

## LECTURE NOTE On Communication Security

My subject -- The historical background of COMSEC in the Armed Forces -- is a very broad one because it should include the background of the development of each of the components of COMSEC: cryptosecurity. transmission security, and physical security. But since time is limited and I think you would be more interested in the phases pertaining to cryptosecurity. I will omit references to the history of the other two components. And even in limiting the talk to cryptosecurity, I will have opportunity only to give some of the highlights of the development of the items that comprise what we call our cryptomaterials, leaving out comments on the history of the development and

improvement of REErypD tage 848 procedures and practices -- all of which are extremely important. 't Coming now the the history of our cryptomaterial's themselves, I suppose there is no need to tell you of the profound effect of the 19th and 20th centuries on electrical communications -- directly upon military communications and indirectly on military cryptography. Hand operated ciphers and codes became almost obsolete with the need for greater and greater speed of cryptooperations. That meant that cryptomachines would have to be developed.

## REF ID: A6287 SRYPTOGRAPHY

Begin 2nd part with brief history of development of cipher machines - with growth of radio and communications - effect on military communications profound - necessity for speed

### REF ID:A62873

YAMAMOTO

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### Accident -- limestlyID :bafablenga

a. An event that takes place without one's foresight or expectation; an undesigned, sudden, and unexpected event.

b. Hence, often, an undesigned and unforeseen occurrence of an afflictive or unfortunate character; a mishap resulting in injury to a person or damage to a thing; a casualty; as to die by an accident.

c. Chance; contingency.

"Thou cam'st not to that place by <u>accident;</u> It is the very place God meant for thee."

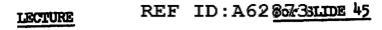
# REF ID: A62873

One more contrasting example of poor and good COMSEC. Volume of communications necessary in-preparing for large-scale operations on hostile shores is tremendous. The figures staggering, both as to number and longth of mossages. Take the same of Japa "No. 10 Maneuvers" in early 1944, Marge expedition involving redeployment of troops for Dutch East Indies. Their shipgment met with many "accidents" because inadequate Japanese COMSEC disclosed all their plans. Antire move delayed 3 months and energy suffered heavy losses in material and personnel. But take case of TOROH not only made in great secrecy (took Germans entirely Ky supprise) but also their troops (100-200,000) "just happened" to be in the wrong place at the right time.

#### REF ID:A62873 But this did not "just happen" and was no accident -it was brought about.

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The earliest picture of a cipher disk, from Alberti Trattati in cifra, Rome, c. 1470.

"Oldest tract on cryptography the world now possesses"

LECTURE REF ID: A628 TOR SLIDE 45.1

One of the cipher disks in Porta, 1563

And apparently nobody thought up anything much better for a long, long time. In fact, not only could they not think up anything better, but those who did any thinking at all on the subject merely "invented" or reinvented Alberti's disk -- and that happened time and again.

LECTURE NOTE REF ID: A62873 SLIDE 45.2

The Myer cipher disk, patented 14 Nov 1865

"I know it takes a long time to get a patent through the patent office, but Alberti's device was finally patented in 1865, the inventor happening to be the then Chief Signal Officer of the Army, Major Albert J. Myer."

## LECTURE NOTE REF ID: A62 80733LIDE 45.4

The Alberti Disk reincarnated in the U.S. Army Cipher Disk of 1914-18.

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LECTURE REF. ID: A628 10 SLIDE 47

The cipher disk as again patented in 1924 --Runtington Patent

/Shows that the Patent Office does not have general information on cryptography because of the secrecy involved.7



### REF ID: A6208 333DE 49.1

The Decius Wadsworth cipher device (invented and built in 1817 when Colonel Decius Wadsworth was Chief of Ordnance.)

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The Bazeries cryptographe cylindrique (1901) as shown in his book "Les chiffres secrets devoiles"

/But he may have described this in his article "Cryptographe a 20 rondelles-alphabets" Comptes rendus, Marselles, 1891.7

## LECTURE NOTE REF ID: A6287 FOR SLIDE 160.1

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Hitt's earliest model of strip cipher device (15)

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#### LECTURE NOTE

# REF ID: A62873 FOR SLIDE 50.2

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### Show M-94

#### If time tell of failure to solve and why

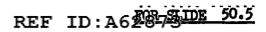
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# LECTURE NOTE REF ID: A62873

Second page of Jefferson's description of "The Wheel Cipher"





U.S. Army cipher device M-136

Begins experimentation with changeable alphabets

#### LECTURE NOTE REF ID: A620878BIDE 50.8

U. S. Army Strip Cipher Device M-138.

### LECTURE REF ID: A 628 837 DBE 50.12

U. S. Army cipher device, Type M-138-A (with Russian legends)

[Story of Russian legends and how they came to be there.]

## REF ID:A62873

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The Kryha cipher machine

### REF ID:A62873

Swedish machine connected to electric typewriter.



### REF ID: A6287 BR SLIDE 65

The keyboard electrically-operated B-211 Swedish machine.

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[Self-contained, instead of separate typewriter.]



# REF ID: A6287 3 10 71.1

The first Hebern machine.

Manufactured for use by the Ku Klux Klan.7



# REF ID: A62 R. 3 LIDE 72

The 5-rotor Hebern machine

<u>/Story of solution</u>



# REF ID:A62873<sup>165</sup>

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# W.F.F.'s "work-sheet" solution of Navy challenge messages.

### LECTURE NOTE REF ID: A62 BR SLIDE 172.10

One of Hebern's developments for the Navy, after his release.

This is the one that wouldn't work - but Hebern said the contract didn't specifically state that it had to work. He insisted on being paid -- and was/

(One Navy file insisted that Navy had an admiral in Navy District HQ in S.F. just to keep Hebern out of jail so he could finish Navy contract!)

170 REF ID: A6287 BR SLIDE 50.7? LECTURE NOTE ~

My theory re external key and development of M134 TI (1932)

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### REF ID:A62873 170

U. S. Army Converter M-1347B1

Basic principle - external keying element

## REF ID:A62873 170.4

#### U.S. Army Converter M-134-T2 (1936)

## REF ID:A62873 173

The SIGABA/ECM (Converter M-134-C)

A & N get together. Benefits thereof withheld from all Allies.

## LECTURE NOTE REF ID: A628 PR SLIDE 56

With growth of teletype communications the need for and practicability of automatic encipherment became obvious.

--- The first attempt -- the machine developed by the AT&T Co. (1918) in collaboration with the Signal Corps.

# LECTURE REF ID: A62873 FOR SLIDE 61

The IT&T Co. teletype cipher attachment

Autumn 1931. With the growth of teletype communications, cipher teletype attachments were invented.

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#### **REF ID:A62873**

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The IT&T Co. Teletype cipher attachment

(Internal mechanism exposed)

Solution story

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Effects of lack of contact with work

Lesson re flying pay

#### LECTURE NOTE REF ID: A62873 FOR SLIDE 178

In 1942 the need for automatic teletype encipherment was met on the basis of expediency: Therold AT&T Co. double-tape system was adopted and installed on a "crash" program at the few signal centers, while a large program for the production and procurement of Converter M-228 (SIGCUM) was being executed.

# LECTURE REF ID: A62873 FOR SLIDE 171

M-161: Signal Corps model made at Fort Monmouth

(Efforts to develop field machine)

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### REF ID:A62873 70.1

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Converter M-209

### REF ID:A62873

70.2

Converter M-209 with keying mechanism exposed.

LECTURE NOTE REF ID:A62873 Example of American resourcefulness and skill under difficulties. Two GI's in Italy mechanize the M-209.

(The cartoon, showing a couple of GI's with a home-made "still," and the legend: "Yes, but will it work?")