INTRODUCTION TO DESTRUCTION:
Can I design a simplified version of the 1923-1945 German Enigma, with an accurate representation of its three rotors, reflector, steckers, plug board, and lamp board?

HYPOTHESIS:
With two schematics, copies of captured German Enigma codebooks, a basic knowledge of the history and theory of the German military Enigma, and enlarged photographs, it is possible (as well as plausible) to construct a simple structure that demonstrates how the Enigma worked. It should be mentioned that this is meant to be a representation only: constructing an entire, working Enigma would take somewhere along the line of six years. As Stephen Budiansky (Budiansky 74, 2b) puts it:

If a million million computers on each of a million million planets in each of a million million galaxies spent a million million years trying every possible combination of wiring three Enigma rotors, and took a millionth of a millionth of a second to test each one, they would still have less that one chance in a million million of finding the correct one in that time.

MODUS OPERANDI:
1. Extensively research the German military Enigma, including its history, setup, design, use, forbearers, influence, breaking, and cryptanalysis.
2. Contact an engineer, or someone who has a widespread knowledge of machines.
3. Collect all or as much of the following: various sketches of the Enigma as represented by a variety of people, basic or detailed schematics of the original Enigma, and plans for simple electrical hookups. (All of above have been obtained.)
4. Construct Enigma. Use all or as much of the materials listed below. (A basic design can be obtained by analysis of sketches and schematics, and more detail can be obtained with each new bibliographic reference.) This is a representation only! At present, the history of the Enigma is more important than the actual construction, but the representation should be accurate! In replication of Project: Enigma, base the design off of the attached photographs.

KEY (ANNOTATED) BIBLIOGRAPHIC REFERENCES:


“On Enigma and its Method for Decryption.” Describes the principal behind the German military Enigma: mono-alphabetic substitution, put into use by a scrambler unit, lamp board, plug board, three rotors, a reflector, and steckers. Describes how the Enigma was used by the German Kriegsmarine (which employed a more sophisticated version) and gives examples of how to send coded messages via Enigma. Describes its Polish history and its flaws, which eventually led to its being broken, with the help of British bombs and cribs. Includes the Bomby computer code and many examples of substitution, as well as the mathematics of the Enigma. (Website author: Harald Schmidl)

Describes the major publications of Alan Turing, father of the computer, and gives an account of his meritorious service in the endeavor by British cryptanalysts to crack the German military Enigma. (Turing played crucial roles both in the work at Bletchley Park, where the German code was cracked, and in the early British computer projects.) Does not skirt the issue of Alan Turing’s open homosexuality, and brings training in mathematical physics and extensive research to bear on the subject. An emblem of Turing’s career, suggesting that Turing’s inner code remains unbroken. (Review Grade: B)


A million pages of new World War II codebreaking records have been released by the U.S. Army and Navy and the British government over the last five years. Battle of Wits presents the history of the war that these documents reveal. Stephen Budiansky’s revelations include how codebreaking machines worked to crack the Japanese, the German, and even the Russian diplomatic codes. This is the story of the Allied codebreakers puzzling through the most difficult codebreaking problems that ever existed. Shows the crucial effect codebreaking had on the battlefields. Brings to life the unsung heroes of this secret war: Joseph Rochefort, Alan Turing, and villain Admiral Dönitz. A step-by-step precision on how the codes were broken.

MATERIALS:
(It should be noted that materials are subject to change—modifications to the Enigma will take place in the process of construction.)
- Schematics that outline the basic structure of the Enigma
- Multiple photographs or illustrated drawings that present many views of the Enigma
- A mentor in engineering
- Something to validate the history of the Enigma and the accuracy of its representation(s)
- Physical tools: wire, electrical hookups to provide currency (hookups are subject to change: however, it should be noted that either a voltage less than 220 or a battery will be used), rotors (metal), and other key innovations of the Engima (metal), wire clippers, and keyboards.

INDEPENDENT VARIABLE: The possible accuracy and detail of a simplified Enigma machine, created in one month.

DEPENDENT VARIABLE: The accuracy of the representation of the original German military Enigma.

CONTROL: The Enigma schematics.

NUMBER OF SAMPLES/TRIALS: N/A (unlimited)

CONSTANTS: The Enigma schematics, photographs, drawings, and paper representations.

PROPOSED CHART(S): The Enigma schematics.

LOCATION OF RESEARCH SITE: 813 Acaipulco Rd. NE
Rio Rancho, NM 87144

CONTACT PERSON AT THAT SITE: Cosette Wong
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ADDITIONAL NOTES: Safety issues include (but are not limited to) electric shock, wire cuts, and other minor issues that are a result of project construction. However, these issues should be considered minimal—Project Enigma is more a historical representation than an engineering one. Nevertheless, safety is ensured with heavy-duty gloves and a designated supervisor.