

This document is made available through the declassification efforts  
and research of John Greenewald, Jr., creator of:

# The Black Vault

---



The Black Vault is the largest online Freedom of Information Act (FOIA)  
document clearinghouse in the world. The research efforts here are  
responsible for the declassification of hundreds of thousands of pages  
released by the U.S. Government & Military.

**Discover the Truth** at: **<http://www.theblackvault.com>**



DEPARTMENT OF THE AIR FORCE  
WASHINGTON, DC

OFFICE OF THE SECRETARY

14 January 2015

SAF/AAll (FOIA)  
1000 Air Force Pentagon  
Washington DC 20330-1000

Mr. John Greenewald



Dear Mr. Greenewald

This is our final response to your 31 December 2014, Freedom of Information Act request for copy of DTIC Document AD0222630, Antigravity, Jan 1958. We received it from NASA FOIA under their Ref: 15-HQ-R-0003.

The document was previously reviewed and released in its entirety by Air Force Space Command Los Angeles FOIA. Copy of document is attached.

Please direct your questions to the undersigned at (703) 693-2736 and refer to case 2015-01899-F. Department of Defense Regulation 5400.7/Air Force Manual 33-302 indicated fees be assessed for processing this request; however, there are no applicable fees in this instance.

Sincerely

ESPINAL.JOHN.

M.1184810375

JOHN M. ESPINAL

Government Information Specialist

Digitally signed by  
ESPINAL.JOHN.M.1184810375  
DN: c=US, o=U.S. Government, ou=DoD,  
ou=PKI, ou=USAF,  
cn=ESPINAL.JOHN.M.1184810375  
Date: 2015.01.14 10:05:38 -05'00'

1 Attachment

**UNCLASSIFIED**

---

**AD 222 630L**

*Reproduced  
by the*

**ARMED SERVICES TECHNICAL INFORMATION AGENCY  
ARLINGTON HALL STATION  
ARLINGTON 12, VIRGINIA**



---

**UNCLASSIFIED**

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.

**Best  
Available  
Copy**

L  
CATALOGED BY ASTIA  
AS AD No. 222630

DOC. NO. 7-7799  
COPY NO. 3



TECHNICAL LIBRARY  
AIR FORCE BALLISTIC MISSILE DIVISION  
HQ. ARDC  
U.S.A.F.

Techn.

Dec 1-58

WDD FORM 0-158  
12 NOV 56

NAS-ARDC Special Study  
Box 131  
Woods Hole, Mass.

COM-379

ANTIGRAVITY

by W. K. Ergen

REG. NO.

39692

NO.

9-10079

NOT

SUMMARY

According to Dirac there is, for each elementary particle of ordinary matter, a conjugate particle of opposite properties. This "antimatter" has been produced only recently, and only in quantities too small for the performance of gravitational experiments. Since no experiment exists which either proves or disproves the repulsion of matter and antimatter, it is legitimate to explore the possibilities of such a concept. However, it appears that the use of antimatter for engineering purposes would be most impractical, uneconomical and disastrous.

This document was prepared under Contract AF 16 (600)1661 between the Air Force and the National Academy of Sciences as an informal working paper for the NAS-ARDC Study Group. Further distribution is not authorized. The statements contained in this report are those of the individual author(s) and concurrence by the Study Group is neither intended or implied.

RECEIVED

For the Secretary  
NOV 1957

National Academy of Sciences  
National Research Council

Cy No. 9

ANTIGRAVITY

by W. K. Ergen

Recent speculation has arisen as to the possibility that matter and antimatter may gravitationally repel each other.<sup>1,2,3</sup> The word "antimatter" refers to a concept introduced by Dirac, according to which there is, for each elementary particle of ordinary matter, a conjugate particle of opposite properties. Thus, for the ordinary proton, which carries a positive charge, there is an antiproton which is negatively charged. Similarly, there are particles conjugate to neutrons, namely, the "antineutrons." Antiprotons and antineutrons interact in exactly the same manner as protons and neutrons, and hence atomic nuclei can be built of antiprotons and antineutrons. Each such nucleus would correspond exactly to a nucleus built of ordinary matter. The nuclei made of antiprotons and antineutrons combine with positrons to form atoms and molecules, just as ordinary nuclei combine with electrons. The term, "antimatter", comprises antiprotons, antineutrons, and the atoms and molecules made of these particles and positrons.

If matter and antimatter get into contact they annihilate each other, that is, the matter and antimatter disappear, and a relatively very large amount of radiation energy appears. Conversely, energy can be converted into matter and antimatter, and single antiprotons and antineutrons have been "created" in this way, although it takes the highest energy accelerators available today to do this and the process is extremely inefficient on the basis of the comparison of the electrical energy consumed to the energy contained in created particles.

If matter and antimatter would gravitationally repel each other, Einstein's principle of equivalence between a local gravitational field and a uniform ac-



acceleration would be violated. This principle has been verified experimentally with great accuracy and in a variety of ways. However, none of these experiments involved antimatter, which was produced only recently and only in quantities too small for the performance of gravitational experiments. It is therefore legitimate to engage in scientific speculation as to the consequences of the assumption that matter and antimatter repel each other gravitationally.

It should be mentioned that these speculations lead to rather unsatisfactory theories, but this is beyond the scope of the present study.

If matter and antimatter repelled each other gravitationally, the earth, consisting of matter, would repel a body of antimatter. As to the idea of connecting such a body to a body of matter to obtain a weightless combination, the following remarks may suffice:

1) Nobody claims the gravitational repulsion of matter and antimatter to be a fact. It is only pointed out that no experiment exists which either proves or disproves the assumption of such a repulsion. (The "proposed" experiments in this direction <sup>2,3</sup> are actually quite unfeasible because of the smallness of the effects.) The mere fact that the repulsion has not been checked even on the smallest experimental scale proves that it would not be practical to use such repulsion for engineering purposes, even if the repulsion existed.

2) Even assuming 10% of the theoretical maximum efficiency in the "creation" of antimatter from energy (an assumption which is far too optimistic) the production of an amount of antimatter required to make a man weightless would require the total electrical output of the TVA system for eight centuries, and this electrical energy would cost twenty times the value of all the gold at Fort Knox.

3) If the antimatter were connected to the man to make him weightless, annihilation radiation would result and the man would make his entrance into heaven in a flash equivalent to two hundred thousand 20-kiloton bombs.

REFERENCES

1. Philip Morrison and Thomas Gold: "On the Gravitational Interaction of Matter and Antimatter."
2. Herman Stika: "An Experimental Search for Gravitational Repulsion."
3. Roberts U. Cordova: "The Use of Antimatter as a Means of Overcoming Gravitational Attraction."