposes a stringent accuracy require-</td> <td>and and a mission</td>	Accession No.     Accession No.     SECART     Accession No.     Accession N	•	an annuaceur annual fune. A study was made which indicates		le imposes a stringent accuracy require-	and and a mission
Anome         Anome         Statistic         Statis         Statis         Statis	Accession Re- parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     SECURT     Accession Re- parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     SECURT     Accession Re- parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Security Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Secure Para Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Secure Para Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Secure Para Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Secure Para Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Secure Para Parameter Parameter Para Laboratories, Washington 25, D. C. Springestiller Muscluss (S) - P. Krepen     Springestiller Muscluss (S) - P. Krepen       Springestiller Muscluss Massellis Muscluss (S) - P. Krepen     Springestiller Muscluss (S) - P. Krepen     Springestiller Muscluss (S) - P. Krepen     Springestiller Muscluss	1	and and a minable imposes a stringest accuracy require-	funce	saible error in the instant of detonation of	
Average Re.         Average Re.         SEGRT         Average Re.         SEGRT         Average Re.         Secret	Accession No.     Accession No.     Accession No.     Accession No.     Accession No.     Accession No.       Probability of A passive Electronotratic FUEX Probability of A passive Electronotratic fue products and permission endore electronic fue water electronic fue and permission electronic fue water electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue action electronic fue action for A procession and electronic fue approach and a electronic fue action for A procession and electronic fue approach and a electronic fue approach of the approach and a electronic fue approach and electronic fue approach a	7	The small astronizable arror in the instant of detonation of	Electrostatic		and a start starter
And         Accession No         BEGRT         Begrand         Accession No         Begrand         Accession No         Begrand	Accession No.		DOLT LINE CANES		SECRET Report	DA Proj Sub-Ul-Vie
Anome         Accession Res.         Result of Accession at the subset of Accession Accession at the subset of Acce	Accession Re- resulting of A parsity E ELECTROSTATIC FULE ANTHORSELLS MISSILES (8) P. Krepen       BECRAT       Au       Accession Re- results and permission static entropy of another static results entropy of a parsity factor and an addition of a parsity factor and a permission static entropy of a parsity factor and a permission static entropy of a parsity factor and a permission and a permission and a permission factor and a permission factor and a permission and permissin and a permission and a permission and a pe	٢	DA Proj 500-01-010 SECRET Report		ORD Proj TN3-9109	in the second second
Any       Account No.       REGRT         Any       Account No.       No.         PHE FEASURELY OF A DESUFE CENOTATIC FUE       No.       No.         PHE FEASURELY OF A DESUFE CENOTATIC FUE       No.       No.       No.         PHE FEASURELY OF A DESUFE CENOTATIC FUE       No.	Account No.       ECGET       AD       Account No.       Account No.       Account No.         and Ordanese Proc. Laboratories, The Laboratories, The Statistics of Processing No.       1. </td <td>1</td> <td>A</td> <td>funes .</td> <td></td> <td>TR-579, 28 Feb 38,</td>	1	A	funes .		TR-579, 28 Feb 38,
An       Account No.       BCART       An       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       No.       Barned Ordaness Proc Laboratories, Washington 25, D. C.       No.       No.       No.       Scient No.       Scient No.       Scient No.       Scient No.       No.       No.       No.       Scient No.       Scient No.       No.       No.       No.       No. <t< td=""><td>Accession No.     EXCLUT     Application of the second state of the sec</td><td>1</td><td>TR-579, 28 Feb 58, 10 pp text, tables, mus., opposition</td><td>Proximity</td><td>in the oblas flus, appendices</td><td></td></t<>	Accession No.     EXCLUT     Application of the second state of the sec	1	TR-579, 28 Feb 58, 10 pp text, tables, mus., opposition	Proximity	in the oblas flus, appendices	
An     Accession No     SECRET       Diamed Ordanese Pase Laboratories, Washingen 25, D. C.     Named	Accession No.       BCCRET       AD       Accession No.       Accession No.       Accession No.         read Ordnance Twee Laboratories, Washington 25, D. C.       L.       L.       The Statustic Vision Control Fuzz       L.       L.       The Statustic Vision Control Fuzz       L.       L.       The Statustic Vision Con				issues (a) r. armen	FOR ANTINGSSILE M
Ansame       Averaging No       Weight and Strather Fuel Laboratories, Washington 25, D. C.       Sector         PHE FEASIBILITY OF A PASSIVE ELECTROFIATIC FUEL       Fuel Providence Fuel Laboratories, Washington 25, D. C.       Numerical Contracts of	Accession No.       REGRT       AD       Accession No.       Internation of the second of	•	FOR ANTINGSSILE MISSILES (a) r. arapen		TA PASSIVE ELEVINOUTINE	THE FEASIBILITY O
Anome       Accession No.       RCART       RCART       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frace Laborenteries, Washington 25, D. C.       Image of Contanees Frac	Accession Re.       Accession Re.       SCART       AD       Accession Re.       Notation Re.         and Ordnance Fue Laboratories, Washington 25, D. C.       Name	1	THE FEASIBILITY OF A PASSIVE ELECTINGIAN TO FUEL	Pases	TABOTATOTICS, WASHINGTON TO, TO	Diamond Ordnance Fu
An	Accession No.       BECRET       AC       Accession No.       Acc	2	Diamond Ordnance Fuse Laboratories, washington an, at the	٢	Washington 25. D. C.	
An       Account No.       SECRET	Accession No.       BCGRT       AD       Accession No.       Harmond Ordnance True Laboratories, Washington 25, D. C.       Name         FEASIBILIT MUSSILE MISSILE S (5) - P. Krepen       Name       Name <td>-</td> <td></td> <td></td> <td>ACCEPTION IN.</td> <td>IND</td>	-			ACCEPTION IN.	IND
An and ordnases Pass Laboratories, Washington 25, D. C.       Internal Ordnases Pass Laboratories, Washingto	Accession No.       BECRET       AD       Accession No.       In         and Ordsance Fuse Laboratories, Washington 25, D. C.       1.	1	AD Accession No.	SECRET		
An and Ordnance Fuel Laboratories, Washington 25, D. C.       1.       The statistic fuel of the spectrum of	Accession No				ATA CANNOT BE PREDETERMINED	I BURBANTING D
An       Account No.       Account No. <td< td=""><td>Accession No.       BCGET       AD       Accession No.       Hommed Ordanses Pass Laboratories, Washington 25, D. C.       Hommed Ordanses Pass Callaboratories, Washington 25, D. C.       <t< td=""><td></td><td>CANNOT BE PREDETENDINED</td><td></td><td>ic fuse program. (S)</td><td>- Han all electrostati</td></t<></td></td<>	Accession No.       BCGET       AD       Accession No.       Hommed Ordanses Pass Laboratories, Washington 25, D. C.       Hommed Ordanses Pass Callaboratories, Washington 25, D. C. <t< td=""><td></td><td>CANNOT BE PREDETENDINED</td><td></td><td>ic fuse program. (S)</td><td>- Han all electrostati</td></t<>		CANNOT BE PREDETENDINED		ic fuse program. (S)	- Han all electrostati
An       According No.	Accession No.       Accession No.       Accession No.       Accession No.       Accession No.         ad Ordannee Fue Laboratories, Washington 25, D. C.       Nathington 25, D. C.<		when any electrostatic fuse program. (S)	Card g	ssiles be investigated before under-	ber ballistic mi
An and Ordanses Pase Laboratories, Washington 25, D. C.       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.         Phile FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.         PRE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.         PRE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Freedmity       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.         PRE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Freedmity       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.       1.       Diamond Ordanses Pase Laboratories, Washington 25, D. C.       1.       1.         PRE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Freedmity       1. <td< td=""><td>Accession No.       BICRET       AD       Accession No.       BICRET       AD       Accession No.       In         and Ordsance Fine:       Laboratorites, Washington 25, D. C.       Fine:       Fine</td><td>\$</td><td>on a ballistic missiles be investigated before under-</td><td>The second se</td><td>is recommended that the electrical</td><td>in Consecutive in</td></td<>	Accession No.       BICRET       AD       Accession No.       BICRET       AD       Accession No.       In         and Ordsance Fine:       Laboratorites, Washington 25, D. C.       Fine:       Fine	\$	on a ballistic missiles be investigated before under-	The second se	is recommended that the electrical	in Consecutive in
An       Accession No.       Accession No.       ACCEST       ACC	Accession No.       Accession No.       BECRET       AD       Accession No.       I.         and Ordnance Place Laboratories, Washington 25, D. C.       1.	8	ant Consequently, it is recommended that the electricat	Copy No. 20	ends on the electrical charge on the thr-	and molective but depu
An       Accordian No.       Accordian No.       ACGRET       AC       AC       Figure Figur	Accession No.       Accession No.       Accession No.       Accession No.       Accession No.         and Ordnamee Fuse Laboratories, Washington 25, D. C.       Fractional Cruzz	5	and velocity, but depends on the electrical charge on the		se is independent of the approach angle	af the electrostatic fu
An       Accession No.       Accession No.       ACCESSION AND ACCESSI	Accession No.       Accession No.       BCGRT       AD       Accession No.       I.         and Ordnance Puse Laboratories, Washington 25, D. C.       Fraction 10, C. </td <td>2</td> <td>of the electrostatic fune is independent of the approach and</td> <td></td> <td>ven for distances over 1000 It. Operation</td> <td>of closest approach, a</td>	2	of the electrostatic fune is independent of the approach and		ven for distances over 1000 It. Operation	of closest approach, a
AD       According No.       ACCART       AD       ACCART       AD       ACCART       AD       ACCART       AD       AD       ACCART       AD       ACCART       AD       AD       AD       AD       AD       AD       ACCART       AD       AD       AD       AD       AD       ACCART       AD       AD       AD       ACCART AD ASSIVE ELLECTROSTATIC FUZE       AD       ADD Proj 506-01-010       AD	Accession No.       Accession No.       Accession No.       Accession No.       Accession No.         ad Ordnance Phase Laboratories, Washington 25, D. C. PASSINE ELECTROSTATIC FUZE ANTIDESSILE MUSSILES (5) P. Krupen       1.		of closest approach, even for distances over love to optimize		oper function should occur about the point	this requirement. Pro
AD       Accounter No.       ACCURT       AU       AU       AU       Au         Diamond Ordannee Prace Laboratories, Washington 25, D. C.       I.       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The providence Prace Laboratories, Washington 25, D. C.       In       In       The prace Prace Prace Laboratories, Washington 25, D. C.       In       In       The prace	Accession No.       Accession No.<		this requirement. Proper function should occur about the Prom		e, passive electrostatic fuze would satury	that a relatively simpl
AD     According No.     According No.     BECRET       Diamond Ordannes Pure Laborstories, Washington 25, D. C.     1.     1.       Piezastibility OF A PASSIVE ELECTROSTATIC FUZE     1.     1.       FOR ANTIMUSSILE MISSILES (S) P. Krupen     2.     1.       TA-579, 24 Feb 54, 10 pp text, tables, filme, speedices     2.     1.       DoFL Froj 25421     ORD Froj TN3-9109     2.       DoFL Froj 22421     ORD Froj TN3-9109     3.       The small permissible error in the instant of detonation of tables, trapent sciencely require.     1.       The small permissible error in the instant of detonation of tables, trapent sciencely require.     1.	Accession No.       Accession No.       Accession No.         and Ordannece Fuse Laboratories, Washington 25, D. C.       1.       1.         FEASIBULITY OF A PASSIVE ELECTROSTATIC FUZE       1.       1.         ANTIDUSSILE MISSILES (S) P. Krepen       1.       1.         Antipuestic fulles, filles,	[	that a relatively simple, passive electrostatic and the solar	The state of the s	Suze. A study was made which indicate	ment on its proximity
AD       Accession No.       SECRET         Damand Ordanace Pure Laboratories, Washington 25, D. C.       1.       1.         Diamond Ordanace Pure Laboratories, Washington 25, D. C.       1.       1.         THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       1.         FOR ANTIMUSSILE MISSILES (S) P. Krupen       1.       1.         TA-579, 24 Feb 54, 10 pp text, tables, Electro fuel fuel president       2.         DA Proj 506-01-010       04D Proj TN3-9109       2.         DOFL Proj 22421       04D Proj TN3-9109       3.         DOFL Proj 22421       04D Proj TN3-9109       3.         The small permissible error in the instant of detomation of       face	Accession No.       SECRET       AD       Accession No.       I.         ad Ordanace Puse Laboratories, Washington 25, D. C.       1.       1.       Diamond Ordanace Puse Laboratories, Washington 25, D. C.       1.         readinguility OF A PASSIVE ELECTROSTATIC FUZE       1.       1.       Diamond Ordanace Puse Laboratories, Washington 25, D. C.       1.         readinguility OF A PASSIVE ELECTROSTATIC FUZE       1.       1.       Diamond Ordanace Puse Laboratories, Washington 25, D. C.       1.         readinguility OF A PASSIVE ELECTROSTATIC FUZE       1.       1.       Diamond Ordanace Puse Laboratories, Washington 25, D. C.       1.         readinguility OF A PASSIVE ELECTROSTATIC FUZE       1.       1.       1.       1.       1.         readinguility OF A PASSIVE ELECTROSTATIC FUZE       1.       1.       1.       1.       1.       1.         readinguility OF A Passive Laboratories, State Laboratories, State Laboratories, State Laboratories, Washington 25, D. C.       1.       <	2:	ment on its proximity fuze. A study was made which which		imposes a stringent accuracy require	an antimissile missile
AD     Accession No.     SECRET       Diamond Ordannee Fuse Laboratories, Washington 25, D. C. THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE FOR ANTIMISSILE MISSILES (S) P. Krupen     1.       TR-579, 28 Feb 54, 10 pp text, tables, filus, spendices DOFL Frej 22421     10 pp text, tables, filus, spendices SECRET Report     1.       DA Frej 506-01-010     ORD Frej TN3-9109 SECRET Report     0.0.0 Frej TN3-9109 SECRET Report     1.     1.       DOFL Frej 22421     SECRET Report     1.     1.     1.	Accession No.     Accession No.     ACCART     AD     Accession No.     I.       ad Ordannece Fune Laboratorizes, Washington 25, D. C.     D. C.     I.     I.     Diamond Ordannece Fune Laboratorizes, Washington 25, D. C.     I.       ANTIMUSSILE MUSSILES (S) P. Krupen     I.     I.     Diamond Ordannece Fune Laboratorizes, Washington 25, D. C.     I.       Mathematics Fune Laboratorizes, Washington 25, D. C.     I.     I.     Diamond Ordannece Fune Laboratorizes, Washington 25, D. C.     Fune       Mathematics MUSSILES MUSSILES (S) P. Krupen     I.     Inc.     Diamond Ordannece Fune Laboratorizes, Washington 25, D. C.     Fune       Mathematics Mussiles MUSSILES (S) P. Krupen     I.     Inc.     Fune     Formationity     Fune       Mathematics Mussiles MUSSILES (S) P. Krupen     I.     Fune     Fune     Fune     Fune     Fune       Mathematics Mussiles MUSSILES (S) P. Krupen     I.     Fune     Fune     Fune     Fune     Fune       Mathematics Mussiles MUSSILES (S) P. Krupen     I.     Fune     Fune     Fune     Fune     Fune     Fune       Mathematics MUSSILES (S) P. Krupen     I.     Fune     Fune     Fune     Fune     Fune       Mathematics MUSSILES (S) P. Krupen     I.     Fune     Fune     Fune     Fune     Fune	•	an antimissile missile imposes a stringent accuracy		the error in the instant, of detonation	The small permiss
AD     Accession No.     BECRET       Diamond Ordannece Fuse Laboratories, Washington 25, D. C. THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE FOR ANTIMISSILE MISSILES (S) P. Krupen     1.       Diamond Ordannece Fuse Laboratories, Washington 25, D. C. THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE FOR ANTIMISSILE MISSILES (S) P. Krupen     1.       TR579, 24 Feb 54, 10 pp text, tables, flue, spreadices DOEL Febj 22421     0.00 Proj TN3-9109 SECRET Report     2.       DA Proj 204-01-010     0.01 Proj TN3-9109 SECRET Report     3.	Accession No.     Accession No.     ACCRET     AD     Accession No.     I.       ad Ordanacce Puse Laboratories, Washington 25, D. C.     1.     1.     Diamond Ordanacs Fuse Laboratories, Washington 25, D. C.     1.       FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE     1.     1.     Diamond Ordanacs Fuse Laboratories, Washington 25, D. C.     1.       ANTIMUSSILE MISSILES (S) P. Krupen     1.     1.     1.     1.     1.       ANTIMUSSILE MISSILES (S) P. Krupen     2.     1.     1.     1.     1.       ANTIMUSSILE MISSILES (S) P. Krupen     2.     1.     1.     1.     1.       ANTIMUSSILE MISSILES (S) P. Krupen     2.     1.     1.     1.     1.       ANTIMUSSILE MISSILES (S) P. Krupen     2.     1.     1.     1.     1.       ANTIMUSSILE MISSILE MISSILES (S) P. Krupen     2.     1.     1.     1.     1.       ANTIMUSSILE MISSILE MISSILE MISSILE MISSILE MISSILE MISSILE MISSILES (S) P. Krupen     2.     1.     1.       ANTIMUSSILE MISSILE MI	1000	The small permissible error in the instant of remine			
AD       Accession No.       SECRET       AD	Accession No.       SECRET       AD       Accession No.       I.         and Ordsance Puze Laboratories, Washington 25, D. C.       1.       Diamond Ordsance Fuze Laboratories, Washington 25, D. C.       1.       Diamond Ordsance Fuze Laboratories, Washington 25, D. C.       1.         EASUBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Diamond Ordsance Fuze Laboratories, Washington 25, D. C.       1.       Diamond Ordsance Fuze Laboratories, Washington 25, D. C.       5.         ANTIMUSSILE MISSILES (S) P. Krupen       1.       THE FEASUBILITY OF A PASSIVE ELECTROSTATIC FUZE       2.         TR, STP, 28 Feb 54, 10 pp text, tables, Illue., spendices       2.       2.       2.       2.         TR, STP, 28 Feb 54, 10 pp text, tables, Illue., spendices       2.       2.       2.       2.         TR, STP, 28 Feb 54, 10 pp text, tables, Illue., spendices       5.       1.       5.       1.       5.         TR, STP, 28 Feb 54, 10 pp text, tables, Illue., spendices       5.       1.       5.       1.       5.		the instant of detonation of	Electrontatic	SECULT separe	DOFL Proj 22421
AD       Accession No.       SECRET       AL       AL       I.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.       I.       I.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       I.	Accession No.       SECRET       AD       Accession No.       I.         ad Ordsance Puse Laboratories, Washington 25, D. C.       I.       Diamond Ordsance Puse Laboratories, Washington 25, D. C.       I.       Diamond Ordsance Puse Laboratories, Washington 25, D. C.       I.         REASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       I.       Diamond Ordsance Puse Laboratories, Washington 25, D. C.       I.       Diamond Ordsance Puse Laboratories, Washington 25, D. C.       Passive Puse Laboratories, Washing	Flee	DOFL Proj 22421			DA Prej 506-01-010
AD       Accession No.       SECRET       AD	Accession No.       SECRET       AD       Accession No.       I.         and Ordanace Fuse Laboratories, Washington 25, D. C.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       Fuse       Providenace Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       Fuse       Providenace Fuse Laboratories, Washington 25, D. C.       I.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       Fuse       Providenace Fuse Laboratories, Washington 25, D. C.       Fuse       Providenace Fuse Laboratories, Washington 25, D. C.       Fuse       Fuse       Fuse       Providenace Fuse Laboratories, Washington 25, D. C.       Fuse	۴	DA Proj 506-01-010			
AD       Accession No.       SECRET       AD	Accession No.       Accession No.       Accession No.       Accession No.       Accession No.         and Ordnance Fuse Laboratories, Washington 25, D. C.       1.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       1.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       1.         FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       1.       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       1.         ANTIMISSILE MISSILES (S) P. Krupen       2.       THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       2.         ANTIMISSILE MISSILES (S) P. Krupen       2.       FOR ANTIMISSILE MISSILE MISSILES (S) P. Krupen       2.         ANTIMISSILE MISSILES (S) P. Krupen       2.       FOR ANTIMISSILE MISSILE MISSILES (S) P. Krupen       2.	0.1112	OPA 1-41-9109		10 pp text, tables, mus., and	TR-579. 28 Feb 54.
AD       Accession No.       SECRET       AD	Accession No.       SECRET       AD       Accession No.       I.         ad Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       Fuse       Diamond Ordanace Fuse Laboratories, Washington 25, D. C.       L.       Fuse         FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE       Fuse		TR-579, 28 Feb 58, 10 pp text, tables, mus., spress	Provinty		
AD       Accession No.       SECRET       AD         AD       Accession No.       SECRET       AD         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Fuse Laboratories, Washington 25, D. C.       L       Diamond Ordnance Fuse Laboratories, Washington 25, D. C.       L         Diamond Ordnance Fuse Fuse Fuse Fuse Fuse Fuse Fuse Fus	Accession No. Accession No. Access	Pro	inter the appendices		SILES (S) P. Krupen	FOR ANTIMISSILE MIS
AD Accession No. SECRET AD AD ACCESSION No. SECRET AD AD AD AD ACCESSION AD AD ACCESSION ACCESSION AD ACCESSION ACCESSION AD ACCESSION ACC	Accession No. SECRET AD Accession No. SECRET AD Accession No. Accession Acce		FOR ANTIMISSILE MISSILES (S) P. Krupen	TARS.	A PASSIVE ELECTROSTATIC FUZE	THE FEASIBILITY OF
AD Accession No. SECRET AD Ordnance Fuse Laboratories. Washington 25. D. C. L.	Accession No. SECRET AD Accession No. Access	2 U.S.	THE FEASIBILITY OF A PASSIVE ELECTROSTATIC FUZE		e Laboratories, Washington 25, D. C.	Diamond Ordnance Fuzz
	SECRET AD Accession No.		minuted Ordnance Fuse Laboratories, Washington 25, D. C.			AD
	Accession No.			SECRET		

10

12.

.

.

# UNCLASSIFIED