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NATIONAL SECURITY AGENCY

MILITARY CRYPTANALYTICS
Part II

INTERIM EDITION
(Third Section)

By
LAMBROS D. CALLIMAHOS
and
WILLIAM F. FRIEDMAN

Office of Training Services
National Security Agency
Fort George G. Meade, Maryland

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APPLICATIONS OF ELECTRICAL TABULATING EQUIPMENT IN CRYPTANALYSIS

1. Introduction. Electrical tabulating machines are widely used in commerce and industry to reduce the labor involved in processing or analyzing a large volume of data, or in performing a large number of manipulations or tests on a limited amount of data, or both. The fundamental idea inherent in tabulating equipment such as that developed by the International Business Machines Corporation is the recording of data in the form of holes punched in a card; the holes are used to establish timed electrical circuits which control the functions of the various machines through which the cards are fed. The cards are stacked in a hopper of an IBM machine and made to pass between a set of wire brushes and a brass roller; the presence of a hole in a column of the card permits the brush pertaining to that column to make contact with the roller, thus completing a circuit and operating an electromagnet. This closing of an electrical circuit at a definite time during the passage of a card through a machine and from a fixed position on the card is the basis upon which the various electrical tabulating machines function. The great flexibility of treatment afforded by the IBM system lies in the ability to arrange and rearrange the basic data in a form convenient for study, or to associate the basic data with other units of information on the same or different cards for the purpose of printing the data, comparing items, accumulating totals, etc.

2. The IBM card. The cards used in the IBM system are 3 1/4" x 7 3/8" and are made of specially prepared paper stock, strong in wearing quality and free from foreign particles which might act as conductors of electricity; moreover, the edges have been impregnated with a hardening composition which retards fraying of the edges under use, and thus makes for longer life of the card. Each card has 80 numbered columns in each of which may be punched a single item of alphabetical or numerical information in either plain or coded[1] form. The columns contain 12 punching levels or positions; of these, 10 are indicated by the printed digits ∅ to 9 in the horizontal lines on the card.

[1] By "coding" in this connection is meant a conventional representation of data that may readily be adapted to IBM techniques. For example, the numbers 01 to 48 in a specified pair of columns could be used to represent the 48 States; or the letters "M", "P", "C", or "T" in a particular column might stand for "monoalphabetic", "polyalphabetic", "code", and "transposition", respectively.

The 11th and 12th punching positions, commonly referred to as the "x" and "y" punches, respectively, are at the top of the card and are not indicated by printed numerals. A hole in one of the levels from ∅ to 9 results in the recording of that particular numerical datum, whereas a hole in an "x", "y", or ∅ punch (called "zone punches") in conjunction with a numerical punch in the same column results in the coding of one of the 26 letters of the alphabet. The "x" and "y" punches by themselves have control functions in certain machine operations; furthermore, these punches are also used for the coding of special characters on the Tabulator such as a comma, an asterisk, or other symbols. In Fig. 1, below, is illustrated an IBM card,[2] slightly reduced, with alphabetical and numerical data punched in specific groups of columns

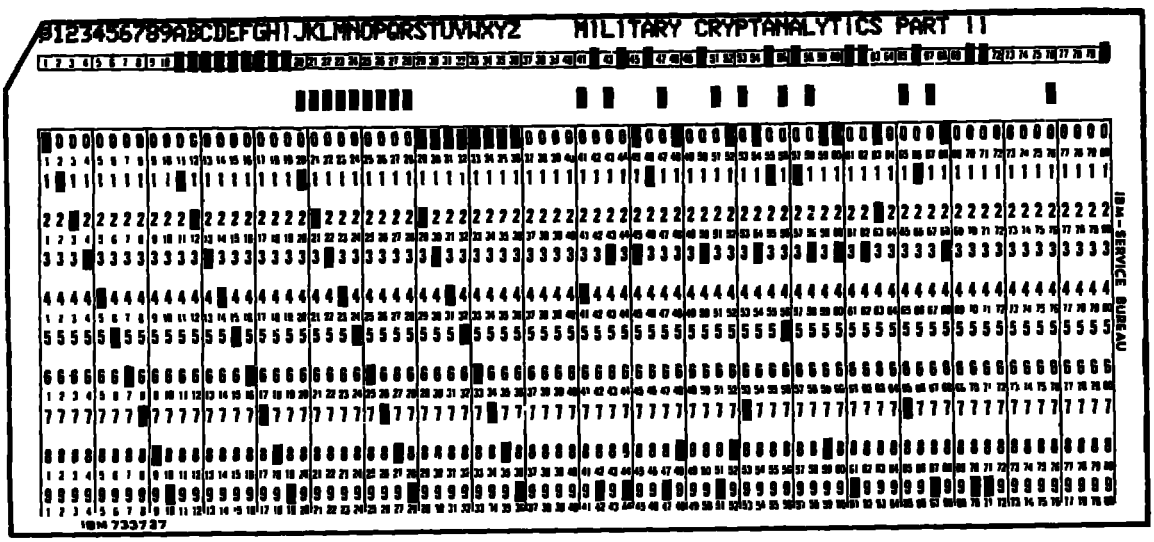

Figure 1.

designated as "fields."[3] Often it is convenient to use cards specially printed with vertical lines to indicate the fields; in addition, the designation of the field may be printed on the card. Each field defines a section of the card in which one particular type of information will always appear, and it is assigned a sufficient number of columns to include the largest number of alphabetical or numerical units which it will be called upon to accommodate.

3. Functions of the punched card. The IBM system, employing a number of different machines taken collectively to constitute a working unit, makes possible multiple uses of a record in the form of a punched hole or a set of holes in the IBM card. A symbol punched in a card can be processed through many operations successively, since the functions of the various machines are rearranged for those operations through proper wiring of their control panels. Specifically, a single punched hole in a card may cause one or more of such operations as the following:

[2] The printing at the top of the columns was performed simultaneously with the punching by a particular type of a card punch equipped with this capability; in normal practice, punched cards do not contain such printing. The student may find it instructive to cover the printing above cols. 41-71 and read the information with the help of the IBM coding shown in cols. 1-40.

[3] Note in this case the field comprised by cols. 1-40, and that comprised by cols. 41-75; also note the "x" punch in col. 76, and the "y" punch in col. 80.

a. It may add the data represented by it to some other data;

b. It may subtract the data represented by it from some other data;

c. It may multiply the data represented by it by some other data;

d. It may divide the data represented by it into some other data;

e. It may cause the data represented to be listed (i.e., printed);

f. It may cause the data represented to be suppressed;

g. It may reproduce the data represented into a different field of the same card, or on a different card;

h. It may cause the data represented to be classified, or to be sorted;

i. It may cause the data represented to be selected;

j. It may cause the data represented to be printed on the IBM card;

k. It may cause the data represented to produce an automatic balance forward;

l. It may cause the data represented to be filed properly among other data;

m. It may cause a paper form to feed to a predetermined position or to be ejected automatically, or to space from one position to another; or

n. It may cause a total to be printed at the end of a group or class of data.

4. The machines in the IBM system.--a. The principal machines which constitute the IBM system are the following:

(1) The Card Punch, with which the cards are punched with the information to be recorded;

(2) The Verifier, which verifies the accuracy of the previously punched cards through an operation similar to key punching;

(3) The Sorter, which sorts the cards in any groupings or classes desired (referred to as "major", "intermediate", and "minor" sorts);

(4) The Reproducer, which reproduces extra copies of a deck of cards, with a rearrangement or selection of the punched data as desired;

(5) The Collator, which performs various operations of merging, filing, matching, and selection of cards, and which may also be used to check the sequence of a sorted deck of cards;

(6) The Calculating Punch, which performs operations of multiplication and division, and punches the result directly on the card from which it senses the data, or on a designated following card;

(7) The Interpreter, which prints recorded data directly on the card from which it "reads" the information, as an aid in certain manual filing operations; and

(8) The Tabulator (also called the Printer), which performs accounting operations of various classes of totals, and lists the data on continuous forms known as "IBM runs" or "IBM listings."

b. In addition to the foregoing standard machines there are special machines for specific purposes, e.g., a card-operated electric typewriter, machines for converting the punched holes of IBM cards into teleprinter tape punched with the coding of the Baudot code or vice versa (for use in certain semi-automatic procedures), etc. Moreover, each of the standard machines has available a number of extra devices which may be incorporated for specialized operations, according to the needs of the problems at hand.

5. General cryptologic applications of the IBM system.--a. Since electrical tabulating equipment is primarily designed as data processing machinery, we may use IBM machines in cryptanalysis to facilitate and expedite the examination of a large amount of traffic, in order to isolate homogeneous cryptosystems, or to prepare a group of homogeneous messages in many ways suitable for studying the patent or latent phenomena in the traffic and thus assist us in arriving at some conclusions regarding its cryptographic aspects, etc. All the manual work incidental to the solution of a cryptosystem could be performed by machine methods, but it must be emphasized that by no means can we assume that the era of clerical work is a thing of the past. Feasibility, practicability, and efficiency are the points which will determine what part of the work, or whether all of it, or none of it, should be done by machine techniques, and it is the IBM crypto-technician (i.e., an IBM expert with a broad background in cryptology) who is best qualified to advise in this respect. Although many phases of analysis are possible with machines, sometimes a judicious proportion of machine work plus manual clerical labor will permit the solution of a particular problem in the least possible time--certainly an important consideration in practical operational cryptanalysis.

b. The preliminary groundwork that was necessary in the cryptanalysis of the various types of cryptosystems covered in Military Cryptanalytics, Parts I and II, may be done by machine methods. For example, we can find all repetitions within a message or among a set of messages and indicate by an asterisk those polygraphic repetitions which exceed a prescribed length; we can prepare message prints or work sheets arranged in proper groupings of characters (e.g., by period-lengths in the case of repeating-key ciphers, by digraphs in the case of digraphic systems, etc.); we can obtain frequency counts for single letters, digraphs, etc., of the over-all text, or columnar frequency counts of the text considering it to be written

out on various trial widths; we can search for specified idiomorphs and print only those sequences corresponding to the specified patterns together with their location in the traffic, or we can search for isomorphic sequences and list their location; we can complete the plain-component sequence, both in monoalphabetic and polyalphabetic ciphers, and print the scores only of those generatrices which equal or exceed a certain predetermined threshold on the basis of two-category, arithmetic, or logarithmic weights; we can perform the ϕ test on distributions and print only those results which meet with pre-established minimum standards; we can match distributions on the basis of the χ or other tests; we can, once an additive has been recovered, remove the additive from superenciphered text and convert a message into monoalphabetic terms; and finally, having recovered all the keys to one message or a few messages in a particular cryptosystem, we can decrypt by machine methods the rest of the traffic in that same cryptosystem.

c. In the cryptanalysis of the more complex cryptosystems, there exist many advanced machine methods and techniques, some of which involve the applications of specialized equipments. A discussion of these methods will be reserved for subsequent volumes in this series.

d. IBM techniques are admirably suited to assist in traffic analysis studies. Traffic analysis is so closely affiliated with operational (as distinguished from academic) cryptanalysis that it is sometimes difficult to define where the one leaves off and the other begins--in present-day practice, these two fields of communication intelligence are complementary. In time of war when there is available for study a large volume of traffic emanating from many stations allocated into a plurality of radio nets, the data from intercept logs and other traffic analysis records may be rearranged in various major, intermediate, and minor sorts on elements such as the transmitting and receiving call signs, the file date and time, the group count, the external message numbers, indicator groups (if these be in the clear), priority or secrecy classifications, etc. The use of IBM runs for such studies greatly facilitates the grouping of stations which belong to the same net, selecting traffic that is cryptographically homogeneous, identifying and locating duplicate messages or isologs, finding communication "service" messages[4] which are so important to the cryptanalyst, identifying proforma messages or messages containing stereotyped reports, etc.

e. In the compilation of codes and ciphers, IBM methods furnish invaluable assistance. Through the use of machine techniques, code books are easily compiled several editions in advance of current needs; random alphabets for strip systems may be generated; and random keys for various cipher systems may be produced with facility and in volume. The use of IBM equipment eliminates the large expenditure of time and labor that is concomitant with the production of cryptosystems by manual methods.

[4] A service message is a message between communications personnel pertaining to any phase of traffic handling, cryptographic operations, communication facilities, or circuit conditions.

6. Application in a typical example in cryptanalysis.--a. Let us assume we have available for study the following five messages,[5] intercepted on the same day on a low-echelon ground net:

Message No. 1

RNZ DE LBF 5980KCS 180730Z

NRPWH FNDWU RMBNO KBFMJ WGHWM WEZLV UDOIN FJPGK DLASW HHHZN
INUFP EQVWB RSBMQ HKEWN UQXKH ZHBHD NVREE ESZBW WRHEZ TTDTX

Message No. 2

UZK DE RNZ 5980KCS 180855Z

OWYWU ZNDQI AHIWB RRSJG IGHXN LCNFL THTNJ FJRZT WUZSF OJWVH
TQBAP TGNHJ KQADF GZBLL LXMQX EJHOK BPTRJ GDYIS NRLKQ RLRRU
RZEPB IVCMC ENHAX MIZQL KDRAS WTNGK EWNUZ JXCJQ WIBGQ EZPDZ
IQMPE HNHJK QRTKF ENBQD XZFVP HLQDT YAVRE ZAPQF FOJJQ KWCMK
HZHBH DNVR

Message No. 3

ZVH DE UZK 5980KCS 180920Z

MSHZH LASWH FGPEB ABJSX JKMLP MCIRE NWPJI RLMWY WBESC SACJA
TLFXY FGZUJ YMNJX CJYWK MCHAF BPZAH QNWJE WRAIQ XJQVD LLRQU
WJKKN KBGAE JUDLL WCMTG QDRA

Message No. 4

RNZ DE VGM 5980KCS 181000Z

KCEWN UNDRS JZYHF NSFLC BNHBE BKJWG KDTRH QVNVQ PQIMQ IASJB
LLLOT NWZKB YQRJJ QVDDI YTLRM ECWKS XJPGK ZZRWJ IKEEE SALTJ
ZDIPL RLMUC WIJZW DTPEH JJPWQ JGCCB EBRIQ ZAFUH LWFGT ALJUT
ZRCSR EJQXM WRIAG UGFYQ BJIGN DLLFC H

Message No. 5

RNZ DE LBF 5980KCS 181145Z

DQEEW UKBFM JWGHW MNQSJ CBEBR DTBQV SPBIA ADQOC JLKQP TNWZU
LGIFO NLXHX XPBPE ZEHWX BAMRH YQZLS XMQXZ ULSPQ XMGKP ZHSBD
RDHHX RIQZN JMLLL IWODL KQ

[5] In actual practice, it would hardly be worth while to process five short messages by machine methods. It will be understood that this exposition applies to a larger volume of traffic.

The first thing to be determined is whether or not the messages are cryptographically homogeneous, i.e., in the same general system and specific keys. In the absence of indicators from which conclusions could be drawn, we must search for repetitions between messages, as well as for repetitions within individual messages; this is accomplished by preparing an IBM index, to be described below.

b. We will begin by punching each message on cards. The intercept data (and preamble information, if any), together with a sequential number (often called the "worksheet number") assigned to each message, are punched on a single card known as a "heading card."[6] The message text[7] is punched on "line cards" containing a predetermined maximum number of text characters per card; in this case, the line cards will contain 25 letters, except for possibly the last line card. (In addition to the message text, line cards will contain a reference line-letter or number, as well as the message number to which the line cards pertain.[8]) Thus, in recording the data from the five messages, we will have a total of 5 heading cards and 31 line cards; these cards are then checked for accuracy of punching on the Verifier.

c. Next, by means of a process known as "offset gangpunching" involving the use of the Collator and the Reproducer, the 31 line cards are expanded into a deck of 736 cards, representing one card for each letter of the five messages. For instance, cols. 21-45 of the first line card of Message No. 1 contain the first 25 letters of the cipher text, viz.,

NRPWHFNDWURMBNOKBFMJWGHWM

while in the following "detail card" generated from the foregoing line card (including picking up the 26th letter of the cipher text from the second line card), we shall have[9]

RPWHFNDWURMBNOKBFMJWGHWMN

in cols. 21-45. The next detail card after that, picking up two cipher letters from the second line card, will contain the following letters in cols. 21-45:

PWHFNDWURMBNOKBFMJWGHWMNE

---

[6] These heading cards are used for traffic analysis studies. It is customary to mark heading cards with an "x" punch in a specified column, in order to distinguish them from line cards in various machine processing operations.

[7] Indicators, if any, might be punched on the heading card; in any case, indicator groups would be deleted in the subsequent indexing procedure.

[8] Information common to several line cards is punched automatically in the line cards from a prepunched master card inserted in the "duplicating rack" of the Card Punch.

[9] Note how each letter is offset one position to the left.

Thus for the 100 ciphertext letters of Message No. 1 we shall have generated 100 cards, each letter of the message appearing in col. 21 of a particular card. In addition to the letters of the cipher text, each card will contain further data as to the message number, and also the position in the message occupied by the letter appearing in col. 21 of the card.[10] There are further processing symbols incorporated into the cards, as an aid to subsequent machine treatment.

d. Using the Sorter, the 736 offset cards from the five messages are now put into alphabetical order according to tetragraphs. This operation takes four alphabetic sorts[11] on four consecutive columns going from right to left, as for example cols. 24-23-22-21. In other words, a "minor" sort is done on col. 24, "intermediate" sorts on cols. 23 and 22, and a "major" sort on col. 21. When this is finished, the sorted deck is put into the hopper of the Tabulator, the control panel of which has been properly wired for this particular processing operation. The listing which results is known as an "IBM single-position index", or, more simply, an "IBM index"; the first page of this index is illustrated in Fig. 2. Every letter of the five messages appears as the first letter (called the "control letter") of the trigraphs in the column labeled "d"; the message number and the position of the control letter in the message are found in the columns labeled "a" and "b", respectively. The 7 letters which precede the control letter are listed in the column labeled "c", while the 15 letters which follow the control trigraph are listed in the column labeled "e". In order to facilitate examination of the IBM run, the control letter and the two following letters are here separated as an independent trigraph from the line of 25 letters; this, however, is an arbitrary convention in this particular case, since any spacing could be used as desired in the listing, the spacing not being in any way dependent upon the arrangement of the punched data on the card.[12] The digraphic and trigraphic frequencies ("intermediate totals" and "minor totals", respectively) are here printed at the right on the listing, in columns "f" and "g", respectively, whereas the uniliteral frequencies ("major totals") are recorded at the end of each grouping of A's, B's, etc., of the control letter.[13] For example, it will be seen in the run that there are 25 A's in the five messages; there are five cases of digraphic repetition in the "A" block with two occurrences each, as well as one case in which a digraph ($\overline{AS}_c$) occurs four times; and there are three occurrences of the trigraph $\overline{ASW}_c$. An asterisk (*) in the column labeled "h" is here employed to indicate a tetragraphic or longer repetition, as may be seen in the case of the sequence $ASWH_c$.

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[10] The message number from the line cards is gangpunched in all the detail cards; the position number is punched in the cards by an automatic numbering device in the Reproducer.

[11] In sorting alphabetical information, it is necessary to sort each column twice, once for the numerical punch and once for the zone punch; in numerical sorting a single sort per column suffices. Thus a tetragraphic sort on literal text requires 8 successive sorting operations.

[12] It will be recalled that the cipher letters are punched in a solid block of 25 columns; the spacing desired is accomplished through proper wiring of the Tabulator control panel. It is of course also possible to rearrange the data punched on the cards in various ways in the listing; this again is dependent upon the wiring of the control panel.

[13] The kinds of totals, as well as the particular location in the printed listing of these totals, are governed by the wiring of the Tabulator control panel.

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
03	124	CMTGQDR	A				
05	035	BQVSPBI	AAD	QOCJLKQPTNWZULG			
03	016	WHFGPEB	ABJ	SXJKMLPMCIRENWP			
03	047	YWBESCS	ACJ	ATLFXYFGZUJYMNJ			
02	063	TGNHJKQ	ADF	GZBLLLXMQXEJHOK			
05	036	QVSPBIA	ADQ	OCJLKQPTNWZULGI	2		
03	109	JKKNKBG	AEJ	UDLLWCMTGQDRA			
03	074	JYWKMCH	AFB	PZAHQNWJEWRAIQX			
04	137	BEBRIQZ	AFU	HLWFGTALJUTZRCS	2		
04	164	JQXMWRI	AGU	GFYQBJIGNDLLFCH			
02	011	WUZNDQI	AHI	WBRRSJGIGHXNLCN			
03	079	CHAFBPZ	AHQ	NWJEWRAIQXJQVDL	2		
03	088	QNWJEWR	AIQ	XJQVDLLRQUWJKKN			
04	146	UHLWFGT	ALJ	UTZRCSREJQXMWRI			
04	097	JIKEEES	ALT	JZDIPLRLMUCWIJZ	2		
05	072	EZEHWXB	AMR	HYQZLSXMQXZULSP			
02	187	TYAVREZ	APQ	FFOJJQKWCMKHZHB			
02	054	JWVHTQB	APT	GNHJKQADFGZBLLL	2		
04	047	QPQIMQI	ASJ	BLLLOTNWZKBYQRJ			
01	043	FJPGKDL	ASW	HHHZNINUFPEQVWB			
03	007	MSHZHL	ASW	HFGPEBABJSXJKML			*
02	124	IZQLKDR	ASW	TNGKEWNUZJXCJQW	4	3	
03	050	ESCSACJ	ATL	FXYFGZUJYMNJXGJ			
02	182	PHLQDTY	AVR	EZAPQFFOJJQKWCM			
02	114	VCMCENH	AXM	IZQLKDRASWTNGKE			
			25				
03	015	SWHFGPE	BAB	JSXJKMLPMCIRENW			
05	071	PEZEHWX	BAM	RHYQZLSXMQXZULS			
02	053	OJWVHTQ	BAP	TGNHJKQADFGZBLL	3		
05	099	MGKPZHS	BDR	DHHXRIQZNJMLLLI			
04	024	SFLCBNH	BEB	KJWGKDTRHQVNVQP			
04	130	PWQJGCC	BEB	RIQZAFUHLWFGTAL			
05	022	WMNQSJC	BEB	RDTBQVSPBIAADQO		3	*
03	042	IRLMWYW	BES	CSACJATLFXYFGZU	4		
05	008	DQEEWUK	BFM	JWGHWMNQSJCBEBR			
01	017	URMBNOK	BFM	JWGHWMWEZLVUDOI	2	2	*
03	107	UWJKKNK	BGA	EJUDLLWCMTGQDRA			
02	143	JXCJQWI	BGQ	EZPDZIQMPEHNHJK	2		
01	078	UQXKHZH	BHD	NVREEEESZBWWRHEZ			
02	204	WCMKHZH	BHD	NVR	2	2	*
05	033	DTBQVSP	BIA	ADQOCJLKQPTNWZU			
02	105	RRURZEP	BIV	CMCENHAXMIZQLKD	2		
04	171	AGUGFYQ	BJI	GNDLLFCH			
03	017	HFGPEBA	BJS	XJKMLPMCIRENWPJ	2		
04	026	LCBNHBE	BKJ	WGKDTRHQVNVQPQI			
04	050	IMQIASJ	BLL	LOTNWZKBYQRJJQV			
02	068	KQADFGZ	BLL	LXMQXEJHOKBPTRJ	2	2	*
01	063	EQVWBRS	BMQ	HKEWNUQXKHZHBHD			
04	021	HFNSFLC	BNH	BEBKJWGKDTRHQVN			
01	013	FNDWURM	BNO	KBFMJWGHWMWEZLV	2		
05	063	NLXHXXP	BPE	ZEHWXBAMRHYQZLS			
02	081	QXEJHOK	BPT	RJGDYISNRLKQRLR			
03	076	WKMCHAF	BPZ	AHQNWJEWRAIQXJQ	3		
02	168	QRTKFEN	BQD	XZFVPHLQDTYAVRE			
05	028	CBEBRDT	BQV	SPBIAADQOCJLKQP	2		
05	024	NQSJCBE	BRD	TBQVSPBIAADQOCJ			
04	132	QJGCCBE	BRI	QZAFUHLWFGTALJU			
02	015	DQIAHIW	BRR	SJGIGHXNLCNFLTH			
01	060	UFPEQVW	BRS	BMQHKEWNUQXKHZH	4		
01	089	VREEESZ	BWW	RHEZTTDTX			
04	060	LOTNWZK	BYQ	RJJQVDDIYTLRMEC			
			35				

Figure 2.

e. At this stage the IBM single-position index would be sent to the cryptanalyst, who would study it to see what he could see.[14] He would note that there are many polygraphic repetitions between messages, many more than would be expected by mere chance; this is proof that the traffic is homogeneous, supporting the probability of homogeneity that was implied from traffic analysis information. He would also note that there is a pentagraphic repetition in Message No. 2, at an interval of 99 (obtained from the run by subtracting the numerical position of the first occurrence from that of the second occurrence), suggesting factors of 3, 9, or 11. On examining the intervals of the repetitions between messages, he would find that 9 is a factor common to all the repetitions, proving that the messages are in flush depth[15] and indicating that the cryptosystem is probably a polyalphabetic cipher of 9 alphabets.

f. With the periodicity established as 9, work sheets of the messages are prepared according to this period; this step may be performed by IBM if the number of messages warrants, without the necessity for further manual card punching. The first over-all IBM index has served its purpose, that of aiding the cryptanalyst in locating repetitions and diagnosing the cryptosystem; so now a new index is prepared, to assist in solution of the plain text. This second run (the first page of which is illustrated in Fig. 3) is an index by alphabet prepared by first sorting the cards back into their original sequence in each message, collating these cards cyclically into 9 blocks (each containing all the cards belonging to one particular alphabet), and performing a tetragraphic sort on the blocks;[16] the deck is then listed on the Tabulator, yielding what amounts to an elaborate triliteral frequency distribution showing many prefix and suffix letters of the control trigraph, in addition to the frequencies by alphabet of the single letters, digraphs, and trigraphs. This

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[14] It may be pointed out that the cryptanalyst at this time is really not sure of what he expects to see in this first index. The index was ordered as a means of examining the over-all immediate phenomena associated with the uniliteral, digraphic, and trigraphic frequencies, as well as finding all polygraphic repetitions present in the cipher text; i.e., the cryptanalyst hopes by this first index to find evidence of nonrandom characteristics in the cipher text or in its over-all frequencies. In addition to these obvious elements (which constituted the main reason for which the index was ordered), any other characteristics which appear to be nonrandom would be searched for by the cryptanalyst. For example, in a particular case he might note that polygraphic repetitions occur in the main only between messages originating from the same transmitting station, or between messages transmitted within certain periods of time, or between messages having identical or nearly identical elements in the preamble such as serial numbers or other groups, etc.

All of this emphasizes the first two of the three basic procedures in cryptanalysis as set forth in footnote 2 on p. 18 of Military Cryptanalytics, Part I, viz.: (1) arrangement and rearrangement of data to disclose nonrandom characteristics or manifestations (i.e., in frequency counts, repetitions, patterns, symmetrical phenomena, etc.); (2) recognition of the nonrandom characteristics or manifestations when disclosed; and (3) explanation of the nonrandom characteristics when recognized.

[15] If the messages had been offset on a keying cycle of 9, the intervals of repetitions between messages could have been factored to 9 if a constant equal to the offset were first subtracted from the interval; this could have been noted from multiple repetitions between two messages.

[16] The appropriate alphabet number is gangpunched in each block; this alphabet number is listed in the column labeled "i" of the run.

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
03	109	JKKNKBG	AEJ	UDLLWCMTGQDRA				1
05	028	CBEBRDT	BQV 1	SPBIAADQOCJLKQP				1
02	064	GNHJKQA	DFG 1	ZBLLLXMQXEJHOKB				1
05	001		DQE	EWUKBFMJWGHWMNQ				1
05	037	VSPBIAA	DQO	CJLKQPTNWZULGIF	2			1
05	100	GKPZHSB	DRD 4	HHXRIQZNJMLLLIW				1
02	190	VREZAPQ	FFO 1	JJQKWCMKHZHBHDN				1
04	127	HJJPWQJ	GCC 1	BEBRIQZAFUHLWFG				1
04	181	GNDLLFC	H					1
03	073	GJYWKMC	HAF	BPZAHQNWJEWRAIQ				1
03	010	HZHLASW	HFG	PEBABJSXJKMLPMC				1
01	046	GKDLASW	HHH 4	ZNINUFPEQVWBRSB				1
04	163	EJQXMWR	IAG	UGFYQBJIGNDLLFC				1
02	010	YWUZNDQ	IAH	IWBRRSJGIGHXNLC				1
04	046	VQPQIMQ	IAS	JBLLLOTNWZKBYQR	3			1
04	091	GKZZRWJ	IKE	EESALTJZDIPLRLM				1
03	028	JKMLPMC	IRE 5	NWPJIRLMWYWBESC				1
02	019	HIWBRRS	JGI	GHXNLCNFLTHTNJF				1
04	172	GUGFYQB	JIG	NDLLFCH				1
04	064	WZKBYQR	JJQ	VDDIYTLRMECWKSX				1
04	082	MECWKSX	JPG	KZZRWJIKEEESALT				1
01	037	VUDOINF	JPG	KDLASWHHHZNINUF	2	2	*	1
02	037	LTHTNJF	JRZ	TWUZSFOJWVHTQBA				1
04	028	BNHBEBK	JWG	KDTRHQVNVQPQIMQ				1
03	064	GZUJYMN	JXC	JYWKMCHAFBPZAHQ				1
02	136	GKEWNUZ	JXC	JQWIBGQEZPDZIQM	2	2	*	1
04	100	EEESALT	JZD 10	IPLRLMUCWIJZWDT				1
04	001		KCE 1	WNUNDRSJZYHFNSF				1
04	019	ZYHFNSF	LCB	NHBEBKJWGKDTRHQ	2			1
03	037	ENWPJIR	LMW	YWBESCSACJAILFX		•		1
04	073	QVDDIYT	LRM 3	ECWKSXJPGKZZRWJ				1
02	109	ZEPBIVC	MCE	NHAXMIZQLKDRASW				1
05	010	EEWUKBF	MJW	GHWMNQSJCBEBRDT				1
01	019	MBNOKBF	MJW	GHWMWEZLVUDOINF	2	2	*	1
02	199	OJJQKWC	MKH	ZHBHDNVR				1
01	064	QVWBRSB	MQH	KEWNUQXKHZHBHDN				1
02	073	GZBLLLX	MQX	EJHOKBPTRJGDYIS				1
05	082	HYQZLSX	MQX	ZULSPQXMGKPZHSB	3	2		1
05	073	ZEHWXBA	MRH	YQZLSXMQXZULSPQ				1
03	001		MSH	ZHLASWHFGPEBABJ				1
03	118	JUDLLWC	MTG 10	QDRA				1

Figure 3.

index shows, for example, that there are 10 J's in the first alphabet, and indicates two sets of polygraphs that begin with the letter J in Alphabet 1. With this second run the cryptanalyst can proceed to locate all the causal repetitions in the five messages--information which, when coupled with the statistical information given in the index, will considerably simplify solution of the cryptosystem.

7. Further remarks.--a. In case the cryptanalyst is interested only in totals of various classes (uniliteral, digraphic, etc.), condensed listings showing only such data may be prepared by a process known as "tabulating" at twice the speed of ordinary listing. If, on the other hand, the condensed data are to be arranged in, let us say, descending order of frequency, a procedure known as "summary punching" is employed. In this case a Reproducer is connected electrically to the Tabulator; totals accumulated (and perhaps printed) by the Tabulator are punched by the Reproducer on "summary cards", together with the information associated with the totals. This technique is often employed when certain information is desired without the volume of data that normally goes along with the usual IBM index.

b. If there are a large number of messages to be indexed, and if all the cryptanalyst desires is to find all repetitions of a specified length or longer, it is possible to obtain a condensed run giving only the necessary information, suppressing the large volume of unwanted data. For example, let us say that in the first listing (Fig. 2) all we wish to find are tetragraphic repetitions or longer; such a listing is illustrated in Fig. 4, wherein are shown all repetitions of the specified lengths for the set of five messages. Note that four of the asterisked repetitions shown in Fig. 2 have been suppressed in Fig. 4; only the long repetitions which begin in the column of the control letter are included in the listing of Fig. 4--this of course cuts down on redundant information, and simplifies even more the examination of the run.[17]

c. The examples shown of IBM indexes have been single-position indexes. Where the cryptographic unit consists of two or more characters, indexes are modified accordingly. For example, if a cryptosystem involved a four-letter code, then a four-position index would be made of the traffic, showing a control column of four-letter code groups with one or more preceding and following four-letter groups.

d. In some cases, it might be advisable to prepare indexes with the major sort on message number; in other cases, an index might be prepared of a number of messages grouped together by indicator relationships, or grouped

[17] The way in which this run was prepared may be of interest. The tetragraphically sorted deck is passed at tabulating speed in the Tabulator, without printing. Whenever a tetragraphic coincidence is noted by the comparison brushes in the Tabulator, the machine senses the letter immediately to the left of the control letter of the two tetragraphs; if these letters are identical, it shows that the repetition extends in that direction, and will therefore be picked up again at an offset; but if these letters are different, it shows that the repetition begins in the control column, and the Tabulator will print the lines belonging to this tetragraphic repetition. Another way in which this could be accomplished is by using the Collator to remove cards with the proper coincidences from the sorted deck, and then listing only these cards on the Tabulator; this latter procedure might be used in situations involving a large volume of cards, to take advantage of the high speed of operation of the Collator.

(a)	(b)	(c)	(d)	(e)
04	050	IMQIASJ	BLL	LOTNWZKBYQRJJQV
02	068	KQADFGZ	BLL	LXMQXEJHOKBPTRJ
04	129	JPWQJGC	CBE	BRIQZAFUHLWFGTA
05	021	HWMNQSJ	CBE	BRDTBQVSPBIAADQ
01	084	HBHDNVR	EEE	SZBWWRHEZTTDTX
04	093	ZZRWJIK	EEE	SALTJZDIPLRLMUC
04	082	MECWKSX	JPG	KZZRWJIKEEESALT
01	037	VUDOINF	JPG	KDLASWHHHZNINUF
04	065	ZKBYQRJ	JQV	DDIYTLRMECWKSXJ
03	092	EWRAIQX	JQV	DLLRQUWJKKNKBGA
03	064	GZUJYMN	JXC	JYWKMCHAFBPZAHQ
02	136	GKEWNUZ	JXC	JQWIBGQEZPDZIQM
05	007	DQEEWU	KBF	MJWGHWMNQSJCBEB
01	016	WURMBNO	KBF	MJWGHWMWEZLVUDO
01	067	BRSBMQH	KEW	NUQXKHZHBHDNVRE
02	130	RASWTNG	KEW	NUZJXCJQWIBGQEZ
01	074	KEWNUQX	KHZ	HBHDNVREEESZBWW
02	200	JJQKWCM	KHZ	HBHDNVR
03	006	MSHZH	LAS	WHFGPEBABJSXJKM
01	042	NFJPGKD	LAS	WHHHZNINUFPEQVW
02	058	TQBAPTG	NHJ	KQADFGZBLLLXMQX
02	157	ZIQMPEH	NHJ	KQRTKFENBQDXZFV
05	106	BDRDHHX	RIQ	ZNJMLLLIWODLKQ
04	133	JGCCBEB	RIQ	ZAFUHLWFGTALJUT
05	046	OCJLKQP	TNW	ZULGIFONLXHXXPB
04	055	SJBLLLO	TNW	ZKBYQRJJQVDDIYT
02	072	FGZBLLL	XMQ	XEJHOKBPTRJGDYI
05	081	RHYQZLS	XMQ	XZULSPQXMGKPZHS

Figure 4.

by date or period of transmission, etc. When a comparison is made between all messages in a large volume of traffic to determine possible homogeneity or relationships, the index resulting from this operation is known colloquially as a "brute force." Such an index makes exorbitant demands on available machine time with standard machines; but on the other hand, in extremis it might be the only guarantee of solution in a complex cryptosystem.

e. Examples of IBM listings for traffic analysis studies are included in the Zendian Problem in Appendix 8.

f. In conclusion, it is hoped that the student has gained an appreciation of the nature of the aid that can be given by IBM techniques in cryptanalysis; but at the same time he should also realize that there may be a delicate point of transition where manual methods leave off and IBM methods begin, or vice versa. This is especially true when the volume of messages or other data to be examined is small.

APPENDIX 5

INTRODUCTION TO THE SOLUTION OF TRANSPOSITION CIPHERS

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INTRODUCTION TO THE SOLUTION OF TRANSPOSITION CIPHERS

1. General remarks.--a. Transposition ciphers are like jigsaw puzzles in that all the pieces of which the whole original is composed are present but are merely disarranged. The pieces of the picture forming a jigsaw puzzle are irregular in size and shape, but the pieces of the plain text forming a transposition cipher must be much more regular, for the sake of practicability. They must be either single letters or pairs of letters, or sets of letters in regular groupings, or, in an exceptional case, whole words. Most transposition methods, however, deal with individual plaintext letters and are therefore termed monographic methods; when the methods involve the transposition of plaintext units greater than single letters, they are called polygraphic methods.

b. Practically all monographic or polygraphic transposition ciphers involve the use of a design or of a geometric figure (such as a square, rectangle, triangle, or trapezoid) in which the letters of the plain text are first inscribed or written according to a previously agreed-upon direction of writing and then transcribed or rewritten according to another and different, previously agreed-upon direction to form the text of the cryptogram. In nearly all cases the specific key controls (1) the use of designs of a specific nature and dimensions, and (2) variation in the direction or manner of inscription or transcription, or both. When a transposition cipher involves only a single process of inscription, followed by a single process of transcription, the system may be referred to as monophase transposition, commonly called single transposition. When, however, one or more of these processes intervene between the original inscription and the final transcription, the system may be referred to as polyphase transposition.

c. Among the most elementary forms of transposition ciphers are those known as route transpositions, which involve the inscription of the plain text into a square or rectangle by one prearranged route, and the transcription of the cipher text by following any other prearranged route. The principal routes are shown in the diagrams below, wherein, for the sake of ease in following the route, the plain text is assumed to be merely the sequence of letters ABC...X, inscribed into a 6x4 rectangle.

(1) Simple horizontal:

ABCDEF	FEDCBA	STUVWX	XWVUTS
GHIJKL	LKJIHG	MNOPQR	RQPONM
MNOPQR	RQPONM	GHIJKL	LKJIHG
STUVWX	XWVUTS	ABCDEF	FEDCBA

(2) Simple vertical:

AEIMQU	UQMIEA	DHLPTX	XTPLHD
BFJNRV	VRNJFB	CGKOSW	WSOKGC
CGKOSW	WSOKGC	BFJNRV	VRNJFB
DHLPTX	XTPLHD	AEIMQU	UQMIEA

(3) Alternate horizontal:

ABCDEF	FEDCBA	XWVUTS	STUVWX
LKJIHG	GHIJKL	MNOPQR	RQPONM
MNOPQR	RQPONM	LKJIHG	GHIJKL
XWVUTS	STUVWX	ABCDEF	FEDCBA

(4) Alternate vertical:

AHIPQX	XQPIHA	DELMTU	UTMLED
BGJORW	WROJGB	CFKNSV	VSNKFC
CFKNSV	VSNKFC	BGJORW	WROJGB
DELMTU	UTMLED	AHIPQX	XQPIHA

(5) Simple diagonal:

ABDGKO	OKGDBA	GKOSVX	XVSOKG
CEHLPS	SPLHEC	DHLPTW	WTPLHD
FIMQTV	VTQMIF	BEIMQU	UQMIEB
JNRUWX	XWURNJ	ACFJNR	RNJFCA
ACFJNR	RNJFCA	JNRUWX	XWURNJ
BEIMQU	UQMIEB	FIMQTV	VTQMIF
DHLPTW	WTPLHD	CEHLPS	SPLHEC
GKOSVX	XVSOKG	ABDGKO	OKGDBA

(6) Alternate diagonal:

ABFGNO	ONGFBA	GNOUVX	XVUONG
CEHMPU	UPMHEC	FHMPTW	WTPMHF
DILQTV	VTQLID	BEILQS	SQLIEB
JKRSWX	XWSRKJ	ACDJKR	RKJDCA
ACDJKR	RKJDCA	JKRSWX	XWSRKJ
BEILQS	SQLIEB	DILQTV	VTQLID
FHMPTW	WTPMHF	CEHMPU	UPMHEC
GNOUVX	XVUONG	ABFGNO	ONGFBA

(7) Spiral, clockwise:

ABCDEF	LMNOPA	DEFGHI	LJKLMN
PQRSTG	KVWXQB	CRSTUJ	HUVWXO
OXWVUH	JUTSRC	BQXWVK	GTSRQP
NMLKJI	IHGFED	APONML	FEDCBA
KLMNOP	XLJKLM	STUVWX	PQRSTU
JABCDQ	WHABCN	REFGHI	ODEFGV
IHGFER	VGFEDO	QDCBAJ	NCBAHW
XWVUTS	UTSRQP	PONMLK	MLKJIX

(8) Spiral, counterclockwise:

APONML	FEDCBA	NMLKJI	IHGFED
BQXWVK	GTSRQP	OXWVUH	JUTSRC
CRSTUJ	HUVWXO	PQRSTG	KVWXQB
DEFGHI	LJKLMN	ABCDEF	LMNOPA
PONMLK	MLKJIX	XWVUTS	UTSRQP
QDCBAJ	NCBAHW	IHGFER	VGFEDO
REFGHI	ODEFGV	JABCDQ	WHABCN
STUVWX	PQRSTU	KLMNOP	XLJKLM

d. One of the very common types of transposition ciphers is that known as numerically-keyed columnar transposition, or, as it is more often called, keyed columnar transposition. In this type, the letters are usually written in a geometric design, most often a rectangle, by inscribing them in the ordinary manner, i.e., in horizontal lines from left to right and from the top downwards; the letters are then transcribed by taking off the columns in the sequence determined by the numerical key. If the cryptosystem stipulates a completely filled rectangle, enough dummy letters or nulls are added at the end of the message to fill the last line of the rectangle. For example, given the prearranged key word WASHINGTON from which is derived a numerical key, the text of the message is written in regular lines beneath the numerical key, thus:

W	A	S	H	I	N	G	T	O	N
10	1	8	3	4	5	2	9	7	6
S	I	X	P	R	I	S	O	N	E
R	S	C	A	P	T	U	R	E	D
T	H	I	S	M	O	R	N	I	N
G	N	E	A	R	N	E	W	T	O
N	B	Y	O	N	E	O	F	O	U
R	P	A	T	R	O	L	S	E	O

The cryptogram produced by taking off the columns in key order would be as follows:

ISHNB PSURE OLPAS AOTRP MRNRI TONEO EDNOU ONEIT OEXCI EYAOR NWFSS RTGNR

In decipherment, a rectangle with the proper number of cells, determined by the length of the message and the length of the key, must first be prepared. In the foregoing example, since the cipher text consists of 60 letters and the key length is 10, an appropriate diagram is made and the cipher text is inscribed vertically down the columns according to the order of the elements of the numerical key. Thus the first two cipher groups when inserted into the rectangle would look as follows:

10	1	8	3	4	5	2	9	7	6
	I					S			
	S					U			
	H					R			
	N					E			
	B								
	P								

When all of the columns have been inscribed. the entire plain text of the cryptogram will reappear.

e. It is not necessary that the transposition rectangle be completely filled, as in the foregoing case; in fact, the security of the system is augmented if the rectangle is not completely filled. The same general procedure for encipherment and decipherment applies in this case, with perhaps a stipulation that if the end of the plaintext message fills the last line of the rectangle, nulls are to be added to make the last line incomplete.

f. In this Appendix we shall treat only monographic, monophase transposition of plain text (excluding code text or other intermediate text), and we shall limit our exposition of solution in the main to those systems involving rectangles (both completely and incompletely filled) for the transposition matrices.

2. Solution of messages enciphered with completely filled rectangles.

--a. In solving a cryptogram known or assumed to have been enciphered by keyed columnar transposition with a completely filled rectangle, the cryptanalyst first factors the number of letters in the message as a means of deter-

mining probable dimensions of the rectangle. He establishes the correct rectangle by considering the vowel percentages of the rows of the cipher text which has been inscribed into the various trial rectangles; in the correct case the rows should contain 40% vowels, without excessive variation. He then cuts apart the ciphertext columns and anagrams them so as to form combinations of "good" digraphs and trigraphs, which are expanded into longer polygraphs until all the columns are correctly anagrammed to yield the original plain text in the rows of the completed rectangle. An example will make these steps clear.

b. The following intercept is available for study:

NETEF LTDSR TSSTF MDCET DRHXS WHOHO EEADU OUUFI RRRRS NEROT
CFIEM EDSHA RTCPJ AOEGE WNLHO EPMWA WERUV AAINA TSDDS OEOAC
EHNTL HFLAU RAEEN OTOTS SOSYS TNNCG EMETT YDYRR NEOOE RESTH
INR

This has all the earmarks of a transposition cipher.[1] The number of letters in the message, 153, has the factors 3, 9, 17, and 53; if keyed columnar transposition with a completely filled rectangle is involved, the most probable dimensions are 9x17 or 17x9. The cryptogram is inscribed accordingly into the columns of the two trial rectangles, as shown in Figs. 1 and 2, below; the number of vowels in each row has been recorded in the column labeled "a" to the right of the rectangle.

1	2	3	4	5	6	7	8	9	(a)	(b)
N	C	U	F	G	A	N	S	D	2	1.6
E	E	O	I	E	A	T	S	Y	7	3.4
T	T	U	E	W	I	L	O	R	4	.4
E	D	U	M	N	N	H	S	R	2	1.6
F	R	F	E	L	A	F	Y	N	3	.6
L	H	I	D	H	T	L	S	E	2	1.6
T	X	R	S	O	S	A	T	O	3	.6
D	S	R	H	E	D	U	N	O	3	.6
S	W	R	A	P	D	R	N	E	2	1.6
R	H	R	R	M	S	A	C	R	1	2.6
T	O	S	T	W	O	E	G	E	4	.4
S	H	N	C	A	E	E	E	S	4	.4
S	O	E	P	W	O	N	M	T	3	.6
T	E	R	J	E	A	O	E	H	5	1.4
F	E	O	A	R	C	T	T	I	4	.4
M	A	T	O	U	E	O	T	N	5	1.4
D	D	C	E	V	H	T	Y	R	2	1.6
										20.8

Figure 1.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	(a)	(b)
N	R	E	O	U	N	M	P	L	E	T	C	A	O	N	Y	E	8	1.2
E	T	T	H	U	E	E	J	H	R	S	E	U	T	N	D	R	6	.8
T	S	D	O	F	R	D	A	O	U	D	H	R	S	C	Y	E	6	.8
E	S	R	E	I	O	S	O	E	V	D	N	A	S	G	R	S	7	.2
F	T	H	E	R	T	H	E	P	A	S	T	E	O	E	R	T	6	.8
L	F	X	A	R	C	A	G	M	A	O	L	E	S	M	N	H	5	1.8
T	M	S	D	R	F	R	E	W	I	E	H	N	Y	E	E	I	7	.2
D	D	W	U	R	I	T	W	A	N	O	F	O	S	T	O	N	6	.8
S	C	H	O	S	E	C	N	W	A	A	L	T	T	T	O	R	5	1.8
																		8.4

Figure 2.

[1] The methods of differentiating transposition from substitution have already been treated in par. 25 of Military Cryptanalytics, Part I.

In Fig. 1, since there are 9 letters in each row, the expected number of vowels is 9 x .40 = 3.6; in Fig. 2, with 17 letters in each row, the expected number of vowels is 17 x .40 = 6.8. Fig. 1 manifests striking variation in the range of 1-7 vowels from the mean of 3.6 vowels in the 9-letter rows, while Fig. 2 exhibits a consistency of smaller variation in the range of 5-8 vowels from the mean of 6.8 vowels in the 17-letter rows; therefore the rows of Fig. 2 are more like what we would expect in a rectangle of the correct dimensions. As further demonstration, we might examine the column labeled "b" at the right of each diagram; this column contains the deviations of the number of vowels in each row from the expected number, with the sum of these deviations at the bottom of the column. For Fig. 1, the average of the deviations is $\frac{20.8}{17} = 1.22$, while for Fig. 2 the average is $\frac{8.4}{9} = .93$; this demonstrates more clearly that the rectangle of Fig. 2 has a greater probability of being of the correct dimensions.[2]

c. In solving transposition ciphers, advantage is taken of all the characteristics and idiosyncrasies which are applicable to the language of the enemy, because they often afford clues of considerable assistance to the cryptanalyst. Firstly, in all languages there are certain letters, usually of medium or low frequency, which combine with other letters to form digraphs of high frequency. For instance, in English the letter H is of medium frequency, but it also combines with T to form the digraph TH, which is of highest frequency in literary text; it also combines with C, a letter of medium frequency, to form the fairly frequent digraph CH. The letter V is almost in the low-frequency category, yet it combines with E to form the digraph VE, which in military text is the 14th in frequency. Consequently, in working with transposition ciphers in English, when there is an H, attempts should be made to combine it first with a T or with a C; a V should be combined first with an E; a K should be combined first with a C; and so on. Secondly, there is usually in every language at least one letter which can be followed only by certain other letters, forming what may be termed an obligatory sequence, or an invariable digraph. In all European languages having the letter Q, the combination QU constitutes such an invariable digraph. In bona fide words of German, the letter C is never used by itself; when present, the letter C is invariably followed by an H, except on rare occasions when the digraph CK is employed. In English, the letter J can be followed only by a vowel; the letter X can be preceded only by a vowel and, except at the end of a word, can be succeeded only by a vowel, or by one of a limited number of consonants (C H P T), and so on. Letters which behave in this manner, that is, letters which have what may be called a limited affinity in combining with other letters to form digraphs,

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[2] A more precise method of discriminating among various trial rectangles is to square the average of the deviations, and obtain a ratio of this square to the expected number of vowels in the rows; the higher the ratio, the more likely it is indicative of the correct case. Thus for Fig. 1, we get $\frac{3.6}{(1.22)^2} = 2.4$, whereas for Fig. 2 we get $\frac{6.8}{(.93)^2} = 7.9$.

constitute good points of departure for solution and are therefore of sufficient importance to warrant their being designated by the more or less descriptive name of pilot letters. The presence of pilot letters in a transposition cipher often forms the basis for the assumption of probable words. Obviously, a special lookout should be kept for words of rather high frequency in military correspondence which contain letters of low or medium frequency. For example, the important word ATTACK suggests itself if the cryptogram has a K, a letter of low frequency, and a C, one of medium frequency.

d. We now look for a start in the anagramming process. We note the J in col. 8; this should be followed by a vowel, preferably a U. Columns 5 and 13 have a U in the corresponding position, so we juxtapose col. 8 against each of the two columns in turn, weighting the digraphs thus produced in order to be able to select the pair that has the highest probability of being correct.[3] This is shown below:

8 5		8 13	
P U	33	P A	61
J U	25	J U	25
A F	38	A R	82
O I	42	O A	48
E R	94	E E	81
G R	42	G E	61
E R	94	E N	99
W N	25	W O	67
N S	71	N T	93
	464		617

The high score of 617 as compared with 464 attests to the correctness of the choice of cols. 8 and 13 to be paired together. The digraph JU should be followed by a consonant, preferably N or S; these letters are contained in cols. 15 and 11. We now juxtapose cols. 15 and 11 in turn against our 8-13 pair, and, in the absence of available trigraphic weights, we weight the digraphs formed by the combination of col. 13 with the new trial columns, as follows:

8 13 15		8 13 11	
P A N	89	P A T	83
J U N	68	J U S	58
A R C	53	A R D	64
O A G	45	O A D	73
E E E	81	E E S	86
G E M	61	G E O	58
E N E	87	E N E	87
W O T	67	W O O	45
N T T	67	N T A	74
	618		628

[3] The weights used here are the centiban weights given in Table 15 of Appendix 2, Military Cryptanalytics, Part I.

The combination of cols. 13-11 yields a higher score than does the combination 13-15; moreover, the trigraphs formed by cols. 8-13-11 look more like plaintext trigraphs than do those formed by cols. 8-13-15. From here on the anagramming progresses very rapidly, without the use of weights, by expanding the trigraphs into the words which have begun to manifest themselves, such as PATROL, JUST, ROAD, etc. The completion of the solution is shown below, together with the recovered transposition key:

3	6	17	7	16	8	13	11	2	14	9	10	1	12	4	5	15
E	N	E	M	Y	P	A	T	R	O	L	E	N	C	O	U	N
T	E	R	E	D	J	U	S	T	T	H	R	E	E	H	U	N
D	R	E	D	Y	A	R	D	S	S	O	U	T	H	O	F	C
R	O	S	S	R	O	A	D	S	S	E	V	E	N	E	I	G
H	T	T	H	R	E	E	S	T	O	P	A	F	T	E	R	E
X	C	H	A	N	G	E	O	F	S	M	A	L	L	A	R	M
S	F	I	R	E	E	N	E	M	Y	W	I	T	H	D	R	E
W	I	N	T	O	W	O	O	D	S	A	N	D	F	U	R	T
H	E	R	C	O	N	T	A	C	T	W	A	S	L	O	S	T

3. Solution of messages enciphered with incompletely filled rectangles.--a. The next case to be considered is that of keyed columnar transposition with an incompletely filled rectangle. This case is not appreciably more difficult than that of a completely filled rectangle; solution may be achieved by one of several methods, e.g., assuming a probable word, assuming the length of the transposition key, and by a general method of anagramming without regard to the key length, among others. For this particular demonstration it will be assumed that the enemy has been using transposition keys from 10-15 elements in length, with 13 being the mode or most frequent length. The following cryptogram is available for study:

AFOOR	QYSHO	SDERN	XCRDA	VAONM		EORFS	RIYRW	SEEIT	AFOOI	TEONC
ESTIH	VIFSE	UFIGU	RXPLS	ELAIO		LIHUM	CTREP	IMNSS	TTSNP	RHERO

Since the message is 100 letters long, this means that for a rectangle of a width of 13 there will be 9 long columns of 8 letters each and 4 short columns of 7 letters each. If the long columns comprise the first 9 columns of the transposition rectangle, we will have the diagram as illustrated in Fig. 3a, below; and since the column "breaks" (i.e., the points where one column ends and the next begins) are in this case known, the columns could be anagrammed from this diagram without any trouble. If, however, the first 9 columns are not all long columns, an adjustment must be made to account for the possibility that some of the first 9 columns are short columns; this may be compensated for by constructing what is known as a hat diagram (also called a crown diagram), illustrated in Fig. 3b. In this latter diagram, it may be seen that if the first column is a short column, the second column will begin with an S, not an H; if both cols. 1 and 2 are short, col. 3 will begin with the letter N; and if only one of cols. 1 and 2 is a short

column, col. 3 will begin with the letter X. It must furthermore be observed that a letter in any designated row may be matched only with those

1	2	3	4	5	6	7	8	9	10	11	12	13
A	H	C	M	Y	A	N	I	U	A	M	M	N
F	O	R	E	R	F	C	F	R	I	C	N	P
O	S	D	O	W	O	E	S	X	O	T	S	R
O	D	A	R	S	O	S	E	P	L	R	S	H
R	E	V	F	E	I	T	U	L	I	E	T	E
Q	R	A	S	E	T	I	F	S	H	P	T	R
Y	N	O	R	I	E	H	I	E	U	I	E	O
S	X	N	I	T	O	V	G	L				

Figure 3a.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1					f	e	i	t	u	l			
2				a	s	e	t	i	f	s	i		
3			n	o	r	i	e	h	i	e	h	p	
4		s	x	n	i	t	o	v	g	l	u	i	e
5	A	H	C	M	Y	A	N	I	U	A	M	M	N
6	F	O	R	E	R	F	C	F	R	I	C	N	P
7	O	S	D	O	W	O	E	S	X	O	T	S	R
8	O	D	A	R	S	O	S	E	P	L	R	S	H
9	R	E	V	F	E	I	T	U	L	I	E	T	E
10	Q	R	A	S	E	T	I	F	S	H	P	T	R
11	Y	N	O	R	I	E	H	I	E	U	I	E	O
12	S	X	N	I	T	O	V	G	L				

Figure 3b.

letters which are a maximum of (n + 1) rows removed, where n is the number of short columns of the rectangle. Thus the hat diagram compensates for the possibility that any designated numbered column will either be short or long, and so facilitates the subsequent anagramming of the columns.

b. We note the Q in col. 1; this should be followed by one of the three U's in the cipher text, in cols. 8, 9, and 10. We will take the U in col. 8 as a start, and we will have the matched pair of columns as shown in Fig. 4a, below.[4] Now the QU should be followed by a vowel, preferably E. Of the 11 E's in the cipher text, only the 6 E's in rows 7-10 of cols. 2, 5, 7, 11, and 13 come into consideration. (Why this is so will be explained in subpar. c.) We now make trial matchings of these columns with

1	8
A	V
F	I
O	F
O	S
R	E
Q	U
Y	F
S	I

(a)

1	8	2
A	V	S
F	I	H
O	F	O
O	S	S
R	E	D
Q	U	E
Y	F	R
S	I	N

(b)

1	8	5
A	V	Y
F	I	R
O	F	W
O	S	S
R	E	E
Q	U	E
Y	F	I
S	I	T

(c)

1	8	5
A	V	I
F	I	Y
O	F	R
O	S	W
R	E	S
Q	U	E
Y	F	E
S	I	I

(d)

1	8	7
A	V	t
F	I	e
O	F	o
O	S	N
R	E	C
Q	U	E
Y	F	S
S	I	T

(e)

1	8	11
A	V	U
F	I	M
O	F	C
O	S	T
R	E	R
Q	U	E
Y	F	P
S	I	I

(f)

1	8	13
A	V	e
F	I	N
O	F	P
O	S	R
R	E	H
Q	U	E
Y	F	R
S	I	O

(g)

Figure 4.

[4] Note that we do not record the letters above V in col. 8; since the first letter of col. 1 is A, we know that this A must be in the first row of the transposition rectangle, therefore it would be impossible to form digraphs with any of the letters above V in col. 8.

the already established pair 1-8, as shown in Figs. 4b-g. It can be seen that there are "impossible" trigraphs in Figs. 4b, d, e, and f, leaving only Figs. 4c and g to be considered; of these two, Fig. 4c yields better looking trigraphs. The anagramming process continues, until the following final diagram is reached (shown here with all the elements of the hat diagram, for purposes of comparison with Fig. 3b):

11	13	1	8	5	4	6	3	2	12	7	10	9
				f		e				i		
			t	s	a	e				t		u
			i	r	o	i	n			e	l	f
i			h	i	n	t	x	s	p	o	s	i
h	e	A	v	Y	M	A	C	H	i	N	e	g
u	N	F	I	R	E	F	R	O	M	C	l	U
M	P	O	F	W	O	O	D	S	N	E	A	R
C	R	O	S	S	R	O	A	D	S	S	I	X
T	H	R	E	E	F	I	V	E	S	T	O	P
R	E	Q	U	E	S	T	A	R	T	I	L	L
E	R	Y	F	I	R	E	O	N	T	H	I	S
P	O	S	I	T	I	O	N	X	E	V	H	E
I			G								U	L

c. In the preceding subparagraph we took the U in col. 8 to be matched with the Q in col. 1. Note in Figs. 5a and b, below, that the other two U's in the cipher text could not possibly go with the Q. The U in col. 9 is more than (4 + 1) rows removed from the Q, so that if it is juxtaposed against

1	9	1	10	1	8	4	1	8	6	1	8	8	1	8	9	1	8	12
A		A	I	A	v		A	v	F	A	v	h	A	v	R	A	v	N
F	u	F	O	F	I	a	F	I	O	F	I	v	F	I	X	F	I	S
O	f	O	L	O	F	o	O	F	O	O	F	I	O	F	P	O	F	S
O	i	O	I	O	S	n	O	S	I	O	S	F	O	S	L	O	S	T
R	g	R	H	R	E	M	R	E	T	R	E	S	R	E	S	R	E	T
Q	U	Q	U	Q	U	E	Q	U	E	Q	U	E	Q	U	E	Q	U	E
Y	R	Y		Y	F	O	Y	F	O	Y	F	U	Y	F	L	Y	F	
S	X	S		S	I	R	S	I		S	I	F	S	I		S	I	
(a)		(b)		(c)			(d)			(e)			(f)			(g)		

Figure 5.

the Q it will leave the first digraph, A-, incomplete; and the U in col. 10 is at the end of the column, so that only 6 digraphs are formed by the combination when we expect either 7 or 8 digraphs in each pair of columns, depending on whether they are short or long. It was also noted that only 6 of the 11 E's in the cipher text could possibly go with the established QU in the pair of columns 1 and 8. In Fig. 5e, col. 8 for the E has already been used for the U, so this figure is impossible. In Fig. 5c, col. 4 is short by one letter at the top, whereas in Fig. 5g, col. 12 is short by at least one letter at the bottom, so these figures are also rejected.

Fig. 5f is rejected because the E is 10 letters away from the U (as may be seen from Fig. 3a), and Fig. 5d is rejected because the Q in col. 1 is 41 away from the E, since neither 10 nor 41 can be made up by any combination of integral multiples of 8 and 7, the lengths of the columns in this example.

d. The simplest solution of keyed columnar transposition with an incompletely filled rectangle has just been demonstrated, viz., by the method of assuming the length of the transposition key and anagramming as has been treated in the foregoing subparagraphs. It was indicated at the beginning of subpar. a that there was also a general method of anagramming without regard to the key length. This amounts to nothing more than searching in the cipher text for a pilot letter such as Q, writing several of the preceding letters of the cipher text in a column over this letter, and several of the following letters below this letter; then a letter which is usually associated with the particular pilot letter is located and placed next to the pilot letter, again recording the preceding and following cipher letters in a column as before. The resultant digraphs are then examined for possible delineation of the upper and lower limits of the columns, based on finding "impossible" digraphs which would indicate these limits, and the digraphs are expanded into trigraphs and longer polygraphs until the solution is complete. In the absence of pilot letters, we might use the first few letters of the cipher text (which must have come from column 1 of the transposition rectangle), or the last few cipher letters (which must have come from the end of the last column), comparing these segments both as preceding and following letters of other segments taken progressively throughout the cipher text, and weighting the digraphs thus formed as a measure of the validity of the matching; where tabulating machinery is available, this method constitutes an important and effective analytical approach.

4. Solution of messages with similar beginnings.--a. It is not unusual in military communications that two messages will begin with exactly the same words, so that the first two, three, or so lines of the enciphering rectangle of a transposition cipher are exactly the same in the two messages. When a single columnar transposition method using incompletely filled rectangles is being employed, the finding of two such messages will very greatly hasten the solution because the identical portions in the two messages enable the cryptanalyst to divide up the cipher text into the exact columns of the enciphering rectangle, thus eliminating the doubts concerning the long and short columns that would otherwise hinder him in effecting a solution.

b. Note the following two messages, with the underlined common polygraphic segments; the fact that there are 12 such segments indicates that the transposition rectangle has 12 columns.

Message "A"

NOSMO	BOOOOI	TEARS	PRDEO	EPOOL	GNTIF
EUUNS	ILATT	ATODO	LYIBR	ARLIM	CTIMC
TTRSE	EMEAA	YENCO	FBPIO	NYIIC	NDSRY
CCFAD	TUGSE				

~~CONFIDENTIAL~~

Message "B"

N O S E A C L I T C O I T F D N L E A I N D E O I L L W E C
S D G N T I L A L N E K N S I T E T S T E F E T O D O M L S
B S G O A R L C T T E R T O R M C T F I B T P R E J M E A E
A A I O A S U O F B P M N U E E O R I C N V Y E I D A I C F
A E E O A R P R I

These messages are now rewritten so as to bring identical portions all on the same lines, as is shown in Fig. 6, below:

Message "A"

1	2	3	4	5	6	7	8	9	10	11	12
N	O	D	G	N	T	A	M	M	O	I	C
O	I	E	N	S	O	R	C	E	F	C	F
S	T	O	T	I	D	L	T	A	B	N	A
M	E	E	I	L	O	I	T	A	P	D	D
O	A	P	F	A	L	M	R	Y	I	S	T
B	R	O	E	T	Y	C	S	E	O	R	U
O	S	O	U	T	I	T	E	N	N	Y	G
O	P	L	U	A	B	I	E	C	Y	C	S
	R			R				I			E

Message "B"

1	2	3	4	5	6	7	8	9	10	11	12
N	O	D	G	N	T	A	M	M	O	I	C
O	I	E	N	S	O	R	C	E	F	C	F
S	T	O	T	I	D	L	T	A	B	N	A
E	F	I	I	T	O	C	F	E	P	V	E
A	D	L	L	E	M	T	I	A	M	Y	E
C	N	L	A	T	L	T	B	A	N	E	O
L	L	W	L	S	S	E	T	I	U	I	A
I	E	E	N	T	B	R	P	O	E	D	R
T	A	C	E	E	S	T	R	A	E	A	P
C	I	S	K	F	G	O	E	S	O	I	R
	N	D		E	O	R	J	U	R		I

Figure 6.

It is clear from a comparison of these diagrams, and consideration of the fact that the long columns must of necessity go on the left-hand side of the rectangle, that the numbers 2, 6, 10, and 12 occupy the first four positions of the key, and that the numbers 1, 4, and 11 occupy the last three positions of the key. By anagramming columns 2, 6, 10, and 12 and columns 1, 4, and 11 we easily determine the exact order of these numbers, as shown in Fig. 7, below:

Message "A"

6	10	12	2	. . . . .	11	1	4
T	O	C	O		I	N	G
O	F	F	I		C	O	N
D	B	A	T		N	S	T
O	P	D	E		D	M	I
L	I	T	A		S	O	F
Y	O	U	R		R	B	E
I	N	G	S		Y	O	U
B	Y	S	P		C	O	U
R	I	E	R				

Message "B"

6	10	12	2	. . . . .	11	1	4
T	O	C	O		I	N	G
O	F	F	I		C	O	N
D	B	A	T		N	S	T
O	P	E	F		V	E	I
M	M	E	D		Y	A	L
L	N	O	N		E	C	A
S	U	A	L		I	L	L
B	E	R	E		D	I	N
S	E	P	A		A	T	E
G	O	R	I		I	C	K
O	R	I	N				

Figure 7.

The rest of the solutions follows quickly, and the transposition key is determined to be 6-10-12-2-8-9-7-5-3-11-1-4. The final transposition rectangles are shown below:[5]

6	10	12	2	8	9	7	5	3	11	1	4
T	O	C	O	M	M	A	N	D	I	N	G
O	F	F	I	C	E	R	S	E	C	O	N
D	B	A	T	T	A	L	I	O	N	S	T
O	P	D	E	T	A	I	L	E	D	M	I
L	I	T	A	R	Y	M	A	P	S	O	F
Y	O	U	R	S	E	C	T	O	R	B	E
I	N	G	S	E	N	T	T	O	Y	O	U
B	Y	S	P	E	C	I	A	L	C	O	U
R	I	E	R								

6	10	12	2	8	9	7	5	3	11	1	4
T	O	C	O	M	M	A	N	D	I	N	G
O	F	F	I	C	E	R	S	E	C	O	N
D	B	A	T	T	A	L	I	O	N	S	T
O	P	E	F	F	E	C	T	I	V	E	I
M	M	E	D	I	A	T	E	L	Y	A	L
L	N	O	N	B	A	T	T	L	E	C	A
S	U	A	L	T	I	E	S	W	I	L	L
B	E	R	E	P	O	R	T	E	D	I	N
S	E	P	A	R	A	T	E	C	A	T	E
G	O	R	I	E	S	O	F	S	I	C	K
O	R	I	N	J	U	R	E	D			

5. Solution of messages with similar endings.--a. In the preceding paragraph it was shown that the solution of two keyed columnar transposition messages having similar beginnings is an easy matter. The case of a pair of messages having similar endings is even simpler; the identical plain text contained in the bottom lines of the rectangle will afford clues to a direct reconstruction of the transposition key, without the necessity for any anagramming whatsoever.

b. Let us examine the following two messages. We find between these messages 14 sets of digraphic or longer repetitions; these repetitions do

Message "A"

C Y M R S (1) T U H I T (2) O O A N B E (3) O D H E D Y T S D (4) E T E (5) O V →

← S B E R H (6) E A V U E E (7) O I E D D D C R E (8) I A L E N (9) S R L O G

M S R F H (10) R E N A S (11) U R A P N (12) N A G I E S (13) F E H N R I (14) C N C

Message "B"

M T I U S (1) R L R O M I (2) H E A E N P J S U (3) R Y S N S (4) R E I E E

O N A G (5) R B T T O I (6) E E M D N (7) R F H H E E O C N C (8) S C V I F →

← E H F F G S T S D E (9) R O T O V (10) S N E U S (11) O O A I I (12) P O D H N (13)

N O R S T (14)

[5] Note that the last letter of the common polygraphic segment GNTI in col. 4 is a chance coincidence, and does not belong to the identical beginnings of the two messages. Such coincidences are frequent in this method of analysis and must sometimes be taken into consideration when allocating the text into the columns.

not occupy corresponding sequential positions as was the case in the messages in the previous paragraph. In order to facilitate our study, we number the common segments serially in each message, as is shown above.

c. We note that segment No. 1 (RST) in Message "A" corresponds to segment No. 14 in Message "B"; likewise, segment No. 2 (OOA) in Message "A" corresponds to segment No. 12 in Message "B". If we set forth the positional equivalencies between the segments in Message "A" against their identities in Message "B", we will have the following:

"A":	1	2	3	4	5	6	7	8	9	10	11	12	13	14
"B":	14	12	13	10	11	2	6	4	1	7	3	5	9	8

Message "A" contains 90 letters, which means that for a transposition rectangle of 14 columns there will be 6 long columns of 7 letters each, and 8 short columns of 6 letters each; Message "B" contains 95 letters, which means that there will be 11 long columns of 7 letters and 3 short columns of 6 letters. Relative to the position the last letter in each rectangle occupies in the bottom row of the rectangle, it is obvious that the final letter of Message "B" is five columns to the right of the final letter of Message "A". Using this difference, viz., 5, we can build up a key sequence from the series of equivalencies given above. Thus, the equivalent of segment No. 1 of Message "A" is segment No. 14 of Message "B", so we place 14 five spaces to the right of the number 1 which was arbitrarily placed at the left; the equivalent of No. 14 in Message "A" is No. 8 in Message "B", so we place 8 five spaces to the right of the 14 just entered a moment before, as is shown below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
1					14					8			

The equivalent of segment No. 8 of Message "A" is No. 4 of Message "B", so a 4 is placed five spaces to the right of the 8 in the diagram above, treating the sequence cyclically. This process is continued, until we have constructed the following complete sequence:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4	6	5	13	14	10	2	11	9	8	7	12	3

This sequence, 1-4-6-5..., is either the transposition key itself, or a cyclic permutation of the transposition key.

d. The underlined segments of the messages in subpar. b indicate the end of the columns of the transposition rectangle, since the identical plaintext portions are located in the final rows of the rectangle; for example, the first column of Message "B" must contain 7 letters, ending in SRL. Since we know that Message "B" has three short columns of 6 letters each, we can look for these columns delineated in the cipher text by the ending segments;

we find these to be col. 5 (EEONAG), col. 13 (IIPODH), and col. 14 (NNORST).[6] Since these short columns must be at the right of the transposition matrix, the actual transposition key must then be 10-2-11-9-8-7-12-3-1-4-6-5-13-14. The cipher texts of the two messages are now inserted into the appropriate rectangles, and the plain texts emerge as is shown in the illustration below:

Message "A"

10	2	11	9	8	7	12	3	1	4	6	5	13	14
O	U	R	A	D	V	A	N	C	E	B	E	I	N
G	H	E	L	D	U	P	B	Y	D	E	T	E	R
M	I	N	E	D	E	N	E	M	Y	R	E	S	I
S	T	A	N	C	E	N	O	R	T	H	O	F	C
R	O	S	S	R	O	A	D	S	S	E	V	E	N
F	O	U	R	E	I	G	H	T	D	A	S	H	C
H	A	R	L	I	E								

Message "B"

10	2	11	9	8	7	12	3	1	4	6	5	13	14
F	R	E	S	H	E	N	E	M	Y	R	E	I	N
F	O	R	C	E	M	E	N	T	S	B	E	I	N
G	M	O	V	E	D	U	P	I	N	T	O	P	O
S	I	T	I	O	N	S	J	U	S	T	N	O	R
T	H	O	F	C	R	O	S	S	R	O	A	D	S
S	E	V	E	N	F	O	U	R	E	I	G	H	T
D	A	S	H	C	H	A	R	L	I	E	.		

6. Reconstruction of literal keys from numerical keys.--a. If the enemy is using numerical keys which have been derived from literal keys, it goes without saying that the cryptanalyst should try and reconstruct these literal keys as the last step in the solution. This reconstruction may be of more than academic interest, since the original literal keys may furnish clues as to the enemy's thinking and its possible influence on his cryptographic habits or idiosyncracies. For example, if the cryptanalyst determined that the enemy used the names of flowers for the derivation of keys for five successive days, on the sixth day the cryptanalyst would probably consult a botanical anthology and perhaps guess the probable key for the day; this method of cryptanalysis is very rewarding when it works--and it does.

b. When numerical keys are derived from literal keys in the usual manner, i.e., by assigning numbers to the letters in accordance with their relative positions in the normal alphabet,[7] the sequence of key numbers forms the basis for a keyword reconstruction diagram. The diagram for the key derived in subpar. 2c is shown in Fig. 8a, in which the individual key numbers are written from left to right on different levels so that each level contains only numbers normally in sequence.

[6] Note that the third column of Message "B" must end in TSD, and not TSDE; the extra "E" at the end of this segment in the two messages was a fortuitous coincidence, as pointed out in the preceding footnote.

[7] See in this connection par. 38 of Military Cryptanalytics, Part I.

	11	13	1	8	5	4	6	3	2	12	7	10	9
1			1						2				
2								3					
3						4							
4					5		6				7		
5				8									9
6												10	
7	11									12			
8		13											

Figure 8a.

On the first level, the number 1 represents a letter near the very beginning of the alphabet, and is most likely an A; the number 2 also represents a letter near the very beginning of the alphabet, and this too is quite probably an A, although it might be a B or C. On the second level, the equivalent of 3 must be at least one letter to the right in the normal sequence after whatever letter the 2 represents; likewise, on the third level, the equivalent of 4 must be at least one letter after the equivalent of the digit 3. It is also clear that the number 11 must represent a letter in the last half of the alphabet, and that 12 might be this same letter, or one further to the right in the alphabet; the number 13 must of course represent a letter after that represented by 12. The probable ranges of the various numbers of the key are thus recorded in the keyword reconstruction diagram, as shown in Fig. 8b, below. If desired, the ranges of the letters comprising

	11	13	1	8	5	4	6	3	2	12	7	10	9
1			1 A-C						2 A-C				
2								3 B-E					
3						4 C-G							
4					5 D-I		6 D-I				7 H-M		
5				8 H-M									9 L-S
6												10 N-T	
7	11 P-T									12 R-U			
8		13 R-W											

Figure 8b.

the equivalents of the key numbers might be listed as shown in Fig. 8c, below, which some students will find to be a more convenient diagram for selecting combinations of "good" letters forming fragments of the literal key:

11	13	1	8	5	4	6	3	2	12	7	10	9
P	R	A	H	D	C	D	B	A	R	H	N	L
Q	S	B	I	E	D	E	C	B	S	I	O	M
R	T	C	J	F	E	F	D	C	T	J	P	N
S	U		K	G	F	G	E		U	K	R	O
T	W		L	H	G	H				L	S	P
			M	I		I				M	T	R
												S

Figure 8c.

c. The next step is to find a good word (or word fragments, if the numerical key has been derived from two or more words) from among the many possibilities; in this step we may be aided by the relative frequency of initial and final letters of words in the language.[8] If we study the ending, we can see that ION is a possibility, which is then expanded progressively into TION, ATION, and CATION. At this point we might consult a list of words arranged in rhyming order according to word length,[9] or we might make trials for various possible beginning digraphs (which must be followed by A, since the fifth letter from the end has been established as an A); when QUA is tried, the word QUALIFICATION emerges, without any inconsistencies. It must be pointed out that if the numerical key is rather short, there may be multiple possibilities for the choice of literal keys. With numerical keys of 10 or more numbers, it is usually possible to reconstruct the original literal key used; furthermore, the longer the numerical key, the easier it is generally to recover the literal key. As an exercise for the student, it is left to him to reconstruct the literal keys from the rest of the numerical keys in this Appendix.

7. Solution of messages of identical length and in the same key.--a. In the mechanics of transposition ciphers, the essential feature lies in the changes in positions of the letters constituting the plaintext message, the changes being determined by a key. It follows, therefore, that the letters of two or more messages of exactly the same length, when enciphered by the same key, will undergo exactly the same changes in positions. If we have several such messages, solution may be achieved by writing them under one another and anagramming the columns thus formed;[10] this method holds true regardless of the size or shape of the transposition matrix, or whether the transposition involves monophase or polyphase transposition.

[8] Cf. Tables 2-D and 2-E of Appendix 2, Military Cryptanalytics, Part I.

[9] Cf. Section B of Appendix 3, Military Cryptanalytics, Part I.

[10] This process is known as multiple anagramming.

b. Let us assume that we have intercepted four 50-letter messages on the same day, and that there is reason to believe that the same transposition system and specific keys might have been used for all four messages. These four messages are superimposed as follows, together with a notation of the positions the cipher letters occupy in the messages:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Msg No. 1:	N	U	R	I	L	O	R	R	H	M	H	T	D	T	E	E	O	T	G	A	R	U	U	D	E	I	D	I	N	O
Msg No. 2:	I	P	S	L	T	O	L	L	N	O	X	T	R	E	I	U	R	N	H	L	Y	S	T	E	N	A	O	T	T	A
Msg No. 3:	T	Y	T	P	O	I	E	R	R	I	E	E	N	R	U	N	S	P	N	R	O	N	H	B	A	I	R	G	O	A
Msg No. 4:	F	T	N	O	I	T	N	E	S	E	E	M	S	R	V	A	E	I	N	T	A	I	N	A	I	C	E	I	M	F

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Msg No. 1:	H	N	V	D	M	E	Z	I	I	N	A	C	A	E	T	A	T	S	E	R
Msg No. 2:	E	R	U	C	S	C	I	E	Q	E	H	E	E	O	I	L	R	Y	I	T
Msg No. 3:	E	T	S	W	G	N	R	S	L	E	E	K	P	O	N	T	A	A	O	T
Msg No. 4:	P	I	E	I	I	R	A	S	R	T	R	P	O	N	E	W	O	M	T	O

In Message No. 2 we are fortunate in having a Q; this should be paired with one of the two U's in the message, as shown in Figs. 9a and b, below. Since Fig. 9b produces better digraphs, we conclude that the pair of columns (39,33)

39 16	39 33	39 33 43	39 33 15	39 33 49
I E	I V	I V A	I V E	I V E
Q U	Q U	Q U E	Q U I	Q U I
L N	L S	L S P	L S U	L S O
R A	R E	R E O	R E V	R E T
(a)	(b)	(c)	(d)	(e)

Figure 9.

is more likely to be correct than is the pair (39,16). The QU should be followed by a vowel; if the vowel is E, the only column which does not produce an impossible trigraph with the combination (39,33) is col. 43, as shown in Fig. 9c; if the vowel is I, the only possible combinations are shown in Figs. 9d and e. Of the foregoing three possibilities for trigraphs, the best looking set is that in Fig. 9e. On trying various continuations of QUI, we arrive at the following fragment:

	39	33	49	43	12	
Msg No. 1:	...	I	V	E	A	T ...
Msg No. 2:	...	Q	U	I	E	T ...
Msg No. 3:	...	L	S	O	P	E ...
Msg No. 4:	...	R	E	T	O	M ...

After a little further expermentation, all four messages are completely anagrammed, yielding the following:

	41	10	35	23	1	4	14	26	17	29	45	7	20	38	32	48	42	11	36	24	2	5	15	27	18	30	46	8	21	39
Msg No. 1:	A	M	M	U	N	I	T	I	O	N	T	R	A	I	N	S	C	H	E	D	U	L	E	D	T	O	A	R	R	I
Msg No. 2:	H	O	S	T	I	L	E	A	R	T	I	L	L	E	R	Y	E	X	C	E	P	T	I	O	N	A	L	L	Y	Q
Msg No. 3:	E	I	G	H	T	P	R	I	S	O	N	E	R	S	T	A	K	E	N	B	Y	O	U	R	P	A	T	R	O	L
Msg No. 4:	R	E	I	N	F	O	R	C	E	M	E	N	T	S	I	M	P	E	R	A	T	I	V	E	I	F	W	E	A	R

	33	49	43	12	37	25	3	6	16	28	19	31	47	9	22	40	34	50	44	13
Msg No. 1:	V	E	A	T	Z	E	R	O	E	I	G	H	T	H	U	N	D	R	E	D
Msg No. 2:	U	I	E	T	I	N	S	O	U	T	H	E	R	N	S	E	C	T	O	R
Msg No. 3:	S	O	P	E	R	A	T	I	N	G	N	E	A	R	N	E	W	T	O	N
Msg No. 4:	E	T	O	M	A	I	N	T	A	I	N	P	O	S	I	T	I	O	N	S

c. The key recovered in the diagram above, 41-10-35-23..., represents the order in which we must read the elements of 50-letter messages so as to yield the original plain text; in other words, this is the cipher-to-plain (abbr. C→P) sequence for messages of this length. If we examine this sequence, we will note a pattern repeated at an interval of 16. Let us copy this sequence in lines of 16 under each other, as shown in Fig. 10a, below.

41	10	35	23	1	4	14	26	17	29	45	7	20	38	32	48
42	11	36	24	2	5	15	27	18	30	46	8	21	39	33	49
43	12	37	25	3	6	16	28	19	31	47	9	22	40	34	50
44	13														

Figure 10a.

If we now assign numbers to the columns of Fig. 10a in the order of the ascending series of elements in the columns, as shown in Fig. 10b, we will

14	4	12	8	1	2	5	9	6	10	15	3	7	13	11	16
41	10	35	23	1	4	14	26	17	29	45	7	20	38	32	48
42	11	36	24	2	5	15	27	18	30	46	8	21	39	33	49
43	12	37	25	3	6	16	28	19	31	47	9	22	40	34	50
44	13														

Figure 10b.

have the actual transposition key. The transposition rectangle for Message No. 1 is therefore as follows:

14	4	12	8	1	2	5	9	6	10	15	3	7	13	11	16
A	M	M	U	N	I	T	I	O	N	T	R	A	I	N	S
C	H	E	D	U	L	E	D	T	O	A	R	R	I	V	E
A	T	Z	E	R	O	E	I	G	H	T	H	U	N	D	R
E	D														

With the transposition key recovered, we will be able to read any further messages in the same key, without regard to the length of the messages.

d. The foregoing method of multiple anagramming constitutes a general solution for all transposition ciphers, and is one of the reasons that transposition of plain text is not often encountered in actual operations. Moreover, after the C→P sequence has been recovered, it is possible to reconstruct the transposition matrix, regardless of shape or design, as well as the transposition key or keys involved; these topics will be reserved for extensive treatment in Military Cryptanalytics, Part IV.[11]

8. Concluding remarks on transposition ciphers.--a. We have seen how easy it is to solve keyed columnar transposition ciphers using rectangular matrices. It might be mentioned that the security of such ciphers is enhanced if nulls are incorporated into the matrix; these nulls are arbitrary letters (usually high- or medium-frequency letters) inserted in certain cells designated for this purpose, with the intent to confuse the cryptanalyst in the anagramming process, causing him to discard combinations of columns which might actually be correctly matched. An even more effective measure for augmenting the cryptosecurity of transposition ciphers is the incorporation of blanks in the matrix, i.e., certain designated cells which are left unoccupied; this usage greatly impedes the cryptanalyst in ascertaining the lengths of the columns and considerably complicates the anagramming process.

b. We have shown the value of special solutions in dealing with transposition ciphers, taking advantage of special circumstances such as cases of messages with similar beginnings or endings. In transposition ciphers, perhaps even more so than in substitution ciphers, special solutions are of exceptional importance; sometimes the only possibility of solution of a difficult system lies in finding a message or a pair of isologs manifesting an untoward situation, correctly interpreting the phenomena, and capitalizing on the cryptographic idiosyncracies exhibited. Almost any kind of an isolog situation, and especially one in which some kind of cryptographic error has been committed which is then followed by the corrected version, may be of inestimable value to the cryptanalyst in leading him to a quick solution.

c. The solution of route transposition ciphers such as those illustrated in subpar. 1c is merely a matter of experimenting with rectangles of various dimensions suggested by the total number of letters in the message, and then inspecting these rectangles, searching for portions of words by reading horizontally, diagonally, vertically, spirally, and so on. In many of the routes no experiment is even necessary to determine the dimensions of the rectangle in order to get a starting point. For example, consider the following message:

FISET	VEARA	DCDKP	REATT	SUTWI	YNISI	SOOON	WEIPH	NPNON	YAEOA
TSTSL	USTEE	RSRCR	ELOFO	RSAOT	LPATC	NEAAG	EOLIW	TELDO	N

[11] It should be noted that the simple characteristics present in the diagram in Fig. 10a are typical only of monophase keyed columnar transposition involving rectangular matrices. Other types of transposition ciphers yield C→P sequences of much greater complexity, and may pose considerable difficulties in the way of solution.

If we start off by assuming an alternate diagonal route for the transposition, the first two groups yield good fragments, as is shown in Fig. 11a. We continue the method until there are conflicts, as in Fig. 11b; this in-

F I V E	F I V E P R I S N	F I V E P R I S O N E R
S T A	S T A K E N I O	S T A K E N I N Y E S T
E R	E R D A Y S N	E R D A Y S P A T R O L
A	A C T I O P	A C T I O N E S C A P E
	D T W O N	D T W O H O U R S A G O
	S T O H	S T O P A L E R T A L L
	U N P	U N I T S L O C A T E D
	W I	W E S T O F N E W T O N
	E	

Figure 11a. Figure 11b. Figure 11c.

dicates that the method, which worked for columns of 8 letters, does not work for 9. We therefore assume columns of 8 letters and go back to the point where the sense broke; from Fig. 11c it can be seen that the alternate diagonal route was the one followed in the transcription, and that a 12 x 8 rectangle was used. Of course the cryptanalyst might not hit upon the correct method until after he had tried several other routes, but such trials take only a very few minutes. It is to be noted that large rectangles of this type have not often been used because in many of the routes whole plaintext words show up in the cipher text.

d. A type of transposition that has occasionally been encountered is that involving the use of a square sheet of paper or cardboard, called a grille, in which small square cells have been cut out in definite but irregular positions; the letters of the plain text are inscribed on a sheet underneath the perforated design. Usually, the grille is revolved 90° in four successive operations so that the resulting square of letters inscribed beneath the grille is completely filled, and then the letters are taken out in groups of five, reading horizontally or otherwise according to agreement. The perforations in the grille must, of course, be correctly disposed on the grille so as to produce the result that every space on the sheet over which it is placed in inscribing the letters shall be filled after the four turns of the grille have been completed. Techniques exist for solving even single messages in such ciphers; where several messages of identical length have been intercepted, the general solution given in par. 7 may be applied. The grille may then be reconstructed by an analysis and comparison of the cipher text with its corresponding plain text.

e. Monophase transposition is characterized by a relative simplicity of the methods of analytical attack, as has been demonstrated in the preceding paragraphs. Polyphase transposition, on the other hand, produces ciphers of formidable complexity, which under certain circumstances may defy solution. The most frequently encountered form of polyphase transposition is the double transposition cipher employing rectangles for the matrices; after the plain text has been inscribed in the first rectangle, the letters of the columns (taken in the order of the numerical key) are inscribed horizontally into a second rectangle (based upon the same or a different key), from left to right and from the top downwards; the cipher text is then taken

7	1	6	3	2	8	5	9	4
F	I	R	S	T	R	E	G	I
M	E	N	T	C	O	M	M	A
N	D	P	O	S	T	H	A	S
M	O	V	E	D	T	O	N	E
W	L	O	C	A	T	I	O	N
S	O	U	T	H	O	F	N	E
W	T	O	N					

Figure 12a.

7	1	6	3	2	8	5	9	4
I	E	D	O	L	O	T	T	C
S	D	A	H	S	T	O	E	C
T	N	I	A	S	E	N	E	E
M	H	O	I	F	R	N	P	V
O	U	O	F	M	N	M	W	S
W	R	O	T	T	T	O	G	M
A	N	O	N					

Figure 12b.

off from the columns of the second rectangle in the order of the second key. In the illustration above, Fig. 12a is the first transposition, Fig. 12b the second. The final cipher text would read as follows:

E D N H U R N L S S F M T O H A I F T N C C E V S M T O N N
M O D A I O O O O I S T M O W A O T E R N T T E E P W G

Although such a double transposition cipher is theoretically extremely difficult to solve, nevertheless there are certain disadvantages to the system when used in military cryptography. The greatest danger is the failure on the part of careless clerks to execute both transpositions. The interception and solution of a single message which has undergone but one transposition will immediately provide the key for the solution of all the other messages even though they have been correctly enciphered. Again, the interception of two or more messages of exactly the same length will provide material for an effective solution. Again, the interception of a message which is based upon a perfect square, even though both transpositions have been effected properly, will enable solution; and the solution of completely filled matrices, though they may not be perfect squares, is also possible. Other special solutions have been devised, to take advantage of certain circumstances.

f. In cases of transposition ciphers which employ a more or less irregular geometric design accomodating exactly n letters, a long message may be split up into sections of n letters and then these identical-length sections may be attacked simultaneously by the multiple anagramming method. This possibility should not be forgotten in dealing with a transposition system that is known or assumed to incorporate a matrix of fixed dimensions.

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APPENDIX 6

CRYPTOGRAPHIC SUPPLEMENT

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CRYPTOGRAPHIC SUPPLEMENT

1. Introductory remarks. In the formal portions of Military Cryptanalytics, Parts I and II, the exposition of the details of solution of various monoalphabetic and periodic polyalphabetic substitution systems was preceded by a discussion of the cryptographic aspects of these systems, much in the same way that anatomy and physiology precede more formal medical and diagnostic studies. Further cryptographic treatment was included in this present text: in par. 99 a brief introduction to the basic principles of aperiodic substitution systems was presented, and in Appendix 5 the mechanics of transposition systems were outlined. However, the student has not yet been introduced to the nature of code systems or machine systems, nor has he encountered in his studies thus far certain other systems which are representative of important types of cryptography. In the paragraphs which follow these additional aspects of cryptography will be treated, so that the student may round out his perspective and education in general cryptography, in order to provide a steppingstone to further advanced cryptologic studies.

2. Combination systems.--a. Some cryptosystems involve superencipherment, i.e., the plain text of a message undergoes a first or primary encipherment and the resulting cipher text then undergoes a second or secondary encipherment, for the purpose of augmenting the degree of cryptosecurity. If the two processes are well selected, the objective is actually reached,[1] and the resulting cryptograms present a relatively great degree of cryptosecurity; but sometimes this is not accomplished and the augmented security is of a purely illusory character.[2] The final encipherment may, in fact, be no greater in degree than

[1] Cf. additive encipherment of underlying dinome and monome-dinome text treated in Chapters XI and XII, which encipherment represents a considerable sophistication over the basic system of the first substitution.

[2] Cf. the discussion on repetitive encipherment in subpar. 84d of Military Cryptanalytics, Part I.

if a single encipherment had been effected, and in unusual cases it may even be less than before. It is impossible to describe all the combinations of systems that might be employed; only a very few typical cases can here be considered, and these will be selected with a view to illustrating general principles. A cryptosystem incorporating superencipherment may involve 2, 3, ... successive processes of substitution; or it may involve 2, 3, ... successive processes of transposition; or substitution may be followed by transposition, or vice versa.[3] These cases will be taken up in the subparagraphs below.

b. Monoalphabetic substitution followed by another monoalphabetic substitution obviously does not make any contribution to cryptosecurity; the transformation ${}_sC_1 \longrightarrow {}_sC_2$ still remains monoalphabetic in character. Monoalphabetic substitution followed by polyalphabetic substitution, or vice versa, likewise does not add anything more to cryptosecurity than is already inherent in the polyalphabetic system. If periodic polyalphabetic substitution is followed by polyalphabetic substitution of the same period, no increase is made to cryptosecurity; if, however, the key for the secondary encipherment is of a different length from that for the primary encipherment, the results are quite different, in that the period of the resultant cryptogram becomes the least common multiple of the two key lengths. For example, if the length of the key for the primary encipherment is 4, and that for the secondary is 6, the result is the same as though a key of 12 elements had been employed in a single encipherment. If the key lengths selected are relatively prime to each other, the method may give rise to cryptogram of considerable security; this is the principle of the two-tape cipher teleprinter discussed in par. 97.

c. Combinations of substitution and transposition methods can take many forms. It is possible, of course, to apply substitution first, then transposition; or transposition first, then substitution. The most commonly encountered systems, however, are of the former type, i.e., ${}_sC_1 \longrightarrow {}_sC_2$. Furthermore, it can be stated that as a rule practicable systems in which both processes are combined use methods that are relatively simple in themselves, but are so selected as to produce cryptograms of great security as a result of the combination. To give a very rough analogy, in certain combinations the effect is much more than equivalent to the simple addition of complexities of the order x and y, giving x + y; it is more equivalent of the order xy, or even $(xy)^2$. Some of the most effective combined substitution-transposition systems make use of multiliteral substitution for the first encipherment, followed by a transposition of the multiliteral elements so as to separate these elements and distribute them throughout the cipher text; that is, the fractional parts of the cipher equivalents are thoroughly disarranged and distributed evenly or irregularly throughout the text. Such systems are known as

[3] It will be convenient to adopt the symbol C to represent the cipher text produced by any unspecified process of encipherment. The symbols C_1, C_2, C_3, ... will then represent the successive texts produced by successive processes in superencipherment. The subscript letter s or t may be prefixed to the C to indicate that a given process is one of substitution or transposition. Thus, the steps in a system where a first substitution is followed by a second substitution can be represented symbolically by ${}_sC_1 \longrightarrow {}_sC_2$. In a similar manner, ${}_tC_1 \longrightarrow {}_tC_2$ represents a double transposition. The notation ${}_sC_1 \longrightarrow {}_tC_2$ means that the text from a first process of substitution undergoes transposition as a second process.

fractionating systems; these will be treated in the next paragraph.

3. Fractionating systems.--a. All fractionating systems have inherent in their cryptography a substitution phase in which each plaintext letter is replaced by a cipher equivalent composed of two or more elements or "fractions", and then these elements are subjected to a further encipherment, usually transposition, in a second phase. This latter may be followed by a third phase, recombination of transposed elements, and a fourth phase, the replacement of the recombined elements by single ciphertext letters; thus such a system may embrace a first substitution, a transposition, a recombination, and a second substitution.

b. Let us consider the following example of a factionating system. In Fig. 1a there is illustrated a bipartite square which is used to encipher a message as shown in Fig. 1b; the bipartite cipher elements have been recorded as vertical dinomes underneath their plaintext equivalents. The two

	1	2	3	4	5
1	H	Y	D	R	A
2	U	L	I	C	B
3	E	F	G	K	M
4	N	O	P	Q	S
5	T	V	W	X	Z

Figure 1a.

O	N	E	P	L	A	N	E	R	E
4	4	3	4	2	1	4	3	1	3
2	1	1	3	2	5	1	1	4	1

P	O	R	T	E	D	L	O	S	T
4	1	5	3	1	2	4	4	5	
4	1	3	2	4	1	1	3	2	2	5	1

Figure 1b.

44	34	21	43	13	44	15	31	24	45
Q	K	U	P	D	Q	A	E	C	S

21	13	25	11	41	32	41	13	22	51
U	D	B	H	N	F	N	D	L	T

Figure 1c.

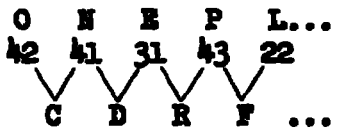
rows of θ_c^1 and θ_c^2 elements are now recombined horizontally in pairs, and the pairs are reconverted into single-letter cipher equivalents using the same bipartite square; this is shown in Fig. 1c.

c. It will be noted that there are four basic steps involved in the foregoing encipherment: (1) a process of decomposition, substitutive in character, in which each θ_p is replaced by a bipartite θ_c, composed of two parts, θ_c^1 and θ_c^2; (2) a process of separation, transpositive in character, in which each θ_c^1 is separated from the θ_c^2 with which it was originally associated; (3) a process of recombination, also transpositive in character, in which each θ_c^1 is combined with a θ_c^2 with which it was not originally associated; and finally (4) a new process of recomposition, substitutive in character, in which each new $\theta_c^1\theta_c^2$ combination is given a letter value according to a bipartite alphabet. In the foregoing example the alphabet for the recomposition was the same as that for the decomposition; this, of course, is not an inherent necessity of the system--the decomposition and recomposition alphabets may be entirely different.

d. Another method for recombining the bipartite elements is by a diagonal relationship, as shown by the arrows in Fig. 1d, below; every θ_c^2

Figure 1d.

is recombined with the θ_c^1 of the following plaintext letter, until the end of the message is reached, at which time the last θ_c^2 is recombined with the very first θ_c^1. The first several recombined pairs are 24 13 14 32 21..., which becomes CDRFU... when converted into single letters by means of the bipartite square in Fig. 1a. The last θ_c^2, 1, is combined with the first θ_c^1, 4, to yield an R for the last letter of the final cipher. Another way of accomplishing this method is to set down the bipartite equivalents horizontally and recombine them as shown below:



The results are identical with those obtained in Fig. 1d.

e. The systems shown in subpars. b and d are aperiodic in nature, since the fractionating treatment is applied to the message as a whole. It is also possible to apply these processes to groupings of fixed length, resulting in a periodic fractionating system.[4] For example, let the message and the bipartite square be the same as before, and let the unit of encipherment be five letters. The letters of the plain text are written in groups of five, and the bipartite cipher elements are written as vertical dinomes below their plaintext equivalents; this is shown in Fig. 1e, below. In the

O N E P L	A N E R E	P O R T E	D L O S T
4 4 3 4 2	1 4 3 1 3	4 4 1 5 3	1 2 4 4 5
2 1 1 3 2	5 1 1 4 1	3 2 4 1 1	3 2 2 5 1
Q K L H F	R E M H N	Q A G C H	Y Q W L T

Figure 1e.

recombination process, the bipartite elements in this case are taken horizontally within the periodic groupings; thus the elements of the first five plaintext letters are read as 44 34 22 11 32, yielding QKLHF as the final

[4] The invention of periodic fractionating systems is commonly attributed to the French cryptologist F. Delastelle, who described them in his excellent treatise, Traité élémentaire de cryptographie, Paris, 1902.

cipher. The same treatment is applied to each succeeding group of five plaintext letters, until the entire message is encrypted.

f. In the foregoing examples, the fractionating schemes involved bipartite alphabets. Higher orders of multiliteral alphabets may also be used, as is shown in the periodic fractionation system below:

H 111	B 211	P 311	O N E P L	A N E R E	P O R T E	D L O S T
Y 112	E 212	Q 312	2 2 2)3 1	1 2 2)1 2	3 2 1)3 2	1 1 2)3 3
D 113	F 213	S 313	3)3 1 1)3	2)3 1 2)1	1)3 2 2)1	1)3 3 1)2
R 121	G 221	T 321	3 2)2 1 1)	2 2)2 1 2)	1 3)1 1 2)	3 1)3 3 1)
A 122	J 222	V 322	J S P Z B	A A Q A E	T T V D Y	Y X X M X
U 123	K 223	W 323				
L 131	M 231	X 331				
I 132	N 232	Z 332				
C 133	O 233	. 333				

The multiliteral cipher elements are written as vertical trinomes underneath the plaintext letters, and then these elements are recombined as horizontal trinomes within the periodic grouping, as shown by the parentheses in the illustration above; thus the elements of the first five plaintext letters are read as 222 313 311 332 211, yielding JSPZB as the final cipher. If in the recombination process a 333 is produced, this may either be represented by a 27th cipher character, which is impractical, or else a convention must be agreed upon such as that 332 will always be represented by $\overline{ZA}$ and 333 will always be represented by $\overline{ZB}$; the deciphering clerk will then take the next letter into account upon encountering a Z, before he decomposes this cipher letter.

g. Fractionation may be combined with keyed columnar transposition; such a system was used with considerable success by the German Army in 1917-1918 as its high-command cipher. This system was known to the Allies as the ADFGVX system, because only these letters appeared in the cipher text of the messages. Essentially, it involved a 6x6 bipartite matrix, the coordinates of which were the letters ADFGVX (chosen because their Morse equivalents are easily distinguishable from one another), the interior of

	A	D	F	G	V	X
A	G	7	E	5	R	M
D	A	1	N	Y	B	2
F	C	3	D	4	F	6
G	H	8	I	9	J	ø
V	K	L	O	P	Q	S
X	T	U	V	W	X	Z

Figure 2a.

O	N	E	P	L	A	N	E	R	E
VF	DF	AF	VG	VD	DA	DF	AF	AV	AF
P	O	R	T	E	D	L	O	S	T
VG	VF	AV	XA	AF	FF	VD	VF	VX	XA

Figure 2b.

D	E	U	T	S	C	H	L	A	N	D
3	5	11	10	9	2	6	7	1	8	4
V	F	D	F	A	F	V	G	V	D	D
A	D	F	A	F	A	V	A	F	V	G
V	F	A	V	X	A	A	F	F	F	V
D	V	F	V	X	X	A				

Figure 2c.

the matrix containing a keyword-mixed sequence comprising the 26 letters and 10 digits. The biliteral cipher equivalents from the primary encipherment were inscribed into a rectangular transposition matrix, and the columns were taken off according to the numerical transposition key; this accomplished an effective fractionation of the primary encipherment. In Fig. 2a, above, is shown a sample bipartite matrix; in Fig. 2b, the biliteral encipherment of a message; and in Fig. 2c, the transposition rectangle. The final cipher text, transmitted in groups of five letters, is VFFFA AXVAV...

4. Cipher devices and elementary cryptomechanisms. Simple devices have been used in cryptologic practice which produce periodic polyalphabetic encipherment; we have already seen typical examples of these, such as the primitive disc cipher device described in par. 10, and the rudimentary strip device described in par. 76. There are certain cipher devices, however, which operate in such a manner that periodicity is avoided or suppressed. Among them the most interesting of these are the Wheatstone cipher device, cylindrical cipher devices, and the Kryha machine; these will be discussed in greater detail in the succeeding paragraphs. As a rule, however, cipher devices, by their very nature, can hardly avoid being cyclic in operation, thus causing some kinds of manifestations of periodicity to be exhibited in the cryptograms.

5. The Wheatstone cipher device.--a. This device, invented by Sir Charles Wheatstone[5] in 1867, is a little more than four inches in diameter, and consists of a dial with two hands, as shown in Fig. 3, below:

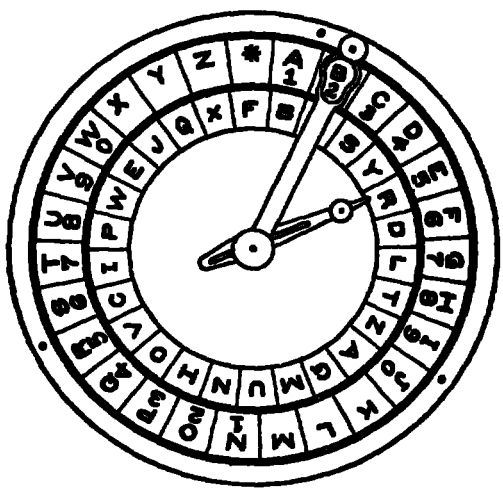


Figure 3.

[5] Credit for the invention of the device and system described in this paragraph belongs not to Sir Charles Wheatstone, as is commonly thought, but to an American, Decius Wadsworth, who in 1817 constructed a device identical in principle with that described on pp. 342-348 of the Scientific Papers of Sir Charles Wheatstone, published by the Physical Society of London in 1879. The Wheatstone device used a 27-element outer alphabet and a 26-element inner alphabet; the Wadsworth device used a 33-element outer alphabet (26 letters and the digits 2-8, inclusive) and a 26-element inner alphabet. Furthermore, whereas in the Wheatstone device only the cipher component could be varied, in the Wadsworth device both components could be varied according to identical or nonidentical mixed sequences. Wadsworth later became Chief of Ordnance of the U. S. Army; Wheatstone, it will be recalled from footnote 11 on p. 138 of Military Cryptanalytics, Part I, was the man who did not invent the Wheatstone bridge.

The dial is composed of two independent circles of letters. In the outer circle, which constitutes the plain component, the letters progress clockwise in normal alphabetic sequence, but there is an extra character between the Z and the A which is used as a word separator, making a total of 27 characters; furthermore, the digits 1-ϕ are inscribed together with the letters A-J and also N-W, for enciphering numbers. In the inner circle, which constitutes the cipher component, the letters are arranged in a mixed sequence and are inscribed either on a surface which permits of erasure, or on a detachable cardboard circle which can be removed and replaced by another circle bearing a different sequence.

b. The two hands are pivoted concentrically, after the fashion of the hour and minute hands of a clock. In a clock, when the minute hand makes a complete revolution, the hour hand makes only 1/12 of a complete revolution; the action in the case of this device, however, is somewhat different. The short hand is free to be set independently of the long one, although the motion of the latter affects the former. Since the outer circle has 27 spaces and the inner one only 26, by a simple gear assembly each complete revolution of the long hand causes the short hand to make 1 1/26 revolutions, thus causing the short hand to point one place in advance of where it pointed at the end of the preceding revolution of the long hand. For example in Fig. 3, when the long hand is over B of the outer circle and the short hand points to R of the inner circle, if the long hand is pushed clockwise around the dial, making a complete revolution, the short hand will also make a complete revolution clockwise plus one space, thus pointing to D.

c. To encipher a message, the long hand and the short hand are first set to prearranged initial positions, or set according to an indicator procedure; furthermore, by previous agreement, the long hand is invariably to be moved in the same direction, usually clockwise. Suppose the message to be enciphered is SEND AMMUNITION. The long hand is moved clockwise until it is directly over S on the outer sequence; the letter to which the short hand points is the cipher equivalent of S and is written down. Then the long hand is moved clockwise to a position over E, and the letter to which the short hand points is noted and written down; the next two letters are enciphered in the same manner. After the encipherment of each word, the long hand is moved clockwise to the asterisk, and the cipher equivalent of this word separator is recorded; when a doubled letter occurs in the plain text, as in the case of the doubled M of AMMUNITION, some infrequently used letter such as Q_p must be substituted for the second occurrence of the letter, and encipherment proceeds as before. To decipher a message, the hands are first set to their prearranged initial position, and then the long hand is moved clockwise until the short hand points to the first cipher letter; the long hand is then directly over the plaintext equivalent. The process is continued until the message is completely deciphered.

d. The same results as are obtained by using the Wheatstone device can be obtained by using sliding alphabet strips, providing that the operator will bear in mind that every time a θ_p on the plain component is situated <u>to the left</u> of the preceding θ_p, he must displace the cipher component

one position to the left, if the correspondents have agreed upon a clockwise movement of the long hand, or the right, if they have agreed upon a counterclockwise movement of the long hand. What makes the Wheatstone device particularly interesting is that the motion of the cipher component is highly irregular and unpredictable, depending as it does upon the plain text being enciphered and upon the arrangement of the letters in the plain component; at the time of its invention, the Wheatstone device was considered by the cryptologic world as "absolutely indecipherable." The student is used to such appraisals by now--the cryptanalysis of this device will be treated in the next text.

6. Cylindrical cipher devices; strip systems.--a. In 1891 the noted French cryptologist Captain Étienne Bazeries invented[6] an ingenious (for its day) cipher device which he called the "cylindrical cryptograph." Bazeries proposed this system to the French General Staff, which turned it down along with previous proposals of his; Bazeries was considerably piqued, and in 1901, now a major, he gave vent to his feelings in his book, "Les Chiffres Secrètes Dévoilés,"[7] in which he described fully his "chiffre indéchiffrable."[8] Because the principle upon which the cipher system is based was first described in print by Bazeries, it is usually referred to in the literature as the Bazeries principle; for the sake of historical accuracy, however, it should properly be called the Jeffersonian principle. The device was independently invented for the third time in 1914 by Captain Parker Hitt, U. S. Army; and since then, it has been invented several more times.

b. Essentially, the Bazeries device, illustrated in Fig. 4, below, consisted of 20 discs mounted on a spindle, each of the discs bearing a different alphabet engraved on its periphery; the discs were indentifiable

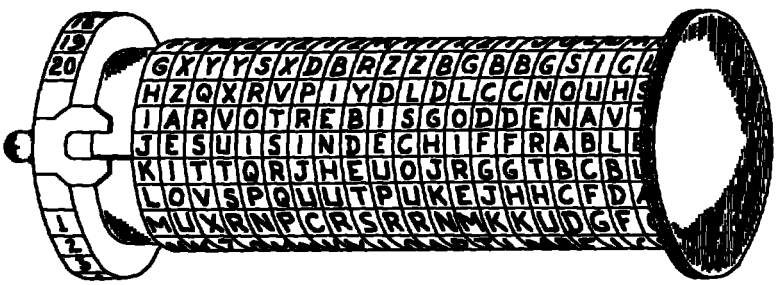


Figure 4.

[6] Credit for the original invention of this cipher device and cryptosystem belongs to Thomas Jefferson after there was discovered, in 1922, a description of the device among Jefferson's papers in the Library of Congress (vol. 232, item 41575, Jefferson's Papers). For a photographic reproduction of this historically interesting item, see pp. 189-191 of Articles on Cryptography and Cryptanalysis Reprinted from The Signal Corps Bulletin, OCSigO, Washington, 1942.

[7] Librairie Charpentier et Fasquelle, Paris, 1901.

[8] Bazeries apparently was not troubled by the fact that a general solution had been arrived at by the Marquis de Viaris and published in the latter's book, L'art de chiffrer et déchiffrer les dépêches secrètes, in 1893. The theory of solution formulated by de Viaris is one of the most brilliant pieces of cryptanalysis in history, considering the state of the art at the time.

by a unique number from 1 to 20 assigned to each disc. In using the device, the discs were first arranged on the spindle according to a predetermined order, and the first 20 letters of the plaintext message were set up in a row across the device. The discs of the device were then locked into position, and the cipher text was obtained by reading off, in groups of five letters, any one of the remaining rows or generatrices. The same treatment was applied to the second, third, ... sets of 20 plaintext letters, until the message was completely enciphered. In decipherment, the 20 discs were first arranged on the spindle according to the specific key, and then the first 20 ciphertext letters were set up in one row on the device; then, by inspection, the deciphering clerk would find the one and only one row of letters that read plain text all the way across, which process would be repeated until the entire message was deciphered.

c. Bazeries' device incorporated 20 systematic 25-letter alphabets, including 14 keyword-mixed sequences, some of which were calculated to appeal to a patriotic Frenchman;[9] Jefferson's device was comprised of 36 discs, on the periphery of each there was to be put "all of the letters of the alphabet, not in their established order, but jumbled & without order so that no two shall be alike"; Hitt's device had 25 discs consisting of systematic arrangements of the vowels and consonants. Captain Hitt brought his device to the attention of Major J. O. Mauborgne, in the Office of the Chief Signal Officer; Major Mauborgne devised 25 very thoroughly disarranged alphabets which augmented considerably the security of the device, and he was the one responsible for the manufacture and production of the U. S. cipher device of 25 aluminum discs, known as the Cipher Device, Type M-94; this was widely employed in the U. S. military services and to a more limited extent in other U. S. services from 1923 until 1942, when it was superseded by better devices.

d. A modification of the Jeffersonian principle which has found merit in practical cryptography is the strip cipher system. This is nothing more than a series of printed, random-alphabet strips to take the place of the discs of a cylindrical cipher device; these strips, bearing identifying numbers, slide freely in a strip board which may be made of metal, wood, or plastic. The strips are simpler to produce and more economical to replace than metal discs; but, most important of all, with the use of strip systems it is possible to incorporate certain simple modifications of the Jeffersonian principle which result in a very considerable augmentation of the security of the system. First of all, in cylindrical cipher devices the number of discs must be limited, for the sake of practicability, and furthermore all n discs (20 in the Bazeries device, 25 in the M-94) are always used together, so that the latent period is always n. But with a strip system, it is possible to employ, say, 100 or more strips in the basic system, and then choose, for example, 30 of these strips for a daily key; furthermore, it is possible to employ a variable keying element for each message, so that several of the 30 strips are eliminated before encryption begins, avoiding the possibility of the encryption of two messages in exactly

[9] Two of these sequences were based on "Allons enfants de la patrie, le jour de gloire est arrivé" and "Dieu protège la France"; a little harder to rationalize were the sequences based on "Evitez les courants d'air" and "J'aime l'oignon frit à l'huile."

the same key, and in general resulting in a flexible latent periodicity of perhaps between 20 and 30. Finally, because of the ease of production of paper strips, it is possible to have different sets of strips for different groups of holders, or for various types of traffic, thus reducing the volume of traffic in any one cryptosystem.

7. The Kryha machine.--a. This machine, invented by Alexander von Kryha in Germany in 1924, is a spring-operated polyalphabetic cipher machine which has as its principle the irregular displacement of two concentric discs which comprise the plain and cipher components. (Actually, the cipher component is a 52-element disc while the plain component is in the shape of a semi-circular frame juxtaposed against the revolving cipher component.) The letters of the two components are printed on small metal tabs which are inserted in slots on the two discs so that the sequence of the letters in the components may be varied according to prearranged keys. The displacement of the alphabets occurring after each encipherment is accomplished through a selector wheel having on its periphery 17 toothed sectors consisting of from one to six teeth each, the sectors being designated by the numbers 1-17. These teeth serve to displace the components a distance equivalent to the number of teeth in the sector; however, owing to the manner of spacing between the toothed portions of the wheel, an additional displacement of four positions is added at each operation of the machine. The selector wheel has the following effective displacements between its 17 numbered positions:

Pos.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1
	7	6	7	5	6	7	6	8	6	10	5	6	5	7	6	5	9	

Since the sum of these displacements is 111 (≡ 7, mod 26), it follows that after a complete revolution of the selector wheel the two components will be displaced 7 positions to the right (measured on the cipher component) from their original juxtaposition; and since this number, 7, is prime to 26, there will be 26 series of 17 displacements each, making the period of the machine 17 x 26 = 442.

b. As an illustration of encipherment, let us assume that the components of the machine have been arranged as follows:

P: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
C: H Y D R A U L I C B E F G J K M N O P Q S T V W X Z

If the initial juxtaposition of the components is that shown above (i.e., in the key of H), the first plaintext letter is enciphered in the H alphabet, and a stepping button is pressed to bring the next alphabet into position. If the setting of the selector wheel was at position 16 at the beginning of the encipherment, the next alphabet to be brought into play will be 5 to the right of the H alphabet (i.e., the U alphabet), and the one after that will be 9 places to the right of the U alphabet (i.e., the K alphabet), and so on.

c. A subsequent model of the Kryha machine incorporated a selector wheel with 52 adjustable screws or "stops," each screw having the function of bringing into play a particular displacement of the alphabets. Any combination of these 52 screws may be used to generate a sequence of successive displacements. The complete cycle of this machine is dependent on the number of stops employed, and is usually equal to 26 times the number of stops selected; the cycle therefore lies between 13 or 26 (when only one stop is used) and 1352 (when all 52 stops are used).[10]

d. The usual claims of indecipherability were of course made by the inventor for this machine--we would be very much surprised if they weren't. The inventor demonstrates "mathematically" that the number of possible keys with his machine is 1.4×10^{64}; this number compares very favorably with the number of atoms in the universe, namely, 3×10^{74}. With this happy note we will go on to the next subject.

8. Code systems.--a. A code system[11] is a more or less highly specialized form of substitution. The basic principle underlying code systems is the replacement of entire words, long phrases, or complete sentences constituting the plain text of a message by arbitrarily selected equivalents having little or no relation to the elements they replace; these equivalents may be other words, groups of letters, groups of figures, or combinations thereof. It is only exceptionally that the replacement or substitution process is applied to elements smaller than whole words, and when this is done the elements are single letters, groups of letters, or syllables. If it were possible to memorize a long list of words, phrases, and sentences, together with the arbitrary equivalents called code groups assigned to represent them, there would be no need of having written or printed code books. In a code book, the words, phrases, and sentences are listed in a systematic manner and accompanied by their code equivalents; correspondents must possess identical copies of the document in order to be able to communicate with one another. An ordinary dictionary may, and often does, serve the purpose of code communication, so far as single words are concerned, but as a rule a specially prepared document containing the words, phrases, and sentences, suited to particular types of correspondence, is used. Such documents are called, in the United States and in Great Britain, code books or simply codes. In other countries they have been called repertories, word books, cipher dictionaries, etc., although the term "code" is becoming prevalent throughout the world.

b. There are various types of codes each suited to particular types of correspondence. Some are large books used for general business or social correspondence; others are intended for particular industries--for example, rubber, sugar, steel, and automobile--and contain highly specialized technical vocabularies. Most large commercial firms have their own private codes, constructed especially for their use. While the resemblances between the

[10] If several stops are used and the sum of the displacements is 13 (mod 26), the length of the cycle will be only twice the number of stops used; if the sum of the stops is 26 or a multiple thereof, the cycle will be equal to the number of stops used.

[11] Cf. subpar. 11d, Military Cryptanalytics, Part I.

ordinary commercial codes and the usual military codes are marked, their primary purposes are different. Code is used in commercial communications principally to effect economy in cost of communicating, secrecy being of secondary importance. In modern military signal communications, code is used to effect secrecy, brevity, and speed, especially in front-line communications. However, in lengthy administrative messages, the economy afforded by a properly constructed code is important.

c. Messages encrypted by means of a code book are secure only when the code book is kept secret. There are, however, code systems in which secrecy is not a factor. Such systems are intended for brevity or, in transmission by commercial telegraph, for economy. Code books afford a means for abbreviating or condensing the writing necessary to convey information. A single, comparatively short group of code characters may represent a whole word of as many as 15 or more letters, a long phrase, or a complete sentence. Thus, as a rule, the text of a code message is much shorter than the plain text, and therefore costs less to send. Naturally, the condensing power of a code book varies with the extensiveness of its vocabulary, since in a small book there can be listed only the most common words and only a few phrases and sentences, whereas in a large book practically all the words likely to be used in telegraphic communication, together with many common phrases and sentences, may be included. When a code book is used to condense text only for purposes of economy, it is called a non-secret code. Examples of such codes are the ordinary commercial codes sold in book stores. A code book may combine the features of economy and secrecy, in which case the book itself must be safeguarded from the enemy as a secret code. In addition to money saving, code systems save time and labor in transmission and reception, as the number of characters handled in code systems is smaller than in cipher systems. The saving of time is an important factor in front-line communications where speed is essential and sometimes outweighs security considerations.

d. In military cryptography, the greatest degree of condensation is afforded by "prearranged-message codes," "brevity codes," and the like. A prearranged-message code is a tactical code adapted to the use of units requiring special or technical vocabularies; it is composed almost exclusively of groups representing complete or nearly complete messages and is intended for shortening messages and concealing their content. A brevity code has for its sole purpose the shortening of messages. A field code is primarily a small tactical code which contains a large number of code groups representing words and a few common short phrases, from which sentences can be composed; a syllabary, which is a list of code groups representing individual letters, combinations of letters, or syllables, is usually provided for spelling out words or proper names, not present in the vocabulary; numerical tables, or lists of code groups representing numbers, dates, and amounts, are also included. A jargon code is another name for a simple, very short code in which bona fide dictionary words, baptismal names of persons, the names of rivers, lakes, etc., are used as code groups. A voice code is used for transmission by the small radio-telephone sets used in combat areas and may be a prearranged-message code, a brevity code, or a jargon code. Other names used to designate small military codes are combat code, and operations code.

e. In encoding a message, a code clerk merely replaces the various words, phrases, sentences, and numbers of plain text by their code equivalents. The code text is built up from code units each representing the longest possible plaintext unit the code book affords. For example, if the sentence ENEMY FORCE ESTIMATED AT ONE BATTALION ENCOUNTERED ONE MILE SOUTHEAST OF GREENVILLE is to be encoded, and the code book lists the phrase ENEMY FORCE ESTIMATED AT, the code group representing this phrase would be used rather than separate code groups representing the individual words ENEMY, FORCE, ESTIMATED, and AT, all of which might also be present in the code. The word GREENVILLE would be encoded by using the equivalent of the word GREEN, followed by the group for the syllable VILLE, or, if this latter is not in the code book, by spelling out VILLE as V-ILL-E or V-IL-LE by means of the syllabary of the code.[12] The process of decoding is the reverse of that of encoding. Each code group is looked up in the code book, its meaning found and written down. Where the errors in transmission are few, the process is rapid; but even a small number of errors in a message may obscure the meaning or render a message unintelligible.

f. The elements of which code groups are composed may be of one or more of the following types:

(1) Bona fide words--real words taken from the dictionaries of one or more languages. The usual languages employed as sources for code words of this type are Dutch, English, French, German, Italian, Latin, Portuguese, and Spanish.

(2) Artificial words--groups of letters having no real meaning, constructed more or less systematically by arrangements of vowels and consonants so as to give these groupings the appearance and pronounceability of bona fide words.

(3) Groups of letters presenting no appearance of bona fide or artificial words and resembling cipher groups.

(4) Groups of arabic figures.

For special purposes, code groups composed of intermixtures of letters and figures within groups may be used. Call signs for radio stations, such as W2KA and W5AZZ, are examples of such intermixtures often used in radio call-sign codes. In certain highly specialized naval or military codes, the intermixture of letters and figures is sometimes necessary. Such intermixtures, however, are either not accepted or, if accepted, are charged for at a greatly increased rate when they appear in messages transmitted by commercial communications agencies.

g. A code may contain two or more parallel sets of code groups of different types. For example, in many commercial codes and in some military and naval codes, there is one series of code groups of the bona fide or

[12] Many codes contain a small block of code groups designated as "supplement groups", the meanings of which are defined in special lists which are effective for specific dates or for specific geographical areas. These supplement groups may contain equivalents for specific names, places, organizations, and the like.

artificial word type and another series of the figure-group type, both applying to the same series of words, phrases, and sentences of the code. There are several reasons for this. In most parts of the world where italic or roman letters are used for writing, letters possess greater advantages in accuracy of reading and handling by telegraph personnel. This is necessary for correct transmission and reception of messages. However, in some parts of the world--for example, Russia and China--telegraph personnel, except in large cities, are unfamiliar with the English alphabet and hence many errors in transmission arise. But arabic digits are almost universally recognized and used, so that for communications between obscure ports and small cities in foreign countries, figure groups are preferred over letter groups. There are certain methods of condensing code groups composed of figures into still smaller groups composed of letters by means of condensers, so that many firms use figure groups for such purposes in expensive transmissions. Finally, in certain methods of enciphering code messages for the sake of greater secrecy, figure groups often form the basis for the encipherment more readily than do letter groups. Prior to 1 January 1934, in practically all modern codes constructed by experts, letter code groups were of the artificial-word type. On that date new rules in international communication became effective,[13] permitting the use of letter code groups without restriction in their formation, as class (3) in subpar. f, above. The majority of the codes published subsequently to the foregoing date contain letter code groups of the unrestricted type.[14]

h. The greatest advantage possessed by letter groups over figure groups lies in the availability of a far greater number of permutations, or interchanges, of letter groups, because there are 26 letters which may be permuted to form letter code groups, whereas there are only 10 digits which may be permuted to form figure groups. If code groups of five elements are used, then there are available 26^5, or 11,881,376 groups of five letters, and only 10^5, or 100,000 groups of five figures. Now since the number of permutations of 26 letters taken in groups of five is so great, only permutations conforming to special types may be selected for use, and there will still remain a sufficient number of code groups for even the largest codes.[15] Certain types of code groups are selected so that possible error in telegraphic transmission can be reduced to a minimum. If the code groups have been constructed scientifically it is possible to correct such errors quickly without having the message repeated.

i. The length of code groups used, whether the groups consist of two, three, four, or five elements, depends upon the size of the code. This applies almost exclusively to field military or naval codes, where transmission is through a governmental agency; in commerical messages or in governmental communications transmitted over privately-operated lines, five-letter or five-figure groups are used almost exclusively because of the

[13] See Telegraph Regulations, International Telecommunication Convention, Madrid, 1932.

[14] For a treatise on the development of codes see "The History of Codes and Code Language, the International Telegraph Regulations pertaining thereto, and the bearing of this history on the Cortina Report," by Major William F. Friedman, Sig. Res., Government Printing Office, 1928.

[15] A real whopper in codes is the Western Union Code, comprising nearly 380,000 groups.

regulations adopted by the International Telegraph Conferences and by commercial telegraph and cable companies. As a general rule in the transmission of code and cipher messages, each group of five letters is counted as one word regardless of the number and arrangement of vowels; each group of five figures is counted as one word.

j. Code groups of modern codes are constructed by use of tables which permit more or less automatic and systematic construction in the form desired. These are called permutation tables. Because they may be used to correct most errors made in transmission or writing, such tables are usually included in the code book and are called mutilation tables, garble tables, error-detector charts, etc. Before the invention of permutation tables, code as a system of communication was not wholly reliable. Scientifically constructed tables, however, include a feature which has remedied this fault to a great extent; this will be discussed in the next paragraph.

k. To make an error in a group of five letters is not unusual on the part of the average telegraph or radio operator. If a difference of only one letter distinguished one code group from another in the same code, as ABABA and ABABE, then serious errors may be introduced in the meaning of a message, or the message may be made unintelligible by only a few transmission errors. If, however, every code group in the code book is distinguished from all other code groups in the same code by a difference of at least two letters, then there would have to be two errors in a single group and these two errors would have to produce a code group actually present in the code before a wrong meaning would be conveyed. This principle of making code groups within the same code differ from each other by a minimum of two letters is called the two-letter differential. It is most easily incorporated in code groups by constructing the permutation table to this end. The differential may be the absolute difference in the identities of two letters or the relative positions occupied by them. For example, BACOF, and BACUG differ from each other in the identities of the final pair of letters; considered as a combination of letters, the two groups present a two-letter difference. The two groups BACOF and BOCAF, however, differ in the relative positions occupied by two of their letters, but considered as a permutation of letters, these two groups as well as the two groups BACOF and BACUG, present a two-letter difference. In short, when at least two corresponding letters in a pair of code groups differ in their identities, the two code groups are said to present a 2-letter difference. Errors arising from the exchange of position of two letters, without a change in their identities, are referred to as errors of transposition. They are not unusual but fortunately, as a rule, they involve only letters which are either adjacent or alternate. For example, in the pair of groups BACOF and BOCAF there is a transposition of the alternate-letter type. In recent codes, attempts have been made to devise permutation tables which will eliminate one of the two members of every pair of groups which differ from each other by the mere transposition of two adjacent or alternate letters. Codes using groups based upon a permutation table will show the table and explain how to use it in correcting the usual mutilations of groups. The use of the two-letter differential reduces the possibilities for constructing letter-code groups from 26^5 to 26^4 (= 456,976), but considering the advantages, the

sacrifice is worthwhile. Permutation tables for the construction of figure-code groups are similar in nature and purpose to tables for the construction of letter-code groups. However, because of the more limited number of characters available for permutations, the maximum number of 2-figure difference groups possible in a 5-figure code is 10^4, or 10,000.

l. In their construction or arrangement, codes are generally of two types:

(1) One-part, or alphabetical codes. The plaintext groups are arranged in alphabetical order accompanied by their code groups in alphabetical or numerical order. Such a code serves for decoding as well as for encoding.

(2) Two-part, or randomized codes. The plaintext groups are arranged in alphabetical order accompanied by their code groups in a nonalphabetical order. The code groups are assigned to the plaintext groups at random by drawing the code groups out of a box in which they have been thoroughly mixed, or by some other manner in which the element of chance operates. Such a list can serve only for encoding. For decoding, another list must be provided in which the code groups are arranged in alphabetical or numerical order and are accompanied by their meanings as given in the encoding section. For this reason a two-part code has often been called a cross-reference code. The following brief extracts from typical one-part and two-part codes illustrate the difference between them:

One-part code	
ABABD	A
ABACF	Abaft
ABAHK	Abandon
ABAJL	....it
ABALN	Abandoned
ABAMP	....by
ABAWZ	Abandoning
ABBAD	Abandonment
.....	.....
.....	.....
ZYZYZ	Zero

Two-part code			
Encoding Section		Decoding Section	
GAJVY	A	ABABD	Obstructed
TOGTY	Abaft	ABACF	Term
FEHIL	Abandon	ABAHK	Zero
BAYLT	....it	ABAJL	If it has not
ZYZYZ	Abandoned	ABALN	To be sent by
NYSYZ	....by	ABAMP	Acceding
IFWUZ	Abandoning	ABAWZ	Building
RUNGO	Abandonment	ABBAD	Do not attempt
.....	.....	.....	.....
.....	.....	.....	.....
ABAHK	Zero	ZYZYZ	Abandoned

Between the two extremes are codes which have features of both; that is, complete sections may be arranged in random sequence, but within each section the contents are arranged in some systematic or logical order. This is true, however, only of some of the older codes. In modern types, the two-part construction is more common.

m. When a strict alphabetic arrangement is used in the sequence of the phrases, the code is said to be a strictly alphabetical code; when the phrases are listed under separate headings based upon the principal word or idea in the whole expression, the code is said to be a caption code. The following extracts will serve to illustrate the two types:

Caption code	Strictly alphabetical
Assistance	Assistance
Give assistance	Assistance for
Require assistance	Assistance from
No assistance required	Assistance has been sent
Assistance has been sent	Assistance to
Assistance for	Assistant
Assistance from	Assisted
Assistance to	* * * * *
Assistant	Give
Assisted	Give assistance
	* * * * *
etc.	No
	No assistance required
	* * * * *
	Require
	Require assistance

More precise and economical encoding is possible with a caption code than with an alphabetical code. With the caption code it is easier to assemble an extended variety of expressions and shades of meaning under specific headings than with the alphabetical code. On the other hand, the use of a caption code involves more time and labor in encoding, especially by untrained or unskilled personnel, than the use of an alphabetical code. Where the phraseology of communication is standardized or stereotypic, the most common expressions may be listed in an alphabetical code as readily as in a caption code. In both types of codes there may be tabulated material, such as tables of numbers, dates, equipment, geographical or personal designations, either forming isolated sections in the code or inserted in the vocabulary under appropriate headings.

n. Two-part codes are used by many governments for their secret diplomatic, military, and naval communications because the advantages they offer over one-part codes are greater than their disadvantages. The disadvantages are: a two-part code is harder to handle than a one-part code because it is at least twice as large in content, since each code group and each plaintext element must appear twice; the cost of printing is approximately double; and the amount of labor in compiling a two-part code is nearly four times greater because of the necessity for preparing the accurate cross-reference arrangement which is its basic principle. On the other hand, the advantages of two-part codes are greater secrecy, and greater accuracy.

o. In a one-part code the plaintext groups progress from A to Z in a regular alphabetical sequence, accompanied by their code groups, also in a regular alphabetical or numerical sequence. If the word ABAFT is represented by a code group whose initial letter is A, or whose initial number is 1, then the word ABANDON will be represented by a group whose initial letter is also A, or whose initial number is also 1. In other words, the enemy cryptanalysts have definite clues to follow in breaking down the code because of the parallelism of the two sequences; the determination of the value of one code group affords definite clues to the value of many other code groups. In a two-part

code, however, the word ABAFT might be represented by a group whose initial letter is T, or whose initial number is 8, and the word ABANDON might be represented by a code group whose initial letter is F, or whose initial number is 3. In other words, the two sequences are not alike in progression; hence the determination of the value of one code group will give no clues to the value of any other group.

p. In considering the greater accuracy of a two-part code over a one-part code, the following pair of phrases (in a hypothetical one-part code) are given as an example:

WOVAM	Will be ready to attack
WOVEN	Will not be ready to attack

Such an arrangement is subject to two sources of error. A code clerk working under great difficulties, in a hurry, may accidentally write down WOVAM instead of WOVEN as a result of the contiguity of the two sets of letters which are similar in appearance and are so close together on the page that his eye may take the group from the wrong line. Again, on account of the similarity in sound, his ear may deceive him into writing WOVEN when he should have written WOVAM. Now the meaning of the one group is the exact opposite of the meaning of the other and, since either meaning may fit in correctly with the context of the message, the error may remain undiscovered for some time, thus causing serious inconvenience or, in the case of combat, actual loss of life. Furthermore, although the making of two errors in a single group is rather unusual in transmission or reception, nevertheless it does happen and, in such a case as the above, would not be detected. This is especially true in connection with tabular material such as lists of numbers, dates, and names, in which the context often fails to yield clues to the correction of garbles or errors, or to give conclusive evidence of the presence of an error. But in a two-part code such errors are improbable. In the first source of error mentioned above, the clerk would be very much less likely to confuse two entirely different groups of letters; in the second source, if two errors are made in the transmission or reception, and if these errors involve two letters producing a group which actually has a meaning in the code, this meaning is so unlikely to fit in correctly with the context that its probability of occurrence may be negligible. Thus, if this sort of error does happen, the meaning of the group fails to fit in with the context and at once indicates an error. Knowledge of such an error, even if it is impossible to correct it, is more preferable than ignorance of its existence, with a possible action based upon incorrect decodement.

q. The following are some closing observations on the subject of codes and code systems:

(1) In commercial code messages there is sometimes encountered the practice of mixing plain text and code text; in governmental code messages, military or diplomatic, such intermixtures are today so rare that their presence in telegrams indicates abysmal ignorance of some of the fundamental rules of cryptographic security. Because the plaintext words give

definite clues to the meaning of the adjacent code groups, even though the former may apparently convey no intelligibility in themselves (such words as and, but, by, comma, for, in, period, stop, that, the, etc.) their presence constitutes a fatal danger, and no cryptographer who is aware of this danger will countenance such intermixtures.

(2) It often happens that correspondents employ a code which makes no provision for encoding proper names or unusual words not included in the vocabulary of the code book. Rather than leave the unencodable text in plain language in the message, since its appearance will surely lead to clues to unauthorized reading of the message, the correspondents encipher such words and proper names by means of any prearranged cipher system. Also, in some cases, when the code is limited in its vocabulary and the various inflections of words are not represented, the correspondents may suffix the proper inflections ("ed," "ing," "tion," etc.) in cipher. This procedure, however, is not to be recommended, because it considerably reduces the cryptographic security of the whole system.

(3) Sometimes correspondents make use of two or more codes within the same message. This is occasionally the case when they are making use of a general or commercial code which does not have all the special expressions necessary for their business, the latter expressions being contained in a small private code. Sometimes, however, the intermixture of code text from several codes is done for the purposes of secrecy, though it is, as a rule, a rather poor subterfuge.

9. Enciphered code systems.--a. Sometimes the code groups of a code message undergo a further process of encipherment; the resulting cryptogram constitutes an enciphered code message. Both of the two general classes of cipher methods, transposition and substitution, may be used in enciphering code. Enciphered code is used under the following circumstances:

(1) When the basic code has had wide distribution and the code might fall into unauthorized hands. Commercial codes sold in bookstores, and even special codes distributed widely throughout governmental offices, illustrate the types of codes to which this added safety factor should be applied.

(2) When increased security is necessary for highly classified communications. Although the basic code book may already be secret, further encipherment would greatly delay the solution of the code if it fell into the hands of enemy cryptanalysts.

b. Transposition methods wherein whole code groups or series of them are shifted about according to some key are not frequently encountered; transposition methods applied strictly within the code groups, by rearranging or shifting about the letters or figures composing them, have occasionally been used. One of the most commonly used transposition methods for the encipherment of code is keyed columnar transposition, either with special matrices, designs, or forms having nulls or blanks, or without these features. Transposition encipherments of code, however, are very subject to error and require high-grade personnel for their practical operation. They

are, of course, wholly unsuited for practical military usage, though they can be employed for other purposes. Solution of such systems can be a very difficult matter indeed, especially if the basic code book is not known.

c. All of the methods of substitution applicable in the case of cipher systems may be used for the encipherment of code, ranging from simple monoalphabetic methods to the most complex polyalphabetic methods, including machine encipherment. Digraphic methods may also be used; combinations of digraphic and monographic methods are frequently encountered. A favorite method in one-part codes having both letter-code and figure-code groups is that in which the letter-code group standing at a prearranged interval before or after the letter-code group representing the actual word or phrase intended to be conveyed is substituted. The interval may remain fixed within a single message, or it may vary according to some predetermined key; numerical code groups make the use of large intervals practicable. This method, with modifications, has also been used for the encipherment of two-part codes.

d. Substitution tables of various sorts are often employed. For example, using a table applicable to code groups of 5 figures, a table giving pronounceable combinations of letters for the combinations of digits may result in converting a group such as 75152 into the letter group KOBAL. Tables for substituting combinations of letters into other combinations of letters are equally feasible. The substitution may be strictly digraphic, combining two 5-letter or 5-figure groups into a series of 10 digraphs; or it may be a combination of trigraphic and digraphic substitution, each 5-character group being split up into a 3-character and a 2-character combination. Other combinations are, of course, also possible. In all of the foregoing methods the chief objection is that the advantage of the 2-letter differential feature is more or less dissipated by the encipherment, but this is true of almost every substitutive method that is superimposed on code; this disadvantage is absent in those cases in which the encipherment operates merely to substitute other code groups of the same book for the message code groups. The most common methods of this type make use of the figure-code groups, the latter being manipulated in various ways to change them and the resulting groups then being given their letter-code equivalents.

e. The most important of the various methods of enciphering code are arithmetical methods, which will now be discussed. If the code groups are numerical, the addition (usually mod 10) of an arbitrarily selected number to each code group in the code message constitutes a simple form of encipherment. It may be varied by prearrangement between correspondents, simply by changing the fixed number as frequently as may be deemed necessary, or by some easily arranged system of change. The group of digits composing the number which is added to the plain code values is commonly termed an additive group, or, more often, an additive, or sometimes simply an adder. In decipherment, the additive is merely removed from the received enciphered code groups by subtraction, leaving the plain code groups, which can then be decoded by reference to the code book. Often the date or some number derivable from the date is employed as the additive but usually the number

is simply an arbitrarily composed group of digits. Because the same number is employed throughout the encipherment of the entire code message, such an additive is called a fixed additive.

f. Methods such as the foregoing are particularly weak cryptographically if the basic code book and the code groups embody limitations in construction. For example, should it be employed in connection with a code having only 3000 groups numbered consecutively from 0000 to 2999, then the initial digits of the groups are limited to the three digits 0, 1, and 2; the application of a fixed additive can therefore produce only three different digits as the initial digits of the enciphered code text. This phenomenon would, of course, quickly lead to the determination of the initial digits of the plain code groups. One rather simple scheme involving the use of fixed additives in the case of codes having alphabetical as well as numerical code groups is to apply the fixed additive to the numerical code groups representing the plaintext words or phrases and then take the alphabetical code groups corresponding to the sums as the final enciphered code groups. In codes of this type, the additives may be rather large numbers and the process of finding the alphabetical code groups corresponding to the sums is very easy. But in codes wherein only alphabetical code groups are listed, that is, no figure-code or numerical groups are also given, the additives employed must naturally be rather small numbers. It would be extremely laborious to count 573 groups forward, for example. In cases such as these, additives limited to numbers from 1 to 20 or 30 are common.

g. Instead of adding a fixed number in encipherment, the latter may be subtracted, in which case, in decipherment, the fixed number must be added to the enciphered code groups as received. Such a group may be termed a subtractive group, or subtractor, because subtraction is the process used in encipherment; in decipherment the group becomes, of course, an additive. A third method involves the subtraction of the plain code group from the key to yield the enciphered code group in encipherment, and the subtraction of the enciphered code group from the key to yield the plain code group in decipherment; this method, known as the minuend method, is quite prevalent in cryptographic practice. Addition and subtraction of a fixed numerical group may be alternated within the same message, according to some simple subsidiary key; for example, a series of additive groups corresponding to the keyword BAD might, by prearrangement, consist of the numbers 200, 100, 400. These might be used in repetitive manner, or the correspondents might agree to use these key numbers alternatively in additive and subtractive manner, such as +200, -100, +400, -200, +100, -400, +200, -100, +400, etc.

h. Instead of a fixed additive, it is possible to employ a sequence of digits used in the manner of a repeating key for addition or subtraction, the sequence being agreed upon in advance or derivable from a literal key, etc. If a 9-digit key were employed in conjunction with 4-digit code groups, the keying cycle would repeat after the encryption of 9 code groups. If, however, the key were composed of 10 digits, then the keying cycle would repeat after only five code groups, since the common factor 2 cuts the potential keying length in half; and if a 12-digit key were employed, the keying

cycle would repeat after three code groups, because of the common factor 4 between the numbers 12 and 4.

i. When special tables are employed as the source of the additives or subtractors for enciphering code, a much more secure system is provided. The tables may be contained in a book or document called a key book, an additive book, or a subtractor book. On each page of such a book, groups of numbers are regularly disposed in rows and columns on the page. By applying identifying symbols called indicators to the pages, as well as to the rows and the columns on each page of the key book, it is possible to provide for the safe encipherment of a large volume of traffic. All correspondents must, of course, be provided with the same basic code book and the same key book. In employing the key book, the indicators tell the recipient of a message what key groups were used; that is, where to begin in the decipherment of the enciphered code. A page from a typical key book of this sort is shown in Fig. 5; this figure contains two sets of 100 4-digit key groups, disposed in numbered blocks each containing 10 rows and 10 columns of groups. To designate a group as the initial one to be employed in encipherment or decipherment, it is merely necessary to give the block number, the row number and the column number of the group. For example, 0116 is the indicator for the group 8790.[16] It is usual to take the successive groups in the normal order of reading, that is, from left to right and from the top downwards, although any other order of reading may be agreed upon between correspondents. The book from which this example was taken consisted of 50 pages each containing 200 groups, making 10,000 in all. The groups themselves, of course, consist merely of digits selected at random when the key book is in preparation.

j. If a key book for an additive or a subtractor system is used once and only once, security of an absolute order is imparted to the messages even if the basic code book is known to and possessed by the enemy. It is not even necessary to use indicators except where a question may arise as to the serial order of one of two or more messages arriving at about the same time. In such a case the system is referred to as a one-time system and the key book is called a one-time pad because the pages are usually fastened securely in the form of a tablet or pad and are destroyed as soon as it is certain that the recipient of a message has properly deciphered and decoded it. The disadvantages of such a system are two in number, both very serious. In the first place the production and distribution of the pads present very difficult problems in composition, printing, assembly of sheets, etc. For voluminous correspondence many pads are necessary and the mere question of the production, timely distribution, and proper safekeeping of the pads is a serious one. In the second place, a system such as this is suitable for only two correspondents and even in this case there usually must be two pads, one for incoming, the other for outgoing messages, otherwise it will occasionally or frequently happen that both correspondents will use the same series of additives or subtractors.

[16] In actual practice, indicators are often disguised or encrypted by a special key or set of keys; this procedure adds considerably to the security of the system.

BLOCK 00

	1	2	3	4	5	6	7	8	9	0
1	0378	9197	3260	3607	2699	9053	9733	1844	6622	4213
2	7185	0135	6091	2387	4957	3113	7284	0750	3501	1945
3	5037	3365	1294	8261	2149	0718	3678	2510	7238	5268
4	8004	5199	3859	1293	5311	3550	9915	0512	1518	3776
5	9282	6893	4229	9736	0927	1418	1930	9864	0090	8974
6	7259	9399	0769	3144	9801	1378	4732	5134	1435	5282
7	2878	9963	7943	4519	3404	9810	0190	4467	7069	5348
8	1620	5879	0218	1064	9560	5732	6661	0883	1883	2619
9	3868	1905	2500	6654	0824	3710	3875	6332	1503	7259
0	4319	3298	7819	8721	1549	6630	6301	5701	3586	1907

BLOCK 01

	1	2	3	4	5	6	7	8	9	0
1	9328	1135	3871	1549	0839	8790	1771	8251	3274	1173
2	2297	9550	5033	0102	6817	5597	0847	4038	1200	2949
3	3640	3984	3299	1181	3811	8844	2500	4557	4133	0487
4	1456	9614	5520	8372	1941	2417	1098	4039	3943	8282
5	1751	4254	8479	8647	2684	5511	8680	4660	3858	4266
6	3643	0445	4673	6178	5250	4310	9580	0481	1005	4100
7	5875	0710	7652	5415	6851	6001	9668	2109	8471	3276
8	4555	9772	0128	2171	6835	3142	9514	1478	9746	7625
9	0183	2959	3757	7481	4398	4586	8143	8049	7478	8417
0	5072	4405	4128	9068	5023	4374	7741	6373	9454	7733

Figure 5.

k. The foregoing difficulties make it desirable to modify the system so that while its security may not be absolute it can be employed by a larger number of correspondents, cutting down on the number of pads required and permitting of intercommunication among all correspondents. For such use, indicators are absolutely essential in order to facilitate the prompt decipherment of messages received from several different correspondents. The security of a scheme such as the foregoing is dependent upon the manner in which the indicators are treated in the enciphering processes. If the indicators are given in clear, that is, without disguise of one sort or another, it becomes possible to study a series of enciphered code messages and perhaps to solve them, even without possession of the code. On the other hand, if the indicators are themselves disguised by enciphering them according to a well-designed method, the system as a whole becomes very secure and may, indeed, be made impregnable against attack for a very long time.

l. It can be perceived by this time that the foregoing arithmetical methods are, in reality, substitution methods. Where a fixed group is added or subtracted from the plain code group this is easy to see. For example, if the fixed additive is 3089 and the plain code group is 8752, the enciphered code group is 1731. This is the same as saying that a 4-alphabet system is involved, and the alphabets are as follows:

Plain code.....		1	2	3	4	5	6	7	8	9	0	
Alphabet No.	1	4	5	6	7	8	9	0	1	2	3	"Cipher"
	2	1	2	3	4	5	6	7	8	9	0	
	3	9	0	1	2	3	4	5	6	7	8	
	4	0	1	2	3	4	5	6	7	8	9	

Note that merely a simple cyclic displacement of values is involved in the process, the amount of displacement being governed by the particular digit in each position of the additive group. What this amount to, in cryptographic terms, is a four-alphabet encipherment using direct standard alphabets, where the "normal alphabet" is 1 2 3 4 5 6 7 8 9 0. The process could be made more difficult by employing "mixed alphabets" of course, but then the feature of speed, which is now possible (in view of early training in addition, whereby the mental arithmetic involved becomes second nature), would be lost, since constant reference would have to be made to enciphering and deciphering tables.

m. It becomes clear that when a series of different additives or subtractors is used, as when a key book is employed, then the number of alphabets involved corresponds to the number of digits employed. Thus, despite the fact that the encipherment process is here one that involves merely the numerical equivalents of direct standard alphabets, the system can have great cryptographic security, depending upon (1) how long the keying sequence is, that is, the number of groups comprising the additive or subtractor series; (2) the composition of this keying sequence, that is, whether it consists of random digits or is systematic in its construction; and (3) whether this sequence or parts of it are used only once or several times.

The last-mentioned factor is the most important of the three, for if the keying sequence or parts of it are used but once or a very limited number of times, say 2 or 3, its recovery by cryptanalytic processes is difficult or impossible and therefore even if the sequence is systematic in its construction, this fact might not become known. However, as a rule the additives or subtractors are merely digits selected by a purely random means, such as drawing them out of a box, or equivalent means. The length of the sequence is guided only by the amount of traffic to be enciphered; for a voluminous traffic, key books containing thousands of groups are necessary, even with a good indicator system, and even then the key books must be changed at frequent intervals.

n. Arithmetical methods are favored above most other methods of encipherment of code because of their simplicity and relatively better speed of operation than in the case of alphabetical methods. The speed factor is, of course, attributable to the fact that practically everybody can add (or subtract) rapidly and accurately when single digits are involved, and although very similar processes could be applied in cryptographic processes involving letters of the alphabet, the operations of addition or subtraction would proceed very much more slowly because early training does not devote any time to arithmetical processes involving letters. For example, every child learns that "8 plus 5 equals 13" but none learns that "H plus E equals M." However, these arithmetical methods have two serious disadvantages. First, there is the disadvantage that the final enciphered code text is composed of numbers. The latter are not only more subject to errors in telegraphic handling than are letters, but also it is more difficult to correct garbled groups when figures are involved than when letters are involved. These disadvantages are, it must be admitted, more serious in American practice, when emphasis in training is laid upon the telegraphic transmission of letters and not figures, than they are in other practices; they may not hold in regard to countries where the emphasis in training is in the other direction, figures being preferred to letters. Second, the physical procedures involved in the preparation, reproduction, distribution, and accounting of the necessary key books of additives and subtractors are tedious, costly, and time consuming. Where provision must be made for voluminous intercommunication among many units and for relatively long periods of time, these matters constitute a difficult if not impossible problem for the compiling agency.

10. Machine cipher systems.--a. Cryptographic principles or methods which are too complicated for hand operation may nonetheless be readily mechanized and become highly practical. Electrical and electromechanical cipher machines have been developed which are capable of producing cryptograms of great complexity; these cipher machines are to be differentiated from cipher devices, which latter are relatively simple mechanical contrivances for encipherment and decipherment, usually hand-operated or manipulated by the fingers, such as sliding strips or rotating discs.

b. Machine cipher systems may be classed into two broad categories of systems: (1) literal systems, in which the plaintext and ciphertext symbols produced or accepted are the normal alphabetical characters and digits;

and (2) nonliteral systems, designed for the transmission of data in which the symbols or signals produced or accepted are other than the normal alphabet and digits (e.g., teleprinter, ciphony, cifax, civision, etc.). Furthermore, literal cipher machines may be divided into the general classes of key generators and alphabet generators, or a combination of the two; nonliteral machines are almost always of the key generator class.

c. Transposition cipher machines are rarely encountered; the files of United States patents disclose but two examples and so far as is known no actual machines have been constructed conforming to the specifications covered therein. Since substitution methods lend themselves so much more readily to automatic encipherment than do transposition methods, the possibilities for the construction of cipher machines for effecting transpositions are almost completely overlooked. Basically it would seem that a machine for effecting transposition would have to include some means for storing up the letters until all the plain text has been fed into the machine, whereupon the transposing process is begun and the letters are finally brought out in what externally appears to be a randomized order. It is conceivable that a machine might be devised in which the disarrangement of the letters is a function merely of the number of letters comprising the message;[17] daily changes in the randomizing machinery could be provided for by resetting the elements controlling the process.

d. The substitution principle lends itself ideally to mechanization by cipher machines; these cipher machines range from the most primitive types which afford only a monoalphabetic substitution to very complex types in which the number of alphabets and the length of the keying cycle run into the millions. Little need be said of those machines in which the ordinary keys of the keyboard are merely covered with removable caps bearing other letters or characters (such "machines" have actually been patented!). Even when the mechanism is such that a whole series of alphabets can be brought into play, if the encipherment is monoalphabetic for a succession of 20 or more letters before the alphabet changes, the degree of cryptosecurity is relatively low, especially if the various alphabets are interrelated as a result of their derivation from a limited number of primary components. In some cipher machines on the commercial market the number of secondary alphabets is quite limited, but the method of their employment, or rather the manner in which the mechanism operates to bring the cipher alphabets into play is so ingenious that the solution of cryptograms produced by means of the machine is exceedingly difficult. This point should be clearly recognized and understood: other things being equal, the manner of shifting about or varying the cipher alphabets contributes more to cryptosecurity than does the number of alphabets involved, or their type. For example, it is quite possible to employ 26 direct standard alphabets in such an irregular sequence as to yield greater security than is afforded by the use of 1,000 or more different random-mixed alphabets in a regular or an easily ascertained method. The importance of this point is not always recognized by inventors.

[17] A further variable would have to be introduced in cases such as these, to avoid or eliminate the possibility of producing two or more messages of exactly the same length in exactly the same key.

e. In the following paragraphs we will discuss the Hagelin C-38 cipher machine as a typical key generator, wired-rotor machines as typical alphabet generators, the B-211 cipher machine as a typical fractionating machine, three machines which are representative of typical cipher teleprinters, and we will discuss the principal notions involved in the encryption of speech, facsimile, and television signals.

11. The Hagelin machine, type C-38.--a. This machine, one of an array of ingenious machines invented and manufactured by a Swedish engineer with the resounding name of Boris Caesar Wilhelm Hagelin, is a small, compact, hand-operated, tape-printing, mechanical cipher machine, weighing 6 pounds, with dimensions $7\frac{1}{8}$" x $5\frac{1}{2}$" x $3\frac{1}{2}$". The cryptographic principle embodies poly-alphabetic substitution, employing a complex mechanical arrangement to generate a long running key which is used in conjunction with reversed standard alphabets for the primary components. In encipherment, the machine effectively subtracts (mod 26) each θ_p from the key to yield the θ_c, and subtracts each θ_c from the key to yield the θ_p;[18] because of this, the C-38 and machines of similar genre have sometimes been called "letter subtractor machines."

b. The C-38 has six wheels or rotors of identical diameters; these wheels are so constructed as to have individual periods of 26, 25, 23, 21, 19, and 17. Equidistant around the peripheries of the wheels are engraved the following sequences of letters:

Rotor I or "26 wheel":	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Rotor II or "25 wheel":	ABCDEFGHIJKLMNOPQRSTUVXYZ
Rotor III or "23 wheel":	ABCDEFGHIJKLMNOPQRSTUVX
Rotor IV or "21 wheel":	ABCDEFGHIJKLMNOPQRSTU
Rotor V or "19 wheel":	ABCDEFGHIJKLMNOPQRS
Rotor VI or "17 wheel":	ABCDEFGHIJKLMNOPQ

At each lettered position there is associated a small pin near the edge of the wheel, which pin may be pushed to the left (or "inactive" position) or to the right (or "active" position). The six wheels[19] of the C-38 move one step with each encipherment or decipherment; if they are initially aligned at AAAAAA, the second alignment will be BBBBBB, the 18th will be RRRRRA, and the 27th will be ABDFHJ. Since the wheels are relatively prime to each other, the cycle of the machine will be the product (26x25x23x21x19x17) or 101,405,850; in other words, the wheels will not return to their initial position until after this number of letters has been enciphered.

c. Just behind the six wheels is a revolving drum something like a squirrel-cage, composed of two circular retaining plates holding 27 horizontal bars,[20] on each of which are two lugs,[21] one or both of which may be

[18] The machine actually adds the key to the complements of the plain or of the cipher.

[19] The formal name of these wheels is "variable pin rotors," to distinguish them from "fixed pin rotors" used in some types of cipher machines, and from "wired rotors" used in electrical cipher machines.

[20] The retaining plates actually have 29 slots, and some models of the C-38 have been equipped with 29 bars.

[21] Some models of these machines were equipped with only one movable lug on each bar, other models have been made which had one lug, permanently fixed, on each bar.

set at six effective positions (corresponding to the six wheels) on the bar, or to neutral positions. The pins, when in the "active" position on a specific wheel, serve to engage those lugs which have been set opposite that wheel,[22] causing the particular bars to be displaced slightly to the left; these displaced bars act as teeth of a gear wheel, displacing the reversed standard alphabets[23] a corresponding number of positions. The number of lugs in the path of a particular wheel is known as the "kick" of that wheel; the total kick or key is the sum of all the kicks contributed at a given position of the six key wheels, as governed by those key-wheel levers which are in a position to contact the lugs on the drum. When both lugs on a bar have been set to effective positions, the activity of either one or both of the wheels involved will still contribute only one kick for that bar, since the bar acts as one tooth of a gear. This situation is known as the "double lug effect," and the amount of the "overlap" (i.e., the number of displaced bars having two effective lugs) must be subtracted from the total number of lugs actuated at a given setting to ascertain the actual total key; for example, if wheels with kicks of 1, 4, and 7 are the only ones at a given position with effective kicks, and if among the bars displaced there is an overlap of 2, the total key is $(1 + 4 + 7) - 2 = 10$.

d. The encipherment (or decipherment) of a letter is accomplished by obtaining the sum (mod 26) of the key and the complement of the letter. For example, assuming the juxtaposition of the reversed standard alphabets to be fixed as

(P): ZYXWVUTSRQPONMLKJIHGFEDCBA
(C): ABCDEFGHIJKLMNOPQRSTUVWXYZ

if R_p is enciphered at a setting of the machine where the total key is 5, the cipher equivalent is N_c, measured 5 intervals to the right of the complement, I; if the key were 6, E_p would be enciphered as B_c; etc.[24] The relative juxtaposition of the reversed standard alphabets may be varied by what is known as the slide, which has the effect of adding a constant to all the elements of key being generated by the machine.[25] In the example above, the slide was really A = Z ($= \emptyset$, mod 26). If instead of $K - P = C$ we express the Hagelin formula as $\overline{P} + (K + S) = C$, where $\overline{P}$ is the complement[26] of the plain and S is the slide, and if we use the mod 26 scale

[22] In actuality, the activity of the pins (at a sensing or "reading" position) is transmitted to key-wheel levers behind each wheel. A lever which is pushed back engages the lugs in that wheel position and causes the bars to move to the left; a lever in the forward position does not come into contact with the lugs. (If Rotors I-VI are aligned at the apparent or "window" setting of AAAAAA on the bench mark, the effective positions of the six wheels will be at PONMLK.)

[23] The alphabets comprise the indicating disk (for setting the plain or the cipher) and the type wheel, which prints the enciphered or deciphered letters.

[24] It will be noted that in the operation of the C-38, the kick imparted to the type wheel is in the order of the ascending alphabet, whereas the sequence on the indicating disk moves in the reverse direction.

[25] The slide is brought about mechanically by adjusting the relative displacement of the type wheel and the indicating disk.

[26] The complement of a number a, mod m, is m-a.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	∅

it can be seen that if R_p is enciphered with a kick of 7 and a slide of 22, then

$$\overline{R}_p + (7 + 22) = (26 - 18) + (7 + 22) = 37 \ (\equiv 11, \text{ mod } 26) = K_c;$$

likewise, if E_p is enciphered with a kick of 9 and a slide of 22, then

$$\overline{E}_p + (9 + 22) = (26 - 5) + (9 + 22) = 52 \ (\equiv \emptyset, \text{ mod } 26) = Z_c.$$

Since the C-38 employs reciprocal alphabets, the operations of encipherment and decipherment are complementary; therefore the decipherment formula is $\overline{C} + (K + S) = P$, as is shown by the example

$$\overline{K}_c + (7 + 22) = (26 - 11) + (7 + 22) = 44 \ (\equiv 18, \text{ mod } 26) = R_p.$$

e. As an illustration of the generation of key in the C-38, let us assume that the six wheels have the following pattern of active (x) pins and inactive (·) pins:

Rotor I:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
	·	·	x	x	x	·	x	·	x	·	x	·	·	·	x	x	·	x	x	x	x	·	·	x	·	x
Rotor II:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X	Y	Z	
	·	x	·	x	·	x	·	·	x	·	x	·	·	·	·	x	x	x	x	·	x	x	x	x	·	
Rotor III:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X			
	·	x	·	x	x	·	x	·	·	x	·	·	x	x	x	x	·	x	·	x	·	x	x			
Rotor IV:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U					
	x	x	·	x	·	x	·	x	·	x	x	x	·	·	·	·	x	·	·	·	x					
Rotor V:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S							
	·	·	x	x	x	x	·	x	·	x	·	·	x	·	·	·	x	x	x							
Rotor VI:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q									
	x	·	·	x	x	x	x	·	·	·	x	·	·	·	x	·	x									

Let us also assume that the lugs have been set up against their respective wheels as shown below (with the overlap distributed as is indicated by the brackets):

I	II	III	IV	V	VI
	⌜2⌝	⌜ 1		⌝	
8	9	4	1	6	2

The sum of the kicks of the individual wheels is 30; this number minus the three overlaps shows that 27 bars have been used. (With this particular overlap pattern, when wheels I and II are effective, their combined kick is 15; when II and V are effective, their combined kick is 14; and when wheels I, II, and V are effective, their combined kick is 20.) If the rotors are aligned so that the effective setting is at HHGNKF,[27] and if the slide is ∅ (i.e., the indicating and print wheels are set at A = Z),[28] the generation of the first 30 key elements is shown in the following diagram:[29]

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2	I	·	8	·	8	·	·	·	8	8	·	8	8	8	8	·	·	8	·	8	·	·	8	8	8	·	8	]	·	8	·	8
	II	·	9	·	9	·	·	·	·	9	9	9	9	·	9	9	9	9	·	·	9	·	9	·	9	·	]	·	9	·	9	·
1	III	4	·	·	4	·	·	4	4	4	4	·	4	·	4	·	4	4	·	4	·	4	4	·	]	4	·	·	4	·	·	4
	IV	·	·	·	1	·	·	·	1	1	1	·	1	·	1	·	1	·	1	1	1	·	]	·	·	·	1	·	·	·	1	1
	V	·	·	6	·	·	·	6	6	6	·	·	6	6	6	6	·	6	·	6	]	·	·	6	·	·	·	6	6	6	·	·
	VI	2	2	·	·	·	2	·	·	·	2	·	2	2	·	·	2	2	]	2	2	·	·	·	2	·	·	·	2	·	2	2
Total key:		6	17	6	20	0	2	10	19	25	16	15	27	16	25	14	16	26	3	21	10	4	24	10	19	1	14	20	14	12	15

If the first word of a message was ADVANCE, it would be enciphered as EMJSLYE with the keys 6 17 6 20 0 2 10. Note, in the diagram above, that the key of 26 in col. 17 is equivalent to ∅, and that the key of 27 in col. 12 is equivalent to 1. Also note that there are several ways to obtain certain keys, such as a key of 10 in cols. 7, 20, and 23.[30] As an exercise in decipherment, let the student recover the plain text from the following cipher which was encrypted with the keys above, and continuing for a total of 50 key elements:

E M J S L Y E S E A O K H X U K Z Q L V Y X C A V I F N K A
G J L Y U G Z N K H V S P K U O K S A B

f. The following are the detailed steps performed in the encipherment of a message with the C-38.

(1) First of all, of course, the pins and lugs are set up according to the key for the particular date. A slide is selected (either at random or according to a prearranged key) and is set on the machine. An initial

[27] The apparent setting in this case would be SSQBSM (cf. footnote 22).

[28] If the slide were any value but ∅, the total key would be increased by a constant equal to the amount of the slide.

[29] The brackets in the individual key streams mark the cycles of the respective key wheels in terms of the initial alignment.

[30] There are 64 possible combinations of six things taken from 0 to 6 at a time, and since there are only 26 different displacements possible of the primary components, there is of necessity a considerable duplication of key elements. With this particular lug arrangement, there are 7 key values (2, 3, 4, 5, 23, 24, 25) that can occur in only one way (considering that 26 = 0 and 27 = 1), 6 key values that can occur in two ways, 8 key values that can occur in three ways, 4 key values that can occur in four ways, and 1 key value (15) that can occur in five ways. With some lug arrangements, certain key values might be impossible to produce.

message rotor alignment is selected, usually at random, and recorded for future reference; this initial alignment, together with the slide used for the message, will be incorporated in the indicator groups which are usually placed at the beginning of the final cryptogram.[31] The letter counter is reset to zero, and a small encipher-decipher knob is set to the "C" position. The machine is now ready for encipherment of the message.

(2) The first letter of the message plain text is now set on the indicating disk against a bench mark, and the drive knob is given a clockwise turn. This causes the drum to make a complete revolution, imparting a kick to the print-wheel assembly equal to the number of bars which have been displaced by the action of the pins against the key-wheel levers, and the enciphered letter is printed on the tape at the end of the operating cycle.[32] The six key wheels have moved one step each during the process, and new pins have come into contact with the key-wheel levers to set up the key for the encipherment of the next letter.

(3) The succeeding plaintext letters are treated in the same fashion, with the proviso that at the end of every word a fixed letter (usually Z or K, depending upon the construction of the machine) is enciphered as a word separator. After the encipherment of every fifth letter (if the counter had originally been set back to zero, or for that matter to any multiple of 5), the machine will cause the tape to advance an extra space, so that the final cipher text will be printed in 5-letter groups, ready for transmission.

(4) In decipherment, the pins and lugs of the machine are first set up according to the key, and the slide and the message rotor alignment for the particular message are established from the indicators. The encipher-decipher knob is set to the "D" position, and the first letter of the cipher message is set on the indicating disk against the bench mark; when the drive knob is operated, the decipherment will be printed on the tape. When the encipher-decipher knob is set to "D", it engages a contrivance which suppresses in decipherment the printing of Z_p (or, in other models of the machine, K_p); since the letter Z_p was enciphered at the end of every word in the original plaintext message, the suppression of printing of this Z_p results in the deciphered plain text being printed on the tape in word lengths.[33]

g. Now that the student has gained a knowledge of the cryptographic principles and of the mechanical aspects of the C-38, he is in a position to peruse the illustration of the machine in Fig. 6 with more understanding.

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[31] These indicator groups are usually not sent in the clear, but instead are encrypted either by means of special indicator enciphering tables, or by means of the machine itself.

[32] In case the tape is exhausted, the enciphered result may be read on the reproducing disk which moves together with the type wheel.

[33] Words which contain a Z, such as ZERO and ORGANIZATION, are sometimes spelled with an X in place of the Z (such as in XERO and ORGANIXATION) before encipherment, for the sake of ease in reading the text when it is deciphered.

The machine is shown here in the open position, with the inner cover raised to expose the mechanism. The principal components of interest to us are

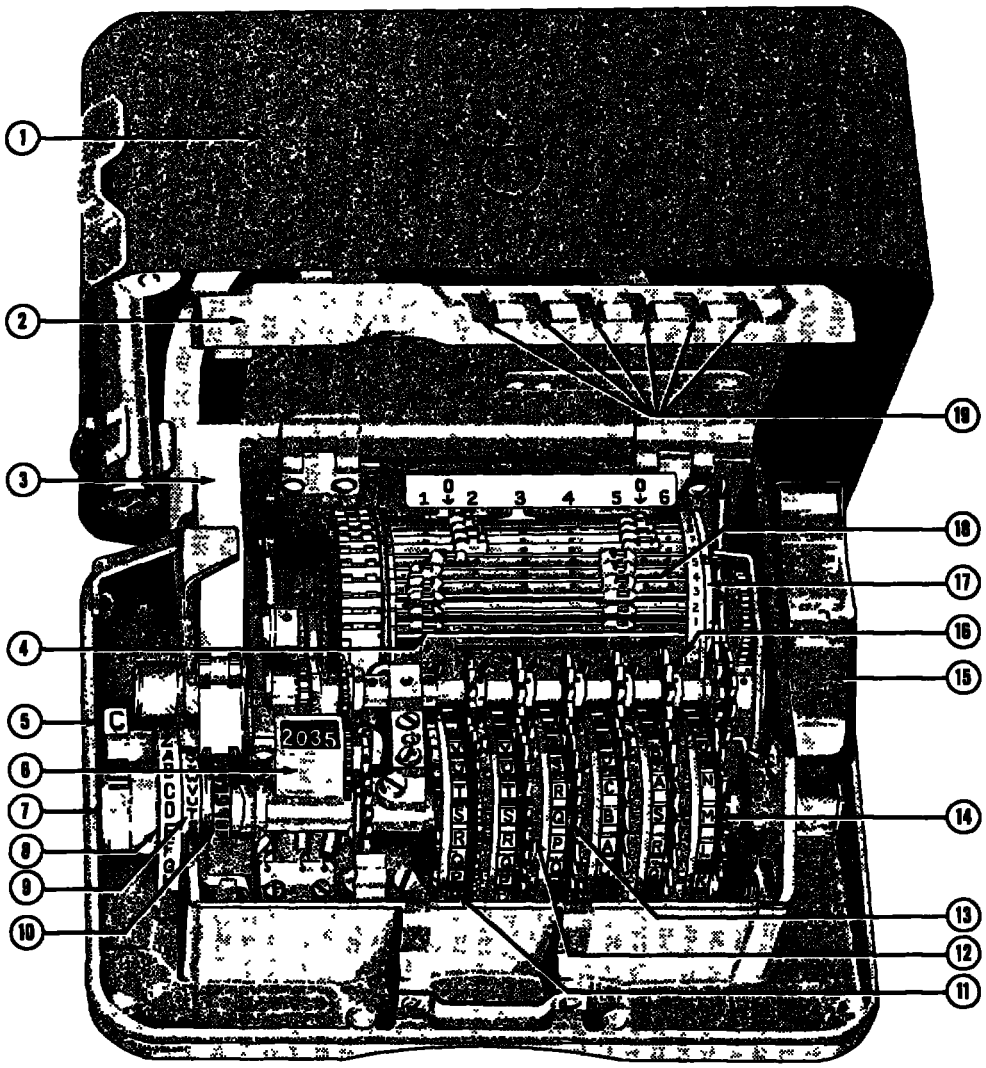

Figure 6.

marked in the illustration and are enumerated as follows: (1) the outer cover; (2) the inner cover; (3) the paper tape; (4) a lug; (5) the encipher-decipher knob; (6) the letter counter; (7) the setting knob, which moves the indicating disk (8), the reproducing disk (9), and the type wheel (10) simultaneously; (11) one of the key wheels; (12) a pin set to the "inactive" position; (13) a pin set to the "active" position; (14) the row of letters which will be at the bench mark when the inner cover is closed; (15) the drive knob; (16) a key-wheel lever, in the rear position where it will contact the lugs set opposite its corresponding wheel; (17) the drum; (18) one of the drum bars; and (19) the key-wheel windows, through which the alignment of the key wheels at the bench mark may be seen when the inner cover is closed.

h. The C-38 was used during World War II by United States military forces as a low-echelon cipher machine, under the nomenclature of M-209 in the Army and CSP 1500 in the Navy; the U.S. machines, however, were not equipped with a slide, and the reversed standard alphabets were set at A = Z. The Hagelin machine, type C-36, was similar to the C-38 except for the fact that it was a five-wheel machine having single fixed lugs. The original model of the C-36 had 25 bars with a lug arrangement of 1, 2, 4, 8, 10; the feature of the slide, as well as the introduction of 27 bars (and sometimes 29), was incorporated in later models. The Hagelin firm makes many different types of cipher machines which are available on the commercial market; when the designation "Hagelin machine" is used without further elaboration, it usually means the C-36/C-38 type.

12. Wired-rotor machines.--a. Electrical cipher machines of the alphabet generator class usually employ cryptographic components called wired rotors as a means of generating a multiplicity of alphabets. A typical rotor might be visualized as a disk approximately 3" in diameter and perhaps ½" thick, made of molded plastic or other insulating material. On each of the two faces of the rotor there are 26 small metal studs or contacts, arranged in a circle near the edge of the rotor. The studs on one face are connected in a random manner by wires to the studs of the opposite face; thus we have a representation of a mixed alphabet by means of electrical wiring. The rotors have engraved on their peripheries the normal A-Z sequence, as a means of aligning the rotors at specific positions against a bench mark. Several of these rotors are used side by side in a cipher machine, so that the studs of each rotor come into contact with the studs of adjacent rotors; the entire set of rotors in the machine is contained between two endplates likewise constructed with a circle of 26 contacts which touch the studs of the rotors placed next to them. In encipherment, when a letter of a typewriter keyboard is pressed, it sends a current to one of the points on the input endplate, going through the maze of rotors (each of which contributes the effect of one monoalphabetic substitution) to a point on the output endplate which is connected either to one of 26 lamps or to a printing mechanism, giving in this way the cipher equivalent of the plaintext letter. This is illustrated in schematic form for a three-rotor machine in Fig. 7, below:

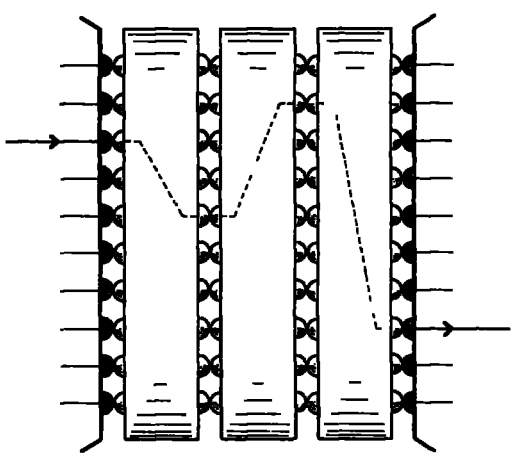

Figure 7.

In decipherment, the current is merely sent through the rotor maze in the opposite direction, and the plaintext equivalent is either indicated by the lighting of one of 26 lamps or by printing on a tape.

b. If the rotors were fixed and did not move, the encipherment would be nothing more than simple monoalphabetic substitution with a random-mixed alphabet; however, after the encipherment of each letter, one or more of the rotors will move one step, turning on the principal axis. This will result in the generation of a succession of different alphabets, the number being equal to 26 raised to the nth power, where n is the number of rotors in the maze. Thus for a three-rotor machine we will have 26^3 or 17,576 different alphabets, and for a five-rotor machine we will have 26^5 or 11,881,376 different alphabets. If the motion of the rotors is metric (i.e., meter-like as in an ordinary counter or an odometer),[34] these numbers will also represent the periods of the machines.[35] In Fig. 8a, below, we have a diagram of a three-rotor machine, in which the wiring of each

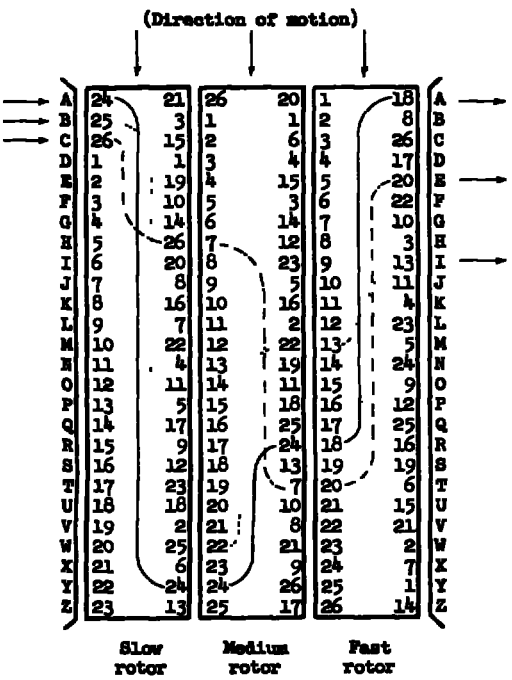

Figure 8a.

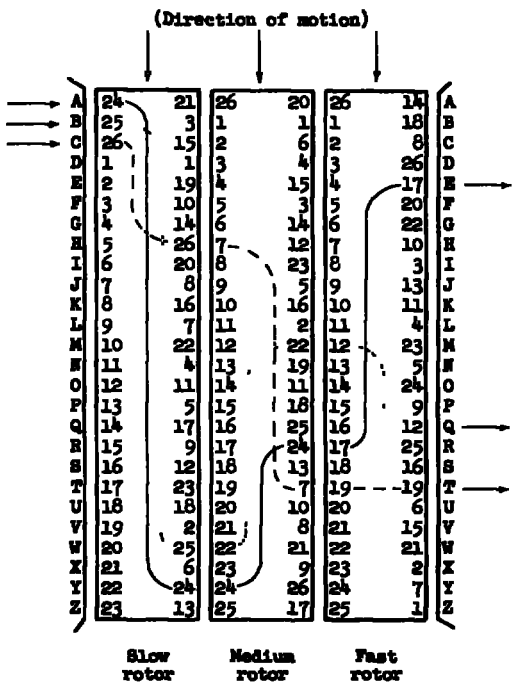

Figure 8b.

[34] It is usual to refer to the rotor which always moves one step after each operation of encipherment or decipherment as the "fast rotor"; the rotor which steps at a certain position (or positions) of the fast rotor is called the "medium rotor"; the rotor which steps at a certain position of the medium rotor is called the "slow rotor."

[35] Rotors have one or more turnover points which cause other rotors to step when the position of a turnover point is reached. In a set of rotors with single turnover points, if the rotors are set initially at these positions, the medium rotor will step once when the fast rotor has made a complete revolution, and the slow rotor will step once when the medium rotor has made a complete revolution.

rotor is represented by numbered contacts on the left- and right-hand faces of the rotor; wires are understood to connect like-numbered contacts from one side of the rotor to the other. It can be seen that A_p entering the input endplate comes out as A_c on the output endplate; at this same position of the rotors B_p becomes I_c, and C_p becomes E_c. (In decipherment the current is sent in the opposite direction, so that $A_c = A_p$, $E_c = C_p$, and $I_c = B_p$.) After the encipherment of one letter the fast rotor has moved one position, as is shown in Fig. 8b; at this setting of the rotors, it can be seen that $A_p = E_c$, $B_p = Q_c$, and $C_p = T_c$.

c. The foregoing illustrations were of straight-through rotor machines. It is also possible to have rotor machines which incorporate what is called a reflector or a reversing rotor as the last element of the maze. This reflector has studs on one face only, and these studs are connected two-by-two by thirteen pairs of wires; a current which enters the single endplate (known as a stator) goes through the maze to the reflector, which sends the current back through the maze in the opposite direction along a different path, exiting at a point on the stator different from the original entry point. Such a machine, known as the Enigma[36] type, is shown in schematic form in Fig. 9, below:

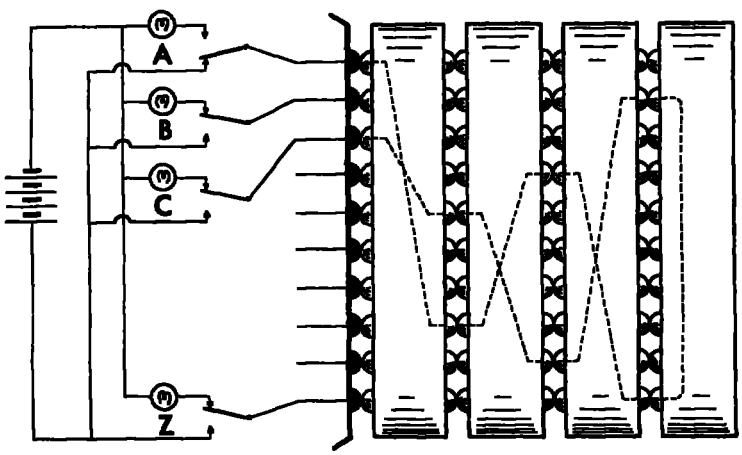

Figure 9.

Note that when the key associated with the letter A on the keyboard is depressed, the current is sent through the three rotors to the reflector, and back through the maze to the lamp associated with the letter C. It can be seen that Enigma encipherment is reciprocal in nature;[37] in the

[36] The first patent application for a wired-rotor machine was filed in Germany in 1918, a modification of this machine was patented in 1923 and manufactured commercially under the trade name of "Enigma." The machine of the original patent was a straight-through rotor machine, and was the invention of either Hugo A. Koch or Arthur Scherbius, it is not known which; the Enigma machine with the reversing rotor was invented by Koch.

[37] Note, however, that Enigma encipherment is noncrashing, that is, it is impossible for a letter to be enciphered by itself. In Hagelin encipherment, which is also reciprocal, the noncrashing feature is not present.

foregoing illustration, A (either plain or cipher) goes to C (cipher or plain). If the "C" key were depressed, the current would go through the rotor maze and come out at the "A" lamp, since the "A" key would now be in the "up" position. The circuitry of an Enigma machine is shown more clearly in Fig. 10, below:

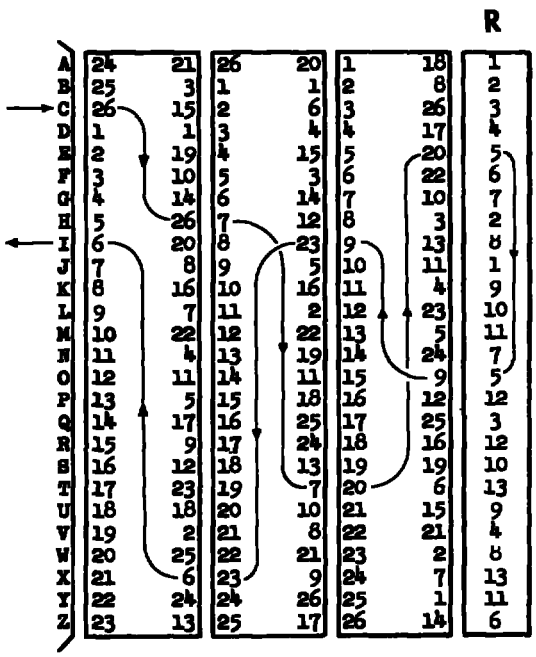

Figure 10.

In this illustration the encipherment (or decipherment) C = I is indicated by lines representing the wires which constitute the path of the current through the maze. (The reflector "R" is here shown as 13 pairs of numbers which represent the pairing by two's of the 26 points of the reflector.)

d. In Fig. 11, below, we have an illustration of one of the models of the Enigma machine. This particular machine has three rotors and a reversing rotor; the rotors are interchangeable but the reversing rotor (in this machine the first one at the left) always occupies the same position. All four rotors may be set to a particular initial alignment, but only three of the rotors step during the operation of the machine--the reversing rotor is usually a "dead" rotor with no motion. In the illustration below of an Enigma machine with the outer cover removed, the salient features have been indicated as follows: (1) inner cover; (2) aperture for reading the message rotor alignment; (3) slot through which rotors may be set at initial alignment; (4) rotor; (5) reflector; (6) illuminated lamp board; (7) keyboard; (8) plugboard, by means of which the connections from the keyboard to the stator (to the right of the fourth rotor) may be varied in order further to enhance the cryptosecurity of the machine; (9) battery box; (10) battery connection jack for outside power

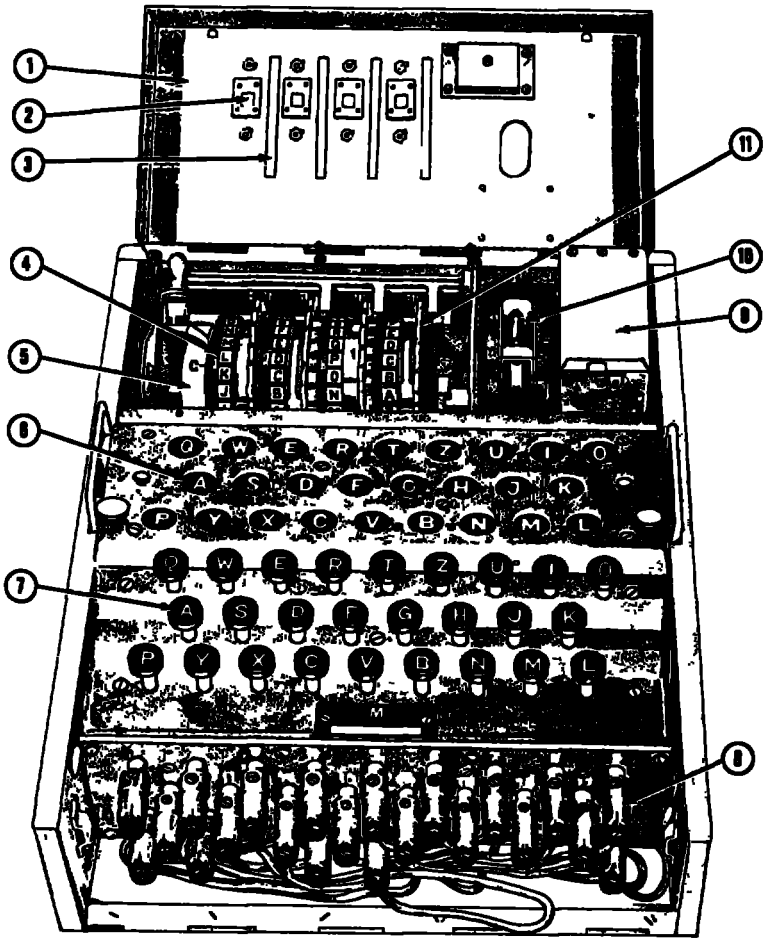

Figure 11.

source; and (11) rotor rim which projects through slot in inner cover. In the operation of the machine, the rotors are first arranged in the order specified for the particular date, and the plugging is also set up according to a key list. An initial message rotor alignment is selected, and the key associated with the first letter of the plain text is depressed; the lamp which lights up is the cipher equivalent of this letter. The depression of any key also causes a rotor or rotors to step, so that a new alphabet comes into play with each letter enciphered or deciphered. The message rotor alignment, in clear or disguised form, is included as an indicator, usually at the beginning of the message. Since the Enigma is a reciprocal machine, decipherment follows along the same steps as outlined for encipherment.

13. The B-211 cipher machine.--a. This electromechanical cipher machine was invented by Boris Hagelin and put on the public market in the late 1920's. The cryptographic principle of the B-211 may be expressed as a fractionation of the plain text by means of a 5x5 square, followed by separate encipherment of the row- and column indicators of the square, and finally a recombination to unilateral terms through the same square. The fractionation is accomplished by a clever mechanical arrangement, whereby the depression of a key on a keyboard sets up a unique pair of rods equivalent to a specific pair of row- and column indicators of the fractionation square. The enciphering elements consist of four variable-pin rotors of sizes 17, 19, 21, and 23 (similar to those in the C-38) and two electrical switching devices. The switching devices consist of two 10-point "half-rotors," in which only the exit contacts of the rotors oppose an endplate, the entry points of the rotors being made through slip rings, in contradistinction to the usual wired rotor which in effect moves between two endplates; these switching devices, the movement of each of which is controlled by its associated pair of variable-pin rotors, serve to select what amounts to one of ten rows of a table for the encipherment of the row coordinates of the fractionation square, and one of the ten rows of another table for the column coordinates.

b. The fractionation square of one of the models of this machine is the following:[38]

θ^2

θ^1	L	N	R	S	T
A	L	M	Y	F	X
E	O	J	B	R	S
I	P	U	G	C	W
O	K	N	T	D	Q
U	I	H	V	E	A

If there were no further encipherment, the word YOUR would be encrypted biliterally as AR EL IN ES. Now let us assume that both of the following two sets of alphabets are used successively to superencipher the θ^1_p and θ^2_p components of the fractionated plain text:

θ^1_p

	A	E	I	O	U
	O	I	U	E	A
θ^1_c:	E	I	O	A	U
	U	O	A	I	E
	I	O	U	E	A

θ^2_p

	L	N	R	S	T
	R	S	N	L	T
θ^2_c:	S	T	R	L	N
	N	R	L	T	S
	R	S	N	T	L

It can be seen that the biliteral pairs AR EL IN ES are enciphered as ON IS AR OT; these new cipher digraphs are then transformed into single-letter cipher equivalents by means of the original fractionation square, resulting in $\overline{\text{NCYQ}}_c$ as the encryption of $\overline{\text{YOUR}}_p$. The two sets of 10 enciphering alphabets (labeled A through K, omitting J) produced by the

[38] In this square the letter Z is missing; words which contain a Z are spelled with an X in place of the Z before encipherment.

rotation of the switching devices in the B-211 are actually the following:[39]

θ_p^1

θ_k^1	A	E	I	O	U	θ_c^1
A	A	E	I	U	O	
B	O	I	U	E	A	
C	E	I	O	A	U	
D	U	O	A	I	E	
E	I	O	U	E	A	
F	A	U	E	O	I	
G	O	U	A	I	E	
H	E	A	I	U	O	
I	U	A	E	O	I	
K	I	E	O	A	U	

θ_p^2

θ_k^2	L	N	R	S	T	θ_c^2
A	R	S	N	L	T	
B	S	T	R	L	N	
C	N	R	L	T	S	
D	R	S	N	T	L	
E	L	N	T	S	R	
F	N	R	L	S	T	
G	T	L	S	R	N	
H	L	N	T	R	S	
I	S	T	R	N	L	
K	T	L	S	N	R	

Figure 12.

The switching devices step each time an active pin is sensed (at the effective position[40] of the rotors) on either or both of the variable-pin rotors associated with the switch; this stepping takes place just prior to the encipherment or decipherment of each letter. Each of the four variable-pin rotors moves one step at every encipherment or decipherment, as in the C-38.

c. An example of the mechanics of encipherment on the B-211 will serve to clarify the foregoing discussion. Let us assume that the four variable-pin rotors have been set up at the apparent setting of AAAA at the bench mark, and that at the effective setting the patterns of the active (x) and inactive (·) pins for the first 30 positions are as shown in the top four lines of Fig. 13, below, just under the position reference numbers. (The two switching devices are also assumed to have been set at AA.) The plugs are in the normal position, A = A, E = E, etc.

[39] The B-211 has two sets of plugs which serve to change the composition of the θ^1 and θ^2 enciphering tables; one set of five plugs consists of plugs marked with the letters A, E, I, O, and U, while the other set is marked with L, N, R, S, and T. Any one of the 51 (=120) permutations may be used for the vowel plugs, and similarly for the consonant plugs, so that the total number of combinations of pluggings is $(51)^2$ or 14,400; cross-plugging between vowel and consonant plugs is inadmissible. The tables in Fig. 12 result when straight-through plugging is made (i.e., where A = A, E = E, etc.). If the plugging were such that, for instance, A = O, the effect of the plugging would be that all the A's within the matrix would be changed into O's.

[40] The "23" rotor has the letters A-Y (omitting J and W) in normal sequence on its periphery, as a means of designating the setting of the rotor against a bench mark, the last letters of the "21", "19", and "17" rotors are V, T, and R, respectively. When the 23, 21, 19, and 17 rotors are all set at "A" against the bench mark (i.e., when the apparent setting is AAAA), the effective setting will be GFHG.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
23:	·	x	·	x	·	x	·	x	·	x	·	·	·	x	x	·	·	·	x	·	x	·	·	·	x	·	x	·	x	·
21:	x	·	x	·	x	·	·	x	x	x	·	x	·	·	·	x	x	·	·	x	·	x	·	·	x	·	x	·	·	x x
19:	·	x	·	x	·	·	·	x	·	x	·	x	x	·	·	x	·	·	x	·	x	·	x	·	·	·	x	·	x	·
17:	·	x	x	·	·	x	·	·	x	·	x	·	x	·	x	·	·	·	·	x	x	·	·	x	·	·	x	·	x	x
θ_k^1:	B	C	D	E	F	G	G	H	I	K	K	A	A	B	C	D	E	E	F	G	H	I	I	K	A	B	C	C	D	E
θ_k^2:	A	B	C	D	D	E	E	F	G	H	I	K	A	A	B	C	C	C	D	E	F	F	G	G	G	H	I	K	A	B
P:	Y	O	U	R	B	A	T	T	A	L	I	O	N	W	I	L	L	S	U	P	P	O	R	T	F	O	U	R	T	H
$\theta_p^1\theta_p^2$	A	E	I	E	E	U	O	O	U	A	U	E	O	I	U	A	A	E	I	I	I	E	E	O	A	E	I	E	O	U
	R	L	N	S	R	T	R	R	T	L	L	L	N	T	L	L	L	T	N	L	L	L	S	R	S	L	N	S	R	N
$\theta_c^1\theta_c^2$	O	I	A	O	U	E	I	U	I	I	U	E	U	U	U	U	I	O	E	A	I	A	A	A	A	I	O	I	I	A
	N	S	R	T	N	R	T	L	N	L	S	T	S	T	S	N	N	S	S	L	N	N	R	S	R	L	T	N	N	T
C:	N	C	Y	Q	H	B	W	I	U	P	E	S	E	A	E	H	U	D	R	L	U	M	Y	F	Y	P	Q	U	U	X

Figure 13.

The 23 and 21 rotors actuate the switch for the θ^1 components, while the 19 and 17 rotors actuate the switch for the θ^2 components. Since, as we have already said, the stepping of the switches takes place just prior to encipherment, the presence at position 1 of an active pin on the 23 rotor will cause the switch for θ^1 to advance one step; the θ^2 switch does not step, because the pins on the 19 and 17 rotors in position 1 of the diagram are both inactive. Therefore the keys for enciphering the θ_p^1 and θ_p^2 components of the first plaintext letter are BA. The key stream for enciphering the first 30 plaintext letters is shown in the two lines labeled θ_k^1 and θ_k^2. In the line labeled "P" we have the plain text, which is shown in fractionated form in the lines labeled $\theta_p^1\theta_p^2$; the encipherment of the fractionated plain text is shown in the lines labeled $\theta_c^1\theta_c^2$, and the recombination into the final cipher text is shown in the last line, labeled "C." In decipherment, the cipher text is fractionated into its $\theta_c^1\theta_c^2$ components, deciphered into its $\theta_p^1\theta_p^2$ equivalents, and converted into the original plain text. As an exercise in decipherment, the student may try his hand on the following cryptogram which was enciphered with the keys above, containing an additional 20 letters beyond the last elements of key given.

N C Y Q H B W I U P E S E A E H U D R L U M Y F Y P Q U U X
A W M B N R I Q C T T J L I W O Y L M B

d. In the operation of the B-211, the pins of the four rotors are first set up according to a prearranged key, as are the plugs. Next, the four rotors and the two switching devices are set up at some arbitrary alignment against the bench mark; the six letters designating this alignment constitute the message indicator, which is sent in either plain or encrypted form. The letter counter is set to zero, the encipher-decipher switch is set to the "C" position, and the machine is ready for enciphering. In decipherment, after the pins and the plugs have been arranged according

to the key for the cryptoperiod, the rotors and switches are aligned according to the indicator, and the encipher-decipher switch is turned to the "D" position.[41]

e. The maximum period of the B-211 is $10^2(23 \cdot 21 \cdot 19 \cdot 17)$ or 15,600,900, while the shortest period is $(23 \cdot 21 \cdot 19 \cdot 17)$ or 156,009; the other periods possible are 156,009 multiplied by one of the factors 2, 5, 10, 20, 25, or 50. The B-211 has a self-contained tape-printing unit; in two earlier models, the one designated as the B-21 had lamp indications similar to the Enigma, while the B-22 was to be used with a specially equipped electric typewriter.

14. Cipher teleprinter systems.--a. Machines for the automatic and simultaneous encryption and decryption of the Baudot code used in teleprinter communications are usually constructed along the lines of key generators, and the key which is produced is applied to the plaintext Baudot characters according to the rules of Baudot addition.[42] Generally, these machines employ either notched wheels (which in effect are fixed-pin rotors) or variable-pin rotors as a means of actuating relays which determine the substitution key for the plaintext Baudot character at each position of the message. Examples of some typical machines are described in the subparagraphs below.

b. A cipher teleprinter invented by Col. Parker Hitt, U.S.A., retired, and built in 1931 by a subsidiary of the International Telephone and Telegraph Corporation, had in its cryptographic unit an assembly of ten notched wheels mounted on a common shaft in such a manner that each wheel stepped one position with every operation of the keyboard of the machine. The first wheel had 96 positions, and each wheel thereafter had one more position than the preceding one, so that the tenth wheel had 105 positions. The depression of any key on the teleprinter keyboard actuated the mechanism which moved the wheels one step each.[43] Behind each wheel was a cam switch which was acted upon by an irregular arrangement of notchings (i.e., elevations and depressions) on the periphery of the particular wheel. At 26 of the positions of each wheel, spaced more or less regularly on the circumference, were the letters of the alphabet in normal order, permitting the wheels to be set up at designated initial alignments against a bench mark.

c. Each pair of wheels, 1-2, 3-4, 5-6, 7-8, and 9-10, was used in combination to produce a key stream for baud levels 1 to 5, respectively, for the encipherment of a Baudot character. For example, if the notches at the reading position of wheels 1 and 2 were alike (either two elevations or two depressions), the key produced would be a mark (+); if the notches were unlike (i.e., one elevation and one depression), the key produced would be a space (-). The key produced by the five pairs of wheels was applied by Baudot addition to the plaintext character to yield the enciphered resultant.

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[41] The effect of the encipher-decipher switch in the "D" position is to send the current through the machine in the opposite direction from that which it follows when the switch is in the "C" position.

[42] Cf. subpar. 97b of the text, on p. 345.

[43] The period of this machine is therefore the least common multiple of the wheel sizes; in this case it is $2^5\ 3^2\ 5^2\ 7^2\ 11 \cdot 13\ 17 \cdot 97\ 101 \cdot 103$, or approximately 8.65×10^{14}.

At each operation of the keyboard, ten new notchings would arrive at the reading position to be combined into a new Baudot key character. As an illustration of the key generation and application, let us assume that the ten wheels have been aligned at the bench mark so as to produce the individual wheel streams shown in Fig. 14a, below. The combined key streams

	1	2	3	4	5	6	7	8
Wheel 1:	+	−	+	−	+	−	+	−
Wheel 2:	+	+	−	−	+	+	+	+
K_1:	+	−	−	+	+	−	+	−
Wheel 3:	−	+	−	+	−	+	−	+
Wheel 4:	−	−	−	+	−	−	−	+
K_2:	+	−	+	+	+	−	+	+
Wheel 5:	+	−	+	−	+	−	+	−
Wheel 6:	−	−	−	+	+	+	−	−
K_3:	−	+	−	−	+	−	−	+
Wheel 7:	+	−	−	+	−	+	−	+
Wheel 8:	+	−	−	−	+	+	+	−
K_4:	+	+	+	−	−	+	−	−
Wheel 9:	−	+	−	+	−	+	−	+
Wheel 10:	+	+	+	−	−	+	−	−
K_5:	−	+	−	−	+	+	+	−

Figure 14a.

	1	2	3	4	5	6	7	8
	A	D	V	A	N	C	E	9
P_1:	+	+	−	+	−	−	+	−
K_1:	+	−	−	+	+	−	+	−
C_1:	+	−	+	+	−	+	+	+
P_2:	+	−	+	+	−	+	−	−
K_2:	+	−	+	+	+	−	+	+
C_2:	+	+	+	+	−	−	−	−
P_3:	−	−	+	−	+	+	−	+
K_3:	−	+	−	−	+	−	−	+
C_3:	+	−	−	+	+	−	+	+
P_4:	−	+	+	−	+	+	−	−
K_4:	+	+	+	−	−	+	−	−
C_4:	−	+	+	+	−	+	+	+
P_5:	−	−	+	−	−	−	−	−
K_5:	−	+	−	−	+	+	+	−
C_5:	+	−	−	+	−	−	−	+
	Q	R	J	8	9	D	F	X

Figure 14b.

are shown in the lines labeled K_1, K_2,...K_5. Now if the first word of the message were ADVANCE, followed by a space (Baudot "9"), the five key streams shown in Fig. 14a would be applied to the plaintext bauds as shown in Fig. 14b, to yield the final cipher resultant of QRJ89DFX. That is, the first plaintext character (A), ++---, when enciphered by the first key character, ++-+-, yields +++-+ (= Q) as the cipher, and so on for the rest of the encipherment.

d. The next cipher teleprinter we shall take up is the machine patented in 1941 by the Olivetti firm in Italy. This machine has for its cryptographic elements a set of seven wheels having near their circumferences 26 holes into which may be screwed small metal studs at random so as to produce what amounts to fixed-pin rotors, of a variable sort at that; these wheels have the letters of the alphabet marked near the positions of the holes, so that the wheels may be set at specific initial alignments. Five of the wheels are cipher wheels, each one of which is used to produce the key stream for enciphering one of the five baud levels of the plaintext Baudot characters;[44] the remaining two wheels are used as motor wheels for stepping the cipher wheels in an irregular fashion. The first motor wheel (at the extreme right in the assembly of seven wheels) moves one step with every operation of the keyboard; the second motor wheel (immediately to the left of the first motor wheel) moves one step every time there is no pin effective at a sensing position on the first motor wheel.

[44] The leftmost wheel is used for the first baud level, the one immediately to its right for the second baud level, etc.

The first cipher wheel is moved in similar fashion, stepping every time there is no pin effective on the second motor wheel; each succeeding wheel steps in the same way when there is an absence of a pin at a sensing position on the wheel immediately preceding, so that, for example, the fifth cipher wheel (at the extreme left of the assembly of seven wheels) is stepped by the absence of a pin at a sensing position on the fourth cipher wheel. In this machine a dependent ("junior") wheel keeps on moving as long as no effective pin is being sensed on its controlling ("senior") wheel.

e. The Olivetti machine is equipped with a set of ten wheels, any seven of which may be inserted interchangeably in the machine; this permits greater latitude in the number of keys available, without the necessity for frequent changing of the screwable pins. The internal key, governed by the cryptodate, consists of the particular selection and arrangement in the machine of seven of the ten available wheels; the external key or message indicator is the 7-letter sequence which specifies the alignment of the seven wheels against the bench mark.

f. The third cipher teleprinter we shall discuss is the Siemens cipher teleprinter patented in 1931 and manufactured in Germany by the firm of Siemens-Halske. This machine possesses the interesting feature, among others, of accomplishing in the encipherment not only baud substitution, but also baud transposition. The machine contains ten notched wheels with the number of positions on each wheel relatively prime to each other; these wheel sizes are 73, 71, 69, 67, 65, 64, 61, 59, 53, and 47. Five of the wheels are used for the substitution key applied to the plaintext Baudot characters, and the five remaining wheels are used to obtain the transposition keys which transpose the bauds of the first substitution to yield the final cipher;[45] the selection of which wheels will be used for the baud substitution and which for the baud transposition is controlled by the plugging of a small ten-position plugboard. In later models of the machine, the key for the five elements of the substitution and for the five elements of the transposition is obtained from ten different combinations of four wheels each, the particular combination for each element being determined by a plugboard.

g. In the original Siemens machine, all ten of the wheels moved one step with each encipherment or decipherment; in later models, two types of complex motion were introduced. In one type, the motion of a particular wheel is controlled by a motor sensing position on two other wheels, and in the other type of motion, different from the first, there is introduced an additional factor of irregularity by a kind of autokey feature, wherein the presence of a mark in the third level of the preceding plaintext character causes a movement of two of the wheels, while the presence of a space in the third level of the preceding plaintext character causes a movement of two other wheels. These two types of motion, called "ohne" and "mit" respectively, take their names from the legend on a two-position switch whose two states are marked "Ohne Klartextfunktion" and "Mit Klartextfunktion." If the ten wheels in descending order of size are designated by the letters A through K (omitting I), the two types of motion are as follows:

[45] The 5! (= 120) permutations theoretically possible yield only 32 distinct Baudot characters after the transposition, however, owing to the particular switching arrangement in the Siemens machine, only 30 transpositions are actually possible.

"Ohne" Motion

A,B,C,D step if E is - or F is -
E steps " F " + " G " -
F " " G " + " H " +
G " " H " - " J " -
H " " J " + " K " -
J " " K " + " A " -
K " " D " - " E " +

"Mit" Motion

A steps if B is +, C is +, or θ_p^3 is +
B " " C " -, D " +, " " " +
C " " D " - or E " +
D " " E " - " F " -
E " " F " +, G " -, or θ_p^3 is -
F " " G " +, H " +, " " " -
G " " H " - or J " -
H " " J " + " K " -
J " " K " + " A " -
K " " A " + " B " -

Note that in the "ohne" motion the first four wheels step together as a block; this has the effect of guaranteeing a cycle of at least 73·71·69·67, or 23,961,009. The "mit" motion, being aperiodic, has no determinate cycle.

15. Ciphony, cifax, and civision systems.--a. Methods for the encryption of speech, facsimile, and television signals employ the same general ideas of substitution and transposition as are found in literal cryptosystems. However, whereas in literal cryptosystems the unit of encryption is usually a single character, the corresponding unit in a ciphony, cifax, or civision system is a timed portion of the continuously varying audio or image scanning signal. Ciphony, cifax, and civision systems fall into two broad categories of systems, viz., privacy systems and security systems. The cryptosecurity afforded by a privacy system is minimal, offering protection only against direct listening or viewing; on the other hand, security systems offer maximum, which in some cases might be absolute, protection against cryptanalysis.

b. Speech privacy systems embrace those systems which operate directly on the speech itself, in either the frequency dimension or the time dimension, or both. The earliest basic idea of a speech privacy system is the principle of frequency inversion such as is embodied in commercial transatlantic telephone systems. This principle involves the modulation of the audio signal with a fixed frequency, so that the resultant signal is the difference[46] in frequency between the two component signals; this has the effect of changing high frequency sounds into lower frequency sounds, and vice versa. From this simple idea we can progress into systems in which several frequencies are used in a changing pattern for the modulation, or in which the modulating signal is continuously changing within a frequency band. Another idea widely used in commercial ciphony equipments is that known as band splitting, involving splitting the entire speech band into several smaller bands and then shifting these smaller bands in the frequency spectrum.

c. The foregoing systems are substitutive in character; the next system to be mentioned, transpositive in nature, is that known as time division scrambling. Speech in this system is recorded on a magnetic tape, and the

[46] The sum of the two signals is also produced at the same time, but this sum is eliminated by a filter circuit.

transcription from the tape is "read" in an irregular manner. In one typical system, units of speech of 3/4 second's duration were divided into 20 segments, and these segments were transposed to constitute the enciphered speech transmission.

d. Speech security systems embrace those systems in which the continuous speech wave is first converted into a series of binary impulses (similar to the impulses of the Baudot code), and then this intermediate plain text of "binary digits" is enciphered by adding a binary key stream (derived from a suitable key generator) to the binary plain text. The three principal methods by which speech is converted into binary form involve (1) pulse code modulation, (2) delta modulation, or (3) a vocoder. Each of these methods converts the continuous speech wave into a digital approximation of the original wave, as described below:

(1) In pulse code modulation, the amplitude of the speech wave is sampled at a rate at least twice the highest frequency component in the wave; each sampled amplitude is then approximated by categorizing it as one of n discrete levels (represented by binary coding) spaced along the amplitude dimension. In a typical system, the speech is sampled 6000 times per second, and each sample is identified with one of 16 possible amplitude levels represented by a four-element binary pattern; the output of this pulse code modulation system is a stream of binary signals at the rate of 24,000 "bits" (i.e., binary digits) per second.

(2) In delta modulation, an approximating wave is generated by comparing the amplitudes of the speech wave and the wave being generated. If the amplitude of the generated wave at the instant of sampling is less than that of the speech wave, the next fragment of a synthetic wave is generated for a fixed interval (until the next sampling instant) and with a fixed constant positive slope; if the amplitude of the generated wave is more than that of the speech wave, the next fragment of the synthetic wave is generated with a fixed constant negative slope--thus the generated wave being synthesized is constantly correcting itself, in zigzag fashion, so as to produce an approximation to the original speech wave. The positive and negative slope information is represented by binary digits; good quality speech can be obtained by the delta modulation process using approximately 25,000 comparisons per second.

(3) The vocoder is a speech analyzer and synthesizer developed by the Bell Telephone Laboratories; in a vocoder system the spectrum of the speech wave is separated into a number of nonoverlapping frequency bands, and the amplitude in each band is sampled and coded by the pulse code modulation process. At the receiving end, a synthesizer creates artificial voice sounds from the incoming digital information.

e. The earliest idea for a facsimile privacy system was patented in 1928 by Edouard Belin, and involved variations in the velocity of the synchronized sending and receiving drums of the facsimile equipment. Other facsimile privacy systems include pretransmission scrambling, in which the

plaintext copy is optically disarranged before transmission, and time division scrambling similar to that employed for ciphony purposes. In facsimile security systems, the plaintext copy is optically scanned and converted into a stream of binary digital signals; each square inch of the image is converted into approximately 10,000 binary digits of black-white information. A binary key, generated by a suitable key generator, is added to the binary intermediate plain text; at the receiving end, the same key is added to the incoming cipher signals to produce the original plaintext copy.

f. Television privacy systems may use adaptations of any of the methods of speech privacy systems. Television security systems would likewise employ the same general techniques as are found in secure speech and facsimile systems; however, owing to the broadness of the frequency spectrum necessary to transmit the secure digitalized television signals and the very high speeds necessary in the key generation for encrypting them, major difficulties are encountered in the development of these systems.

APPENDIX 7

INTRODUCTION TO TRAFFIC ANALYSIS

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INTRODUCTION TO TRAFFIC ANALYSIS

1. General.--a. In Appendix 7 ("Communication intelligence operations") of Military Cryptanalytics, Part I, the general nature of traffic analysis was broached briefly, together with the related fields of interception, radio direction finding and radio position finding, and Morse operator analysis and radio fingerprinting. Traffic analysis is defined as that branch of cryptology which deals with the study of the external characteristics of signal communications and related materials for the purpose of obtaining information concerning the organization and operation of a communication system. By means of traffic analysis valuable information can be derived concerning the enemy and his intentions, even without actually reading the texts of the intercepted messages; the solution and translation of messages are the functions of cryptanalysis and not traffic analysis.

b. Traffic analysis can yield a detailed knowledge and thorough understanding of a communications network; traffic analysis techniques involve, among others, the reconstruction of the nets and the determination of the methods of their operation, the solution of callsign and routing or address systems, the solution of frequency rotation systems, the identification and analysis of components of the message externals, the interpretation of radio procedure, the study of the distribution of cryptosystems, and the analysis of authentication systems. The results obtained from traffic analysis materially contribute to the following:

(1) Intercept operations. Traffic analysis provides information such as call signs, frequencies, locations, and schedules pertaining to target enemy stations, thus assisting intercept stations in the accomplishment of their missions; and, in coordination with cryptanalytic and intelligence interests, traffic analysis assists in establishing the priorities for the interception of individual circuits.

(2) Cryptanalysis. Traffic analysis furnishes assistance to cryptanalysis in many ways, depending upon the particular communications situation; this assistance includes information as to the identity and location of radio stations, information of cryptanalytic interest gleaned from enemy operators' "chatter," identification of possible stereotype or proforma messages from external characteristics of the traffic, and identification of isologs.

(3) Intelligence. The organization of a radio network and the manner in which messages are passed over this network reflect troop disposition, command relationships, and impending movements and preparations for military activity; therefore an analysis of net structure, traffic contacts and patterns, traffic volumes, and similar communications features, is of considerable assistance in building up a complete intelligence picture.

(4) Security. The techniques developed by traffic analysis in the attack on intercepted enemy communications may also be applied to our own monitored signal communications in order to uncover possible weaknesses and to maintain high standards of communication security by preventing these weaknesses from developing in our communications.

c. There are three kinds of basic data used in traffic analysis, as follows:

(1) Intercept data, comprising all information supplied by the intercept operator, and consisting of the frequencies on which transmissions are heard, the time the transmissions are heard, intercept operator comments such as signal strength and audibility, "fist" characteristics of the target radio operator, and any peculiarities in the transmission or handling of the traffic that strike the intercept operator as being significant or out of the ordinary.

(2) The transmission, comprising everything transmitted by the target radio operator, and including the initial call-up, the exchange of call signs, the traffic passed, the servicing incidental to the traffic being passed, the radio operators' chatter, and the signing off. Traffic consists of the message externals (i.e., the preamble and postamble, if any) and the message text proper. The externals comprise various items that facilitate the handling of the message, among which are the radio station number and perhaps a message center number or other reference numbers, the group count, routing and address information, precedence indicators, the file date and time, etc.; all this information is of considerable potential value in traffic analysis. The message text, if it displays patent cryptographic characteristics, can also be of use.

(3) Collateral information, comprising any information, other than that derived from a study of intercepted communications, which may be of value in traffic analysis; e.g., captured documents, intelligence reports, etc. In addition, traffic analysis is aided by communication intelligence collateral such as direction-finding bearings, Morse operator analysis, plain language messages, and decrypted traffic.

d. In traffic analysis the details of each feature of the communications operations or structure are studied, followed by analysis of the interrelationships among these features, culminating in the reconstruction of an entire net together with all the details of its operation. At the start of a traffic analysis problem, little may be known concerning the target communications; it would first be necessary to segregate initially intercepted traffic into several major types or nets by means of cryptographic features,

common operating characteristics, or other means. At this point the intercept stations are given general search missions over the entire range of radio frequencies to intercept desired types of transmissions. As traffic accumulates, fragmentary nets are diagrammed and analysis is begun on the transmission characteristics and on the message externals, with particular emphasis on the preamble components and on routing methods; research is performed on call signs, frequencies, schedules, procedure signals, external message numbers, routing indicators, and cryptographic features, resulting in the ultimate reconstruction of the complete net with all its pertinent details.

2. Radio communications.--a. Efficient radio communications are dependent upon (1) the physical laws for the transmission, and (2) the requirements imposed by the necessities for the establishment and maintenance of communications. The first consideration involves the frequencies and power used, and the second consideration embraces the details necessary for the communications themselves, such as the call signs, routing, message numbering conventions, and receipting and servicing of the traffic. These latter items may be varied or changed by direction of the communications authority either for convenience in handling traffic, or for purposes of secrecy, or both.

b. From the standpoint of traffic analysis study there are three main aspects of radio operations, as follows:

(1) The operating data. These consist of the basic operating and functioning data of the net; e.g., the structure or form of the net, the frequencies, the call signs, and the schedules.

(2) The radio transmission. This includes the particular Morse code used, the procedure signals employed, the order of elements of the transmission, and radio operators' chatter.

(3) The messages. These include the message texts proper, together with the message preambles and postambles. The cryptographic features of the message texts, such as discriminants and message indicators, the type of cryptographic text (whether in letters or digits), and the length of the code groups, are all of considerable assistance in traffic analysis; plain-language messages are also exploited.

3. Operating data.--a. Radio stations are linked together and organized into nets for the purpose of intercommunication; this organization follows definite patterns, reflecting the command structures since the lines of communication must coincide with echelons of command in order to meet military communication requirements. In a particular grouping of stations the one serving the senior echelon is the station usually in charge of the subordinate stations; this station is called the net control station (abbr. NCS), and the others are called outstations. The control station is responsible for the supervision of transmissions, procedures, and circuit discipline. A typical net structure is shown in Fig. 1, below.

Station 1 is the superior headquarters, with Stations 2, 3, and 4 as the immediately subordinate outstations; Station 2 in turn has two outstations,

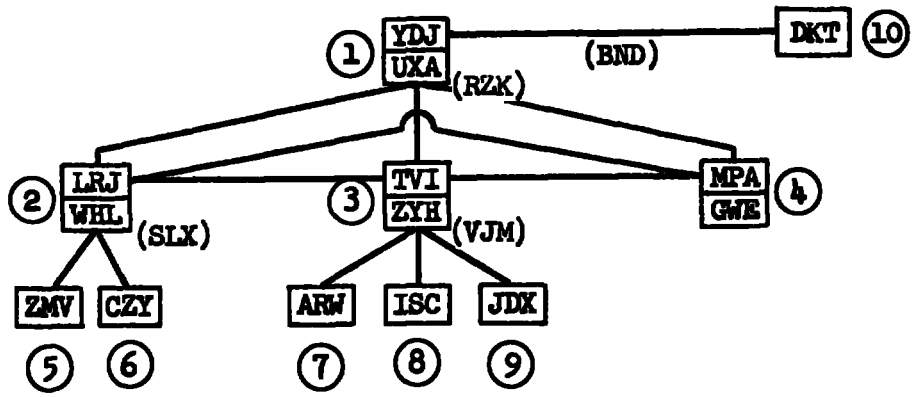


Figure 1.

and Station 3 has three outstations. Station 1 is also in communication with Station 10, the NCS of another net.

b. Stations are identified by one or more call signs which consist of a group of letters, digits, or both. In the diagram above, Stations 1-4 have two call signs each, while the remaining stations have but one call sign. Multiple call signs are used for convenience of operations, or for security; they are either in the form of variant call signs (the selection from which being left up to the radio operator) or of split call signs (the selection of the proper call sign being governed by the time of day, the radio frequency used, etc.).

(1) The usual type of call-up is the double-station call procedure, wherein the call signs of the called station and of the transmitting station are sent, separated by the procedure signal DE (meaning "from"); for example, if TVI is calling UXA, he would transmit the following:

UXA UXA UXA DE TVI TVI TVI

The reply from UXA would then be:

TVI TVI TVI DE UXA UXA UXA

(2) In the single-station call procedure, only one call sign, usually that of the called station, is used. For example, if ZYH is calling ARW, he would send ARW ARW ARW; when ARW answers, he would reply in the same manner, ARW ARW ARW.

(3) Sometimes one particular call sign is assigned to a link, i.e., for intercommunication between two specific stations. For example, referring to Fig. 1, when Station 1 wishes to make contact with Station 10, he would send the link call sign BND repeated several times, and Station 10 would reply with the call sign BND.

(4) In addition to the foregoing types of calls, there may also be used a collective call sign for calling several specific stations in a net; when such a call sign is used for alerting all of the stations in the net, it is called a net call sign. For example, Station 1 uses the net call sign RZK for reaching his three outstations, and Station 3 uses VJM as his net call sign.

(5) In all of the foregoing procedures, split-call working might be employed. As an example, we note in Fig. 1 that Station 3 uses the call sign TVI when communicating with its superior, Station 1, or with Stations 2 and 4; however, when Station 3 is communicating with its own outstations, it uses the call sign ZYH.

c. Stations in a net are assigned one or more frequencies for radio communication; the allocation of frequencies is predicated upon transmitter characteristics, distance requirements, the time of transmission, and other factors. In simplex working, stations operate on a common frequency; in complex working, more than one frequency is used. In complex sending, stations are assigned transmitting frequencies, and each station uses its assigned frequencies to make contact with other stations; in complex receiving, stations are assigned receiving frequencies, and stations sending to a particular station use the frequency assigned to it.

d. The time of communication is an important factor in radio operations. Schedules for communication are established for those stations which pass comparatively little traffic, or which have an insufficient number of operators for free communication with all necessary stations; in such cases, schedules are arranged so that each operator may take care of several circuits at different times. Such schedules also permit maximum use of one frequency, without interference or confusion. When no schedules are in force, stations are free to contact each other at any time, either by setting the time for the next contact at the last transmission, or by maintaining a watch on assigned frequencies.

4. Radio procedures.--a. In radiotelegraphy the transmission of information is accomplished by means of Morse codes. In the case of countries whose alphabets differ from the English alphabet, modifications of the international Morse symbols are introduced to take care of accented and other unique letters of the language.

b. Radio operators use certain signals and signs to facilitate operating and passing of traffic. The most common sets of operating signals, used in international practice, are "Q" and "Z" signals which are three-letter combinations beginning with these letters. For example, QRU means "I have nothing for you," and QRU followed by a question mark (Morse IMI) means "Do you have anything for me?" Besides these operating signals, various procedure signs are used by the operators, such as the following:

AR	End of transmission	GR	Group count
AS	Wait	IMI	Repeat or question
BT	Break	K	Invitation to transmit
C	Correct	WA	Word after
DE	From	VA	End of schedule

In addition to the foregoing, radio operators may be provided with a specialized cryptosystem, usually in the form of a small chart (with row- and column coordinates) containing letters, digits, words, and useful short operators' messages.

c. In order to prevent enemy stations from entering a net and confusing its operations, authentication systems are used. In station authentication, challenges and replies are exchanged mutually by stations upon establishing initial contact; in message authentication, certain elements from the heading and from the message text are designated by prearrangement as test elements, and these test elements are validated by an authenticator symbol or symbols in the preamble.

d. In military communications, a single time designation is used to avoid the confusion that would result if each station used local time as reference. Normally, Greenwich Mean Time is used for all communications, although in some instances the time zone of the capital of a country is employed; in any case, it is usual practice to include the suffix letter of the time zone, as for example 231600Z meaning 1600 Greenwich Mean Time on the 23d of the month.

e. There are certain elements of the transmission which are standard for most radio operations. These are: (1) the call-up, or the procedural rules by which stations make contact with one another to prepare for the transmission of traffic; (2) the order of traffic, governed by rules which determine which station is to transmit its traffic first, and in what order; (3) the transmission of traffic, in a prescribed manner; (4) the receipting for traffic, in which the receiving station acknowledges receipt of messages; (5) corrections and services, to insure that the traffic transmitted and received is as garble-free as possible; and (6) the signing off, or the procedures prescribing the manner of terminating transmissions. Variations in the number and detail of the foregoing elements exist not only among various nations, but also among the military services of a particular country and among the different echelons of these services.

5. Radio messages.--a. Radio messages must carry pertinent information to insure proper handling in both the message center and the radio station. This information, almost invariably incorporated in the message externals, usually includes serial numbers of various kinds, date-time groups, precedence symbols, routing instructions, addresses and signatures, the group count, and other special instructions.

b. The number which is put on the message by the transmitting radio operator for reference purposes is known as the station serial number

(abbr. NR); a number series may be assigned to all messages transmitted by a particular station, or separate number series assigned to messages passed on each communication link. Message center numbers (abbr. MNR) are numbers assigned serially by a message center to all outgoing traffic, regardless of destination; these numbers are used for reference purposes between originating and receiving message centers. When messages are relayed, the station serial numbers change on each link of the communications path, whereas the message center number usually remains constant. Other kinds of numbers are sometimes found in message externals, especially at the higher echelons, such as cipher office numbers, radio station in-desk numbers, etc.

c. Precedence indicators or symbols for expediting traffic are either in the form of abbreviated plain text (such as "U" for Urgent) or in encrypted form as a group of letters or digits. Sometimes variants are provided for these indicators as a security measure, or these indicators may be subjected to encipherment.

d. When direct communication between two stations is not possible, routing instructions are usually incorporated in the externals of messages. Designations of locations or units in plain text may be utilized for this purpose, or call signs may be used for the routing, but, more usually, routing codes are employed which contain code groups for principal locations or units, as well as syllabary groups for encoding designations not in the body of the code. Similarly, when addresses and signatures are distinct from routing instructions, a separate scheme may be devised for the transmittal of this information, usually by means of codes.

6. Preliminary net reconstruction.--a. In the initial approach to a traffic analysis problem, traffic identified by the language of plaintext chatter or by national characteristics of the transmission as belonging to the target country is segregated into major homogeneous types on the basis of common operating characteristics, message formats, discriminants, chatter, or any collateral information. Thus traffic from army, navy, air force, and other nets may be isolated into distinct groups.

b. A preliminary grouping of stations is diagrammed from observed contacts between stations. Simultaneously, analysis is begun on the characteristics of the radio operations. As an example, let us assume that the groupings of stations in Figs. 2a and b, below, have been reconstructed from observed contacts on the transmitting frequencies in kilocycles as indicated, and that we have made a mental note that, on the basis of procedural characteristics, UXA and ZYH are probably net control stations. We note that TVI and ZYH have the same frequency; if frequencies are assigned uniquely to target stations, then TVI and ZYH represent the same station. Tentative confirmation may be obtained if it is found that the serial numbers used by TVI interlock with those of ZYH, or if routing information on messages from TVI and ZYH shows identical originators; further confirmation may be obtained from chatter (wherein, for example, the operators at TVI and ZYH refer to the same person as their commanding officer), from direction

finding bearings, Morse operator analysis, discriminant and indicator studies, etc. By continuing this method of analysis, we shall arrive at

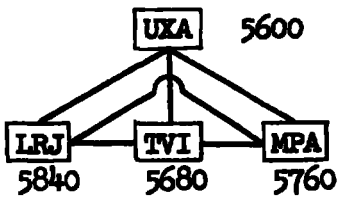


Figure 2a.

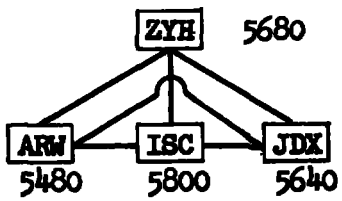


Figure 2b.

a portion of the diagram in Fig. 1, wherein TVI and ZYH are shown as split call signs belonging to one station. This example of approach is perhaps an oversimplification, but it is illustrative of the general methods followed.

7. Analysis of radio operations.--a. This phase of traffic analysis involving the study of the operating data and the elements of the transmission is, as previously stated, carried on concurrently with initial net reconstruction. When fragmentary nets have been put together, continuity over date breaks is made possible by the analysis of radio operations.

b. Callsign analysis embraces the determination of the methods of generation, allocation, and rotation of call signs, together with the system of use. Call signs may merely consist of different random N-character groups, in which case no system of generation is recoverable, or they may be generated by a permutation table or similar scheme. The available call signs may be arranged in the form of a chart or in a book of tables, and stations may be allotted specified positions in the chart or book on, let us say, the first of the month; subsequent changes of call signs may be governed by following a prearranged route in the chart or book, or by the application of some mathematical formula. Callsign systems may also involve several sliding strips as a means of generation, with a convention prescribed for the manner of selection and rotation of the call signs derived from the strips. Regardless of the system of generation and rotation, when sufficient callsign continuity has been established, interpretation of the patterns and phenomena disclosed will permit recovery of the system.

c. Frequency analysis has the same general objectives as callsign analysis, viz., the determination of the methods of selection, allocation, and rotation of frequencies, together with the system of use. When more than one frequency is assigned to each station, lower frequencies are generally used at night and higher frequencies during daylight, for technical reasons; certain of the frequencies may also be designated as standby frequencies. Frequency assignments may be published in chart form, with an initial allocation and rotation system similar to that used in callsign systems. Here again, continuity of frequencies will permit recovery of the system. Both in callsign and in frequency analysis, continuity may easily be obtained if some of the operating data or elements of the transmission change and some

do not. Even if call signs and frequencies change daily, continuity may be established by taking into consideration any of the following: patterns of station serial numbers or message center numbers; routing information; discriminants (especially one-time-pad discriminants which are usually unique for each link); procedural peculiarities (e.g., the use by a particular station of distinctive separator signs, tuning signals, etc.); chatter; schedules; service messages over a date-break; and direction finding and Morse operator analysis reports.

d. Procedure messages and chatter between operators are of particular interest in traffic analysis. When unknown procedure signals are used, or when procedure signals are encrypted, their meanings may be determined through observation and interpretation. As an elementary example, let us suppose that at 0915 an intercept operator hears TVI send to UXA on 3800 kilocycles the procedural transmission "XLC 1200", after which contact with TVI is lost, and that TVI is heard calling UXI again at 1158. The inference may be made that XLC means "I shall contact you again at ____ hours", followed by the time. Or again, let us suppose that after that same transmission, contact with TVI was lost, and that the intercept operator in searching for target stations on his receiver picks up TVI a few moments later on 4800 kilocycles. In this case, it may be inferred that XLC means "I am changing my frequency to ____ kcs", followed by a frequency designator which is to be multiplied by 4 to indicate the actual frequency.

e. The identification of preamble components is a relatively simple matter. If messages from Station A to Station B are sorted by intercept time, the station serial numbers should be in an ascending series (barring, of course, missed traffic), so that we look for such manifestations in elements of the preamble. If all the traffic sent from one call sign, regardless of direction, is sorted by file time (where this information is included in the preamble), the message center numbers should be in an ascending sequence, with gaps caused either by missed traffic, or because the station concerned used more than one call sign, or because some messages may have been transmitted by means other than radio. The position of originator groups in the message preamble may be discovered by sorting traffic by transmitting station and noting the consistency of certain groups in a particular position; likewise, addressee groups may be identified by sorting traffic by receiving station and looking for a high rate of occurrence of some group or groups in a particular position in the preamble. The identification and interpretation of precedence indicators may be accomplished by studying a small volume of traffic emanating from one station and comparing the file times with the intercept times; when a series of messages are transmitted by a station one after the other, the messages with higher precedence are invariably transmitted first, and study of the traffic will give clues as to the meanings of these indicators. Sometimes preambles also contain groups indicating the security classification of the message; these groups are often difficult to identify and interpret, but nevertheless a study of chatter and of the discriminants used on the various cryptonets will permit a solution.

f. As may be observed from the foregoing discussion, identification and partial solution of the elements of the preamble proceed simultaneously; further study and analysis will make possible a complete solution of these elements. Additional information on radio operations can be derived through study of schedules, textual features of encrypted traffic, cryptonets, and discriminants and indicator usage. Collateral information will be of assistance in these studies, as will information derived from cryptanalysis and other communication intelligence sources.

8. Traffic intelligence.--a. The last phase of traffic analysis is the reconstruction of the complete enemy network in the form of an intergrated diagram showing call signs, frequencies, and other technical data such as serial-number allocations, discriminants, etc. Identifications of unit organizations and their geographical locations are shown, which, when coupled with intelligence from all sources, will portray the enemy Order of Battle.

b. When changes in net structure take place, these may be brought about by the appearance of new units in a command or the deactivation or redeployment of old units. Changes in contact relationship may be indicative of impending moves; significant changes in traffic volumes or in cryptographic systems may be indicative of preparations for military activity.

9. Concluding remarks.--a. Traffic analysis furnishes much information on communications features of assistance in cryptanalysis, such as information concerning the originators and addressees of the messages, isologs and resends which result from cryptographic error, messages with potential crib value, and chatter pertaining to cryptographic matters.

b. Some traffic analysis items of particular interest to the cryptanalyst are the following:

(1) When the group count is constantly checked by the enemy operators, this is usually indicative that the cryptosystem includes transposition as one of its steps.

(2) When the date or file time is invariably checked, it is indicative that these elements are factors in key selection.

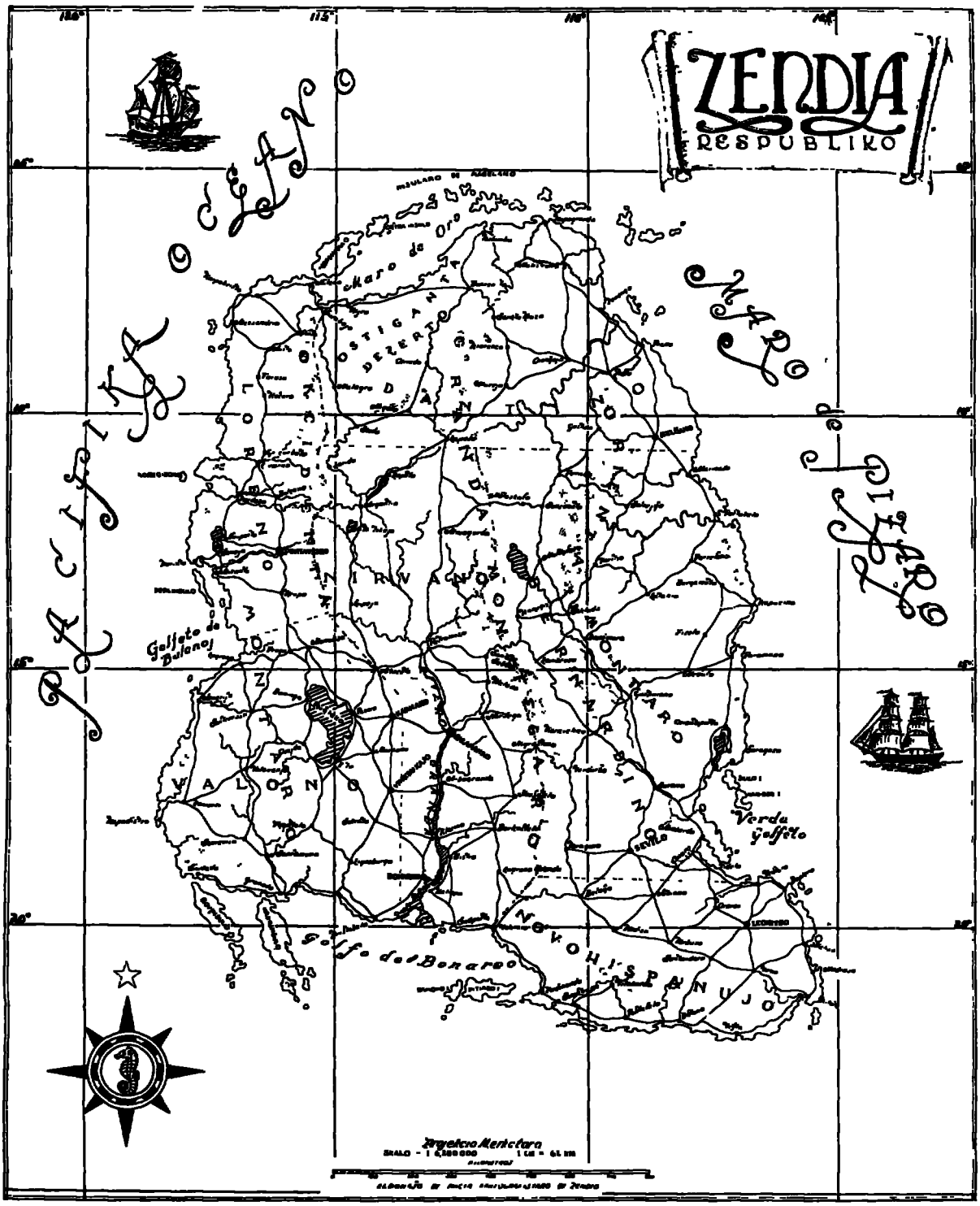
(3) When a group in a particular position of the text or of the preamble is checked frequently, this may indicate that it is involved in key selection.

(4) Rapid sending, with no requests for services by the receiving operator, is an earmark of practice or dummy traffic.

c. The general principles of traffic analysis have been presented briefly in the preceding paragraphs; however, actual application of these principles and techniques in some typical problems is necessary in order to insure that an adequate comprehension of the subject has been obtained. In the next appendix, "The Zendian Problem: an exercise in communication intelligence operations," opportunity is offered for the student to apply the general methods of traffic analysis he has learned and modify them to suit the contingencies of the particular situation, learning thereby additional facets of the art.

APPENDIX 8

THE ZENDIAN PROBLEM: AN EXERCISE IN COMMUNICATION INTELLIGENCE OPERATIONS


ZENDIA
RESPUBLIKO
Oceano Pacifiko
Mar de Oro
Mar de Plata
Golfo de Balanoj
Golfo del Bonaroo
Verda golfeto
Projekcio Mercatora

THE ZENDIAN PROBLEM: AN EXERCISE IN COMMUNICATION INTELLIGENCE OPERATIONS

A. Introduction

1. The Zendian Problem, presenting an operational communication intelligence situation in miniature, affords opportunity to apply the techniques of traffic analysis and cryptanalysis, to derive intelligence, and to prepare reports. This problem deals with the enemy communications during an amphibious operation against Zendia, an island in the Pacific located approximately 2000 miles west of Peru, with an area of 990,000 square miles and a population of 17,320,000. Zendia is a totalitarian state under the absolute dictatorship of Marshal Salvo Salasio, the Prime Minister, who embarked upon a series of high-handed actions which led to an ultimatum by the United Nations Security Council; this ultimatum was rejected by Salasio. The United States, acting under the authority of the United Nations, assembled Task Force Pearl and embarked upon Operation Seahorse which had as its objectives the establishment of an occupation force to liberate the Zendian people from the Salasio regime, with a restoration of the true Zendian Republic.

2. In Phase I of Operation Seahorse, initial assault elements of the U.S. Eighteenth Army (consisting of XXV and XXX Corps) landed at 0500 on 16 December, under support of naval gunfire and air attack, on beaches near Aleksandrio on the northwest coast of Zendia. The outnumbered Zendian shock troops near the invasion area fought a delaying action, retreating southward and crossing the Pontine River at Grizurbeto. The remainder of the U.S. expeditionary force was landed successfully, and by the night of 22 December had advanced to the north bank of the Pontine River; in the meanwhile, strong Zendian reinforcements were brought up on the opposite bank, preventing further advance on the part of the United States forces.

3. Intelligence efforts during the period of the U.S. advance yielded but little information; the few Zendian prisoners taken would give only name, rank, and serial number; and the interception of enemy communications revealed little of value, the enemy elements in the vicinity confining their radio activity almost entirely to sporadic low-power voice transmissions between rapidly moving units. By the morning of 23 December, however, radio intelligence units assigned to the U.S. Army headquarters and to the two U.S. Corps were fully operative and began an all-out effort to intercept and solve the greatly increased and now entirely encrypted Zendian communications, in order to secure vitally needed intelligence.

4. The traffic intercepted on 23 December totalled 375 messages; these are shown in Section B, with a digest of the day's chatter in Section C. The top line of the message heading is the intercept line, consisting of the receiving and transmitting call signs, the frequency, the intercept date/time, and the intercept station designation; also included is a teleprinter serial number (which can serve as a worksheet number in subsequent machine processing) used in forwarding the traffic

to the United States by radioprinter. The second line of the heading is a message preamble which consists of eight 4-digit groups; this is followed by the message text, invariably transmitted in groups of five characters. (In all messages, the first two groups are repeated at the end--these from their appearance are the discriminant and message indicator.) Initial analysis of the preamble components revealed that the first three digits of the preamble constitute the station serial number, the next three a message center number, the next six the file date/time, followed by four groups whose meaning has not yet been determined; in the last group of the preamble, the first two digits constitute the group count, and the last two digits are still unidentified.

5. Data from the traffic for 23 December were recorded by hand on traffic analysis logs for initial study; as machine time became available, these data were punched on IBM cards from the original traffic and listings were made for traffic analysis purposes. In the listing shown in Section D, the major sort is on the transmitting call sign and the minor sort on the receiving call sign; in Section E, the major sort is on the frequency and the minor sort on the transmitting call sign; the listing in Section F (useful for cryptanalytic purposes as well) has the major sort on the discriminant, with intermediate and minor sorts on the A2 and A3 groups. Data from the traffic of 24-26 December are included in Section G, which is a listing with major sort on date, intermediate sort on transmitting call sign, and minor sort on receiving call sign. In all the listings except that in Section F, the data are in the following order: (1) worksheet number; (2) transmitting call sign; (3) receiving call sign; (4) frequency; (5) intercept date/time; (6) station serial number; (7) message center number; (8) file date/time; (9) to (12) the four unidentified tetranomes in the message preamble; (13) group count; (14) unidentified dinome in the message preamble; and (15) discriminant. In Section F, certain elements of the heading have been omitted in order to make room in a concise listing to include the first five groups of the message.

NCM DE IZW 5385KCS 230136T USM-99/00001

0018 0923 0100 1101 3644 5815 3917 8012

JGGJG DZBDD XJXUF TWLDM XOPAF QKQPM WGLMF KQLAF ROOVB TECWK
XDMIU MWSNA UWKAD YXDHM WQAPW LCDNP STUBQ WVXAI HEYXC LMCCJ
PLDWG ZOJCR LFLLE BRSXA SXBMZ XXDGC MBZQK HXRKO GGMHN RYHDA
PJXCB TXZFR MMAHE YFVEP PASZK DRTCY KKTXM CVCYO KUPXR IQEPJ
XSCLL ESDAX ONZBY DTMQY DRPTJ DHBXL TOKJW ZSLNS AWAHQ OEJMK
YYJQF MOMVU LUETR POHLZ CBAET TLZVH UDEHH JOPWT QUAAV CZKDI
MEQNC FXNNE BSTJB VIPHA EJCIM XKOZA VRYRG FGKQA XYKGN QOAGL
XOJEH EVZCR MJTHZ RCKPD OFPIM RLTNC AXYSW DDBKN JGGJG DZBDD

NCM DE IZW 5385KCS 230157T USM-99/00002

0028 0923 0100 1101 3644 5815 3917 8024

JGGJG BRDAJ TWSPR ZFYUZ JWADS GSOAG HCVXT MPIEF PVAHL HQGXF
VJVED LKUVI BSXPQ KIVWA KERDN WMGAL HOJCX HYLIS HMQOU FXNTQ
VDRKD XSEFD PZGZS AINJJ JFFLF EBOIT ZVKEI KTMXG HCING YOHVC
SMUEX VEMLM HHAAI XYMBG NBYTG VZDFF XOWWD CMCQR EOBYX SLLTW
RQVKE VTHFV HTEZE GZFTB LIHYU NTNGP MPFWE QKYJP JKFBI UELLS
SOZYX MYCYG HZXLF GLOFL YBDYN AUDVB FYBNR CRPKG MRGCH QIWNO
MXRQD XUMJD RAOBL OQIAQ ZNDHF KNVMZ PPYTW VFFXX TUMDU YDDTT
XFBYP LODDO VBGME OZFZF AJPZQ EBLLF ZAEHN DWLAW JGGJG BRDAJ

FZX DE GFH 2620KCS 230103T USM-99/00003

5511 6723 0025 1101 4606 4997 0172 4411

CIBCI WUHLJ HAVAM TYBAG FBKLK BUVKM CXZAF BYRQI NJUDT HBPEI
EDXFD BIGGJ HDCIE AKLKC ZIZDO UMZWD BSVMQ YEYJC FHACD AMHBB
UKGLD PRKKN RDPKI QKYTJ EDUYU ILDMN IWTGP CLBVZ HUVBG MIPHA
UYMGU FIDIT SXNKE LEROT FCMLH XFOGB QGHIH YWRIH CWZBZ DIIGH
TRSRB SUIUS CIBCI WUHLJ

ZIC DE HCO 2350KCS 230104T USM-99/00004

0537 1823 0020 1561 2239 8740 5726 4507

FBHFB KZVEJ KHIGO QDBXN ZUQIA TVWQL TTZVV LFRKR QICGE VYKON
XWBSW ZYORT PKNWN CTPJS CKXTD KZQBW FYOKG MZLWP PJZMZ OZRJN
CCJFO RDLOQ XCEPO PCTKU WFPTB NHOQV UIHRJ UCFGO EPYOC WYICX
FFBGD IPHXY FMFJX RFOTP YBWGJ YOQHF TUVLW IWAFA AUCUD MDZDB
MSQKL YVYUA HIQXB FBHFB KZVEJ

SFV DE XYR 2310KCS 230054T USM-99/00005

3516 3123 0005 8140 7487 8641 5320 6630

EGBEG PLIGH FHOYZ YQKCM KOKHB KKNRD LYVNE FRBAW LSNWC RYDVP
JYTHV OLECC IXMKA LWRLZ MFAXM KZUQA SHDWQ GHEUB BIZRH WTBYM
VPAAF MEQDI GGWZV HWTCX ACJOM AFILL CHVAT CLBUT RCATS ISBID
ZRXBR ZDKHT GOUDD FGALS YIANC ISWZC RKDUG IKIWV TNGOX PJGAW
BFRCP UTSWE WYNHX XBXJY QLNAQ YIVYF TBPYR BWJVT JNJJV JCPXG
DXBGW JWWGG ZJHRV AEWFB MABGS PEVNI WBNYZ YIMVY OTUYC EGLQO
XPZRO WTXBE LJLWU RINVT EGBEG PLIGH

IZW DE WNN 3490KCS 230154T USM-99/00006

8515 1823 0110 2172 4803 5743 0334 5226

EIDEI RLKHB GUHHI YEUOL WOVJE LEYAN SFBMX GRVMO IBDZZ FTNQR
IVGGF LZKGL NHLJL ATTWU BDZMR LEUDE OBMUP XTGDQ BQFCC BVOAV
FFWFU WGIYY XIDJI JMSRN CTQXP AEODI PCZPY WRKHG MXMBG MPZOU
QJDFF LYTTA NPITT DBDHD TTGQC JBMFG STFMR HGZPG EVDAG VTHBM
ERVAA QIHMQ TNGBJ ZJRRG HNEDM ISSOH ODDKJ KXHPE WHBBQ AUAHL
EIDEI RLKHB

LLZ DE ZZZ 2030KCS 230116T USM-99/00007

1011 2123 0040 3973 4094 4258 5942 6323

IIHFF CJRBC MJUKM LNVPW JQIFG EKJJC PEJMF CACPZ ZDEDJ DHASZ
EHDLH ETBPI PODDZ XAHPT JELUB ZCOEC OURIY WXASK PXMBW XDMQF
VIHRW RALKP UDOHU UZMPH OPPJX XCZBC QQOTB PETBQ NDEHY LAUIX
MJEMR GZNTY RENDP WQZON KYBQP IATUU SPZLB LOKDZ BWLXT AWSHM
MWTLJ WIYCT UGAYV TBTPJ EKAXR WBSIS AVBQQ LYUNK AJUZV AHBXQ
OKKDK JUOAX ZRRHY WZCBE TBYZM XTZMR VBTXE LBTZY XTHBQ ELFII
JXNXX IIHFF CJRBC

BWO DE TFY 3360KCS 230157T USM-99/00008

7018 1123 0120 8943 0611 2025 8156 3227

CFIFC GIKBX AEMFO MBDAL THAZQ JAOAP IGWFO WCFUW BMUKV VUFYF
EVDCY KMMBS GKOZK MOHUQ YPCTY YPCAU BBIVZ FAVBM AEUPI GWKYH
QXUGB QIXOQ EMDMU KVXYD XGUFM HOGPB YCSFY OATOA TJAQA HBSCX
CFIFC GIKBX

IZN DE XTG 3990KCS 230058T USM-99/00009

6516 2823 0005 9518 8423 7543 9083 7135

DDHAA GNZME LWSRZ FBMTQ ZFQZA LCWCY FMIYI VPVQX LHSXN QWFLZ
MGHKL QLZDE XWBYW RYLID XUUWM JMJEP HYZLP SVLYL ZFLQR VLXSZ
WLYWT GLOUH XXRTJ CJBWE BNCHY ISGKE LBFHH IENOY DIMVK XTKDE
YYBPH ULRRQ WKXHV JSIKZ YFKIF LYGYK MRMXC ACZFK UHFKH HPYPR
XGOPD JDDXFE LRHII TGYOB TCPVV HRUVV XVNDG DRSXK HUZGN CGUSA
CQTLP FFOSS RZRKP VDBLO QKUDF HCUAD KYTCT ZSTYB AWUTE GKHTM
IESND QIDJC VHYDL GFDPH EIAAE SWMYV RLTIU ILPOU WXXXX DDHAA
GNZME

MKP DE PSD 2960KCS 230053T USM-99/00010

5518 4823 0010 5504 1476 6607 5762 6107

ECHCE TNUOS ROIRT APDIU XRDOA EMPAN ENERO CSRUC SSOQF LOCNN
RPOTL FIEEA ETIEN MSHMP GSSPO ETOTE NAFYR AAWSI RUJLS EMRII
EAOPA HRHTA ROECO AMSIN RRHOP ELINT LMDME UEZAB EDATO FARLT
PCOOZ OEAIR RCEEO RPPAU ENEAE SEMPA BLPEB ONFSR TDEZT OUNNS
METER EIREE MAEKI MMTIB LNLDO OASRS MLPOE LOSMC NRORP PONOA
EVRXB ACTMF NENEF ESNEP EIAIA CGOXO UYCNM MAELL AWVED ECHCE
TNUOS

MKP DE PSD 2960KCS 230114Z USM-99/00011

5528 4823 0010 5504 1476 6607 5762 7516

ECHCE TWMUO NOMZT APVLL NEROA OSMCP ERECE NSIDO ZSTMO WECUE
RPORU SEZEA NTHEI AROZP GSTPM AROTO FTPNI NOWSA RAIMZ EMREE
ELORO EPCEP ONOSO EABTM NUXOI UBNIM MEDRH XAAVE AUMNE SSECR
FFPAO FOPOX SEMEU OAMBO TLMIW MARAE RELRE GERNO OEDTA PRRTO
HPILP RTXTC MVCZM IUECR OECNT ERBTO GRSSR ENPRN AISON OIRNE
MVNPC PAZAO OADSE LMTPC WTILA MBOLT ERTEE EOEKO HUEII EAAAZ
ESARK GVITC XSWOP PSHER ASACI RRPIB EANAT RNELN KESAP EZCGF
UMPER ACEKO MOTEA ECHCE TWMUO

YWP DE EOU 2220KCS 230313T USM-99/00012

5522 2123 0240 3749 0420 7101 4718 3728

CBECB LJEBA CZMSK BRERC UAYJK AZYLE WUZHK PIXES NKKVZ RHDCY
QDEPV MEPYL GVCWV ZRTEZ MBCEK OBNGQ FGWZL YMKLF AQDCT SVMKG
TWAGD EKLLV EMREK KEWZL ZLREP SRKFY YMJGY RINOI OLZCW LKECJ
SILIN TSYXX IOLNQ BGJKP HKHYN CEECB LJEBA

ZIC DE PSD 2400KCS 230354T USM-99/00013

2516 4723 0310 8140 7487 1161 5726 4625

HDBHD PESDI AMCQV VBHEK JCCBU NQLLI AYEAJ KRBIP SZBPH JYXHA
ZJTDC QANJR ZETFQ SWNPI BKMAZ IWGYP TKMEX YWIWP HEDVJ UJHVV
SBHIP ZCOKJ BAWYK NRPIL NUMNF TKDCC MSFCM VQTVI MBOGN KFQUS
XVQEN LFDLJ LNTEK SLIYR NUMTB MLDLK JEBEN VMTCM XCPWD DYIJN
OHDBG EDMER RPIIR FQJFQ HDBHD PESDI

SFV DE XYR 2310KCS 230243T USM-99/00014

3546 3623 0200 9518 2239 8641 5320 4944

EGBEG DZXFD EEWWX BJJNE BYQVK QZCSJ FQDUU HDQYG VDBST FPZUF
EPBVX ODRSH WRJPL GSIVC BWIAV HTCVM KQOFM JWFFQ OGVLX FFFXW
XMBZF TZBFY GDMBX SOJCH LAQSG WSXQK MXTFI QVUSW QKYVO FIAPW
LAMMF VBGTI JIHNX FUSNE WJPSH WQIJC GRFNU IAOBK BQXZF HRYSE
OIQTQ UAKPC WPOKV DXPVP RFHPH IGDJO TBFUG EGBEG DZXFD

ZIC DE EDH 2210KCS 230212T USM-99/00015

1534 8023 0125 4775 1663 6977 5726 4437

BGIBG HTQHI HEFEJ XSYDJ NYUHH XPVFL SJTYU DKWWQ NJAAV TG6JG
CTJEI OKCQC YNOZH SLWZI RTUYB WGMUW ZJWBI SOWEK MQFBH QYHHA
FYITG KVWRY OZVJU GYCSI YKHPT DHBCL CEFFZ URHNS ELQXC MADOK
XVBRZ DNRYA IAKKB HOHYI OAXBC BARAS SVGBG XWJEN EARXL IMYCS
GTLEJ WIKJK BGIBG HTQHI

PVK DE AAA 2685KCS 230317T USM-99/00016

6022 1523 0235 9969 7046 9262 3061 4808

IIHFF BJOBC JCMUK LDKWV NLOQF WOQAF BYYIC PJTMJ XGZZC PXZUW
KTMFG FIUCM GUGNB HFCDS UVFLE CHFWU KLQIB MFDBC PDIWE VYFYT
MRBIV LQZDB UJDJP TTNBL NJFSW DXDIO ALTHG FZTLH BZMVN ISNGO
BEKVB JBASE KKDUN SNGMH JRMBL BUTDW BXLBG VOWYY DNVFK WJSCA
SSJXK WKROD MVIIV SPODC ACFDO TBPRS IIHFF BJOBC

ZZZ DE LLZ 3520KCS 230236T USM-99/00017

6016 1223 0140 9329 5074 8146 7094 8017

HAIHA FLVBI UYGKK RRHAA BOCKY ELMNN IUAFN QYDKV PDMSK JUJAF
IUIMR YTDVW TGKFX HBFYD MLBXE XFBCB STMIB VEKFY IHSND FIFML
OMIXP IVDUX QAGAA GIEKJ XUOPZ OWARI LQBIJ CULRM CJYYC OBKIY
XUETZ FREAQ EYUJQ TEYTX NCZPP EEJOG PSYIH ZQLJT YIQZK LCQZD
FBQGP BBYRN LZWHC PENDL JXJLU VUYNW JGUDY HPUCS KAHYN DCJJC
XEYKH UUAXP AFDDV FANJD CFRFG XXDCS WEAPB UOANS CESQL JVVGX
SZOQC LFRYY AUCPX BWCRV GDLUH SIYKD NKFOQ WOIWO LAPAV OMQIE
ULVOR CTIMZ UNZRM ZJMHY OYUKC WUMMU PKSFV LRKIX HAIHA FLVBI

ZZZ DE LLZ 3520KCS 230259T USM-99/00018

6026 1223 0140 9329 5074 8146 7094 6028

HAIHA FLVJE CLFBP KXELU UWFAK IMNIV NUDBN PFOYR JYRLH LECKN
NIKYR VSDLL VUWLL YZREU SOFKI ROEWT VETDM BADMO RCJAX IBTGR
HDXVB TXLIF FEJQJ XWLVC AJSSN SDFWR HZQPP UEHXF LYMVK IMIVX
WNZQQ PRUUZ WLLSA WJGKJ ZYXNS SIWTT AKCRA IQBLX LWWJF ZHVOM
ZNKEH OGJXP EFMIZ NCQUY ZLGKJ YKPML RJWYF CUHNU QIRPH FTAYP
PONCU BURKZ TWDTE RAKNI BDANA OWLTX OCWAI OFYYW HAIHA FLVJE

RBW DE NVT 2020KCS 230242T USM-99/00019

1025 8723 0205 4775 2645 7525 1081 3638

AJAAJ LMPDG GZXFI PMDVH XYPSB JFMRL IBHPB UEBDA SJLJW KFPCY
DLJFU KIWQM LGOKO PSHMM HXLVP MBGUL TINCT JSQHC RSNEV FQBRK
DMXAJ QROSR AOOZM UQJFV VDGZY ZAZKY SXMVX PSLBV EQIMM NLJXQ
YXXPT PQPPU XQBAM UEAPT AJAAJ LMPDG

ZZZ DE MLH 2020KCS 230347T USM-99/00020

7025 9023 0315 3973 7487 7525 7094 9028

FEAPE TZSIG QFXUZ PCYLK TIIXR BOBKA UBOBW OXBRO JBWFU JVRET
TBCAV TDHPA KQUEJ BJNXO XQQVP FWGTK KRQJB YBCAV DUQBO TVKNW
EBILY RYDZS XMYTG PQSJD MMOBM XBTTC HDLHR BJGWU SQLDO BQUFR
ACLJM ZCPLP XQPJJ FBPZD IGAGP ZRSBW UJODQ HPBFB BFHEL UXIBU
IDHRL QFXWO UEBTA YRIMY XAIOH DHKIY JDAWW TJLLA LBSRF QJHRE
TULOS OVQZS VBUVA WFTHX WYBVG OSMOQ LSIWE IYRLJ UMFJT LSSTL
IBIIX AXQCZ MCPQJ JFBPK OMSWY YRIXG BMSLZ GXNLQ LIVBZ VQGBM
CJQIU IKXQF IPQPQ KRZKE SIJBO EEJNP UACQT YXHLJ UXILF SVEMG
ZAILG LVOTF YXUYE ILURT BIHKU CVARH UCGMU DUNTP FEAPE TZSIG

BCM DE IZW 5385KCS 230212T USM-99/00021

0038 0923 0100 1101 3644 5815 3917 3422

JGGJG BRDIF VJHFQ ZFKBE HNGKI LSXNP FFLLM PXWQH FIRTH SKIKD
MBWAO RZJCF TJCPJ DFALB VMOOP NBTVN KJKBX IBCRU SKXXI ATUCP
JNGMV IMQFU BBWCL UGROA PJJIW MNPCR GAXHS HDDUB NFUIX AHEKF
THBGP RTIBG JGGJG BRDIF

ZZZ DE ZZZ 5955KCS 230326T USM-99/00022

0011 2623 0200 2750 2664 4258 7094 8718

IIHFF AKLBC TOLCL NYMFJ YNDHI BWKGW SAWDA LWLVC ZBNIG RAIVT
XLGQT ZFCAM ZJTYD RVRTV FXMOZ PYBHU DUDYP HUKQM YBKLE BOTPL
OGDMA MUXHX LBBHJ PQVZZ BMRBP GAEBJ HUDQM AYKDI XLERO BGFXO
RNGQT ZPQIL BSQKL VUZIO BNKQX BNJQY BNCXC IQLJP DGFOP ICATM
WUGUH LACAK IOBBQ KUPKB RFCAC OMDLL VBNVI QJHIL RSOGQ RBIUA
SFNIY ZPVBO KOPBM KXBRQ YFDPM WPMPX FBMPW LFBVB VBAKX DZBMB
BANBK RIYRD MPIHA IGQRD LQUJJ LGAAI BPPBP SAHPP PWAPH VPLYJ
KMZGV JCZDR MPXHL PCOIY XOHXK ZXQDY PFUPX MIOXT IGUZB IOWTE
LAPKL PTTOU PBVHA NSDKL XGUYX IIHFF AKLBC

ZZZ DE ZZZ 5955KCS 230358T USM-99/00023

0021 2623 0200 2750 2664 4258 7094 8510

IIHFF AGOBC VRROS MCSAK PCXOQ VQHYV QIFPL ASAHD TYLHM AMXIC
MYWBC BGHDW NHPWB ZBZSE UPZBJ UVTAC BXMHD EVJPW OUFWP AHIAR
IYJLE OJHCZ GYZGK UKJXY LZMBX MUGBN LQCRL QNTFJ KLUOX BTZIF
VBQIP APBNB ODKGY ACCRZ JWZXT SIRBT QAEET GQMQP RVFFL YEPID
ASRVR OPMMZ SYZAA KTFYP FQCYG OUYAW CYUBN UZAHN QBFTH FDBOH
FWCBM DHDBI UODOZ BWOZB GHDPT QROYB RCFER AXQZV VBNAI HIGAC
QRRBM TLHBL HVQOU PVMKP AYVTR BYLWL RMXDL OGWTV RQFYT LNKWH
CQAVA BRLLE MTQOC EPBUE TXLVG VMBGF DQZDW RXXWL OCEPP AJQRA
GZEDL BQEFR OZXXX IIHFF AGOBC

TFY DE BWO 3990KCS 230337T USM-99/00024

2036 3223 0210 5504 1476 3565 9713 5930

CFIFC SYDTR EVONU IVMOH UQYPC TYYPW UBVQY XLGIK SQIKO TOKCG
OIQJA OAWBW THBKD LXMVJ EVGCY TVVOT HVALH ZUYUB YQRCA UBSAN
HLEDR HETTZ UYUBY QRSIW USUMD MYLVZ AZZDA LTNAZ QRUBR WBWTB
EKDWU BVVOR LDUYC BOTWT IQKCA UBCID IREQI HOWXZ IWUBU NDWOP
KKYHQ QAIBD EVCZU YUBYQ RMEKM FUWBK UEODA OWVOH BLEDR ZIWUJ
UTBSU NDBOO RPUYM HAZQV IPKGO GOPOA PKXXX CFIFC SYDTR

UNK DE FHI 3670KCS 230208T USM-99/00025

4516 0823 0115 9942 3456 6869 7904 6029

80808 42831 71157 33931 99675 09460 50648 52699 93419 55699
05090 44424 93475 23012 99169 13772 92900 31931 37729 29602
93489 89761 81423 59595 52934 53197 12893 07227 59833 93493
43728 69293 23050 30305 62359 74444 24934 75230 12991 69137
72929 50102 93489 89761 81423 59595 52934 53197 12893 07227
59833 93493 43728 69297 30669 74029 38829 56740 80808 42831

YWP DE UBT 2850KCS 230347T USM-99/00026

6524 9323 0310 1561 6010 6832 4718 3923

AEFEA XYSMB BCHDA IRXYU OKBER FYQUV YBTCY RTFBO WREFY SULBB
AKQPY BOTIQ KAAUH XYEYK UFPKY LTRYU IQAKC LICFF IDLXA VUWEU
RVEQM DAGPZ IBCWI FBBIH MWIRN HAVGN OXLVI MGREF YLBMK KYLTC
IYDNU HUXAW VHARQ KOMWP OFUJY AHKYL THYFM AEFEA XYSMB

YWP DE INJ 3330KCS 230249T USM-99/00027

7518 1123 0215 9329 2645 1864 4718 6409

AEFEA WIRNP OZOZO EBXYV PVYDV XOCYK OZKCY TVFOM SHIZI TUUMD
EKREE PUDAI RLICP QAKCV UHAMO FSPYV HFAFP NOXLH IZILO DPSUL
BMIQD WEQNV IAVLU NIQAC VXYFZ VYDVC YKMQE PGCYT VFOMS IYOBM
AMBMO ZMKYL TTING DAIRL ICFBE FLBUW YCOZD KACQP EYPVE HDQAK
CWEQN VIAVF UOTKY LIZUY UHIDN MAUKG OHPWI HDLBG UTUUM TOIBB
AFMFO UAFON TQAAT ZUYUB AYEDA IRFAB IMEMA QAKCN AFFKY LTKUE
OKARE PEBSX AEFEA WIRNP

YWP DE INJ 3330KCS 230331T USM-99/00028

7528 1223 0240 1120 7263 1864 4718 4004

AEFEA CAIQF YTKQA OGQAK CFYBW HUXEP YERKY LTBYU VJIQR HIDNZ
AMMGU OUZUF BNUTF DEGOP IAQZA MWYE ZMITG SULBZ UFBPO RFROH
YBUNP BEKPJ OSBKY LIRYU ITUUM DOLQJ EVGBU NPVYO FWIRN VUFIM
YNXRY CRMAQ FQOVL KIGST OMBMI UBWIR NQAKC JOSBX AEFEA CAIQF

MKP DE SFV 3910KCS 230356T USM-99/00029

4033 8823 0300 0120 1871 5086 5762 4816

DJDJD VUKCH IBLKO ZKCYT VHYQW HIZIW YNFSA HCGAL VQYDR ZUBXS
AVQKA QDTAC YVUKC HIBLK OZKCY TVHYQ WHYQW JISCJ OFFRY FUJIB
MVUKC HIBLK OZKCY TVHYQ WHIZI TEGBR AYSSI QICAS ZDUMQ LARFB
OKHQY DRWOY TBAHC MAHXW YNFGE BLDUM QTOIW LOOZH OAIHI BLWBM
IVUKC HIBLK OZKCY TVBET YBETY JISCX DJDJD VUKCH

NIO DE POH 3520KCS 230321T USM-99/00030

7516 0823 0105 2750 7263 8146 8912 7701

FFBGG SHRIH MSYCQ YMDUK QWQSW VIGCC TFAMG YRTZE GHMOQ RMKSQ
ZKJJE CFLZK CAXAM WMMCA OMEIW VRIFM TMGEG EUIYQ IRGQE ACFZT
AJREP SXQFZ ZGMUP KTJAI PLTVD GQWFX ROYAC RAJTP WSIQH FIBKY
QBLHN ILOOS JHQNR KSZNE WFBRD LEGOP LQTVS BSMOO RGFJW GCAMB
WWNNU CFZII KHBJR GZYUW AKSUF KIIAG CCIRO SVVHF AOSTM ABTMW
FDRIQ QTNBF WOVBW SBCEH RGKHN PKZST CQEBO GWMJH QXWKN MRUTT
LPKBZ YEYBT EAAYE AKCEO AQFLI RPHKJ GDDSK CZFXN SMFXX LPJLS
CFDMU MRKVS KQKSA XJZZX VQUGA FFBGG SHRIH

FBG DE POH 3520KCS 230305T USM-99/00031

8516 1423 0215 1101 7820 8146 3313 6326

FFBGG FKTNA CUGNE VRFCR BMQTO EYHWX YIZAC OBQZB LHTTY SHOGJ
RPHHD VNMFW JJIMD KDNCS MZKEP VRUQM ISNVT YOMIP JMAJX HDXAS
RELPJ VEZLG ZTOUN AUEFN NLMML PTDQW TONSF QOUNM SBKNM OHTGB
UCKZM RMSRA CEOAD DINKN XPZKS AIWDJ DJYTB NMQDN ADFDK KZLVU
ERLNH IZYHV GNXAE PRJBU KEPMN VWXXA XDFQD DTHYW HZGMW MEBIV
XXSAI YGVFL SAOAD ZSXZI FBTBG FYUAE ZGSSF YJEMG LBVRB YDUYY
DXXXX FFBGG FKTNA

WRN DE IZM 2100KCS 230252T USM-99/00032

3028 1023 0130 0121 8820 5815 4718 9422

DDHAA LJTYE PBJMU GLZBH CPRUM IYEBO QWIGO TLTBM CJTDT DVKMJ
CCSDO CBOLX VSDIS DOIBW FJRYL CFWBR HOLCW WMCMV FEJUK SZCAU
PILZL CAQIE GZYOS JHLVN OTXMR KAFFX TFXKV ESYYT IMRKU UKPUD
ILQJF CPKMW SFBRL BKIWY BTOQV LZDJP NIBCT CCFER WWDBB DEFBU
AVNMP FXZBE EYCPS VSRKP RSZZW SHWJE NJCFV JCDCE AWXHQ RNFBU
BHYBF ORVXD ZGBQV PJLFG TYRKC MRMLV ECKQI VDIPJ GROOP UBIQH
EQFQP DWJRF SVEVC TKFRZ JAVJN QUGSW UEIXF AUABA MQBBU RDUGS
RKHZG BLQDL BFUAJ PTTVJ WHVAX PZTLB DYWZD VCTYB WMOOG MBGXE
JNHIG DFFYD CLJMY TDAJD RDKHO WBUCM SFTPQ OZYCB FUPVJ WJWFL
URMBM GMZXX DDHAA LJTYE

MKP DE HZY 2750KCS 230248T USM-99/00033

7017 6523 0135 9942 8820 8623 5762 6112

95459 68942 32654 13390 43054 48740 48192 14428 56569 61846
67451 85456 96184 66743 30944 62295 41068 94232 65680 60643
16538 46617 47365 83213 73638 46617 47385 45881 79886 06443
36229 54106 89423 26568 06064 31653 84661 74730 58817 98860
64433 38998 01273 85692 24273 85841 67944 32472 28258 73659
51263 22822 32986 73554 76229 91173 12292 42982 25800 95459
68942

XYR DE VLH 2990KCS 230338T USM-99/00034

2017 2223 0315 9742 5237 1260 8444 5524

50505 77620 98696 91537 27597 03349 39747 97968 91774 37997
45857 97462 09896 96527 48597 57373 98060 57398 79795 91986
05794 70504 91573 98958 60591 69605 28605 96497 60336 99965
38849 76737 56960 98573 57277 52985 89759 13879 42597 47979
75898 97603 37898 96969 95395 73059 99698 73905 91997 41914
19199 04752 73380 50505 77620

FMT DE FZX 3760KCS 230513T USM-99/00035

5011 9123 0420 9518 7487 7741 2620 4418

GHBGH CWIHE VBMIS UROFR RDBEU UWRWU XFZBN ZOQXS IUGRM HIYYZ
BORBJ LLFET URBDU QBXAB PBJAK UMLXO ZUBBK EBQLS JWOSB ELNFG
CUUBL HOQVO IWIQB MKSUJ BWCBW KNYGC MXNJL PGVFU MUQHO ZZAHZ
TNWKV UJGDO XIVCT HLDBR BZFIR KGVFH XCHPM MIQDC SITLL PRYNS
ZSTUC TWYBM GHBGH CWIHE

1ZW DE CUN 4265KCS 230557T USM-[illegible]/00036

9521 3523 0515 1101 5074 2241 3083 5838

AGHAG TPOCG EZNQQ WWUUS MKQHC HGVIM IPHPC CSITY XOJIF VSOHT
FOPRQ OSFRW KMZTZ AYBBO GDIHK FEQYB UDLZG MNIDY SZHZE BGOAC
PZKBL DOWVR QLUEN PWROJ WHURT CMSGS OPGNO GTYNU FYAVP DALSM
TJPUR FTNWA KVHSW JQYYK KNOEN OXFLA GHQDK KMMMN YJIEF BIGAP
HUUOG MRIGP FFSRW RPNHY QOCKO IQRKC YCCOU RJUXK JZIWD GCCKW
QHWAK RBZRL RPGFU NYGHR PZHED BQKMF AGHAG TPOCG

ZCA DE WTN 3480KCS 230508T USM-99/00037

9512 7323 0420 3329 2239 4717 1081 3909

BFHBF NFIED NSDJD SPYYY JKATT HAFMU ZZCTE IQJWZ AWIKL QUAQZ
FEVOK BQZKG REDND ECSSZ ZAWWY HYRPM OUQUI PKUUI GJYOK KLGFP
RDUVN JJFAB YHOUO JERXG XURKS RPKCL DUTFJ ZFKYN VCIFR NSWGO
EHUFT GZWUC FJOQP CLWSX YLUAB KVTUW LFVOU BFHBF NFIED

NIO DE BWO 4095KCS 230536T USM-99/00038

3016 4023 0455 1561 6442 3565 2125 6712

CEHCE JLXDF UWFKE GHRXR FQEUJ SBNAB QJUMC ZAWQL QHUCP UVYVI
HASIW GMQCL LIIPC QVQFO KBEKA DDCVH DREHP ZCUAO DNNXU RTTTJ
NZHRY EAXQA XVOXT ELABJ TTTCY HOSXX IJTTC YHDZV CYDXB QDFLZ
TBNES OVHLF VDAYO NWPER RLNVS WSFUL XOBRQ YWVZK YQUYC BNXHZ
WEEZK IHYTX BCRQP UATUW OXNGK JEZKO OJNJT PVFTQ LSDXB JMEMR
RNIVY PHSAA JINXG YSVGN JTABW NBRYX FCFTC RWHNX QDDIR EHJAJ
BIMMT ELLFG IGGTZ ESWBZ FWCEU CEHCE JLXDF

NVT DE OAL 3910KCS 230456T USM-99/00039

0523 9023 0410 5161 7487 4555 3485 3723

CJCCJ GLNJJ MMHIM PDSUJ DXGMH SZWSK ODKFS MUHCG DKECC MYBLZ
NGUYF ZAONL APIFJ WFWZH AIRYG XNOJK NRJKG RRUZG TJDDH EIXDG
QGOBH CNKPN GERBA MEZBN BGVWX TYXFE YSQXX PCZVA CZUBM BLFXX
EULDV SRWMZ WESTW BTOOD ZTDEQ CJCCJ GLNJJ

MLH DE ZZZ 5955KCS 230557T USM-99/00040

3011 3823 0500 1101 7487 3637 1117 7620

FEAFE SOJFH SCYZR LLZTU XHVPL ZGVDS YXONG MKUTO QZHKS DVFVF
USJUE MKEIZ IFOKN GRCON AMWVV FLXGM OYQFS PNVZS TRFDY JSWFC
CDQYX OIZWN DSURQ GLDUP TUKPS NRVOB XPRXL SFTAK ZGDKP OHLJN
PRVJP QLZAX JEQDF DTBWM TYXRE VBJVG SOJJM NLNFF IEXUA YBOQV
BVLTB FPAQU BWFFW IFNVB YZPVO CIQPZ SJTOX NYMHD EBFYJ RAGBR
WWAMK ICYTC OPUFO BGAXF SBTPT MVSOZ NMAUR OYNGY FPAYK MDPBM
JIIKO MVORE KVBFP XYSAS UNCRE REARA AALFB HMCEF NIVBA SDPUN
XIQLF UYWXI XTHGX DSLGP FEAFE SOJFH

ZZZ DE ZZZ 5955KCS 234431T USM-99/00041

0031 2623 0200 2750 2664 4258 7034 8321

IIHFF BIRBC TCMPE LNXLJ VQUZY JDJTY NVKFO JMHPL BNVQF MSDRX
CCVWC UQGDW EYXVO XXEVQ RAZES MGGLF UQCAO WAOZP QSVXA SZBVL
JAKIL YSPZI BCBHE LKORG VFNUI CFESJ HMVGX QKSGB DMJIQ HIKWH
KCZBR DZIVP HCPNT YKHZS IXFXQ FFOYO BFUQX HSPLX PLMVB DYONV
CMYKG YYTWD GVGBZ WVWND DAPWE RBUTL UAPPO QWZKS BRSDA MFNSP
WMJBW UNPXX UPOWM GMNSB BVADV HJSZB QHVXO FUVOA GEQES HDEEJ
FHLMG YFHKL JFTKE PBVPP JAAWU LKJVS LZPNI DTOYO URBYV TDFKQ
VEQYA YETWC ZFVSJ VTWAP BBTUA EOBXO APVJV DUZRZ RPJFX QJEZE
GIKOL IIHFF BIRBC

DYO DE ZZZ 2030KCS 230403T USM-99/00042

4011 3023 0315 4775 8423 4258 3717 0016

IIHFF AGQBC HVBMM EOEJL RHZJR YPIKP TFKTP XNCJB DZQHR ZRCYO
XEQIR YUBXW MPAIZ JUZRI RNIHL GPOLB PMESW BJGLR GPWHI YUGRE
MFNLV CYPAV QGMHM PSRLN RVQPJ DBTBQ JJPNG UGJPB BNKSF WREKV
YIAUQ EHWPA KETAB EAZCA ARENG BJJAI ZJYXA QTTMF MQOAC USSQQ
RMDTB CTMIS NOVOR PFHVR APUIY ABTUT DGKHP CWOLK PBSMT ACNOZ
FGEXD FJZEN LDZBW VRGFN AIXVW KMARY HVLBR YAQCK PHAQV IPWAQ
FREUV ZDTES XDDBS RKHAO PZBLF KEJVN LFLOS GYUIV SYLLS CITLN
REHXU KARSJ SYJTV NBAIV AWGKR HPBFL BZRNP QPLDB RJONX QJSRS
YMZDG FTKQR QVPQE HVVDV CFEOG QCGOQ YUZYK UITID JVRTZ ZKSBO
PTSHP EJHBH WEJUB PJIGN JTOYR WDNOY KIHEZ MJXXX IIHFF AGQBC

HDG DE TPY 4505KCS 230553T USM-99/00043

4028 1323 0450 3731 1476 2025 6707 7040

CCFII UUVDF DBNJM EDOPR UYHTW UTEFP TMBRD NYZQS MKGPU IMXSW
LMGFD VBZTA DGCVS UPTKC KDUCH LRXFH JVXGP KUDOL HZEBW ORFQP
GCZLI LPODR EYAYU IQXDI WSXLZ QSVXT OFATP QXSVN USBXP SHTCW
DQOZF EHCJT IXTWM FSUWS ULDCE MUEGO FLJRD NEJZV EFVBM PLSMO
BFLAN VCZVG RJRSP ZLPEB DFKFB CAXDT BDALX HDWHP BSBCT YUCAZ
LFOQN BVTLD FYEUG JWFDZ VWKTG IQGXV DNKSH GDWYN LOFPY OZGHC
PCPUF DKNPO FPTBM SRVWO UVDFJ CSEQM FDVTL WNXXX CCFII UUVDF

IXI DE XYR 5615KCS 230508T USM-99/00044

2516 3823 0425 9329 2645 8641 2611 4724

68486 40752 20265 14472 54875 47314 19247 90959 58561 22521
48162 56848 53767 12386 51524 01999 71575 87075 29284 23032
32338 15476 11444 24754 89715 75873 14100 89266 04255 71641
14256 82187 58838 48895 20240 12063 84075 47353 89715 80785
04172 02986 58300 92200 88648 68486 40752

ZIC DE HCO 5895KCS 230553T USM-99/00045

0547 2023 0435 0121 3456 8740 5726 6103

DAEAD NUDQN ATKJE WHLAU INOLY FEAIS IUNPA WOMOI VLUZK MUCOK
IDPBY UKJYH PJIZK TOMEJ EZLLO FRNIZ ORONO HAVGK EOAFU MRLYD
NNOVI FEAIP EGXSO ZRSIU NTIVP VAQNM IVIVE IETUT LQITK QOMBH
IKGZY NBWAA YBETY CYKMJ AFSRE ATJUM UDIMS ZIQOT IBVVO DKVEP
LQITK KAAOZ OPCBI INVUF YMAHX DUGLF UMRBE TYHAV GFAYH FITAX
AONSO NEFOZ FTOIB VOVPH OKSJI ITCYA CZUHX DOYDH UBIXX DAEAD
NUDQN

HCO DE FSD 5805KCS 230549T USM-99/00046

3516 5023 0500 2110 7803 1161 8219 3405

DAEAD DOEKZ YZUJI EPNAD UQITK LEKXH ADPFY FKVEI ETOIB GAEPQ
ADWQI TKKOZ KCIKM BETTJ AFSMY XHJUM UDIMS LITFT OATGY KPXOC
YDIMB ZIQOQ ITKKO ZKCYK MOOCY RONIM YXHJU MUDIM SLITF TOATB
ETYGY KPXXX DAEAD DOEKZ

IZW DE XTG 3990KCS 230503T USM-99/00047

6536 3823 0415 9329 5445 5653 7300 6448

DDHAA LFVCD LZUXL HPBNW XXEKE QGRJM QHNVY SVLYL CFFRN FFFIX
REYBF MORSQ XREOF DRMMJ IMFIL QSKFS HXPUQ RMYXE ZDXXP SIGCQ
YGSMF VFOJD ROAGC MDGLG YYZGO WYLXI DLPXT FBSGM LQPID OKDOG
WSALV CZNLF TWHMP ZTHLK DWDIX DKEQT XNTLV QMPDP BPGDZ POGZP
KUWQZ OVQGM VVVZH TITDC FLIMD OYVWK OFNGJ IOMIB XWCZV UCTYO
RSDBK HNLXR NDUND DDKBJ OAWFG EBRWF WYBEY IFSTQ LRUDB GQNEL
DJNLA TXXXX DDHAA LFVCD

EOU DE YWP 3490KCS 230507T USM-99/00048

8025 2223 0425 8140 0665 5833 1793 5122

AEFEA BIEIC AMTFI DLTUU MBOIM KYCLR UVLBO NQCUY BPYAN MUEQL
ICPBY BCVAB YXYEY FYANP EARTU CUPOF UKYLT GUVBV YKBHI DHNUE
RFIDL VIGBD EGOCA MTMOT FBYBC DAGPV IGBLO IUSUL BXYDX TAZVB
ULBSA QLHEK UDEGO FYAND AGPVI TOCOP TMOTF CUORP EMCRU EUZIP
NFUCH ZETSF UCHHA FRMEZ OKYOW CAZGD EGOPE WNFID LTOYR AEFEA
BIEIC

FZX DE VXI 2860KCS 230408T USM-99/00049

9527 3523 0325 2110 7263 6940 0172 5128

EGBGE CYTVW UEYNY IUWUE YBETY MUIUQ OTITE WRXAV UMUIU XOCYJ
YYFDU RVZEN MWOGB WOIDB EBOHI RADIF MBETY DITZJ YYFDU RVZEN
MWOGB XIIFS AOIBE TYJUD MJYYF DURVZ ENMWO GBFIY CXIIF DIFMM
ESGHI ZIXOC YGYKP DURVN OGUWO GBXEE RDIFM BETYK OZKJY YFDUR
VXYBV WOGBM IVIDI FMRAK DJYYF DURVZ ENMWO GBMIV IDIFM EGBGE
CYTVW

FZX DE VXI 2860KCS 230431T USM-99/00050

9537 3523 0325 2110 7263 6940 0172 3628

EGBGE CYTVW UEYNY IUWUE YCYTV VUIUC YTVWE GDDUR VTYGX CEKQJ
ICNDI FMBET YWEGD DURVN EHXCE KQZYH GJICN DIFMX UVQDU RVXYQ
KRANG CEKQJ USADI FMZIA YVAPM DIRXD IFMFU XCXYB VZOGD MYYIQ
YXLJE XINEN CXIIF DIRXX EGBGE CYTVW

INJ DE UBT 4535KCS 230553T USM-99/00051

1524 9423 0500 5504 1476 6832 1397 4623

AEFEA PASKK AYMWA RPVYD VXOCY DITZF AFPTI QKKOZ KKOZK XYEYK
YLTDU DHKAY MQYLY WARPL UYIHA DPXAF EJOCM PANEB YNOFA FPKOY
ICYTV NOXLB EAFKO ZKDIT ZHBMW KOZKX OCYKY LTJOC MPANE BYNOC
YKMKO YIFAF PNOXL BEAFC YTVCY TVHBM WCYTV CYKMK YLIRY UIPEB
SQICT BEKPJ OCMDY NQXXX AEFEA PASKK

POH DE FBG 2910KCS 230408T USM-99/00052

2044 6823 0320 3749 4257 7165 4493 5620

FFBGG XPRJD IFRAN WDGIF JOPYB LFUJJ ZDUJM AIBYD ZHVIN SJGRF
PUBPF ZVIWK EFYMD MZANV VPVBR FQVJN HJJIB KXJBX UXGJH ANUQM
IFMUO XLCOW ISGCP YUHWV FWNDZ CGPFL UMBWE RETFY DOCIM QYONG
CHISP RODWU DOVIY OGGIL CEYDR KVHXM ZQBZU GZJBM NAHYY YSKNA
WEZGM UNOEJ AIBBT EWLBW SPCDM WUDQT ZNUTV AEYUS ODVQX OMEPC
RCQTD RMKSR IWBBY BRZDR FFBGG XPRJD

OAL DE RBH 3160KCS 230407T USM-99/00053

2020 2423 0335 4152 5218 2610 5320 6121

DDHAA RHETB XSHLG FNYHJ XEBNE XNLAH VZZIV LLAIC EZJHK DJWFA
OKPMO OOBII YXBKA KOXUX GEITJ UZMBS XDDSL IFCRB DUUWW EZDMA
FUWQL GXJZA QJFCY FFDWG NHUWZ IVVVI EVRTA YXOPJ NWVNC XRKPD
WKXUT MVAMQ EMOBK DAWJQ UBMOT UMRBU TZAZI DGJFU UCZHN HKQWE
LJFUQ KJOVY QCFII VDVMH ROKUW FBWUQ HTUFL KKFJK CFICW WNBUK
LCKHI ARBIV BUMWE FKTBA GBETY BFWUZ RDNOP HMUOL XOMDV DDRAA
RHETB

NVT DE RBU 2460KCS 230437T USM-99/00054

6547 6723 0320 0121 7263 1080 2198 7138

DDHAA WRDZJ EJIRF IHFBS OFTDD CGPHK NRGUX QCPEZ QLEUJ PRRDI
QOULR RXSWZ IYALT IDRMR BLTQR CMSXS XWROL WAHUW DNIQZ MMZUQ
GVXNW CHCOB JSLFE DNJJB CFABD RIKEN XZPBP GEIDA YMBPB WITUK
BAULQ IHTWW OWDQP SUZOP QFLTO RFKAP APDQX HSXDG KNIAY MMYGD
HYHOA HQEHQ QBCNI CPYTW SDTJF MSNUY HGEDI PODFW SBYBU TFGSC
ZRWIM CCWOR OCZSA HQAYC NNNEK ZEVZU HVREQ BISGF MQDNK YFCVO
APMBJ AQPZI RQZPI YKEQX YGDCA VKQXM UYEVI EPIWL NKCLX DDHAA
WRDZJ

FZX DE GFH 2620KCS 230406T USM-99/00055

5541 6923 0310 5504 4257 4997 0172 5025

EGBGE CYTVW UEYNY IUWUE YBETY MUIUF OWCWI CYTBW RXAVU LUYIX
ULFMU IUZEN MJYYF DURVZ ENMMO GBWOI DBEBG HIRAD IFWRE ADJYY
FDURV ZENMW OGBXI IFDIF MJUDM JYYFD URVZE NMWOG BFYYC XIIFD
IFMBE TYKOM WJYYF DURVZ ENMMO GBMIV IDIFM KOZKJ YYFDU RVNOG
UWOGB XITQD IFMFA FRJYY FDURV NOGUW OGBKE SRXXX EGBGE CYTVW

FZX DE GFH 2620KCS 230424T USM-99/00056

5551 6923 0310 5504 4257 4997 0172 5625

EGBGE CYTVW UEYNY IUWUE YCYTV MUIUC YKWJY YFDUR VXYBV WOGBM
IVIDI FMBET YRYQW ZYTOC YTVXA BAKOZ KCYKM VUNFD IFNCY TVXOC
YGYKP ZYTOK OZKXA BAIOC YVUNF DIFMK OZKKO CYGYK PDURV FAFPX
ABACY TVVUN FJICN DIFMB ETLJY YFDUR VKOCY HIZIC BKQKI IFDIF
MBETY MESGH YQWDU RVCYK MGYKP CEKQJ ICNDI FMHIZ IXOCY GYKPD
URVHI ZIXOC YCEKQ XIIFX EGBGE CYTVW

YWP DE EOU 2220KCS 230528T USM-99/00057

5542 2423 0435 1101 7046 7101 4718 5939

AEFEA HADPX AMLMU COVEN IWIRN DUNRZ OROGO BIQIE VXAFE WEIQQ
ORGPO UIKOZ KDEGO CYTVG YGMMI MZMOF SFAFP POUIC YTVDE GOCYT
VGYGM MIMZM OFSVO BVGUV BCXWY FEPXV OBVMO FBNOG UPOUI CYTVW
YHAMI MZVOB VREAT CYWYF EPXVO BVDEG OQEPG MUHER YTHPA FPWYH
AMIMZ VOBVC YXMCY WYFEP XVOBV KYLTH OFOBU LBFEP XROUL LEPCS
OOFKY LTHON VMOTF CAMTF IDLKA CQRIA SXXXX AEFEA HADPX

XYR DE IXI 3170KCS 230449T USM-99/00058

1018 0223 0420 5161 2645 0586 8444 3730

68486 40721 86550 38848 53779 05684 28243 13839 60752 13139
09815 92184 49715 80787 58501 70149 58591 06564 71258 65529
32323 23842 85245 09240 04151 65796 57585 60314 48189 70149
95091 15852 47288 42194 40000 68486 40721

ZZZ DE MLH 2020KCS 230551T USM-99/00059

7035 9423 0430 4775 2239 7525 7094 6330

IIHFF DJOBC RMHUK DWXPN XGBHL AMGFB MYMEH ELENH GCSRI YTFDS
YFLAP OKJAI WLZCH NFBOY NGVPX HYGOU GCHHH BKKCG FZQPO VRHVT
AJLJK OFUGC FHUIL DBVXX ORGFS BNFIN EGBBQ RSRBX BOIBX ALHRA
TOAWJ BEPHT CGHOF BLEPV RNAGO DWKBM PSRLX VGNCP WMAZQ VJBAP
HPEJP FNDAI HAFWL MIYSU PBMLT KGYJG ICUKU WZLUP AKBGJ RORQB
QUFRT YBCDX HQRGW QDDNT FJZFP LGROV PSUPS MNGIT KWZZF NQFBZ
MSRSX IIHFF DJOBC

ZZZ DE LLZ 3520KCS 230542T USM-99/00060

6066 1723 0355 3731 9054 8146 7094 0039

IIHFF AGFBC YAASM SCUOJ FRZKD PZPSD JUOYH QWNFD UJLXN WKPBL
JOIKE WWSAL OLOHO BMDBS PBGLQ AYVOV DPAZY AFJTJ PFWKF TIZLE
MIHYL SICVM ROMFS EBEHI UNQLH GAIAE MXJCL ATZUJ ZOCAN PFMXE
ICDAG QNSZM DSKIS LOGJD GWZRT PXNLS YUVLN ZAOSR IYWXA SXBFJ
THXSC QCBMH GQGBG YAGQV LQTBW UUOHN FUXLG KZVOK CCKRG FKHBU
UCENN KDARV LGMFR ZODQO WIWBV SRGBO PBGLD LJMFE XEQDU KYPBD
JQUFH IBORP MRXEC VQQLM CSXPM EIGHM AMCNU TUUUP HLMXE FHOUX
FVJBX ASGRL JUIQL QNUJQ ZBLMK MNBGY XDZBZ GQQLZ PNIKO IPDWJ
QMXVW PGDKY MMHDP GCBBU HMRZU WAWFT QAAUJ RXUWT IXQQQ GZYKP
FVXBJ VRBMV BDYQW KLSTJ OBKDI PQWBX OIMXZ OTVBX IIHFF AGFBC

DYO DE ZZZ 6350KCS 230704T USM-99/00061

4061 5123 0640 6320 5433 3637 1577 7721

ABCAB HOSBB QNNLN VJELL FBHIY WTBDV YPYBF WWUNI JVOPM YPVYR
PBGBF JBUFH QAPAO BODEY TBBSX JKPTN BMIOK VQXHP OBZUB XGKBF
QJYXI YHPVN CSMPP MMNVC TOBIP ITQDZ CULVL BQZAA IFSOS AOWCY
RRFUC QNHPS QCKYA FCVPO JIBYF GHPMZ YPBKA HQMMF HNPVS YDPLJ
DUHQO PEYBP FGXAI TUXXC ZWZBB WMFUB WNMEH ZQBBU TJJBQ MQZBB
UVZGT KIKYC UJWQF GCSBS EBBTX GRKLX OEDSL HIGOL HVDLL GRTVR
KQXLS SGXXI GIMZI CASHB YIVCE DNZMG AHFWS YPNZY AMMDX NJICH
PZZSH PHAOA LXSUX PMWPX VTTNF ABCAB HOSBB

LLZ DE ZZZ 5955KCS 230619T USM-99/00062

1041 4323 0545 2172 6010 6445 4493 6524

IIHFF AFFBC GFYFG RJBUZ SXKSY ZPVRC PMGHK XMBAD HRMUC JOHBV
MFNJV LVOVM UBXVU VFIJO BTYRM TZMNC KVHJA QWHIQ MSYHV IYUBU
NMHFU YNYXX EOURU DUEZT PBGDW YJRLR HXEPA YIMIR YEKBH HWLZF
HIAFZ OENGK WMVXH GFDET JWTMX IQDAE HHLMK LZFHY YCJKX RVCEV
VEAAP KRNWX TTLYV YSWPA BCGBI FPTXT RZGSC WDBCV PSZHG YPUKX
CTPCI HGQBV AYIDM OIMDI KYXON LFBIU ZVZNS DZPXS ASXLW VAPAM
YWDWG TIKCG NXXXX IIHFF AFFBC

LLZ DE MLH 6340KCS 230718T USM-99/00063

2516 1623 0545 2110 7263 7525 5942 5824

IIHFF EIPBC ETBSX FMMCQ AYKBC BVBGH UPBFR JVPZD RMXPW IPPCR
VRMLN WXNKG YXBPB NBAWC LJWKC KOGJA MXEHH NZTWA VIGAH GMOQB
KTAVT QWZKP VYEPG PQWIF OXDBM DOQBC GAOCR DHUJL TBXBO WVBXK
QLPZO ZAIUI BCLBK ZJMIP YRQLZ JJMBK KUFBC BUYAK POVMM GYJCA
OGYRO ALSCI GLBBQ PILSM QFCBE PBUAW DQKBP XKIOV ARXGB IFFBM
NSMPC BOYTV KLGZT VWWIA DSMDC XPSMX IIHFF EIPBC

CONFIDENTIAL

ZZZ DE MLH 6340KCS 230659T USM-99/00064

7046 1123 0525 8140 3644 4447 0127 9631

IIHFF BJMBC MFQBK VTAUJ SFLKF QTHYH JDZQY KJLMB YRRPR ABMNT
QUGMI BIYTR RTKDK IIRBK QYCKA VBARF FJROM PZZBZ VJCZF VHXZM
FLUIJ JZTOD DZBKD KYCBX BCZTB TAITR MPDLU IIJKQ IWVFT RCBBO
CZFVE QWHRJ BMHYM KKLOP IXHPU OYBSF YUHOC YAALV CAQLB GDMIE
PMOYY AQWHQ WLIBS BEPOR QMPLM ZQXVO BOBMS ZZGTJ NUUVH TPBWQ
RTWBC VFUQC UBSUS NQQKI XIHAU SWGST ZMMCR LUFYJ ODYXB ETTPO
WKYGH MNAJU BATDO RFXMU UZDRD PYJHR GUIYX LHXOC ERVBE SRTAG
KDMXA YCOHN QTKNS VQMFS IZKHD TKBPN CEKLT ZVPSK SOTLG PLNUS
PKFBG GGBZE ZVIMR JMLJD WLOBL NCIBJ MBJIR HIAQF ZRHXA ITBNJ
UFBUH PBUOP YQAAQ CJCIX IIHFF BJMBC

FHI DE SFV 7830KCS 230725T USM-99/00065

6523 9723 0640 4775 4606 5086 8327 5618

AIJAI FZTGH ROUBV J8OCP YFHDD FVBGK TUZOR PQY8Z WGBGG LXBWK
JMVOT PCCZD CRIYI KNYJM SMRXF EBUIA ASUDP YBKBA UJDOD HWCZB
IFMRA XLRMJ JXP6K DHBID KBEYX ZCRSV AEHPM KQQZY NIPBU ZPPLS
WWYIR QOZGK BFYDA TJEBR IUEDW PLRHA DTMJN ZIMBJ ZDPGO HFPPE
OYGNW CRUKU PPLPL QJZRC TRBSQ YTHQY DSBLV PQZLI JJPEJ DGIPY
YLYLL LBIBO BOMMH Z8WGH AIJAI FZTGH

FHI DE TOJ 6430KCS 230730T USM-99/00066

7519 1023 0705 5161 3456 0162 8327 5321

80808 42831 71157 74793 46985 29674 37380 00505 62893 10105
25719 55694 48932 61592 93413 13731 51596 89111 24609 92117
31974 76882 99146 93752 79957 41910 83923 59798 52869 29319
34289 48092 98234 99342 93435 33130 55471 74449 59169 72013
60711 73197 49375 89796 20129 55929 16914 37529 34779 54177
77444 80808 42831

XYR DE SFV 4795KCS 230613T USM-99/00067

8013 9423 0525 3749 2645 5086 8444 4931

DCQCD TQIDQ JBGVA IPVBE KUUCE CHBRR BEOMT DCBDB DCUIQ PJRPW
ZQUXW GBKZY MQKBG SHLFE WXREH KFLYQ BZQHG JQXWO XOARH DELCG
ZOFBE BLCXS HTNPQ VNTGB FBBUH XTKXO BQBMB DYQKE VVKPY QGKPZ
JTQTB BBJJZ MRVRB HPOPQ SWAJU RUAYC AIRHB YIWGX MQDRH NOZJS
DYCPB RSPAS GZZMS VFUYD FCYMP QCRQO Z8PAX DCQCD TQIDQ

RBW DE OAL 7830KCS 230751T USM-99/00068

3023 9923 0700 1561 6010 5086 1081 6921

DDHAA BQBOF GLWAT WIXBY YXOOI WVPHV LZQBY HBTXG YCZBG AMYTK
PTVIU KUUIW SLSFW TKVGY YQBKM DMJJC GEOFL BJKIY ALKLO KWBYL
HJHZO QHUVP KJQFW CBFPM CIPBU BIIQN OHCZU GPWAT CZPNF ADNCI
XBSXX EVXTY SKHXG ZXHRI HBNWI DNDYX TBMHT TOHDL ZXERF CHVWZ
ODRVP MFIXE ZXHJT JFTHX HBURY UDDMJ AZZDB YVPJT JYGML HBWZD
LBCMY RHBBG XLDMG AMCPP TOGWT XBLQI PTGIN VJAIA BYIUF LXSDU
IONUA KOSAO BGZZM FSHIG ZBJVD QYSJB JLKXX DDHAA BQBOF

TOJ DE FHI 5335KCS 230712T USM-99/00069

6516 1223 0600 2110 0611 6869 5609 8323

80808 10893 70985 29674 37389 37095 04442 49341 62275 98339
34934 37286 92955 83346 98666 15335 81989 78287 62141 35598
91725 99887 72962 43889 30774 79346 95819 72876 41471 97534
23339 93791 44579 96135 93493 12989 15959 79149 27173 19249
64852 69585 94771 73195 06499 33856 47173 19106 44699 39647
17319 90646 86535 99341 95317 64717 31970 64933 40974 19237
62769 74791 31334 89330 12989 73132 33509 74647 17319 80643
31309 34351 92376 27697 47913 13348 93301 29897 31323 35097
46400 80808 10893

TOJ DE FHI 7510KCS 230723T USM-99/00070

6526 1223 0600 2110 0611 6869 5609 5946

GIFIG WGOID BBCGM TMBMV MIMPP PBCBI MTBOS RINBM RTATX ACMTI
TTBBM AOIMR RTMIE MCAOA AIOOM NMCBS ITTIA EBOBC MBMOO HBWAG
AETBA ANCBH MDTFR MNTBS RAIKH ONTRF ORORT DEBOY NMISE WCBON
BBMBE BPRTP RUIOI MROAS ELEBM ONMDK HOBDM IARTR BEAOI OIATE
TRNBO TLDBU OBOAP RERBE HTTBR BCARE DORRS IOOQE DTCBS UBSBS
KIDBE OMIIH TTMEB IPTMX XOIRI ARTPE EASOI GIFIG WGOID

GKW DE MKP 4925KCS 230634T USM-99/00071

2015 8823 0515 8943 7263 6625 9399 7528

95459 39028 18861 13145 04423 84628 19565 95679 76565 69618
46281 33486 46414 83491 81284 94684 46164 64860 27884 13145
03934 23169 25844 23846 28175 75456 77715 65622 22481 60643
11812 84948 58241 74171 27315 22621 07355 42143 27365 65226
21073 65752 26210 73659 56222 24817 38565 22621 07328 42857
58241 74171 23339 02815 10684 30284 22384 99164 02242 34232
19074 94679 76585 70049 08462 81942 36252 12825 49284 04786
39203 22583 30000 95459 39028

3FV DE MKP 7320KCS 230725T USM-99/00072

J525 9323 0645 0120 3698 6625 5320 6926

BCEBC MYYBE GMPKQ WMKUV YVLON VBCXF QDMES KATYN OQCQL TTVMW
JPUUM BACVO YAVAU QJVOP QJRMX LWDOM TKDZD LPQWQ PLJXK VXHUW
KDNZJ JCSNZ HQUFF ZOMGP OFBOR DJFHO WSCUB FWVFT HPKPA GQDKB
GASAP UPSUX ASQDA NXVUL MAIYT XHYSI EKGDG DKUJG CLCKL SRDIT
WOLJO YHKBS LKLRK ZKPMI WNIER FTTTJ ILAVU ESOJE JOSHS PSLVZ
OMHGM XRTVE VUHOV OKRAV FUPPB UOQDU UUHRY LDLUJ KGGFG KUYMO
3UCIW WYUCH LJXYF BKDSW CBAWX WCXBI YUGMD BCEBC MYYBE

BWO DE HDG 5045KCS 230618T USM-99/00073

8533 2123 0520 5504 1476 9145 8156 4021

CFIFC LYDNX AVUJY GOCAU BLUKU REQIS YQFKE KWZOS PBEPU CEBHC
OPTWU DXMAC SNOBP XAVUQ OBRFO IPFUW BMAEU SANBM AIYKY HQTYY
PTILE HAYKM YLVQU ZOCAU BFEVD JAOAK IDPQO BRHAY KGYKP GYKPB
ETYWY EXGYK PGYKP CTTVW UBVHU TAMOH UTILE TYYPX CFIFC LYDNX

BWO DE TPY 7400KCS 230722T USM-99/00074

7058 1523 0635 1120 3456 2025 8156 5447

CFIFC ZISQT AYOVA KGFEV DXOCY GYKPH IZDMO HUTIY STYYB CAUBR
OZQLI ANVOA UROHY HAYKD UOSLI PBMAE UKOYI ROULF UWBQY LYMJH
WBAYE CEBHX UZUBE YDWEV SLEZN BOGKV UFYWU BVFEI RLIAN SUNDQ
OBRKE PBMAE UVIPK VOAUR OHYHA YKDUO SLIAN LYUDH EEPVO AUROH
YDOEK QYXLC OPIZI XVBUT VDOKP SAHCF UWBPI MSWYX QQJUI ZOSPH
IGQSY RGXXX CFIFC ZISQT

BWO DE NIO 4885KCS 230630T USM-99/00075

9534 6523 0525 9942 2664 4140 8156 4648

CFIFC GIKSB UDFJA OAKBK WZOSP FICKT ATPQA OGCAU BXYDX QAOGM
UBVDO NSFAF PKOZK XOCYG YKPBE TYWUB VBICG BUVXW YEXRE MEZOH
EROSI DUSWJ AOAKE KWFIC KROYP TOLDC AUBRI YQWIO CQAOG JONWK
UEOFI AHNUS BWUBV DOMRV YEXZI SQSAK EZYYT XYUOK EXKCO PIJUT
BQOQF HATED EXEDU OSXXX CFIFC GIKSB

OAL DE XTG 7990KCS 230714T USM-99/00076

5046 4323 0600 2110 9054 3565 5320 6127

DDHAA IFJDI GVJAA EMOID UGXMB VMQSA LVFNX MRJTD ZLMMC ZPHRI
QUAKI DJTRF BHYXX ZEYAK VIIGS DDFTD HFOJD RORHB TRNMS UMMZT
RYUWQ MZKFC POUIZ TQHQM ZRUTL LROQW MWGGW YSFIY KKOJA JHNEP
RMLJN LXIBW LVEFR WRNIT TQCSN RQALH AVEUB CIGGX GNEVC ZMFAV
FJJDO AZBSD WDDCN HPMRF GXDMO ZBKHG AHQBZ LMUSG CNMUD XHLMN
XCBDP LJZJQ IFQTH OATBV VNEHC TBZZL TVHRM SXMXZ SMYPT DDHAA
IFJDI

IZW DE WNN 7290KCS 230721T USM-99/00077

8545 2623 0540 6943 7263 5833 3917 9920

DDHAA GZPEQ MCLAJ CYQDZ TGBOC DYDFK SSYEZ FWLIO VBZFO CUVIX
MFZRM JBTYN UZJNJ IFMLX HCCTF WPPNP CQEKS LJDZY LRTOV URLFO
SHZFO LKKOR THRWA YBJJD YIPNP SXZML GILTC PYWCI QSPOF PGRXI
OKBZS VBWDE PMDIU YQFVD MCSIK RGGBE EQQDZ OHUGZ XDZMV WVUBC
CTNRY EDHNO KBELY NVMID KOUVA M6WXQ YZRAV PTIFK GSWJG HMNLJ
JBWAT MUCJA XQDTM RVKRO XLSOP DLAPV SVQDF VXFHI WCPLF QCWPZ
KZTBG PPJIW MERWW YUVFI VLDDG ZFOTQ XTMYZ XLNOF IBGQB SDITY
KCIKD GMXPY XTCPF TMVQK KCTUG UNTOC SBWKM WPPLX QZAQC JWUZK
XEORJ HZRJA EUQUB MFZMJ BHUFZ SZJEP RBMGL LQNTQ NBMJT ZKHAV
XJPLM ZLRLX VOMJE MCOBS PLBHJ FQTKH CIQUX DDHAA GZPEQ

ZCA DE MRS 4845KCS 230623T USM-99/00078

7538 2523 0540 4775 3644 8669 1081 4338

HBJBH SALFZ YZUXO CYXOC YGYKP PUKXN AEVJY YFJYY FRUBU PUGUJ
OOXVE SOQAY RLAMA BAGNP IMMXY XRZIU SPIWM DUTLJ OBLZY CXGUF
MCOOS CYSUV BSOQA YRHEQ ASBWQ QBZRZ EAZZY ZUZIU SZUDZ KADRD
IUAGY FLHYR XZAMM JYTAG ATDJO NWPUZ NZUDZ DUTXN YUFGE RAGOG
OXXXX HBJBH SALFZ

VPO DE POH 4965KCS 230613T USM-99/00079

0026 2123 0530 5504 4257 8146 5942 8633

DDHAA FGRYG TGGWA ZBNUV FAOTZ CBWSN SPUAI IVHRH NVJXA QGJMH
HFFQR KBWJE XQBWM FGIYY JORIS LXVGE AKQYD BQCKB XRBSX FPUJX
OMPSO SHHHE SUKEU NUNVQ MHQWP IIUJW HOFBW MFVUF UMIFQ XEKBK
GTCTD SBHUT VBAHI LAJUJ RTVMH QFZHF MCWVF DQJHF VDLID YOJBE
WEVUB BFWCL TDCKF DVUUF ACDGZ DIHVF QDBOG FGZVL BRQMQ GKFDU
KLSLZ HVZEP DXHOL MRVJJ FIZBV YEIRP YGCXA TBAWL BMAUZ FMWOP
GYHTJ QMUFJ VLRCY FROAF ZITTB XPGGG KTQDM RKKYB GZFRE VHRTQ
HOJHO SOEBE VOWWK JQGMM LXNPN SOYEH ZRAWA XUWEY TMYIV MGOSE
SPGAT GSILJ WVRLR YHEGX DDHAA FGRYG

VPO DE POH 4965KCS 230644T USM-99/00080

0036 2123 0530 5504 4257 8146 5942 8433

DDHAA FGRYG TGGWA ZBNUV FAOTZ CBWSU HOUAI IVHYJ YEQLO SJUGU
BFPQD JTHZG PHTXP PKXYT DKDJN VQLKL ZADGZ MXJXC VFBPT STDYF
BURDZ DCSBY FADYB GIBWI QGFFA DJZVI IWTII CFBYP RAJPF LJKTT
SEANJ GOBUT CIGOI VXPPU FLAKT JYZEB SSWDO UQXSU YBWWL BZCZD
IADXB JRICV RUBQY CVSKK NCIFQ KQNRY CDLIN TGALV AGVCU LKPMP
UHPJJ HJDQJ MGHIL HUBRI RRPDP BRRID AAYXA ADKLF EZQKP CSHXP
IAHTC FITCM XIRBX FBYSF WISDY YKUBG SFAOK YMLBE AVRFY NLYDD
LUCSO DOJRB IWARU SXMUU ZTGTI EYYRH ZRRGB JCTPX ZEBBX QPSOG
FXVUO CJXXX DDHAA FGRYG

VPO DE POH 4965KCS 230715T USM-99/00081

0046 2123 0530 5504 4257 8146 5942 8233

DDHAA FGRYG TGWA ZBNUV FAOYZ CBWBU WMQEY FJLUJ KBAAN FPXIM
JRTBI ZOWLF KQWWN CQKBA MPGLT YJMRC WNTGN BGLQD QLQRO MIGBA
AFGID XJETE KRAWD YVPQQ RHTDO EKYBW GJFOX MZRMK RZGUZ TRNFF
IRSRD EKVBC HMPEF UUAQF HNYXD ZLJTM MWNDC FTJFT ZFLNQ WHKBE
VIAAS HAXDJ EHLFG TORCV JOUDY HDZVA HTVBR KRGYV VSIDN YWXME
QBTGP CFRMX IEZDL PZXNI PQGMY NKKDA QQPZN MGTFQ PRYRZ TPHZG
ELLDI JIIXL YYFDL WRTKU MJXNL YKNXG XIRHD ZBTBB UVPUE EFBTX
QPOCR XKBJS DSARX YOMAW KBCDY ECDAI UNXFX TXDWL MDMEB PFNOG
DDHAA FGRYB

NIO DE POH 4965KCS 230628T USM-99/00082

7546 1923 0440 8943 5445 8146 8912 6331

FFBGG DAOSM ELBRH PSABO AYTBS POZMS GIDRX BVAIM AOCBL EUXOP
AEBTV RHPXN AVBSX UYEQT DEAAN SUSNF PEUOO FUEPA QNGJL KSPEC
MEVAE BSHAW YHEKZ ROIHZ PWNPG KXRXT UVYYJ BSUPD GLGBK UXLXS
KXZHA SHKUY AHROG NBPLY MWKFT XSOCY NRUVS EYJHA CAEKY PGVIM
ORJNG SBLZA IBPTF SRCQH XUDMT LDJRL MGRKU HINOR YDKCW RPJAH
VZPJF QJQXB SKPBH YOCHN OKKPV MIHHF LDWBR MPVUX CUYHZ TPBQB
RTBVX FFBGG DAOSM

OAL DE NVT 5945KCS 230623T USM-99/00083

6046 0223 0500 1561 6010 2962 7896 5543

CJCCJ DRKJA HAZIL LLDWH VWMPK QCHIB ROLIU CLKVY UZPYO CKQTD
XXBAR GIFJF VLUZJ FBMZS PDOCX KCENN PEANU HIHFD TBGVO DYWWG
BSKPX OIUFL XQFLV QJJAS QDWYS NVUUA LZCNH FOBMD TVRYL VKHUY
TDJOL IAAVQ NROAQ DOMOG BUAHG JVEPN HKWQP SPRXM FMBMO FWGQR
XVCPK QYLAL JKKWK OMAXA NTTBD XECHE TTUFF WYUOO PIZGR PHPUT
CSYEV YJVWF JZITU CJCCJ DRKJA

OAL DE NVT 6340KCS 230648T USM-99/00084

6056 1923 0600 1120 4257 7525 5320 8736

FFBGG TDMRK CLUDA PUADO RRTAT OCGKD YZNCS KMDBR LQTUB FBWOU
TDWWC HXDYZ SBZQB IQTBJ OMRMS QBMBZ FXUFE OARNN JMBNW DBKOO
VVHAY SWPVF FJWLK VEKGO YKMVB WODYV MZFLX RGQOZ HMVFC QUSQS
SVYJT SSHKD SQXLT HJMKS LZZXG UYXRS OIYMN QFOSJ GNDKF IVFXY
JILGV DMKFK SLXBW LPBKN NOBYM JGKIX ZNKZI ACEGC PBFLZ KFQWF
BEXCD OUURW OIBUB RJQCL BTGKD JYFNI TBBFX DTBGU HJWSD NFDQE
UIVBK WCTBM USOGI YBLBX SYXPZ WQBUO ZJNPM ZLQBH PTYLY FYUEH
LEJSH TMUDE HOMMR MTARL ORAYY PVFBG PJSRL MYGLI ATFOV SURLZ
MMQIN LUBZF SRJFF SOFFC GXXXX FFBGG TDMRK

OAL DE NVT 6340KCS 230709T USM-99/00085

6086 2423 0640 6960 3058 7525 5320 8037

CJCCJ VLVGG XAGPE IWHKI OUKWE XULWE LGWBL PCFWJ OCKPG RCKKI
EEOQR LUIQJ CKRDW TFQJN HCTOK YNRWO TCBPZ JMAGI KZYAY EUBKB
XNITI TNZDA RSQBB XEVRP CEJTQ JAHPN ULIOI BXSRJ QUUVC UDSTX
ESLRW LMUMZ VDGNR TRCKT BVXDH ANELS AZZCJ WJOPA XBWQX K5VBA
ESWEA TGHJJ AFOYR DVGFL WMOZP CDBNO XXXDY CKHZG TYPOH FYCJU
QJOIY OUJAV KAACI IDCNO HXVLQ JKNWU LLKWH AAIHX O8JRD SRQAI
VBOXB URFLA WFBJK DSZIG LJJZH FRSJV VBHYG XYBGR BSBKR OXPJE
LOYKG CELXH PBJGK GFAMP RBSJQ HMOZE BIZOO XRYGB CJCCJ VLVGG

OAL DE NVT 6340KCS 230714T USM-99/00086

6096 2423 0640 6960 3058 7525 5320 3634

CJCCJ NZBBC GNTUY IWEUC LBYXC JQIOD VGZFU WBRWW DMYDV FJKPF
QUJOF SBMDI MRHXD OMCMR RWKDZ LFMAI IKBZM VBYLB VWKEJ COPXB
PBBUB EBVFI TNIHO CKNFO FUDAL LSRRU AVIYH WZYOT TVBZN UBXVA
FWHLD GKNPX KZDNI QRQVA CJCCJ NZBBC

CUO DE AAA 6405KCS 230806T USM-99/00087

7532 4323 0745 3749 1663 9262 7742 3706

BBGBE PJBGA UDQKX CNXJZ XWOQG BVKPR BCXMR ZJOQX ZCULF BOMAK
IMYDJ TIWPX ZPITH BEBGY ASHCD GBQJJ SGPBC GNMVY HZXCF BOOCT
PSYJE ECVGV QNPOP TVEBZ MRMSW FVANH RLOWL YADBC RUUKL MZJAH
XUWTV MCRJM QITHP AMOXT EZBGH BBGBE PJBGA

WNN DE IZW 5385KCS 230623T USM-99/00088

3058 1623 0515 8943 7803 5815 4718 6916

DDHAA LFAQE IWTVJ DAGJQ QAJKP IAWKD JWAWX FWXBU HYFIY CFOMP
CBFMR IOHVX ILBMN CNRCA ZIVZP ZDAQC GDYZB RLWJS FQJRJ RAFOR
TQOTV JNGGI VDJDU PCPLN PLRXJ FXGDL ATWDS ZEAWI YZMHN QUTIW
FJCIB RVCPI XFOOL JGIFU SVFDF JQZLJ JJDDF QDKPK HWTAT TWQDU
EKBVY GKIVY VLXMP DPJPU ZUDTE VIMBU WIWIZ MJCFG TORLX DRHYN
GUGFH HXTYC EXAAK SFIDF GIQIA ZNPRX PHKNV SCLSL IZVJE QDUXD
JMMAT CNBWB MIVDA RUMBZ CDXOQ HBCRA SXXXX DDHAA LFAQE

MKP DE PSD 6760KCS 230708T USM-99/00089

5558 5123 0600 0121 4257 6607 5762 5429

ECHCE RNNNS RESPE EETMO VEECA AOCOI RODRU UZNVE TTEIE IBNNO
MIFOM SINTM LTDRB EFIOO TNNON XNMTD ELEIE FEEHA POAOU RNUQK
AEEBD OCBAN IPOUI AAISE EEDAI YTIUH TSTTO KOALM NONDC LLTSN
AVEBO KDTNT LROAT TSAAP LCLKR ARTAE FOPNI OOCFY PKBOS TNCSN
TNUDI GHCRI TDDNO UFICN EDEAX SSSNT IANIT LEALE ALFPS RIICD
QOIBO IENTP ECHCE RNNNS

UBT DE YWP 5455KCS 230618T USM-99/00090

1015 2523 0530 3749 4606 5833 9803 5719

GDAGD BIPEA OOTSY ELFLL VLIDM FWOZR LEFXR BORUZ TEJCT IOFPF
QGOFY GFGVT VTPZR GRUCJ BXFRY OLLTE ZDQXZ KRISY VXPTN ROLPZ
ARACG PDKPO NKEXA AUXVW FVKDJ NFZYD FZHPM TPZQP HIGDE XULAX
MEZKR CLOBQ IWVPQ IRRRA WIEXS SMWBK GMEUP AVNKK KYOQQ JQKIK
OULZU JPFQC EQXFT RIGPE YZAKI AZIBL IUQCB UCBSO IXKNY BIBGY
NVREM WOAMF JKPLP MOVOO ETGIM GDAGD BIPEA

XYR DE OWN 4235KCS 230620T USM-99/00091

9516 8123 0605 7932 8423 5095 8444 6831

JAAAJ EUERD OETDN GXAWR SUTEU EIWEN YUENN ODEUH RROMM EELGE
AEGID TESRR RASEB ENORS RNOMM EAYTU NEONT ESFRS NTCRO QCEET
OCORE IITLP OHBRG SSELY TCCSV SOTIU GNTIV EVOMN TMPAA CIRCS
ENREN OTSOI ENREI EKEIO PFRNT CDOGE NYFPE TESNI EACEA ISTEM
SOFEA TROSE EQOAO OSCER HTTAA LUOUY LSAIE TSERR ESEPA PHVDN
HNNTI IARTX LASLD URATT OPPLO AITMM OTIAS TNRIR DCOUT NMFCA
SREER USSDS DHOAH REEKI PROUT NTTHD JAAAJ EUERD

XYR DE VLH 5635KCS 230631T USM-99/00092

2027 2423 0610 3973 7820 1260 8444 4417

28082 21848 52164 96410 22149 14144 06284 12050 42702 51095
61440 63580 38406 41449 10444 37621 21441 14212 10204 26950
02195 96401 34856 75002 02218 54408 73621 14487 25155 10012
66487 37140 36015 69046 47930 84212 77121 41226 95795 69046
50148 20000 28082 21848

UBT DE EOU 4565KCS 230609T USM-99/00093

9522 2523 0435 2110 8820 7101 9803 3123

CCFII PPAEC JLJSN LJNXW HBGWQ XVGMM RDFNC SYZMN ULRWP MREYU
CXVMO JAKFL OWMNK GAELS YZEDY PJTUD FNSYP EJZQA VGMMR DFYEU
GXGZR VPKDF BSBQT VWOLF RWPUZ LMRLJ LCEZT AMOUB FGKGM CCFII
PPAEC

VXI DE GFH 5285KCS 230612T USM-99/00094

0511 7223 0535 8943 7803 4997 3070 6520

CCFII QQPMN ALFSQ JZORF POHKU LJTAC UPCAB EFLPX WHQNR ETQAC
XEORD WEQIK UBXAQ ABRMD GIOLF RWVSE SBAEZ EMCXQ KPRYH JHRIT
WYSRY TQWGX ZTOLI UMUEC IKTKQ OADIX YRILF UVGAH ZEGOY VFFIW
MRDUP ZXENA WKOKO ELGOQ PTKQS BJATI XQLUG ESZOM VFKQZ HEGFY
IRGYB TQSML XMUWD LWVQV JPXBD EOJWV JKBCG ZGELS NCNEC SVHAZ
TLJWE WRIYQ VSNPN WHGEI AYZFL PWEQV AZMOZ RYHVE RCRCN SROMN
XTZEN QMNEY PFDIX CCFII QQPMN

ZZZ DE ZZZ 5955KCS 230903T USM-99/00095

0051 6523 0830 9742 7837 4258 7094 8014

JEEJE JRGCB FIORN HCJXP OASIC KXWTI SCJWX YURRD KOWQP IVDVB
ZGVRN RPLJB SJSXM XQULD BTYVI LXSGX VCPZZ CEQRC LPXSB SUUEA
QIFMH EVDOE NSKDY DYFKE XBWBH WRYLH EUALG QOOHR ORRRI IIALE
QKNUU LREJA CRKXD QBVYQ ZDQDN INOHG HXPLZ UDWCN MKNOX MBQUW
RILZZ PFFKA VQZJV AGEKX SIWTE OIQLN SGCCN LWLPO VJATO REGTB
MFNOY ECQQV LDMIC RIYSI UAVRK XGOSY GWYFP PYRQI YFJXQ XVERO
IYREV VDAJY FNZHH BFBWA HPDEJ MBUYK VBMSX GNOOW FKBGS LOKXF
UPOLY CSEZB RFFBC RVFZU EPJNX QRSRJ PHEJN WTEDW JEEJE JRGCB

ZZZ DE ZZZ 5955KCS 230917T USM-99/00096

0061 6523 0830 9742 7837 4258 7094 7013

JEEJE JRGJH LNEMW TSQST SBYKR PYCPZ RLIZH SUTFS UPNNP TZMMR
QKPZP TWBUY FXVUP XDHBY UEVLS ZXAFD UBRPH TCAMT XDYGA XJTIK
NWSHL RIYDK RARRD LWOME AZLLZ DYFRD HJWMW VPFFI GUSLR SOACN
EVYXF NELWS VYRFS RCAPZ KJFZF POLYD RSZEW ZJWFN BIQJY ARUDM
RWAHE QAJLE SQMYZ WGNXW YYZUD PEHOW ZJEWA QWZBU WCQWC SUEZX
NQVDU BVJLI XOUEW OEBCI ESVEF IUNFZ UIOWX CVQKL CSLYJ ZRSRS
OWKYN FLDUF FBHQX BUWYD GRFHJ VRDPU BEQXI HXXNV JEEJE JRGJH

ZZZ DE ZZZ 5955KCS 230931T USM-99/00097

0071 6523 0830 9742 7837 4258 7094 8030

JEEJE LTTHD JMJZR UBIED RYGTN XUAKI BTPIS HTOZV RNUZO HJMXQ
MOLYE FQLGC TSKXU XEITP ETDIW FWBFZ GCDAP NAWCQ BMBTO MNGBB
BAOHT WGJRH SXLJU DYZZM AGFZJ YTRJU COVTV MSRBJ WOMTH XNEKT
OVDBB ANQZB DGNBS WMMWF DTKIQ RDOLH MLWNA GTDHL DESSW IUSHH
DYRSY CMXZJ LLCJZ GBSBD FJWTV FUZTA NOQRV CIKDT ZSNWT ZDJQO
VBJWC UFJVA UCIZV PDXAO TEBBC KPGMB LWKCX DZOCQ PQPFU KVZWA
ARADB YHCNK HXFLM KVBMO IEQIY XHSYZ LEOOW TPTOU HKZRE XYUIW
CWHDC MFCGY AZOQB YAERJ BDXMQ RJWAD XKTCZ WMMMB JEEJE LTTHD

ZZZ DE ZZZ 5955KCS 230941T USM-99/00098

0081 6523 0830 9742 7837 4258 7094 4220

JEEJE AOSEJ XOMRH IGXTV MSIHN FQDNJ ISKXY AFYGG GLVIK XYOHT
VVBTO OJKTW BDLRU DVGOM LPJTO HELQF WSBNT YALRR BJQGI SQOSP
GVUWH ACAYA WISMT XKVID ICKGK BWXRN ULBKW DTFWR FPARL UMTIZ
ZTQQT KHJSV RNCEN UEXAG RCRUT ECDDD CULFM OGPYV DLHMN CXYOB
JEEJE AOSEJ

CONFIDENTIAL

MLH DE ZZZ 6350KCS 230622T USM-99/00099

3041 5423 0710 9942 7603 4258 4259 9732

IIHFF AGQBC CUPMM KDQOF EKJQZ CMQIO PKWVJ KTENQ RLQUT FCEJV
WBCWM AHHMW LEAOU MJVPA RWQMA GJYBP ZADGN TFWIJ XEKMT MAYFY
IHCOZ MTQRU INSKE KYSSM XVNVG IXAKN SNVKG JPGXF LCAQJ ZZOMT
ZUKFP KJZRW DVJHW ELOMO DXYUK USLRQ GSLLZ HKLPK RYGYS VFDRQ
MYHIU PRNIN XRPDT UKQQJ HOLND GTJJN UWXVO YEYDG PXEWJ TKHWU
HBSHR ZPKMN 5T5RN OBVTT BVTND RMSRL IXUAO XJVAP AMYKJ TOMWV
MAFSU ZZLHE OJPAX FTVUU YDSMR QMHYM SVMKG MBNLQ WNWMK TCYUF
B5EQL DCHGT GXLTQ SMKMW CWYOQ ZTGYY AOQHO MEBOU JPOOI RVIZX
KEFBS GBPUU ITETL YVAHZ LKAKG QOFPT XTVPI VAANT AWXMA LXWOJ
UKNJC IHUGM JVVBJ MVTUP VGXXX IIHFF AGQBC

EOU DE INJ 7450KCS 230918T USM-99/00100

4528 1823 0825 6530 7803 1864 1793 4724

AEFEA NOXLD AZIVO BVBEO TVOBV XAFET UUMKI GSBUN PVYOF WIRNV
UFYRY NBBEP UKIGS TOMEC AMTGA VFTUU MRYQE PYANF ABLRE DWTUW
OGOXE SOKBB YBCNE VLXYA URIRI PEWDC OZDRO RHKYL TZUYU LAYNF
IDLBE FLBUW YCOZD BAYMN OXIKA AOPEB SDEGO DAIRB EMBQY VILIL
XTOPH NYTEG EKGBY BCVIY TJUQY AEFEA NOXLD

FHI DE JNK 6220KCS 230722T JSM-99/00101

9017 5823 0300 3749 7263 1972 6327 4516

50505 77602 43639 77420 73974 87398 91526 99965 58579 74697
09870 98074 48734 75315 63773 96477 54939 09896 36161 21332
77442 91988 60573 35151 71377 47880 15159 16739 01115 11774
98801 31930 36737 57377 57707 73977 62603 34936 20389 69652
74774 73980 33730 50595 77602

FHI DE TOJ 6430KCS 230915T USM-99/00102

7529 1223 0840 3731 9054 0162 8327 3935

GIFIG ERBEW MGEUC GVTDS NADEE EDTSA LHYNE DCORN TRUME TPIVS
NAISO EOHNE SFNAR VITOR SREWN TSCOU SVETE OIFMV NOBIA CEEEE
ETBTI NINPM OESSC PIRIF XTDSA VNIMT LSATO HAKEN RITSO AUCOS
ITGSO CEIHS NSOCT MALTR HENIO EAYWO LBEDU GIFIG ERBEW

FHI DE SFV 7830KCS 230713T USM-99/00103

6534 0123 0730 1120 8820 5086 8327 7127

DCGCD WSGFI NTVPQ QKUDA OWKWZ DBMGF MYRAR KUURP SMYXV EEBZX
BDUPD FQMXA ZAONX YJIYO TVIWT DXGYH JHEYE YXLCQ YBUXM NJLPP
LGYZZ HOCKR IAAPU LLZXC SSTDC IKJRH TBCIE KDQHY XWRBM EFVAU
NNVDK SCYYG BNAML PBWYD HWYBA SOCJO QRGBE VEHOR OEABP LEQVR
JQQWK WRZGR KCKRG ELTUQ JQPDR MGKBJ NMMJJ OBUNY BWPVQ PDTTW
DWQPU DCZEK ZRJXT CUZRP QFFRJ LSKWZ VSZRY LZUCK LZWFM OQDQG
ALJCX LRHSV RGITA WXROL CFWVY FFUNQ GGYLM NLWGN ZFXXX DCGCD
WSGFI

FHI DE XYR 6070KCS 230303T USM-99/00104

5516 4623 0815 6350 2664 8641 8327 4223

DJDJD DUMQP IMBSI QISAN HKOZK CYKMH IZIFO MSQYP CBOZC JISCM
UDPGA ZKPOO CRELD GYKPJ IBMBY RSZYP KWIFB KAQDK OZKHI ZITEG
BLIIV QUOCB YCDJU ENBIQ ZCACK DUMQT IGAHA YKJIS CHUXE DUMQR
ONDJI BMWEK GJIBM GALVB OZCLA WLCYK MKOZK JYYFK UQZQE XPXXX
DJDJD DUMQP

FBP DE FHI 7510KCS 230836T USM-99/00105

8526 1223 0600 0121 7803 6869 5447 9622

28082 50021 00464 81416 57350 13735 44214 41648 73714 03601
56903 82063 58419 40811 64874 48308 35154 12142 51323 56612
02513 44215 21853 82361 73259 23715 60501 19598 14642 30592
25269 20426 33183 26432 40220 83120 79270 11940 65542 62534
42123 73122 54476 16225 12371 56039 03141 32061 73119 40650
02132 06173 54827 42371 56029 47616 95964 01237 15604 14211
23314 60612 65382 06173 11940 64376 21237 15603 46192 81108
11904 62872 38610 04411 22663 51229 03349 02371 56029 47615
21224 13206 17303 84330 33154 30449 85402 13243 37347 92145
60413 12331 92882 06173 28082 50021

FBP DE FHI 7510KCS 230851T USM-99/00106

8536 1223 0600 6530 5445 6869 5447 8222

28082 50021 00464 81416 57350 13735 44500 21648 73544 76166
10723 71560 44106 40427 05483 26237 15602 94761 66422 41423
71560 44106 40426 32061 48488 20617 31194 06404 51748 82061
73526 17354 95664 87354 26957 65261 73549 56320 86062 64219
42557 64924 21492 40603 91165 26237 15641 43263 27221 37120
62191 12262 54826 51144 37531 04411 22735 69217 11624 83731
29304 47941 65692 10492 11652 63625 44343 41957 95674 23328
62354 44215 62262 53040 22214 19087 55418 44134 06126 53200
28082 50021

UNK DE FHI 7510KCS 230804T USM-99/00107

4526 1223 0600 3731 4257 6869 7904 7136

GIFIG WGOAR SSRGM OUAUA LLYPP PQBET OESEE TNOLS UTATT EMIEI
TTQSF TAEOR REIUD EFNTA ARHEL ONDSS SEILP SROET DSHPS NENHR
RCEAO OWOFG REEWC RIOSC AIAMT WLTEC OCMAN INLNE ACADL NONMT
DBOTM EMAMN ATELR TMMMA HNDEI OMOMK CEOOA MNMIU OIDNC OOEHW
IOMIR CRITO IOTFT MMOUA CAMME AMMIN CVMSB RYYIT AKHRR COILM
IMUMD PEMOA ONMFT UPMCM CLOAC SOETE EIMTA EAOEC EMLCY IEAAU
TRAIM TYSNL AAACP TILCR NYIPI MMUCM LCEOA OTXUO CDITA GIFIG
WGOAR

584

UNK DE FHI 7510KCS 230816T USM-99/00108

4536 1223 0600 5504 8820 6869 7904 6342

80608 09147 38937 09852 96743 73893 70909 14794 47173 19406
40585 96434 65264 71731 96064 05859 65813 53326 47173 19206
44272 69392 94496 22177 37269 39295 85934 19992 21773 75075
58226 14982 21722 73728 62942 58198 58715 91698 96119 79014
83174 96916 97201 36076 37551 89335 32376 05184 42275 42894
80993 34126 55914 33934 93437 28692 58269 37598 21040 52571
95569 80808 09147

PZX DE FNT 7340KCS 230823T USM-99/00109

7533 9423 0745 0121 2664 8678 1360 6529

EQBGE NECSM EAPSI XQLJU EFAIS FUFLK ANAZA YYJIT DWIAW GIXFT
OQIDE ZQKUW FFUGM FUFLW ETQDI BHMOC PKUWF PEEVQ ACVXY TNDIE
LLYMV MUIUM ITGRU QFFUF LDIEL LYMVT YARNI SGQAC VKUWF WUEYX
YTNBE MRJUX FJATF KUWFJ EUFHI DNDAX FXYTN KANAZ AYYJI TDQOM
BBIGL BEPUB YUVGY BGMUI UVORL CIMRD OPUFU FLKUW FMUEQ QOVLN
OESXI LHZEA ZQUVK CIDIF UFLQU APZOT QKIIU FAWFH ETDKI IUDAR
ZDOVA WUOHM OFSXX EQBGE NECSM

YWP DE INJ 7450KCS 230812T USM-99/00110

7548 1623 0705 8943 2664 1864 4718 5221

CCFII GGOZS EPIJR TUQKX AWDUN ABDIT BJDNS XQUDP WAKJD LXPTA
POZSM LZJUM ZRYGV CZVYP GOXRT QSNUS AEHBJ NCDEY NRFIM KUFQE
BTJZQ AVAWK EUSMN VUSRZ BNRAU ICWHU VTRDF HXSEU QPOBW ZAYCR
VGLFS KEIOX VQHYW GJAIK XQUSA BRLXD AOPAD GNAEH QDWIU YWPIA
ZWXLQ VWEUT AENEY GOZSE PIJBA QKNCZ KGLTI FZVOK BFKVW OLXXX
CCFII GGOZS

ZCA DE MRS 6900KCS 230927T USM-99/00111

7558 2923 0610 1120 2664 8669 1081 4318

HBJBH MIQDS YGWFA FPQIN DXOCY NAEVJ YYFJY YFRUE UNYXI FETBP
UGUBA LRKOE PZUDZ VIIDJ YYFPU KXJEZ LNATK RICUQ INDKU MVEYQ
WWEEB GYKPX OCYQA LDQAL DZUDZ HUXEV ACZQI NDKUM VHYQW GYKPQ
ALDQA LDZUD ZHUXE VACZH YQWGU FMFUG MSYTI PADVS AWLWA DBPUY
MXXXX HBJBH MIQDS

ZCA DE WNN 7280KCS 230856T USM-99/00112

9542 7923 0800 1101 8423 4717 1081 4009

HBJBH DUEIL ICPPO APBYM NZOCZ LOTEB UDFWE EBKOR BNYHT XYMFB
EIOME PDPID TGUFM DUINA EQASE WQPEN DXYXR GEZIZ EAZPU TGXUE
ZDUTK ZYXSN YHTDU TXZAR RBYMN PUKXK UMVZE AZHAH TQEDV NOZNW
ICYSI ATGUF MHEQA BEIOC OOBQI LBCAB INYHT DUINX HBJBH DUEIL

FSD DE EDH 6170KCS 230939T USM-99/00113

4524 8723 0900 0121 3456 6977 7238 2841

DAEAD MCWIH UDLCI WBFEW EPAOF FEWER IMDSU GXSYR GJOQZ CYKMK
OZKVY EWJYY FKELK TOIBS ONEKA AQZOF CMOZM FUMRD YQTZY ZUMOT
FWINI SUGXS YRGJO QZNIZ OLOPA RICUX DAEAD MCWIH

XYR DE SFV 7830KCS 230929T USM-99/00114

8044 0523 0845 9518 5074 4726 1801 2815

EGBEG HQDCF LFYWY UUZXN EJZXL DOVOA ATOXA DHUCW XCWTX SLQBW
JTYRO XWPXS BQZXU KINFW HHBES CWIEM MMNLQ CHAZB UNGMR HLVXX
RXLFO XAAUR FCEZZ DODJH FGWYI MLFMT EGBEG HQDCF

SFV DE XYR 6070KCS 230812T USM-99/00115

3596 4423 0725 2110 4257 8641 5320 4328

DJDJD LUDOS IQIHE TDXYI CPYXK TEKSK EDQJI BMKUI SFEZH GUBHD
IELDE NUPYY IWAIG JIBMP IBRHE OYGII RNYBN RIVKJ YGOTA CYJIS
CLAMA NYYKW ULEJU UCCAV CDAKS HYZFG ELUGA LVFEI RCASZ SYBRQ
ODTSI QIGII RTIGA WUBVR IYQKI ZLSIQ IWOEC RIHZZ YGBGA ZKPIB
RXXXX DJDJD LUDOS

HZY DE MKP 7320KCS 230815T USM-99/00116

5015 9623 0750 9329 1871 6625 6473 2620

50505 98870 57309 89560 56891 39774 20489 39829 86954 93169
39662 57398 87447 52735 97042 99507 85581 91319 19689 11915
19199 66730 87895 90038 50505 98870

PSD DE MKP 7320KCS 230849T USM-99/00117

3015 9123 0620 3731 3456 6625 1243 7024

28082 22132 65415 26226 12240 94462 06579 51742 15760 34468
04647 65414 92116 34647 63295 26244 49204 40333 01251 16533
72431 51269 56253 10444 21123 31244 82659 25351 04403 92942
85415 41362 14091 40151 15542 15624 40218 53820 61732 59126
43755 00463 26344 21712 05765 42423 32862 35444 21575 11959
83083 62566 10530 15604 01341 48736 95765 26079 30812 62624
07226 36911 22664 87492 42313 70012 21326 53200 28082 22132

NIO DE HDG 7080KCS 230917T USM-99/00118

7013 2823 0825 8943 7263 9145 2125 4532

CCFII DDQHW OKLXF VHXLZ QHXSB OZJIW NUEOP SYRIU YCGPA TXLWC
KYRGW QXVMC BHJST GCKTV PJGQS YPFHC TDXYT JAZQE GVKLQ SZMNX
DABOU FPXOK NEPNX CJDXE FCGEI AQLWB AQVXO LFUEY JUKIP LTQZN
DFKGA WXSWG RBOUC BYUDG VOLZT XFVHX LZQUE YCGME ADHVP UJDPT
IHLQS ZMKGP UIMXS CCFII DDQHW

EDH DE HCO 6030KCS 238022T USM-99/00119

4027 2323 0730 9518 8423 8740 5267 5105

DAEAD LYKTL ORCFA FPQIN DBETY JAFSR EATJU MJFUM RJEZL LOFRC
YTVJY YFTUU MJODN VODXV YQETO IBRUV LCYTV KOZKC YTVWY OGBET
YXOCY NUFBC YTVKO ZKMYO GBETY XOCYZ IQOJE ZLLOF RHYQW BETYJ
ODNVO DXVYQ HTOIB RUVLC YKMJY YFHYQ WWYOG CYTVH YQWNU PBCYK
MJYYF WYOGC YTVHY QWFUM RMOTF ZYZUZ AIIFU UZVIO IHORZ DAEAD
LYKTL

NIO DE BWO 7990KCS 230913T USM-99/00120

3026 4723 0825 9518 6010 3565 2125 4928

CFIFC VEEAQ UZOXO WSLEZ NEAWH WAHFM UCOJA OALEZ NCYTV JAOAJ
YSZGA TDFEV DBAZF MOHUX OCYTY YPCAU BVAKG RUTIM AEUMO QCFUW
BCOUY DOEKD UOSKU BWMYN XWYEK RBQIQ EIABE YDHIA KKEKW LYMVB
AXDNE IYKET FDUVZ QYXLC OPTCA UBFAG QPANE GATDZ IWUSU NDJEZ
LDUOS KYHQK OITJA OAHAS DPUPC ZYIDG YBGXX CFIFC VEEAQ

IZW DE CUN 7720KCS 230913T USM-99/00121

9552 0223 0740 6530 9054 2601 0956 8927

DDHAA CGFLL KJPFK FOHSU VFWRS VYWPQ MEKXA ATJPD KJGZH KQIGW
JMNBR DZTKX PSVJT SOZGY UJDWC USBMO IRMTI RSTQK HLBCY HVAIA
MZNUL VILMM GWXDI TFNTJ YZNAM GBWPU AJUQM CPGSH ZDXQB UKZLH
SKCFY URBMI NITKC IXSKB WEADR SJIOY WLAPG FGXTP FJHZK PSWAP
QFTAU AJUNY COVBY IGUJF LJXNF ZYEFQ WNBPD XIKVG FXUJU YRMBT
XKRDD OOISL UZMAL QDDWM NDLPX MUNYP INTLB LPUUB DHABH ZEYLP
RPAUR HDHZQ HLVYZ HQYLY ZYZRJ CRYXP KZLEJ FGVLY UCZII WKXFR
MUUUX NEIOW KYCNX AWKUI DDKYK VIHGW TOGQW WWPZB USMLN VUDBF
XPGQY RGIOQ XHTKF MFKJN KKLSP QTOSK TPFXX DDHAA CGFLL

ZIC DE FSD 6680KCS 230930T USM-99/00122

2546 5523 0825 4775 0420 1161 5726 3122

HDBHD AYWEF JGBAC PSYKJ ZLGBS FUYLR KFXQD UCAWU PEAXA OEDHW
JCIHL RICGU KMMYS VFKKS QDPRJ YBDSG JOAKD VXOSD LMAGK RJDCB
FVRJM NYDRZ AVIDU HXRUF JNAWQ QZVEJ KKITA UTIHF IAUAY HDBHD
AYWEF

SFV DE MKP 7320KCS 230953T USM-99/00123

0545 9823 0900 9942 2664 6625 5320 6034

DJDJD GYKPV OBVZY LFVOB VHYQW JISCW IMHFO WCGAZ KBETY BAVBT
HKEPI HXNAA RTEKE HIUDJ IBMFI ZGDUM QKAQD QUSGC ELRHY QWJUF
OJIBM FAFPG UIPQU SGTEK EHIUD FUWBQ USGCE LRKOZ KJUFO JIBMH
YQWGU IPQUS GTEKE ZUMSQ IPFQU SGCEL RJIBM CYTVJ ISCJI ZKTEK
EZUWS QIPFQ USGCE LRJUF OJIBM HYQWJ ISCFA VEDEN UXYGA JUFOJ
IBMCI YDJIS CFAVE DENUL EFTJU FOJIB MCIYD JISCX DJDJD GYKPV

ZHK DE POH 7640KCS 230917T USM-99/00124

9516 2723 0800 2750 7263 2340 3151 7738

DDHAA RZGBD JABQM IIBZH CUAIC GZSBJ HCRRY FWIBX SGYDL YQQCA
GYJQM YKIOY CRDLP THQBK WFXKJ CBQES IMTYS VUBJR GSMFS SMBKB
DHXIV PZLKZ IVTBP MXRTK SEQHD JWQXJ XZQXA UGFYB PTNXV IMFHA
MHLHZ HYTFU ZLRGY WUBZZ BECXB MYIDG HIKKN XXZXF FVFVH BTBTL
VIDMJ BBUAJ NBWBY QPQIZ AKPXF TVQUJ WLBUW SNFON UOZUJ YTKED
MAYWN RXBTL RISCP CFGHH JIJOL BMQEV XICCY KMTKK OPTYL JSMWV
HWFLY KMZKT NXRKA YHMPG LJKCD NOEBE NCQRV KFWSR ZLJLM BJBDA
HYKJJ EUSHV FWUQC OQTPY CFXXX DDHAA RZGBD

ZZZ DE DYO 6260KCS 230929T USM-99/00125

5038 3223 0900 9192 4803 9541 3755 4546

ABCAB TNVEJ GPMPP ZTZWI ZBQWT ULPXJ UHUZG KGLQK YHCTM GZDFR
DXUHZ BWOUE DFTJD IVUFP KTZMI KYUFY UJWHN IXOJU PJZHW MSWGK
WNTCW TDYDG FCVTJ MQVDK PXMMB EJJMT MXPTL VAVFX HBHTX ITLZM
IKVFM CGLLM ZSOCH VEHCE NKEXM YBVKX QQNTZ ESUPZ JWNMP HOKYD
EQZPT RGMWL FIPBP ABCAB TNVEJ

ZIC DE EDH 6170KCS 230809T USM-99/00126

1554 8523 0730 1561 3698 6977 5726 3443

BGIBG NXUEF MGUHX ISPOY WASLG ZBADE LXLUP CYVDW DANER LYSVE
LPEGT VWWCY GYBZN OYXZN JRDIY GZNAY XVEMA BEDYB KQWOV DZUDG
JVIAG DQZVM EHEBU VBLTQ SZPYB JRYOD UNIRS RMFRI MCXAR KHBQZ
CRMVZ AVIXT BGIBG NXUEF

RBU DE NVT 6340KCS 230822T USM-99/00127

5046 1923 0600 3731 9054 7525 5726 8728

FFBGG TDMRK CLUDA FFRFU EJHAB UABNO PBTRR BHWTM MAVRT JSFBS
KMCVO WBXSN PNPSO WGOIS USQAP LNVPZ IFGKX HNJBN RSLIT PEKET
TIUWB OQKGG QJKFI SEYJV HPIUR CLLBH KZTTN MWFBQ TBRWG KZDLO
XGVBG YYIXT OTKRQ QPKUY JGSTD MDTET VXPGN TOEKB FQPIF WUOIE
SSSDH OACMV FHQTM NGNLI HCLRS SXLLX NAYZP ZSKLF BFFZY ETNRT
CRHVY SVVQF EJRVI GAKWZ BOORB BFUAY PRQSO JLJBN ZSZUE GCWBL
HJESN UPTER AURBF KDZKW IECOE IGQHP VIZSY XLEAJ ISEWB QGXTG
CCKFX PNFDS WFGLH SYUFE HXNKZ XSBJI VSCYI YJUDN WVKGW FKNQQ
VZPJC KLNOW MQZLK IDSWI VMCXX FFBGG TDMRK

RBW DE NVT 6340KCS 230914T USM-99/00128

1046 1923 0600 2750 2664 7525 1081 8432

DDHAA GZCYP CHYNF NLLBZ WPZFO YQCYO DYWDB FUHJR UIFYY MWJQJ
KBAYB EYDII LUIKE CZDLK PQYQQ DKBOS JMTJN MVEXB BMPQI TGOOB
PBPKJ SOLXP LJPSM UDBYC KNTWS DUTCC LFDLP WOSRO LYFBM RUQWT
XXJVU PJIHP SBQSL SGHNB FLRIE WKFBW PRNOZ EDGXK AYSCQ DVRTO
FWZMU EJSYQ TDMQQ SGEDT BYLWC YJRAS XCDUD HISTJ YRKKH KWHFV
FWWGY YMUSR ZAOAF ZLFUV BRRQN JUCLP UPSEY HSYDO LRTON RRIUD
UFNBT WDQIO QEXRJ SIOXV JQKQD FZMGF DPCDG PIWHN GRYJE TUIRT
YOGVL YUMOH VXJGG AYEOJ MIKWY MNISW IVFJK PTYEC LEKYH NTBCJ
EOJDD HUXXX DDHAA GZCYP

RBW DE NVT 6340KCS 230949T USM-99/00129

1056 1923 0600 2750 2664 7525 1081 8332

DDHAA GZCYP CHYNE NLLBZ WPZFO YQCYO SQOPP YQLFR OOZMC QNWKB
BEOSU TJSGN PYKWF ZLMVG NBWVA JELMM GEDJM BQGOV ZNKVM LUCRT
FCSDL NMFNF AHEDC QQORE QGWAN EPODF WYCXP YQVQI CWWTV OMUYW
HZGUV IFIWL EKMJV TXUPO VZNUA HFXFO SBAAH QOEKK WTXHG LYJZN
QFHNY YOGKK ONQXL YQRIX LHZAE NPAKC XKUBB PIVVR QDLIH AFAUI
UQYTU KEVOO RIIAF THOND AXLNI MNGIX UKCSW BDOIM KKBRQ FXXKD
AMOSE FPHZR GFNXF WLLVV KETMC UCTUL BTELY ZWUZZ VCFOY XMLEE
ACQWC VIYDL GFLDH LEHYY XDZHX PLMMB NMVPK ARQEH LNOHE TMJLM
PWXXX DDHAA GZCYP

NCM DE IZW 5385KCS 230908T USM-99/00130

0058 2823 0800 9942 5445 5815 3917 8609

DDHAA FPCHA DSUNP HVMHH UNOZZ TDYQS FMIRM DYGVV GWJZN IQXVI
GVBRT NFTAO DDDDX WAPBC GBVEL GGMBA AURCH ZYCKP HOTKT BJFMW
WXGYP JYEKU NTMOO NXQLJ OMGOC NBMLR VLFTX OFBEY RQHDM MSKOC
CUMTC HMCVF DGUNZ IFAFZ JIBDB MUSFD XAKLW KLUKB QVBQO WDLDH
RSHNV MQWQP GGLZG KLZYT IHEMX SEVQX FNGIX UUYIC EXGVP AOCEF
KSWTO RGHQM VVGJH DHUXB QTQBX FPCBL WQOLF XIYFV IXNYD YANJB
RDKKY BFUCZ GXTZM UYIEH MMWAZ ODBKV VVOZA IFZZK NJJMQ HEDHH
TDTJE BWCOV IFCWD KTLOR WJJMV YKVOF KCMDG FWCVC CUKHK COMXI
EBRFR OGWKZ HFSNV RGTMG DDHAA FPCHA

NCM DE IZW 5385KCS 230939T USM-99/00131

0068 2823 0800 9942 5445 5815 3917 8409

DDHAA FPCHA DSUNP HVMHH UNOZZ TDYQQ ISIRM DYGOX CCQSA JDHDT
EVQRF DABXE RTSCH EFLSR QGYWJ KMZOF ZHSHR KBJUA BLTFI IVKII
ZOYWV EHRVF CHIZM GEQZO YRQXT AZEJP RJTHF QFMNJ QHZMS ZXKHG
HTJNU CDCVF KJJXZ XSMAK VDIXF ZESCQ PZKWG FLETA GZCVR PKPTM
PELQV UDIQL HRULA TLAON WHZUW QDZPH LNIXC CEZOY ZPVOT QOTHA
UKVLY RYKFP IWGQE EWBOC DIMDO VJJNF PZILF KBBUH KIVOY GZXBB
QHKKB HUTHL QPTOU UDSBH DMUMG XWYOV DYJHO BXSOP WRQDX MYXQT
OEXUE PWOFL ECXRN FOHGZ HXTKZ BUVDF KARNV VMYFQ IEIPK ICORS
YERXB VFXXX DDHAA FPCHA

CUN DE IZW 6260KCS 230903T USM-99/00132

2018 2423 0640 6350 3456 9749 2396 8124

DDHAA AYSTX FPDBG SYFUC DJPSX NZBVO LXJBC VAMQN QUAYP JGGPV
YKSSI SATQO YHSAM ESEDB LULYB DJTBM DBIBD OLLRB SWEDQ DXKDB
EIWQS SHIXP FDLVS UDLPI UMJOF IQLNH MCWTZ YCTTL CTZNC FVKVI
MPXAA MRNXV NJHIK VBKWE IQMPU TXIZF UOJGE LHELX YXMTF CUSPD
XLALB TAUFN WQHTL RDDOH TTZMJ NWKOQ GKFGP PTPXF XCQBW QDXUJ
HNBMK PMYTU BCRZP YRNBW ZSNMV KYALT ZDZRJ GIDYR ZLUPS KTTEJ
CNTXT APIUF COEKL QOUST RVMWL YUAHQ YUVLV MJJQC THBRS DSAAX
RNKJW INNMS DQEDF JHOLL MXNWL TRMTR VSXJM ULGAB AJXXX DDHAA
AYSTX

XYR DE IXI 7130KCS 230923T USM-99/00133

1038 0523 0815 2110 9054 0586 8444 5426

68486 90057 58182 12029 40286 21859 23282 12318 29422 12242
23141 62852 46760 55288 22147 00300 14125 29194 80222 58059
91182 72728 21206 44922 40295 52500 57014 99502 43986 74199
28475 18095 57795 41008 99715 80784 47561 75189 86539 72029
10705 58369 91189 05241 93829 95528 97585 05051 76752 12810
27411 05440 68486 90057

LLZ DE ZZZ 6350KCS 231034T USM-99/00134

1061 8123 1000 8121 2645 4104 4754 6633

HAIHA CEGAC VGHMG XSDWE GHPXO RYKRY PQUZI ICBQK UGRBM MAZLN
CULUC EAKBO NCRZP EPJCC CVVQX FWWMT IZBCL IUZLL HUQDW PHHHT
CXGZD DRCRZ UQWPU FTQNQ ZTIUF KOCGR TRUBN RPBST HPWNG YCPQR
THSPX TXMPC NYYHI IRDKA SVTPT ECQLM WRPWA CEJBB NJJBP JJUUA
YMBED UESAA YIOEP IXBMR TKHEE KNTUC BTRBA HUDXB EVICD KEJQP
VIRLP KAPUG FJEAY FKJJA NEHAT HFNPT HOYAP BBURI XMAVW UVTBA
VBCVD SBGOS MYCTX MYNYJ HAIHA CEGAC

ZZZ DE DYO 6260KCS 231156T USM-99/00135

5048 4023 1105 4775 8820 9749 6644 5322

IIHFF DFLBC LOVIZ SOMHA WLWOE QVNJA IFZOK TNCPS MKLUU LLJMA
SNIQB QACSR IXCEL EXFVS VAGBR DFBOZ FZCTM SLVVL XFJJP XFKMW
VQJHE WUIPL ISCTY SEXPU OAKCK JFMVJ XZXDP ZILKB IQWWE PKYZH
XALKO JTABS BEMBA DNBBV NKJYB PYKPV ZXCMQ VGGQT WMEZV MVKUC
PJUMW ULIKK JFBJO XIHQU JEYVZ QYSFD HTRUJ KVBHE LHUXW DKSSU
PXHXX IIHFF DFLBC

EJJ DE ZIC 5265KCS 231156T USM-99/00136

0027 8723 1115 8140 7487 1918 5726 3952

JFFJF NUNBJ BHDOH EMVMP YMBXB XWNYX BCBVL HPKWB CLLRU ZMPPZ
ITDDF BJMLR ERUXE NWHQQ KEYZQ GHOQV RHZGI OCZWH THADS MOMSO
ALFSZ NTOBB OCFUA RKMGS XRILD SUILG KOQVR HMTAJ GBAUS OCFZL
KHJHA XORQI JSFMB JKPBS PZYWN UBSPP PNUVT JFFJF NUNBJ

ZZZ DE MLH 6340KCS 231006T USM-99/00137

7056 2723 0830 8943 4257 4339 8110 7024

IIHFF CHNBC WJBFT PANCU URLMY BNOPY MXNRO CIZAW IKMFI AJTHJ
XIYZF MMPQP KVQOA WAFBA TJKJY XRLPJ QBLEL UKRPT TUNZC OECOU
RZYVS QIUEJ GTQVE LKOMI HZZLM XYQCU EBAXU IMWOP HABWQ MRAEB
KSTIS JJVTH GQWTL YGXRK CJYRS OQVVO OOLVA LZJJT CMPEL UOYAQ
LFRAJ KXBTK LFQIN KZPAN MIBRC RRQFM TUBXG HXHXU SCMCF XVUJO
PEWMX MCORV AFVJS FFHTQ EIMPC ZAGNQ YNOTZ XTOKO DTPZH NOHCE
LEIYB OLIHI RZTKL WNETT MTLNS ABOCZ ZRWRQ CYICX IIHFF CHNBC

ZZZ DE MLH 6340KCS 231023T USM-99/00138

7066 2723 0830 8943 4257 4339 8110 5624

IIHFF AFLBC CLQRU EOUCI OXYUB UULIM ISCSF MITPV KLMBL XPAFC
JRMGJ FRPEP IHSTC IWPLB ZRNJX VOCJH FHESL JILQV SBFEJ ALTBG
DHPUK CNUUU QZKHC FPSPX ZUESP BFJLO SOSBO WEJYV ISOYI LJURI
ZFYCA FXKJQ EMMMJ TVNKH HXRLT DRECZ YTFWK RIDML QAQZF SBEDW
HMCVS FQXTK RSAPX IBNGJ HGQJV SYQZH CCIDG IPCAN PUEJD VZNZR
OXFVQ RPALX TMIHJ DRNEX IIHFF AFLBC

MLH DE ZZZ 6350KCS 231051T USM-99/00139

3071 7723 0945 8140 8820 4258 4259 9126

IIHFF BKPBC DGECE TQHDJ JZUIC FBZLH ZODES SHCGD YTTZS NSEHG
OXDVP GVBOT ZOMWU VOOHX OUNYY QUHOZ VJYJH UZUJI VAWTO RJFUZ
AWZPN PQGOA XMJYC DWMHA HBVYL AZDOU URYQT POVAP UGMVK TFPWK
XZQBM NOLXP VHGQX WAFWD NUMXJ TJHDV HSVUY VXBAB UDIWY AVPEZ
AKMVE WNUPZ DUCTW JYPCZ FTAGG XVHWQ UVNML LPHIA YBJEM CVDMT
QXZSY IPKHI OUCOC QZBTE QERJK MKNOE YAOWA OZIFV YGKJU LGNGB
VZGPS FRGBH OZSLM HPJZA DPJTO OHOSR EPVBD CSNPM ARKAO FFISN
GJKEX CQJUU QKSUL WEHHN NPKLM ILNQQ EVXBJ HTSQV KLROK BGROI
PRGDP XTCBT TJWGP NJNWP PHGLB RGUVF UHOTX AUOCV VFXXX IIHFF
BKPBC

MLH DE ZZZ 6350KCS 231118T USM-99/00140

3081 7723 0945 8140 8820 4258 4259 9032

IIHFF AJOBC BCTSR FQIOO MWVKX OMVCY OXBCP KODLT EMMCU UQJIU
CAEBA VXPOL ZBQQU DDTTL XFOJB NHVMH UJHCR UACAA RYVGM NOHQB
LJVNG ELAOM MQYLL PSPXJ IWJII ORVXE LHPSW SOPZL FKTLD RFXJM
RZPLL LQVJR GUIXC HNXDC ERJYW QUKPT JBVFD VGTJF GYJPS TDNIK
BUNSS RWWZZ RRHZJ RFYIF TUDOX XEJHT WLFOD OCDEW JRBQJ XAYER
KBIHB BEMBX EPCHS PNQQX XBRQY FBTTF SCMEB MMNHR CKSIR RQTGD
AOQXH IPBRJ MUVHJ GIFYM HWDPJ GUGJR GAYEW EOPVA JUIDM JDANW
ALPBS FAGYJ KWEQG RMCEL ECYYS SDGZH ZYBUE XVZZZ KTVEU BKVSP
GVUDL WXZWZ LUUVL UENZP BQLQQ YTMQP MJPOU FXOOX IIHFF AJOBC

MLH DE ZZZ 6350KCS 231136T USM-99/00141

3091 7723 0945 8140 8820 4258 4259 9219

IIHFF DIMBC JJHVL IFZRT HCYJF TWCRL OJOAW UKNKR PILKE SFBHW
QTBCP EZCFK TDPJW DDABW YZPUJ AGDYQ CPWQZ QLYXG KRXIN QHXSW
YJOXG MCWXX COACL YJYOF WKMQX GFSZY DLTEM WFHHI FZXPW ELSOP
XMKDB LNSLO HWQSC OXWLT HLBWK LPOPF CGVSL IZSRQ LHOAX VTKSY
YRIZP SYBEQ UUUFS WKISZ FRPQK FSFZC AYQVX WTHRK SDFLR QXYPQ
PLQAP IXGPQ ORPMV ELBQE VOQPY JQOZC WTHZB RVWJZ KUPGZ XGMHK
8XXRX QPJZP PRWWP ISJII RMTAO FMGMH ETBNE BXVRQ SEDBJ XQAXH
TDXPZ UTAVG SRXXE KQQPT GFFUP OVPNS PANYR MIACR BKGDW ADHBJ
EMFKV KKKEF RSDZP EKNCG WNKQV DJXAG JPFQU IUCQC ATBLZ AJXXX
IIHFF DIMBC

RHW DE NVT 6340KCS 231046T USM-99/00142

1096 3223 1010 9518 5237 7525 1081 3521

AJAAJ YZMCC FPHKO NRFCG TYACE HCLHB IFJMJ EMHYX VQIRY POXBV
UAUAH XOBAV EKJUL DLBKD SZOKE QIVAQ KIKZR BHMQA VQGMA S1FKM
GRZZA DNMNQ UPASG JHIBW RBMIW DVFMD VFJHF HAZKB NTVKN XCYYJ
JBSWC TOTFH ECKDI AJAAJ YZMCC

AAA DE AAA 5820KCS 231018T USM-99/00143

0032 5123 0940 0120 0420 9262 7319 4919

IIHFF EHQBC PJMJV TIDOE UHKOJ NWTKF ZIYUB VGFZD FGPLZ SKJWS
XNFHQ UYONA LCQTT DMDCW JGHOZ CWTOM MYIHG ZJAYK IQHAR AOONU
EZTTX NBQDM WVFXH XKZSH LKVUX UUDRT KOQAX XCRJH FFKRZ KNEVC
VLTWT PUAZB JRTFX ZNOFT YAFQR GZVNF DRPNF ILUNT GLNAD YITCK
EOZGD NRBCN QHKBE NVFLI FZEGO KSTAW JJNRI IIHFF EHQBC

MKP DE SFV 7830KCS 231124T USM-99/00144

4084 0123 0730 8943 3456 5086 5762 8733

DJDJD BETYV OBVZY LFVOB BHYQW JISCQ UOCNY TEFOZ FBOEH QOBRT
YBSJI NXFOZ FFYNR ZYLFV EDZCA SZKYF OSIQI HEOYC ACKDU MQXER
PWUBV JISCN OLYWO WRDAK SKUMV VUSLG ALVPI CSCIG MPIEU KEFSF
UEKGI LTMXI XMUBN GAZKH OZHJI BMNOT GTEGB KIVGR UIYQE WOTYB
SGYBG RYWLR EIBJE YKQIT KJIBM FOZFN UKKNI ETGYB GGYYD GYBGM
UBMGA ZKFOZ FXOBX DUQUV OFZJI SCQAN FJUEN JUAIH ATEMO YTVEB
XREIB HUAHR AYSCA SZKIV GQITK DUMQD YDGJI BMDEN USORI HYQWG
ALVHE OYGAZ KQITK RYWLX ODZQI XONEC SVUSL TEGBK IVGVE AWGAL
VQEBT HYQWG AZKQI TKJIS CXXXX DJDJD BETYV

FSD DE ZIC 6620KCS 231052T USM-99/00145

7037 8223 1005 3749 2239 1918 7238 3530

HDBHD ECRBG AMCZT SLJIK JKSCI OVBVW GFDBN RNSNA LSDIM TXEDL
BTLDK SWRVE YFCVU CCVCK BMRWX EHHRE CCLXN HEXGG BKLFC ICWOL
HSDBM RPAMD IAWXJ AMZAA GGDXS KTQVT BROGF IBYBE UZRRT VVWPK
AASMT USAOJ YRFLL HDBHD ECREG

CUV DE XIG 4095ACS 231031T USM-99/00146

7526 4323 0940 0121 3456 3565 0172 4426

FFBGG XIBEO NZSZT NXIGK LSMOR EWIFJ NMDYM TLJGY FOGBW IPLVG
VS-TA OVFPD ZHFPX TNCMC CHNFH LNUTC QBEMR SCSSA HSRKJ CTEDO
HJR4B BGYYA VNTNO PSCMV CPYZY LHMLG NQZYC GBOYQ GZPJS UKQTV
PGNKL VVZQD KOHDK UCYNU YQGHN UBYUJ CYXFS LKSRD PPERW ZNVBG
XGQBM BRYXX FFBGG XIBEO

VXI DE FZX 7720KCS 231106T USM-99/00147

6012 1423 1020 9329 2239 7741 3070 4018

HBJHB FVFAB YXVXT QAVFB ERZNX KODDU PZXXP OKHBJ ZPJBS YVTBI
XNAZO QMROP OLLAR WHRKY RKJLD WZGCD REWQV JZKRS JPITW EISCU
VFTHM ZDVGA WNMYC LJDBR PGNEN SYDOL AAJTD KJBIT TCSNC IMSKT
UJYBF GVJPC TMOYN UGDTI KFPHD ENSPH ADPRT FCAWO HBJHB FVFAB

YWP DE UBT 6890KCS 231056T USM-99/00148

6545 0123 1025 1120 3456 6832 4718 4632

AEFEA MOTFS ULBGU VBMUC QWOID BEFUG QMTCA MTFID LMYLV WEURD
AIRLI CPWIR NWELH DOGMB AELBO NQCUY BWEUR CERXX OCYDI TZMES
GTIQK TAGCX YEYKY LTMOT FCAMT FIDLM YLVNE ZPKOM WPOFU XEFDL
UYINU ERMOF SDBGO CAMTF IDLTA WSWAC ACUOR KOBCP YCPFU UZFEV
DMOHU TYQQQ UDBGU NTXXX AEFEA MOTFS

YWP DE UBT 6890KCS 231106T USM-99/00149

6555 0223 1030 2750 7263 6832 4718 4837

CCFII NNUSJ ZATKH JLMZB MFRHJ ZHREX CYHKT YAUGB VWIRO QSJXB
DNGFH QBNXJ UEFLK HJTYN FVLJF VFKWE IYXDA DWEQI KUORL WROEF
CBKJT CFZMV UROLH ZEBWA ZWEGK EIEYL ADWBQ IKUFM TPGRP YPXOF
AJUDU ZATKH JLNGL MZBIY EWVNO EOMIU JQNXO LBFER OQPMR GAXSH
GCZQR BHPF. FZVMI UWAEL KSRZB ADXXX CCFII NNUSJ

ZCA DE MRS 6900KCS 231158T USM-99/00150

7588 3823 1100 3731 3456 8669 1081 3736

HBJBH FUGMH UMTWY IBVEB XPEGX LAQEQ INDJY YFGYK PXOCY ZOHEK
IQBPU KXJEO ZHOMU NUPBP AGYRI CUCIK PSEQK LAQEP UKXKU MVRUM
TWYIB VEBXP EGXLA QEHYQ WGYKP XOCYX OCYZO HEPEB STAMH QEDVP
UKXNI NBBEZ EPUKX VEIEP EZQXX HBJBH FUGMH

WNN DE MRS 6900KCS 231032T USM-99/00151

9028 3323 0945 9942 1476 8669 8408 3330

HBJBH BYIKP ENDZU DZJUX FZYZU GOOVC YTVJY YFQAL DNAEV JYYFJ
YYFRU EUGUF MROTK NUWIR OMCTI TNPUK XQIND HYQWG YKPMY SCPUK
XBUNK CANUT EBWQI NDJYY FQALD GYKBV ULDQA VOROM CGUFM QYSFM
OTFXX HBJBH BYIKP

SFV DE MKP 7320KCS 231136T USM-99/00152

0606 0723 1040 6530 1476 6625 5320 4532

DJDJD BYRSS YDTDU MQXER PFONT ZYLFB ETYKO ZKGYK PFOMS QYPCB
OZCJI BMTEG BLUCN BYRSV OOHFO MSSEY SBOZC JISCP OOCRE LDBET
YGAZK KADRB YRSKU NWJUE NVEQM VEAWP YPBJI SCFOZ FNEEU PYPBM
ERFTE XSDAC YDUMQ XERPF ONTZY LFHEN XRAYS BYRST ACYJI BMGEB
LWAYW QUOCD IDKXX DJDJD BYRSS

FHI DE MKP 7320KCS 231012T USM-99/00153

4516 0023 0925 3731 0611 6625 8327 4326

DJDJD QULZV YFXSE DXDUQ UTOVO XYOHB OZCSI CVHYQ WCYTV JYYFJ
YYFFI XEMER FGAZK XERPW UBVGA LVTIG AJIMW VEDZC ASZNO NAJUO
WTACY PYKWM AGWJI SCZOX UXERP WOYTT UIASI QLXAO NCEGN TOKCH
YQWGY KPJYY FJYYF JISCR UMBPI CSPYX KDARZ TEKSK EDQVE DZCAS
ZSYBR DJDJD QULZV

NIO DE TPY 7400KCS 231024T USM-99/00154

1518 2223 0915 0942 1263 2025 2125 5132

CFIFC QOHXS ANHZY GBQYP CJAOA WEVST URIWU BVHEY IQIXO GOIQQ
YXLGI ALJAO AMUKV BESXR IMDWY EKVUI BJYOV DOKPV UKCXE RPQIX
OJICN JAOAK UEOPO OCXOI EWUDX XERPS YZPCA UBGUE LQYXL QAOGV
OHBDO YDJID OFYTX CAUBR IYQMA EUSAN HFAYH FUWBK UEOCI HNZYG
BWUBV ZIWUS UNDMA EUQIX ONYRC LYMVG UQWMA EUNIN BXXXX CFIFC
QOHXS

MKP DE MRS 6900KCS 231037T USM-99/00155

5028 3223 0940 5504 3456 8669 5762 6216

CCFII GGRIU SDBYJ ICPAX CPXJZ CTFNM LJUNL UTNJZ AVBZT ADBTU
PIWKT WPHIR UIUVY CBAZF YWGCE PZVRZ DEYCR UNACU JQMPV UPQXM
IAMVN TJMGI WIFZX BPQJF BNQZU KNWDU NDJGI OPITY TQBHB TUFQE
NKOEA ZQVFP CINOW TRIHC GXZTL SMRAO VTCBA QUFKG WIZIX BMPNX
DYQPO ADXLK CHQHI LPHFS LHXBD JRHJB NDQOM BWREH EYOJD ILKVB
JDMLJ MIUYZ XBNKO KDPHI RTUWV MUQDH KMBKO NCMIJ TQUQG WNXXX
CCFII GGRIU

VLH DE XYR 6070KCS 231147T USM-99/00156

6016 4923 1110 3749 4094 8641 7157 4343

68486 40721 81198 84853 75524 15921 86393 33960 61313 90981
59218 44125 85542 82958 59131 41852 43575 85012 29287 38290
76555 20829 58591 31215 28592 67653 67528 39122 48865 95846
71238 65432 32384 28520 58226 35412 90894 02528 59269 52428
20000 68486 40721

ZIC DE FSD 6680KCS 231037T USM-99/00157

2566 6223 1000 4369 5218 1161 5726 3527

DAEAD CYKMD YHLDI MSBON EQIAR GEQZG YKPPI QFNOV ICULO SEGAB
EKWJO OXFUM RLRIW TAOKJ IDONI NIPIQ FDIMS NOVIJ EWEWY HADIM
STIVP ROHDJ IALVA TQZUC YDUTK PIQFD OEKMO UGTOI BQITK KAAOH
ORZHA DPRYZ CWYHA DAEAD CYKMD

IZW DE XTG 7990KCS 231104T USM-99/00158

6566 4923 0900 8943 1476 0946 0956 8732

DDHAA OVFJK HMCNI SIVCX UBZVS ZCKAF TFEDY HLRBA MEMGQ UROQQ
UAPMU RHQJE IACLU QKMUB SSJOB DFUFN PXVQA TLONP QDKOP DOOPI
UEKUI GEBMP XIBSF ILPMS OIUCL MQLJG NOZDY GNMNT CZBNG WSNNV
KYKQI FVSMB GWYDC KDRBV KJJAG PSRUF QOJLZ QZNBG BOCKW UUKJT
BHUBY HVVTB DFCPC XBBPI WTELD DYNSW WYQIK JTCWF ZLMNU XQZLK
TPMHV XFIAQ SJBXP NJQYA NVLOE VFIYK XNYWJ CAKRM QNEYG GGKQQ
BOCHI CPTYW SDTJF MXYYO JPTBI KXDMI NMQFK VTHDB FYBRD IMBKI
HSXZI HQXLD KRNIW GMPMY HZRMQ EIXBI SVFTT VFNCJ JSWZZ QJJUZ
LHYAR CDFIC BZUJH VMXHI UKXXX DDHAA OVFJK

WHN DE CUN 7720KCS 231018T USM-99/00159

2542 0723 0900 6350 3456 4366 3395 5442

FFBGG JQCHA ETLFD SZHVB WTHQQ FVNFZ EGXYG ROGFD YPNOF BIXMF
RMVED OBONO RELXX EBDSC FDPBR GLTTX VDSPT QZGKS ULPZG AJRCA
VBSJK TTEHR ATDMO STVBY IBWGN PBNVF LPDLB DGGAR ZIBNS VRDBE
CWGCP WVXNZ GUOMD MQJYU JATFA DQYFY OZVDG MHYAS YWKJF TZAGH
VQVOY BVUJT ZMLUK SHRMI IMSYR LYOKM DFYRU YBTTB IFQRE QQFBT
FUZSK ONXXX FFBGG JQCHA

VXI DE FZX 7720KCS 231119T USM-99/00160

6042 1223 1000 8943 7803 7741 3070 4124

EGBGE CYTVW UEYNY IUWUE YCYTV MUIUX EUSKU WFWUE YMUIU PEBBQ
OTITU XPXAV UWIGC CAZGQ IQGRO WNCYT VHAWH MYYIK OZKKI QRLAW
LKUWF BETYT OG2MU IUCAR YTOQI XYTND IDKBI EICYT VCAZG QIQGR
OWNTO QIQEU MXYMF NYCOM EBQLU RBZRA ZDUQU HUMMX ULFXX EGBGE
CYTVW

VXI DE FZX 7720KCS 231138T USM-99/00161

6052 1223 1000 8943 7803 7741 3070 6624

EGBGE CYTVW UEYNY IUWUE YBETY MUIUC UIMHI ZIBET YMESG DIFMJ
UQYTI YSDIB HTUZR CUXAT YNDQO TIWIG CCAZG QIQGR OWNRU QFFAF
PDIFM HIZID IFMGA PZDIF MTILE XAQFN EEUDI FMFOP VMILY RUWMX
EUSKU WFWUE YMUIU CAZGQ IQGRO WNKOZ KDIFM DITZD IFMLY TCMYY
IWETQ QYIML AWLMU IUDEA HCAZG QIQGR OWNFO FVRUW MGUAG TOQIR
YUIMU IUTUN ETUZR TBWRX AVUDI FMCAZ GQIQG ROWNF AFPQO VLMYY
ICYKM HAWHF OFVRU WMXXX EGBGE CYTVW

FMT DE FZX 7720KCS 231052T USM-99/00162

5022 1023 0945 2750 7263 7741 2620 6427

CCFII CCFDT JKHIV AEOKV GLQKA CMMML FDKOC MDEIW UENJH CJUBF
KDFCZ IYCKN OGIWS KNEIK UDKLQ KDYVG HKIKH ZEDPH ISOYV XBPIA
VKNLC UPIOD RHGDE RZGEL SNCME CSVNA ELSWV JYAZS CKOLJ HGVMU
FFDKI BFLEC WMXAB CFYHP UZOUE PJLJN YIGIB FGKGM EAMEF AQIAL
JGSJV MRZTP WBLQA GOXNO QFVNU OPSDO HOHBA KIWAX DKNPD BIWBD
JXSYH ZUFCK PKMNI VQVXO XRDGM CNFYR XRDCS NAELM NJIZT VMQHL
SPZJI TYPHI CCFII CCFDT

SFV DE MKP 7320KCS 231004T USM-99/00163

0555 9823 0900 9942 2664 6625 5320 7334

DJDJD GYKPV OBVZY LFVOB VGYKP JISCR AICTE KENYA MJIBM WYOGG
OOVDI QWFYP TJIBM HEPZG UIPQU SGTEK EKOVF TIGAN AARKO VFJIS
CJIZK TEKEN ECSHY ZFNUH UZEWV MUBNT USKJI BMQUS GCELR CYTVG
UIPQU SGTEK EFOVB KOBMW OYTMU BNRAV PRALE VUBLJ IBMQU SGCEL
RJIBM XOCYG UIPQU SGTEK ENYAM JIBMJ OZIJI BMBOE HBONQ GOXBS
ICVWE AKJIB MGYKP WYWPM AHXGU IPTID XVEBX JISCF AVEDE NUXYG
AJUFO TEKBC IYDGU IPQUS GTEKE FAVED ENULE FTJUF OJIBM GIYDJ
ISCXX DJDJD GYKPV

ZHK DE POH 7640KCS 231112T USM-99/00164

9526 3223 0935 6530 8820 6210 9074 0020

DDHAA THVIA XVIBX CYYGN LXBRB DKHIB GVRYY CJHDX DVZXO KKWST
VXHHE XEDJS SIJER GXJCX EGHTE YVPMB IYUJX JLLBV LQDPV CTENX
ALJNC OBZDD CJVNA XDNOJ ENBVS MZMFB CGMAF UJRUU UARBB VIUPZ
IVSUY OWSHS MKWFD KARGO UUVCF IIKZC MPUBV FWWLL GGLWI KDZJN
JERVW OTSUI XJQMJ QXCTU LDVSN EIBME GXQVH GBBSR LEGGH NPZDI
XIULG DSAVJ TYMJG WTFFM XIIBQ TGEDS UENRB BZUXP YHTIZ EDSBW
KZWBC YPAUJ VYOKK NXYZS GCUVX VCPUU LBEJR PKZTP NANBK GFUAD
ADTMY HXPLX KCMIM FDHZX VUZNW PAWFJ KMDUN VYYKT UUFDZ NLAHT
BQALY LEXXM DMMVH UAECY GFNKL ROOXX EPHPD YZBEV PIFCP KFYDR
YYLUQ QIASG EZVJI THJOL GZFEP EWSUP BLFDI MHXXX DDHAA THVIA

NCM DE IZW >5o5KCS 231004T USM-99/00165

0078 2823 0800 9942 5445 5815 3917 8009

DDHAA FPCHA DSUNP HVMEH UNOZZ TDYQQ GBWOJ CHVKX EKARS KOTGQ
QUUTX YBTNQ MDUDT IAOAS DNWOS IZJWQ WCZHI ZZLLG ZDRXM DFVTG
OZTOJ MVIKU RBNTU YINDJ IMFIL QVAZR UGFFH OZLPT QJWHP NONBE
AVTRC UTJBU RINPK CRVXS JNNUJ CJFNZ XRKW1 PKUEB SUBTL HSMPH
CRKPV SROLT XOIIO ONTVX UWDVP WMGQN JEKEB DDQLY XTISC NRPHY
QLQYJ KUNSM JOMJH CDCKC XYCNV YJYAW KFBSX OPMGB YCHMD VIXID
WMSOJ QUIFB EUHQY LYJTZ RIPQJ XWEUV SFKWK NXGOK ZRIVQ ABCEL
DJNLA TRXGF MIXRQ DGHOD SEKOT BVRRO EBXHW LZXOF DDHAA FPCHA

WNN DE IZW 6260KCS 231008T USM-99/00166

3088 2923 0820 2750 7263 9640 5230 8311

DDHAA ZKJYS HTMTJ UGOGB FDONS PHIBS VYQWM YCKWA JSBSP GCXNF
HCWLX NCQBO OASII XBSEN SEANG CRBHU GZTTB SMYII QOFLL TBOOW
HZDVI SHGWA CRETG YOFPC NHQMI EKKHV XBCPI CIGZX GXOJE CUATA
RXLED KRSGJ DSHPB YBGFJ HIKKN XPNJR XIUJQ PRENI VSQNV FBTQV
TTYIF JBHTP KDZRK HQDGF TDYAH JCFMZ QTJXM CBMPT VATBA NPQII
KFOZN TFMLL HPHLJ UTQXS DCIZJ JHMJT YTIZU GWUZK VXQDW IUKUU
ABBME VLBWU DADTP RWWUY IRZMC WPIDN OICTN KKYXT FRBHD MHKVI
DBSUD FUUBU LKLXO NJQSX AIGOG DZAQK KWQLY TRIPW TEUPX GENTM
VPXXX DDHAA ZKJYS

CYO DE PVK 6005KCS 231109T USM-99/00167

2026 9823 1035 9518 7820 6373 7742 4021

IIHFF CILBC ISQXK BKWCR UPUKQ JYHMX WOHMB KGGOH MQECR LKBCW
NYNXI TFGCH YOSRG SDUDM VBLML GLJHV METHX QVKZP JZJHR LBMFW
LXVJJ UXUFQ AOYRC QBMLH ZVXIT EXMFX BUBRG HDEOS WDJJE NRPPA
DKLRB LVWQF ZPIOY FEKMA CFVPK GEYRP SDZGN EPLQY IIHFF CILBC

POH DE NIO 6130KCS 231152T USM-99/00168

1041 6923 1045 9969 8423 2124 5942 8401

DDHAA VDLJU KISLM YQRJX DMHUX DKHJF ZRJDY TQMDD CATRA MAHEU
KYYBZ LWNOP DKWSE SDBRZ JYOPL FUOCN BTOOZ DNGXN KONIK RDMPQ
ZNQYK QBWFG LJTCN DQWBQ RRAMQ PVMKG RJUNQ WRQDJ HERIC SXPQJ
WKXUW APDSO GLFMX MORKT CVKYR SMJMV BMCJH IBGGM QACWL OPPCQ
NFBWQ APBOZ OTHQF UTBDO JQZVJ BMBDK AQCPU BJKIQ VDWSI KOHBK
DBSHI JWBEJ EJCDO BMKPD CHXQA SIBSU PQYYB QPERZ JMKUE NBKAO
OLGSI ZVLHK YGXTP SKZJI AMYQG QKMOB RAGLT CZXDW UFQDL TTVAF
PKIDX VGJOS ZDEPT JFTPW HJROD JOFSN VOUVW YGMGX QSDLF UUOPE
XLKLD KQXXX DDHAA VDLJU

POH DE NIO 6130KCS 231437T USM-99/00169

1061 8623 1350 6350 3456 2124 5942 7949

DDHAA RTPEE SHRPB YBING KQCPU PCJYC UARLG OFAYD IXXVR XTDZK
MOYUB TFXQT OUIUM CWWPM SHKRY WXGOI HGWKJ LNWGL BSXKD DOVZJ
QOICM SYHNU GUNYQ APBQI FUFDZ XPTEFT JUPFO LGGYB MKFJE GAEKU
IOHMU LJABT IQYCN HQUCG JBGFH ARYDR WYHRT HDDKH CSRGB NJGZU
IFCKT PMHRU UCLGT YDBUL IOVDA ZSHFG YAVVM PVBCI XDMOD XWBBC
M4JQL GDGXS JBLLF LLQNT RMVZE MDJDR BCTNS HHUFY WPFFE IATHX
SJZKL ETYFH YUYMR XOCVY RHBTE HDTNS FXQLD KPQWI ATXQY TFGTK
LRVCK KAIHL DNCLE JHRIM PHDSH SHHVQ LMFXX DDHAA RTPEE

POH DE FBG 6830KCS 231458T USM-99/00170

2074 9023 1415 6350 0611 7435 5942 7528

DDHAA ODEPL KUKJE ZMZTV KIYGU ODHZK JAVEJ SAQJK DBILM TIBQF
KTPBT SBHCO NJMAH AMWBL KIRNP FGEVE HMRGR IAROZ TMNZV NFKKH
XBRNR MFGLD TAAVK LGGYB MKSDB CKJUF YLGNU LIWXP PZWZR XZJNT
PKSEJ EJCDE SZFOL NWXPC ONJVV MVZTC UXAZW ZJWAR ZQNDP HRYZS
TCYEM GDYAZ JKZFU OMTRZ QADWR BDPWQ RZKZH VLFMX LLIJZ JQNOF
SDUWM AVMZP EAOFT ATBQD GSVBI QBGZX NIHJP FAFDV JUBPX INQJI
KQSRQ DJODK HMZKF GFZCC ZHNQL TTNPA DPDCK QDCQK LJSFQ LZILY
FWFAK GCYIV CXXXX DDHAA ODEPL

POH DE FBG 6830KCS 231536T USM-99/00171

2084 9323 1445 1120 7820 7435 5942 9718

DDHAA NYQEZ WTAPK TTSAQ TNNWU OBOMJ OKBUF YHDWT GHBNL ERIUV
YJFJG VYLBW ZZHXY MERCA PNVBJ EJKLM YJTRF QBXWV MLJFF YADYW
VITAJ PADQK GKJPG QFKLJ PDBGX GZOBI KGOFD ELERT QIFFR EKLIY
DIKDX PJJVV PQCIO LMNPZ SMJAO YQXIT QWHFQ WRXFB BPPNP ZQAJY
PAFGI VYZKD LTNOH DADDI BJNMA QZYKR KEIYL VWEMA MKWNW QUCXG
DQFMG NPJMJ KZFRA ZRNCN YHBCO RLYDD BCYDD RISQN HOTJZ DNLJF
GAIHF VBNDL QHQRH RICCO UDGDU RSSDA RFKYI VRQDY JZDUN JKFPG
BEJDJ YODCU WOHXT ZRFIH BQZYR PBEOJ MJMBB GOPPN QSQCC WB4JV
QEPPT ZYWWH CLNYJ IFFQG NRYFZ ZLTCR TWIDK OCUBN GIHAU CJYUC
LUYFP VHKDU JHQPI WXRDI EXXXX DDHAA NYQEZ

POH DE ZHK 6660KCS 231103T USM-99/00172

3050 1623 1015 9942 7263 1774 4754 4122

FFBGG IDOOD ANWWS GHJAU FCAFA UHVZX QXXDR IQFFB BJRFW OPHJF
QFVRA RSBDX VRAZV DTESS YGSPR PHGHV LHNTU FAMIX KAWCU MGHDF
HLKDJ JLUEL PUEVC FYSQS WKNPJ AZOFO TONZZ ICHQL JHQDC UIQHD
APUNI LUTXE IZOYX HXDCA RSLND WSSJJ TSSVN ZNXGM MLYGD FFBGG
IDOOD

POH DE 4HK 6660KCS 231158T USM-9//00173

3060 1923 1100 0121 2645 4212 5942 6823

DDHAA GLSKO XSYRN VFUGE PKZWT TELTI HJWHA LUQSW JOTMX LDCBL
ZTGAZ FNSNQ EQARQ LFRWL JQBXZ VSRWG JMBIO BSJBA YFBXP FBIOH
RCHRO OPYLP WMRPH GBJEB WSDME EOODD UVAKW AJLXT SDETP PRYST
EZESP NVNDF MNBEJ CIMDF KZUGR WSANK LZSPI JLVZO ITXOF USLIJ
QOOIA EMPFF LPVKU WGXHL PWSJK UGRAI DFUQM BYUJL HZYYP LBHQV
JZVLY LEHIC ADTVX YDISS CDXUX MUPJT FTXPW UZIQO SMHGV GBYLG
RGMCW AVVTP MEUDJ XYUEW ZTVQI LAXXX DDHAA GLSKO

RBU DE RHW 7120KCS 231112T USM-99/000174

7520 2523 1000 8043 7263 2510 5726 6237

DDHAA HAAYE ZIQQJ WXBQO GYEZC XEOJR JBISL BIYFN LCERZ EEUYZ
LUCRZ QOADD TTFEW PWHLS GOJBF IMTYD DODHA QVJBA YRXII CKAOR
TJESO ISLEU AVHNP FXQIJ GJELW RYPMI HRPVD PZLMX NMZUM EOZVA
ULPTY AUFBZ HAIZD IAMAJ JGWDY ZISME UJMCB WCCDA CHSQM TKGGC
WAOWJ HYIKF HACIS OLOSZ TEIMD JQWNA LTQIQ ULJPK WXGVN MRABZ
IQBIL BdBGT WJUUL TLLSL BFUJD PYFWN HYPSD WPLDG BPMCL IABVO
HCZRO WFYXF GCITD NSMSW NMAPV DMQEO IFWPT WLPTB OWWJQ FEEPO
PZVC AKMVO MLXER SPIJK DLNCY TDLKR YSMJR FLJMX YGKZG ZAXXX
DDHAA HHAYE

OAL DE RBU 6020KCS 231004T USM-//0175

8527 7523 0035 3731 7003 3650 7096 6624

FFBGG OJCHL NHMOJ KHZLV BLIYQ HTF20 KWNKE VUBJN QZGEU BXBUQ
ZNGTF WCKLO LXBID NCTTK VANZZ VVCUD UIZYK JTXHX TTBHM ZHZTE
GVLVE IMRVP CUKXT KQNJK GPOQZ JERAW DIHEY LGELS UYCUL AHXWJ
AVXHK QIJQC DSIZV XHGOU HOURR JQWEX THCNG ITCFM ORZMI TPKDR
PXASR PMTDF RGNZB QPBWH MURUS NAEPZ RVXJL PZJKE GDXLM NIKPD
DHXKG LZYGD VDUWC HPYSS IYOMM FYRPS FXLHK BORLI CQJQH ZSTLH
LUZCV HNGML MZNMU ZRLXH FFBGG OJCHL

INJ DE GFH 0400KCS 231157T USM-99/00176

4021 0023 1015 6530 0611 4997 1377 5018

CCFII SSMLZ JUMZR YGVCZ VYPGO VNXHS CZONO VTRSN RYCPA KIRHZ
ELMCI WUDUC NKUOP WEMUE XWOWD HGWHJ PGJXV BINNX DEHPO XBOFL
VWNTB UYTDU IKJQI ZMWXV W6QNM EWYGI FSNSU QSNRB CRZSS ZILJA
XSMFD RYGJZ AVIBF JUDVX API4X WGROS KSBAT ZVWOK BXEPN YTSBG
CUSNA ELSWC BIJVF DCRJV NEJGK ALXDI GVQOV AXVOX CCFII SSMLZ

YWP DE EOU 6140KCS 231146T USM-99/00177

5552 3623 1100 6530 9054 7101 4716 4429

CCFII QQPMN ALFBQ JZMTQ WBWDH BWHUF TPBFR UESTZ ODJLT SEYHG
BKFZY KJLGQ VMXOJ AKFLO WMNGO PDKAN EJACU PCACU AQWVZ EPNOM
IPOGZ VFKOF ZTVKD GJGYP VFIGH PQUVO UPKHL PDYCF SUTWN MEUDQ
ODWBU YFNEK LWRCJ NGFXN OHKWQ KAIKA BHALH ZXSMI BLDBJ LZAIV
SNPNW HGXXX CCFII QQPMN

FHI DE FBP 7940KCS 231041T USM-99/00178

5018 3423 1010 4775 8423 4122 8327 2534

80808 76885 03090 13340 95374 11731 97433 13014 41423 59593
40576 64734 69323 79581 91934 86510 13499 05594 28933 23692
95194 55725 24400 80808 76885

MKP DE GKW 0100KCS 231142T USM-99/00179

3518 2423 1110 4775 7046 9893 5762 3332

ECHCE RAFNO EAIOI MMIEL OLFFY GDWCO SAGBX DENCU UTSRI WBHTP
RNJSD LFBNR UNEAO EOAEE OEVOG WTRSE NTMCA TTEOI ETRNO FNEIE
COOEO RVFIX RRHWN NETTP TOOOI OOEEE STZZA RTETD URFWP NOION
AOOWO ECHCE RAFNO

HZY DE MKP 7320KCS 231124T USM-99/00180

5036 0423 1000 2110 8820 6625 6473 9028

95459 06843 02842 23840 27884 42926 31692 31402 24234 23219
37494 98298 03929 70825 01813 38374 29214 54374 49484 16793
11666 43639 21411 97479 91660 84190 13329 90445 81668 64104
25142 92631 69231 30697 44423 84067 44535 67536 96184 66746
52560 44617 44449 70825 01813 33322 31158 94043 99482 76664
26213 21041 34022 42342 32190 74943 39980 12393 22311 58948
3 0654 64661 46270 74574 27328 42281 30250 99816 39214 11589
439?? 80811 23223 11509 48392 64646 66044 79693 04232 78230
10440 74705 73942 16829 20417 44211 32282 58000 95459 06843

INJ DE YWP 7290KCS 231303T USM-99/00181

9015 3423 1220 9518 5442 5833 1397 3820

DFJDF AOJGS SOITH BKOBG WWVLB DTWUR VSNXI FILOH GCLRI TPQLD
TFYV TNISE DIIPB IVFPI TWGPU PNQYM JAKTI YGOAE BBOBJ ZULTJ
QNVQA VEAAC VKHMD BBSFN NBHYR CCXPA MQZUF WXDBK PYSWE VFKAA
WBAZE RVHGI VOODV FDMGJ DXAAX EDLBR DFJDF AOJBG

FBG DE POH 7640KCS 231356T USM-99/00182

8526 3923 1210 8140 2645 1639 2549 8342

DDHAA YNFPT BKAPD SCVWQ RCEEK IFRFB BFGTB CIGQD QSHMZ ZAGLT
BBJAQ DCILW YCKCM EGLXO SBRXS WGLFK RGARK BMOFO MBWJF ENDMP
QJVIC KQSUZ DTRWG UGEDT OYNXE NXEXC FLPGB YASQM LDKOD WRLFV
FWZBU BBPXO UAOXF UWKQV WTAUG QHRYW LXLPR XNLDN ERTOQ WBWAL
RWQJO JVYUO ILOPA DJORP VPRMG KHBJL KMFUY MGHHU GVTIG RSGYU
EFDPS GDUTT DPLOW DQWNY XRNAD NQRCT OXPCY RCEIF XICJJ NUMQJ
MONCP HDTPG CXNIB SMZSQ MVDSJ BYBLD FPHWS XBGDI VERPZ IOWUO
CFOJF UBLZZ RXJYW ITOMY JDWKM DMJXR XMSAL VXGIW UDETX VLKOI
DSUJD DDHAA YNFPT

NVT DE RBU 6620KCS 231328T USM-99/00183

6567 9023 1245 7753 5218 8858 3485 6636

DCGDC PLVAF ESBSR BEOVI XOYDN XAVQL NNBGJ EHNKY SSRVX UOIRI
VPZLN RRFAJ ZDLMK QUNZK QZJAX SSFNQ VJGOX VOURA AUFPC ZZEII
RUGTF MZAMC UQXSF CWMZT EIDTW XKZRR ZRYRX DGQFX MXZBL EOTEK
EDGDH FFKGT BWJAT YVGZG LURVM EUVQZ QSNWH MLPOX OTPUA ZRYMT
LLYIZ TJJSV RIBRS OBOHH YKWNY LNKCK YOJCA LTBAF LEHCB UZYYG
SKQQJ IWWCS JRFZN YCBPC ZLMMS NAXGV YJNXW VTJGK EQJUJ VCVVA
XURUN RXUMA FQUGE YLMLD DCGDC PLVAF

CUN DE IZW 6260KCS 231318T USM-99/00184

2078 4423 1140 2110 9054 9640 1360 7031

DDHAA PHENA HOGYT FMZNV PVBWW LYAKU BXNTT NLQXX BWVNC RERYK
GCFZL MLAUJ LIGZS NFIFG KVRTA FDXKU AALFI DGMBQ XXPUW LCYTE
RFKFN TWPQQ YUPXT FRGRC MSLCM NIMFT BWAMK MITIL HHQSR ZPFHL
GUJTK UEZTI HSIQO YBGZT NYJIU BCSSI YPAAQ GYCIX UJBRK GYVNG
PESSN ZPJPB QKNLB GWURB NCIYA QEUOZ FYJIU QWJHQ LUPTZ ETQKV
KKVGZ BPHRM WPTSS ZHPDH JJWIY TYCFV XNPSI JXZKE EGZNW ADPAL
BZBVU WIJGH YKZOW YCTAS HIYGK PXLBZ THFZB BJJXX DDHAA PHENA

ZHK DE NIO 6130KCS 231214T USM-99/00185

2521 7023 1100 8943 8820 2124 3151 7901

DDHAA NVMJN HJZEP TLYRI FVXJP CVNXN ERGIT QUBFM RBXEU SGKXC
FVDZG UEJVC FDLDF VHSNX FQIBZ XBBUW XZAFB GWHRO OMVEQ SBURW
YIHTI DNLBP LORMB ABNWX RTIYG GQFJQ WLCXI LQRVG XOOFT WWLNX
QUEOB XKLIZ HIRKG NSDTL OZELC ANHSU TKTRK QVHBC EOYOK MATSQ
UAYTO SOLOX FWADS DZTHH KYFVT UQWXF GOUJT NLWWM GPOGD EYQGR
HFBHI DVULS ZGAUK JSMQH XPJDK RJGTF MKTVT WWJFG NEDFM CHFBH
PFBIQ FBQFE GHBGV WHPVK CQPUX MFNMJ OHIAW VPBXN VZEUB QJUBB
DTHIS BAOVH CWNMX BHLJB XORPL CQRCH YWSVX DDHAA NVMJN

ALL DE ZCA 4405KCS 231326T USM-99/00186

0010 3523 1210 3749 1663 2610 1081 4302

JIIJI EUMCH CVAFH NFNHC TCNKJ MDDLW ITGLL MBFRR JE2LK AKFKD
FPHLS ISOXA MMCVM TWLFV ZXMLQ OEKXH ZTVCP FLMAX QGXTY BAYEK
HMMUT MWHRQ JSADB IQBEU XELOT LBTVY SZYSS UYJSX KAUWJ LVKFE
XJIWK AFATF OJWHV BDIXZ MJKJT EHEVR MEMMK DBWSE DPFJT HUWUG
DXGNO JIIJI EUMCH

EDI DE VLX 5960KCS 231312T USM-99/00187

0027 0523 1225 1561 3456 6373 3061 7229

FFBGG ZGFPL CVZFA KWKBI BVKQZ DWJJU AEUWA OHQHO YWXQC RCKNT
PUJJW GCBPS KLHMZ LTQBR EWLGH PZTSX PGHBZ DKUDP JXTPX LVQSX
YUAGP VLIYJ FKHBH VZUWW WIALA UKWOL PAEUV ITBRO EYXJL QQREY
CPDHZ IVMVS LLHTQ ZMIWU RXBNW YGKDL ZYTDC EMOEZ MQIIM XNCTC
VATPQ HRERL PLOUG XYUBS TWSRA QZODD DTFAZ HNCPR FLUFR QMADM
CQJEK XBHAL WAIOZ GSXVJ MZECV WQHRR RFPHN KIYEE VADDZ ORGLL
GWLSB EOZCC BXBXR FXACN ZVTWG AKQHG HWGYS FKHQZ KTFQZ HRICS
FFBGG ZGFPL

POH DE FBG 6830KCS 231748T USM-99/00188

2095 0323 1705 6530 5445 5121 2666 7928

DDHAA QOMBV HRTLY XOFTZ XNQPQ MEKIM YPCKT MCFPX KXXUK XKNFW
BYHYG VMFVF ZKFXB KRLVU IJBGX DGHPI WCYNK VCBQH LVHDG CQTGF
JBQKT RNLED HSGMP LXAUM QOWSU WQFNP JRKAF MKYTO ZTPFY ZYYVV
MHQRZ QATBD HPBXT TCWKH LXQRK MBKPZ ELTHP PIMAN CTWSO VBWVC
PHUNY COVYL TZRBX QLNSR BCGPU FHPDU QAQOL KQXPZ EJNKH FNBOF
MWVM EJRKN VMQTJ QABHL SHMQW XVBCK QKMVM VIQXL GQYLP FCXCZ
OGPWK UUXCN TMAFQ XWDGO RXZQO LLQIQ LVWVO PYMVJ IYSCI NIWJY
OKBLI EZTFU QMVMZ JPPGZ ZGMCS OGHVA NEZZX DDHAA QOMBV

ZHK DE FBG 6830KCS 231728T USM-99/00189

9044 9723 1635 2750 7263 7435 3151 9301

DDHAA BCBOI ABGGV OZAGI JXBOY UIOKB YJJXJ XVRBC FDHFQ BWPZZ
DHCGS HGKNS WWCJV ADAJY BALDJ JCBFW ALXQR YRQKI QAEAV GFNVC
LABGP GCWEP PJGNT WLFEJ AVULS YNJUT CVWOB CYDWE IYEHH FMMDH
QOACN LCGQT KCVQQ DJDHK BRAUO WDUSF XBMQK BHIVQ DTELO OSTRH
TPKOK MBKPZ BRIBC XCHIO BRSOD EAOLQ RYHOU GTARR XOHIW YHIDS
KXZQG EFBOL XFYFH AQHCG YNDOH FCGPP IYWPT MHLOI TZGSA TVBVZ
WLDXG JHGGS DGPBX DFVZG GMHZC PDFBG QLJUJ XFVUM DRBAY XQIKR
NXZUM IWNOE LVLCG GLVVN SNQFX IVKSV HCSPT FYJOB PCHDY AJBJQ
SIBJH YJLNB OATOY LQBSQ ZYEAW CNMLQ UKWTI CSFQU WDIHV FLFPM
YMKXX DDHAA BCBOI

MRS DE ZCA 7120KCS 231217T USM-99/00190

1040 2923 1020 6350 9054 2610 0091 9125

HBJBH HYQWV OQKNY UFVOQ KHYQW GUFMS YTIMI IWGUM SXODZ DORWG
AALXY XRSAH CTEAV GYFLL IWIPO AFWAK HQETL HOHQZ EAZVY MDXYM
FGITB PEMCR ICUPU KXMOL YGUMS WILGX YMFWU WQDIU ACANU CYWYW
UZTPU KXKUM VLAUI CAZGS EQKNY ZLFEF OXYMF JIGRR UQFZE HGROS
IGUFM SYTIN ECSDU TKJAR DKSOA KUMVJ ARDSY NCKEC PXUTO ZAFFC
EYEDU RVZUD ZDUTX WSURL IHUZA FFPUK XKUMV TUCUS ETNWA KHSYT
IHEQA VACZT USKWI LGWOU PMEGV ZEAZX UNHLU CNGUF MSYGW SOFXN
IOCKU MVMUN YDAWE TUSKZ EVUJY TASYT IGUFM PIPEK ECPBA FMRUL
AWOUP RUQFB AFMKI CZKEQ CRUQF LYLUB IBFNI SGTUS KMONZ HBJBH
HYQWV

MXU DE ZCA 7120KCS 231352T USM-99/00191

3050 2923 1020 6530 8820 2610 2558 8525

HBJBH HYQWV OQKNY UFVOQ KJYYF GUFMT UCUSE TNWAK HSYTI HEQAM
ULWZY ZUZUA WZEAZ FADND UTXGI TBFEM CKOWG ZUDZD UTXPA PGBIY
CXUNH LUCNC YWYQU MAHUX EXIYV RICUN YHTDA IRNAF WJEPA WUZTP
UKXKU MVTUC UJEGS RIDVW AKHJY TATAM HNYQB TUSKW UZTKU MVPON
BJUEN NYHTM OCPSY TIHEQ AWAVT DUTXZ UDZGU MSGOP WLIHU ZYPKC
AWDDU TXFOT ZQEDV GUFMZ YZUBI YCMIX LFUZN KORBR ICUKU MVVYY
QNYHT DUTXX ESQKU ISSUD UXICZ PIIYN YHTDA IRNEC SKAFT SYTIZ
UDZXY MFFEH QMUBN PAPGP APGBY HIPUK XKUVE SYTIN YXISY TLZEV
UCAWD NINBG UFMXX HBJBH HYQWV

NVT DE RBW 7120KCS 231219T USM-99/00192

5550 3023 1105 2750 1476 2610 4259 9330

DDHAA WXSQP UVYZK XQRFW JKSMR KOVXD GHXNH EOTFP UZMKB LFERO
NTCGF AZPSA QBYLQ IEDUM IQRYV CZGPU YXZRO PXNTK DSLPL LXJCQ
OHMIL ZSAPO AJWXM VVNVU LAWUP BIQUH QFZWW ZXKHN DPJDD WFPKL
SEBLE IUXKR HPPUW LCYTE RFKFA KSQGM XWNRY DIYTV KWAUJ ZLZPB
YUUOR OLHID CJDSQ DDGPL WVRYI RDGYH BNJAP NRCGN RQAGD CBBZT
ZDZNJ GEAOF GJXPP PVJCJ PLYJB WMDUW JOZYG DPCJQ KUMAW BOLFZ
URTDD QOJQC TOJRB IWAMQ PYRVR EMPCS DOYGV YDDHC TUILS YBWQP
KARAH UFLTM ELIAT EJVLX VFLDJ MICBQ YJMMO VAZAZ YEQRV QREBQ
UFVTG YLLHP SCQKO RBLXI ESDVR VSERQ FRQXT UIVIM VCSGD EYQOR
HXXXX DDHAA WXSQP

NVT DE RBW 7120KCS 231237T USM-99/00193

5560 3023 1105 2750 1476 2610 4259 7330

DDHAA WXSQP UVYZK XQRFW JKSMR KODWR GHXNH ESYYT BYBKY UOCOD
DTQYN SJBIS SQOKE QGWAN EZIRV CZAXB ZXLIO HVPIW THRVK GBRNA
RJOWF NMJTF CUHDJ KFWKI RSDQL XWBIC GJHGK CFGJI NYATY QWSZA
OOQGZ JSIWG HGMOI PMGWN XSNDJ TCFUN BXBTR JPDTL ZHUAJ HEVVV
HMUPR JTIJP QCDEF BMSPT ANJLR UUYIC EXKHM QQHEF KSAWL PXPXF
CCEXC ULTKT SXDTJ VJELO BNMZF VORVY YPHDG PFJIW SSNSH EFUPD
RDMPF YVGCF IEMRS DTLBZ WGUEZ MXQNW LOYTI DADVP MGZCA TABHV
OPRGG DDHAA WXSQP

WPX DE NVT 5945KCS 231351T USM-99/00194

0036 4423 1310 9969 4606 7525 4259 3536

JBBJB CTVIA OSGMO LDHDS VOAYB ERQBV EFTZO LVELH MNYGU ZMZID
TKTQG ETYAM URUKX ZMZAX VXCPM XHNPP HSUHO TPTNX XWYBU EUPXU
ZBVWN CFQIN VVFBV FFSVL LQXXI XUJDZ YWART XTBOV ZFIGW GFMVW
WUKLE FMHZD VCFZY JBBJB CTVIA

WPX DE NVT 5945KCS 231208T USM-99/00195

0016 3523 1130 5161 7487 7525 4259 5137

JBBJB ORPFH FMSDE ICFKO VMNKY NTZKW FWYL WIIOF UACJP QSJSO
LYQLR SRDRY ACVKP QEYSV HCCOR HYTEA KCDGX JPWLB WJKXW VTAEW
WPZMN TKRMV SKXJJ LKQZI HBHYH VCOVZ WINIZ NFUYA PFBLH FZGIH
CGFXF WICVS XMAHR FWRBB NOEKT MFLCQ HVWBB YRVZS DZVNK TBTLX
MSYEB NGSFY LWXDN WCJRB EWJWD OXXTX FVLOR MEHCK QSJYI JBBJB
ORPFH

EDH DE ZIC 6620KCS 231219T USM-99/00196

9037 7823 0940 2750 4257 1918 5267 8542

DAEAD GYKPM UAMKI OZMUA MHYQW FUMRX IDAWA ECDUT XZYZU TIBVC
IWBQI TKWOU PTOIB TOHAR YWLVI QLTID XBEMR NOVIR YWLFE WERYF
DCESY MUKVH OUCVE YUXID ADOYD NIZOR ONDCE RXQUE TRYLZ SIUND
IMSZI QOXID AZYNH LULVD UTKNA DUHAP AFYYC RIMDS IUNZI QOVYR
ILYMV RONDH IDNZY ZUTIB VQIOE RYWLN OVIZU BXDIN TRIMD SAAVZ
ECBRY WLXOY UXUVQ FUMRQ ITKRY PDFEA IDINT KYHQN IZOZI QOROK
AROND RYWLS IEKXI EBQYN ARILC DOYDR ONDCE RXDOE KQOAQ ZYZUN
OVILO RCTEA VWEOL FEWEF EWEGI LTDIM SXAVU ZYZUV EIEZY ZUQYE
SZECB QIULF UMRXX DAEAD GYKPM

RBW DE RBU 6620KCS 231221T USM-99/00197

4527 8623 1100 6530 2664 8858 0406 7633

DDHAA FFWLS ZHRPB CUUQY NLYRY YCDSC XMBTZ XIQKJ IYZOX GXFYK
YPJDR CBXRU UURYL MWSPD UUMKK CKYKP CJCYJ FXKOI ASXVN FNVXT
JWSZM MNRLC AMDHL NFBWN NQXTY KORLC EKSGM EBWKW YQYWC SQMKB
GGVTQ CXUZL GLGBR WJUGN WQSZV LVUXO ZSFVQ RWXQC NVINS MXLTG
NBPDQ JMHCF QYLYT ELUYF TXUWK SKVXO SPOSH JOASK ZKLOD TDZWT
PVJTP ZBZXQ BBLLB RJPHN WGZIU ZTWOP DDIWT IWSJY ZZXTE IKXIM
EQFDA EMKUZ BYIDV RTEEV OFYNX YFDUH LHSSP NZPVB EHSTQ FMXPY
YDLLG KCFBW FFUXX CPXXX DDHAA FFWLS

XYR DE VLH 6750KCS 231202T USM-99/00198

2047 2523 1125 9518 2645 1260 8444 3723

50505 79470 98895 99600 69633 69891 37603 30485 78964 97603
35939 35970 98705 17161 91904 89895 90038 85789 64976 03399
67357 95804 93275 98859 19047 57356 01517 19774 98801 11391
67390 11151 17749 88011 19000 50505 79470

HZY DE MKP 7320KCS 230905T USM-99/00199

5025 9123 0620 8943 1476 6625 6473 6324

95459 30697 49439 61925 74202 78847 29232 72814 02242 34232
19074 94991 66790 42923 98254 99292 61000 84134 21482 23089
67419 90761 26438 28133 90412 29281 35413 04127 08250 86621
30684 66749 43813 14506 08419 01664 68483 21694 25172 92327
28140 22423 42321 90749 48318 41646 40414 94796 21094 04128
63399 81128 39864 64660 91243 61045 89451 99122 26214 57306
97400 95459 30697

ZIC DE HCO 6030KCS 231219T USM-99/00200

3577 3023 1145 2750 1476 8740 5726 2708

DAEAD SYDTX ERFWA AYGYK PKOZK JAFBR EATJU MUFUM RRYET XYKDS
AQLNO VIFIE MFUMR FUUZJ YLSTI BVVOD XMIVI HADFM OQCFA YHNOL
YTOIB VODXL EMZBU GIKIE QXXXX DAEAD SYDTX

HDG DE BWO 7990KCS 231350T USM-99/00201

1046 5823 1035 2750 9054 3565 6707 9110

CFIFC CYTVN IRFVU FYNIR FCYTV CAUBX ERPXO DZBUT VHATE FIRYL
IBONI OCBAY EXUBN QYDRR ELJWU MFFOZ FJONW VIUPM AEUPO RFMUK
VBOPS ZYLFW UBVQO MBBUT VFOOU MUKVV YEZNE IYMAC SWYTM NAZQW
UBVWY EXXOW SNYDP ZYIDM IKXDE XEWUK VKOBM QIHYG EOXXU ZUCAU
BXERP HAYKK UEOJI QAQUH WWYEX JIQAX EWUKE PBMOX KBOGY TYMCW
EOLFU WBKUE ONEZP DYTWS OGYWU BVWYE XHEYI ZICAF OZFXE RPZIW
UXOIE MUCOF OOUWO WRZEW VMAEU DIYEK AYMCA UBJYI QHOIR JUCLW
YEKIU ITSIB UMUCO GAVFB EYDXE RFCAU BJADQ KEPBX IROHI HRWOW
RQIHY XIROZ UVRKO ALQIH YNOZN CEKQJ ONWSU QGDUE IXXXX CFIFC
CYTVN

TPY DE BWO 7990KCS 231218T USM-99/00202

2056 5823 1035 0121 5445 3565 9713 8510

CFIFC CYTVN IRFVU FYNIR FBETY CAUBH EYIZI CAFOZ FXERP ZIWUN
UUGSA NHZUB XMAEU KATGK UEOBO PSDOS SGARB FUWBK UECMU YKXEN
YDIYE KEYDW YTMVA KGHEY ICOPT WUDLJ AOALE CQVIQ LXOZV NAZQW
UBVWY EXHEY IKITE FODKF OZFBE YDSUX OQODT MUCON AZQWY EXWYN
FTOPH JAOAT AXTXE RPXIW UHUSZ KUEOF UWBBU TVVOA UDYTW SOKBS
OPGKU EONER GQIXL CAUBS ANHXE NZHOE NDUOB BYBCW UDXWY EXQAI
BJAOA KUEOM OIVZO URNIC RZUVR COFIJ AOALE CQHAY KXIAX XERPF
UWBMU KVPUP CREDW MUYKM UYKZA YYWUB VRUXN XERPR IYQXE RPGAV
FSOPG SEMQC AUBXX CFIFC CYTVN

GFH DE FZX 7720KCS 231254T USM-99/00203

3052 2123 1115 0121 5445 7741 6743 8524

EGBGE KOZKW UEYNY IUWUE YCYTV MUIUM EGVTE NHKUE OSANH MODQM
UEQPE BSWOW RXYTN HYDKV IYTLY HRQUC RFINU KUWFV IYTJA HUMYA
LQATM TOXQK EOTDO QVMBG VZEAZ ROWNF UFLQU WTKOB XBANT DIOUD
IFMMY YIMEG VDOFU MAYOK UEOPO THKAO BNIDS GELUD IOUMY YIWIY
UGAFQ FUFLF YAESA NHMOD QNUNZ VIYTK UWFZO QNDAR ZGELU SOVNR
YBQVI YTLAZ OKIQB MUIUP EBSMY ALQYS FDARZ DIQMR OWNMY YIGIQ
YFUFL VIYTC EIFFA SBVEL GHETD ZEAZF UFLQU WTMOC PWYPH SANHK
UWFKE FSXUS NCEFM JAHUJ AHUQE OFDIF MXAED SANHT OQISA NHQIY
PRYBQ VODXM UIUXX EGBGE KOZKW

UBT DE YWP 7290KCS 231319T USM-99/00204

1025 3123 1145 8943 2664 5833 9803 8710

AEFEA FAFPL IFSWA RFLIF SCYTV KYLTQ OVLJO AKDAG PKOUE LUBMW
UICGA SCDAG PHADP WARPC AMTFI DLBEA FNOXL GUVBQ AOGWI RNDAI
RFISW KYLTQ OMBHI FPRUA QWYEX GAWGD SGODY MPKAY MZUQM QAHAW
OLFHE TDCYF HCUYB REDWS ULBZA NNMOF SPANE HUXEW EURMU UFKOU
EXYAU RUEUV IYTRI TLFUA FPEBS MOFSD AGPCI YDWIH DCUYB WIVRJ
UHQBA FMSUL BDAGP LIERW EQNVU VOKYL TZUFB TOPHG AWGZU FBJAP
BSAOI RITLQ ENESA CXFID LWEUR PEBSW IRNBE OTMOF SKIFC RULAM
ILYDE GOGUV BSULB PEBSV IYTHA TETIO HGAWG HUXEW EURNE LADEG
OBIWA MILYS ULBPE BSKYL TCCCX AEFEA FAFPL

BWO DE TPY 7400KCS 231256T USM-99/00205

7108 2723 1205 4775 5218 2025 8156 3645

ADEAD JRTGE RTJOH SCEVX FWIEB UDFLA WROWZ TDVJS QMJAE WAFVO
UBQSI WLUML HBQUD LYNBJ XNLVN OCEXL GSFNC UVWWS BLTQR KSGKP
IOGKQ QMUHM UTNVJ WUOAC ZFOGE JUATN HZEBJ LJZFE QEFRR SAKNL
BCGXQ LLVVX CMQZQ XODYU ADEAD JRTGE

BWO DE HDG 7080KCS 231312T USM-99/00206

8573 3223 1230 1561 5074 9145 8156 5322

DHBDH LONGH DAAFL NFLGO JIOXU DHNQW PEPMH AOVZK UAKKU CZTJD
YFOFF FLVLB QQQHC PAJBG FGKOA PMAYE BZWEY SJQBS YGECT SIDVC
YFNSL ZYZIL NGTUE UIYNY PTOBG VLDVU ZRZRH AXTEU ILKFP ZNYJZ
ACIRF UBHCR UFFIQ LPUVZ CNOJD FNLTH CYYXD OXVZT JEVXC BZBGW
CHBAF ZIRRZ OGGQL LPKTZ TAULI VCDLJ AGZPD DSIWB BYAJD DANUM
VTAJL DHBDH LONGH

MRS DE MXU 6380KCS 231257T USM-99/00207

1516 3923 1210 2110 7263 6616 0091 2832

CCFII AAVLZ SWFKZ FQXVH SLOZS EYHGJ PTULZ IPTUB NRYOS CMBRK
IARUK HYZAD OYBAN SKAZT LJWVN YCQXV OHIES IHGJN AWKJG QNXSO
NXHKC TUPYO LGCMX ZFBYS EMRPQ HIXXX CCFII AAVLZ

ZIC DE EDH 6170KCS 231323T USM-99/00208

1594 9223 1145 6530 1476 6977 5726 7935

DAEAD HYQWM UAMKI OZMUA MJYYF FUMRB YSTZO KGHAD PPUIW FOMCZ
OFCSO NEQIA RDOEK VEIED YADCA PWBET YKOZK CYTVX UZUBI UYXAC
BVUSL JIITR YPDFE AIVYE WJYYF HYQWH YQWDI MSKOZ KXUZU TYWNW
ULETU UMFAL UGUPV BAZFD IMSJY YFQOM BWULE DIMSL AUINU BONOL
YGAMW XANMZ YGBJY HPPAO FFEWE RIMDH YQWXO CYBET YDIMS HYQWQ
OMBNU LEDIM SLAUI NUBON OLYGA MWXAN MZYGB JYHPP AOFFE WERIM
DKYQK DIMSJ YYFQO MBWUL ELAUI NUBON OLYQU OCXON INOLY XICZW
UICPA OFZUG CNOLY KOZKJ YYFQI NDDIM SXXXX DAEAD HYQWM

ZIC DE EDH 6170KCS 231348T USM-99/00209

1604 9223 1145 6530 1476 6977 5726 7435

DAEAD HYQWM UAMKI OZMUA MHYQW FUMRH YQWXU ZUPUU HKBOA DIMSG
AMWXA NMZYG BJYHP GYBGN IZO6I UNJYY PJYYF DIMSJ YYFRI NEZYP
KTBSN RIMDC IWBFE WEFAF PJYYF DIMSJ YYFRI NEZYP KWAHF NOLYC
IWBFE WEFAF PHYQW DIMSC YTVDE DLGYB GNIZO SIUNG YBGNI ZOSIU
KXOCY DIMSH YQWLA RFTEA VCESY FISZN IZOVY ASJYH PFAMW WAHFJ
YYFRO CYBET YDIMS JYYFQ INDXU ZUMIM ZKEOA VUSLJ IITGY BGNIZ
OSIUM GYKPD IMSZI QOKOZ KHOVD MODQF AUDBI YCREI BVEBX JYYFJ
YYFQI NDXXX DAEAD HYQWM

NVT DE OAL 7830KCS 231353T USM-99/00210

0564 1823 1230 9969 5218 5086 4259 6529

CJCCJ CZZID APXPJ QANBV IKNLW YCVTH BQAGT ORWLZ YZXUY HKFSH
ELXIK NRGXK FKKPT OBRYA FFATC MXIAY XHBTN DLRAH RDRQS FQBQV
VMECR UCLDD ZIBZI KCRMU ERTSG GTZJA UYXGN TZDUM RWQAO SBCRN
YWIKN RKJTP RLLWC YXPHL KDUKB RZGTB XBROG HFABV PSFDM HYJOP
TKNGY YOUQC BSFHK KKMMY BZCIM FFQLU QYUBO JCCYG JCTMC SJQOZ
DKSRR NXGLI XMWBO GCPYI FVSXM UTYCZ KQQXR KKYQV VZWUP HBGYF
ZTSPK UZVPS PWVCJ CJCCJ CZZID

NVT DE OAL 7830KCS 231318T USM-99/00211

0554 1823 1230 9969 5218 5086 4259 8023

CJCCJ CZZAH RFVBU BLRUZ OHUEM DVYKK HSOBS VDCCG WYESC MROLY
GJJTF TKQEC UQJQX EHLRA DPNIF ZURFO ARSJY OWJJB LLDNX QVFBA
FFLTO LLLRR LUKBH CQWGF KOSGQ UHDBE HTHAW EGMCG KNNAR MVVBA
LCGEU OMVBY CZMCG LGXPT MSLDI ONKAD ALFZC YRFUC PATRW AZVXN
XZIBQ LQAPH VZINH FARHY BUXRW KFBOG CJKSM XDFBP LHCVY OIFBU
YWLBS OULKN SWRVC RYRIV ANPGD XTZPE TBGDC FGLRI NVRKV EMOVV
AQYGR BDCGR ETKZB ZSOLT SSZQZ CAVNZ LUZHD NAOHV SHLKZ SMQOE
QTCZD PAXDC NMKFI EPDMX RPITH GTKDZ MAZCX AXGZB CJCCJ CZZAH

SFV DE FHI 7510KCS 231332T USM-99/00212

7546 1523 1220 2750 1476 7642 6536 6022

DCGCD JJCMH EDYOW QXBAW VYMZQ SCNRF UYXLP QLCTG GAXWZ SOIXS
VOIYW TKLNF YBMTQ UDQJF EJPFV JBDBM MWXTW OASMA DXCKE ZETCL
SUWHR IGMDT YEZYR MYQIA DIPGD AIKGF GGBUM EMTHC KYWTO PPTFS
YLSDZ AGGCT VDQQI STBCA CWNYV KXZSV POIUL XQBZT DDZFW WAKRZ
QFNIE HDETV OTMVJ QYVLW CZENN JBWOT ULXUY XIKRT MGTUV BFIPR
MZAUN EUMJC YIQNF YINST TATYV QNVIP UHLWZ SPXXX DCGCD JJCMH

FZX DE FMT 7340KCS 231208T USM-99/00213

7553 9923 1130 3731 9054 6850 0172 3917

EOBGE SYDTV UHAJU QYTIY SDIBH WIGCW ICYTO YRWIG CCAZG QIQGK
OZKXY TNRAW QSUUL MOQCN IIXDI FMCAZ GQIQG CYKMX YTNRA WQBET
YWETQ MOQCB ETYRE ATDIF MCAZG QIQGV EQMXY TNRAW QWOBW MOQCN
OGUMU IUFOW CSANH CETZB IEIFA AKMUI UXXXX EGBGE SYDTV

XTG DE OAL 7830KCS 231309T USM-99/00214

6034 1623 1200 0121 7263 5086 8156 5510

FFBOG CNEKH YUDND NEKGL HBVAG FEKYB VCIKW IVVVY ZEAFL ZOSZT
KCPPX HFGUT EULWD RSNKC QGIAK ZGKCR EYKAL MNEBU BQESJ BIRPU
DNYXX VRHLG WZHER YESKG IZMXA DRWTS ETLRP CUTSL RSBYI JBDCG
NVXXR CMQGU NOGAI UYEOZ OLKEA ODBBK JFGJH TFVRD EXRBM KMYVW
VFSJL WBVFH UHQCY SOMLL AJGFB ZELAJ FQYVN KOADJ TDBCX OKKKK
JVSXO TCINW BRIZX FFBGG CNEKH

MKP DE SFV 4795KCS 231207T USM-99/00215

4104 0123 0730 8943 3456 5086 5762 9233

DJDJD BETTV OBVZY LFVOB VBETY JISCQ ITKDI GNWOW RFYPT GONUJ
ONWTI GADAR ZPUPC JIITV EBKHA MXRYW LTBGB MIAOS IQINO AOLUC
NXOBX KIOZJ IBMDY TWZUB ZPIBU LUCNL OVGPI CSQAN FSODV QUGVJ
IBMGA LVWYD WWIFB WAOMS EDXWO YTLUC NVAUR SAVQN ONAGY BGJIS
CQITK JYKRF OZFVU ZSRIM DGALV YUZSZ AESTA CYFUE KGILT MEIXM
UBNDU MQFOZ FRYKY QEYQG ILTJI BMGAL VREIB SORIR YWLQI TKVED
ZPAEW QUBWZ OLHZU BXMBA XHYPV SEICD IDKJI SCXOD ZQEBT QAKCG
ALVQE WOJUO WQUBW JOMVK IVGQI TKJIS CMUTE DAOWB ONQSA HCXEX
HRILC ZUBXS AVQXE XHHIH RMUTE SAVQW OQLWI OKTBG BLARF CEMSX
DJDJD BETTV

FHI DE SFV 7030KCS 230342T USM-99/00216

6544 0123 0730 3731 4257 5066 8327 8433

DJDJD BETYV OBVZY LFVOB VGYKP JISCR EIBSO RIRYW LQITK VEDZS
EKDKE RPGUM SBIQI GYYDF OZFKO EXDUQ UVOFZ DUMQF OZFDA OWZAQ
QQOZP KEFSS ODVGI SAREI BTEXS KEDQG AZKHO ZdGIT BSIQI NIZOJ
IBMGA LVREI BTUIA ROEVR YWLKI VGZYP KDYTW FUHVN LZOGA LVKBM
YMEHW GAZKJ OSBQI TKVED ZQAZS FOZFD UMQWO WRSAH CQUHW HAWHX
EKHFO ZFGUI PTIMP JISCX ERPZA QQPUH VSAHC QUVKG ALVHE OYGAZ
KFOZF DATBW YOGBA BHHIH RTEXS GAZKH OZEJY KRVAQ NQITK DUMQL
UCNFI ZGWIA WDAOW DAOWS OGYJI BMTYN DQITK MAHXQ ITKJO MVIEK
HGYTY JISCX DJDJD BETYV

POH DE NIO 6130KCS 231527T USM-99/00217

1081 9123 1450 6943 4257 6427 4493 8042

DDHAA OAVDQ DITOV LVXUR ODYDN PFYPB UODDB BXQCJ IBGQV QNOOY
SMYHP CJGGJ AKILJ HBUYL CWXZU IBSRB SNHBQ ODDHA KXCZC RLIWG
OFRJA YKYGO NDTAF YLLVF DQZWQ DOVXB XOHTX DCWYI EZGKR DBSQI
SPUNH ZGJQG JODAD NOHMA PZKNG LAQKI SRDVA NQFPC DCBSH PZYCK
IEMXO HAUVP TOPQG VSTIP WIHLX ZNTDQ SGZTK OHLWB TAQLU PLHIL
OPOVW FINKX KQCBG ZZDCP QMIWC ZDNAD QBEMV MLWXP WKQHK NJUFS
TMDIZ XVGZX RPGDC UUPHJ CNBPA WIYLO CQRVV DJLOQ PARHV VECYD
GMUZZ JOFRU PTJQD SLKGN IXQPG EVUVD EGBVB TCXXX DDHAA OAVDQ

MLH DE DYO 6260KCS 231358T USM-99/00218

4528 5023 1315 0732 5218 5815 4259 7429

IIHFF CGMBC UUUBZ YDRJY RHEZU IZLGT EIDEN PFTRU DHLGQ YYBLN
ZCYWI GAUJN VTPAM SOGJV QKJPQ FMJTM KJYXR APTQR WMKNH RFVSS
ISPAB QDURD LOGZQ XQGTU QCDDU WVWHZ QRPLK PDGOS UAZPC VOKPA
NQMLT ANBSX FVYTF QIJMZ PVMCJ IVCHB MUCYW ZIEFE UATEN JYBKC
FBIVO GSLZA BUYRJ ZOKQX GFYBZ MWMCG KJDIC RMMPH UTBGU JZKQC
NCNTQ OZSMH VMHKH GWHII ASKGS TWBOB HDJSI VBWBU DWQKB CPGYX
FHPBP VKQAP DOBTA BOAGX PKSCG STBMC QSYTP OCZBI ZDJDT FVFCE
JDEZP KAPPX IIHFF CGMBC

ZZZ DE MLH 6340KCS 231354T USM-99/00219

7096 4023 1230 5504 3456 7525 7094 5320

IIHFF CHOBC UAGSR JHOBH ZUWBB TFBGF KDKFW GVBOH QYCOG GDPGQ
PAZEN AKRPK VDCAF PKJZR WDBJY FDUVY BGMGC UZISQ UDLBL BWPBR
WVXMC ZFARQ YQTQI KSPQZ CZMZO DFNFC SZQBM PHMHO YIVQQ PKYRL
YDXQJ TKWBJ UBVQY RGOGM JGMPV GGDEZ BWOCV HJSDZ PBGLB RYUKZ
LNFXR PTANS UFMVB BMFAE IKUIA LQJLY TCVDY LJWOQ CSBXI SZTNB
QCCCX IIHFF CHOBC

ZZZ DE MLH 6340KCS 231337T USM-99/00220

7076 3023 1215 1120 5445 7895 9119 8437

IIHFF DFMBC LYWHF OMOBG ICMUA ZSFBM EHZLZ JCZFE VFHAN QTZPX
AQLHA FCORG XGVHU GRESJ KOHQE GJZDI QQXQS UVBCG CKCMV CMASK
ZDICQ XINZU ENMYY UKJEY FXBSX KXCJT CTMNY MFLOH WXGBU IICOG
MYCFK SITHD EJSVJ IUCUO AUCBS YKRGT RJGLR MQIHA TSUVY BLIRQ
FZXMQ ETKIC SYTDX IHAUS IFFHQ UYTJG LFFLM FSONQ HBPKD MWJCF
CASUQ QBJOQ APZYX FQLUP BBVAX YSFOI RUMHQ FKUCY CZCMU NDYLI
BNTHK ZMSKV AMFNQ VOVMK ELOPF HBMEZ PFCFM UBZMP RNPHP DRNNU
FCEJC WQQIM QOUXY VDCSR FBMKW UCWUD BMVBP PALEN RPGWI UAVFK
CKVPI KZIQP IIHFF DFMBC

GXW DE BWO 4095KCS 231448T USM-99/00221

0016 6823 1400 4775 3058 3565 8156 3917

JCCJC BPZFC DVRBG IUKRD HBRMY XFXRJ LLYIK LLNHQ ITXCL SDBES
JTQHT TQFBD BJBUN GCFQN QKRLJ CHSAT PFRUT NGJLL MMAAC YACPO
QYZNJ UGEZX TABJS IXWIY IZSDP KRPUG DPVQD YHVKH JBRSM XZTOC
YCDFQ ACSVD WLHRL UQBXG XSOIZ RDTAH ILCMA JCCJC BPZFC

YFT DE SFV 4795KCS 231448T USM-99/00222

0014 2523 1400 5161 2239 5086 5320 3433

JDDJD FLCIG UQCSN RPZOC GWJID CYQUF AWOCW JRYLD TLUCL QLAGE
YDNQL CAZFF WHQQQ YONTO NIWNR LPIEX MKZNI TIGCH MNFYI XFCET
DQBQY MQCZG ICJIG PRXCI ZYVLK PKRHS QIBRK MIFEV FBWDR QZEER
AFEOH SGPMF JDDJD FLCIG

NVT DE REW 7120KCS 231543T USM-99/00223

5580 5223 1500 1561 2645 8371 3485 4838

AJAAJ QANGF JKHUI ONGDH DJLUR ZMPOL CAKKV ZIZTR VXXAV GEKDS
XWTEY JQTRQ XBCYG DJNTY MNUWU EPLBW AQPZF HWMEK RMHXN LAOVR
IYZYV KCZHA SWTBE LXMWQ BJDDS TNGEH PSMQT TWJLD YRNPC GEKBK
ORVNY CHTAC WJEVW OTONH QLBZK VIQPG SBKXC TUWRN ZMNUX HJIHF
DUVWJ ELEZH ANIMJ GHYYN KDJAI LLSOF AJAAJ QANGF

MRS DE ZCA 7120KCS 231451T USM-99/00224

1050 4123 1415 9329 3644 2610 0091 3818

EDIED IOKHF OOOQS GNTQE ZNCYR ZVHVK GWUNX XAYTV SBWHV VVXDH
UZCPQ QWPIP AIWWH MDROD ZJGYF ZAFXC QIOQA ICNXR MKWSU ZFNDK
LWUYB MGEIW XZJFN UBEOL IETOC TNDLO EMPXM PTCXS SVOYM KHYUX
DVOUC NTOZS RPIRL KXTDG IXKQB ULURJ EDIED IOKHF

HCO DE ZIC 6620KCS 231438T USM-99/00225

8067 9423 1350 1101 3698 1963 3791 3927

FBHFB GMYEH AQRBR UGLHH JHSPL UDFXA DZIDS YVWTA QTIBF STABP
BXTBM AVQSV TDHVL MFFSU HTAPR LHITF PIDBU PVFKJ JWIWV ILLBC
VASGT BVMIW EYLHT VFEPB UVQIX KXFTJ LWDEW EXRDN TQUTD BAESJ
QTOMY AXBER TKUVH BPTZC IHZBE FZYCP LUXWJ FBHFB GMYEH

IZW DE CUN 7720KCS 231449T USM-99/00226

9562 2523 1415 1561 3698 7741 3917 3523

AGHAG STEFG OCRNT KRNHM WPAPD BAZEB FLFCM MFDLJ OHFMU DCOFD
WLPXG THXAX IIADQ ACYYW JQDYM NBQEX SOOIA XEKRQ UWBTJ VRFDS
XPICS OWQVW RJGYP UHNOO PEBZS YBMTS OQZYN CJUCS OXPKZ JSKIV
BUOYP VRZOZ AAIXY AGHAG STEFG

LLZ DE ZZZ 6350KCS 231451T USM-99/00227

1082 0823 1415 0732 3644 4258 5942 6717

IIHFF BINBC HDEJI EMDCJ KVSML XXRPO YTGLS QVBHQ HVPEJ LFRNE
YCFDC YTLTC BTQPK VOUTL PJIOE YSQTW UGQAK CQMOQ NFPMU FTQCA
XUCUF BXKTN STLLZ NLEKY UPEEZ RWGPH OIEHD UXQDY LVIPD QTRJD
JXFWR IRNHJ CWJZY OCIOP MDGZE PMXQI ELPKT KEVBO JPUVL GKLQB
WMFMS ZQUOH RGKDE PJKWI VICDK ZPNBQ NULXN WUZKQ VJQMQ QKCAW
SLZLU PWWYR FPFMR UAWMF ONKLF JMVVF QCIZI QNESF MESAJ BATTL
SJHTQ EGGVS FWKMY MPLLM GLZRO IIHFF BINBC

DYO DE ZZZ 6350KCS 231412T USM-99/00228

4092 0223 1320 5161 9054 6445 7300 9029

IIHFF EGLBC FBSYT QUQZD FPEXG ZXYQO CKWDS TCPVB XIWGF GKNBZ
CVZSR SQMBN YCWMV ISAWK RGWFZ REVGH DDCCY TJDVK YVXME WJKEM
YTJDA SBYII GUQJD ZWVUL XTBMU ZMGLO YTRJT GFZMX WNLZW IWKQP
YXFCS MEUOD MNYVU RKLQF SLUHD ZQBYO YEOZI QPESO NHGJP KJUVP
GQOSB YNQIZ VFHGV BRFEK NVOJQ QUQZD FPEXG ZXYQO CKWDS TCPVB
XIXWD FUWJV XWCVP PLROU UETMP ESCEK BGRTU DXVXS HTAXE NTOXJ
YXBJF VEUMF RBTUH TDAGT ZXUFI EQIPA QHAUW XLEPS YDDTT GFZFX
HAYDV ESXAE IZXOP LEXLS RYJSK SOVKP NEFSH CXYNF KYTHJ UOBQK
AITPX KTSCR TUKHY YKSLM BVNTZ MBDXW ROWUW KGPKB IIHFF EGLBC

ZHK DE POH 7640KCS 231528T USM-99/00229

9546 5023 1430 3749 6010 2197 8435 8101

DDHAA JQYPL ESJOO QUKCT JEXUO PVCXI HIZSM TPREX QFITO DGFIO
BXGZN OBVQS CLYRF FHXXQ XLNWR TIUYZ ONNSO UVGPK OUZYW IZIKF
HACII MWKLF VVZMI CMLQL KRXFS NRQRS GXPGW MXBHE KSHTM RGKTP
IDMVC FWBZF CIUAX PHJAK WZHXK VPTVB UPSNY GWHRO OMVEQ SBUXC
ZNIFG IXFAH RMOXB MBFBL WDWUR ORLZN SCURJ BAWPY EBWQJ DBDPY
KYSMB KFLBO MSZLH AAJRI KDDFD FUHVJ YVZCG ZAROZ TMFXL NFZKK
GZYMZ UKFWP ERMIM FMLSX MKFWO SCZWV GNYRC UNOVR ILVBS ZQUSD
ILJVI KRXKW QYBJY WILVH EJJNE IVEGU FPABP CMWWS YYFXX DDHAA
JQYPL

ZHK DE POH 7640KCS 231556T USM-99/00230

9556 5023 1430 3749 6010 2197 8435 6601

DDHAA JQYPL ESJOO QUKCT JEXUO PVCXI WRBBK AOMIE OLSZS UMLPN
WKGRZ XDZKD WLOQL CXSWZ UDGNQ JACBP BFZVJ WMVTK XEZUA SQMGW
YSFIW GDPMQ YFEJM NIBPT RNFXG DNGTF BDKQC ANWZP NVQTC IAKRO
XLSOJ UNBLX QPQXC MVVPJ PEPSX ZXCPZ RWUHV PFJIW JENTB HVYAY
IUUCY RMFBI PGOTE AMZJK ZKWMM WLYWW OCDRT BEXQT RLTJR ZBTRJ
BSXBY FPVRT SXBKX NBUOR MUDUK JIGBT QPIWX GSPBX ACKKY ZFZMB
ZXYMZ XUDVL LQMGO XTLXX DDHAA JQYPL

FBG DE POH 7640KCS 231522T USM-99/00231

8546 4323 1315 3731 5445 8146 3313 9301

DDHAA DFBOX VFXVP QLJSM PVRNY BZSOF MVDZY IIGZX FXCOJ FZNMV
IHOVV CUMEH PVCDX NJGHQ MAKWZ LGMCC HFMWL EOGFA YSMEG XVIWB
DJSBY ILAFR RTURQ KQNWL EIHLC WPYQP VYBGP QSQII QIDYF JYKEV
WTXUE DHVJP RPNQY UPPJT NLEFH MGCEU HHBSP JKHGC GNXYR ZOFTV
XICTI DOWXF PZMQG BGIZL BCZDR GAIVC YNLXV VLITX QPOCR XYMOZ
TTHSX VDZDK IIQDO MQHDP YYDVB PPBHO ZOUYV SOXOA AKJNP NMIRZ
ACJRB YWDGW LJIKEW WEEGR BAEOX AOSJY NJCVX QCUTB CBLQJ JNLGJ
IHJNM KALJW ZKIPH HDGFA FRYZR QHJCW YGTNP CCLQY XXVWM EFTVQ
UWEKZ OGJUI EFQWZ IXAQO YOMUJ ZBTGP RHEAR TCQKL YLQTW TMBRH
WYBWI DDHAA DFBOX

FBG DE POH 7640KCS 231738T USM-99/00232

8586 5723 1620 6350 1476 8146 3313 7201

FFBGG MLRDC RHNKD TYBGV KBLFI NIDIW XXSLI EGFXL VIZCE VXSXU
WEDSS OSGBH BLZMV PEXCD FGLSB ZUYLR BOSOH OMEWK QLTHA IHWXE
SXTTJ CPTBJ VHOGX AGWMZ AYRUO ZUUUJ HRIHP CNCKH LDOZY GOIVJ
DFELU TCLTG ZABQZ JOONO JTYFD OQWMJ RENQH ZNEKN FMQZZ MXFOC
NUSNN BXRUI DQYRO SXYTH OHEQA WTNLX BQEYV BAWTO MIYAK TQJQJ
WJZSQ BESOE KKUNO EFAVI CCTQN NGNOF HTWWD IAZZM AASFL HTWMU
JLSPV FKCDY LNZLF XGNAK WSQYY GDUXU EIFAK FATDJ XAWDL STFXX
FFBGG MLRDC

CONFIDENTIAL

ZHK DE NIO 6130KCS 231704T USM-99/00233

2561 9623 1625 0121 2664 2124 3151 7401

DDHAA LYPPP DJTWR JJQUD FUVEN CFKUQ HFZSQ AQPIP MZE/I LIIOX
HOIMZ WHQPV AAQBS LFBWT KBBZH UFXLR JGMGB XGWPR KUDPV BKVWQ
KMLGU UTOSL KUOBN JQUZD DCFJT BQIVE VETHT HBCMB FMJJI IYJCB
VZASN YWWBS LIWQT PWZVI BMGUM ZAQTQ AKFJY ASBLI XDPWS MXSKT
FAMKH HXLRN KZEUB FKVVK CYVDF NDMPZ CABJG DVHAG ZPFGJ RTBMF
YVNQV EBSCG HOWKC ORYTU RRVBR FFXLL PUSIK YUIFT VXBLJ GOATU
NIEBG MIDLP FNURM HCMQU MCPNG AHJJA VXLZX PBJWM HMJBC CXHKO
FHDMX AXXXX DDHAA LYPPP

POH DE ZHK 6660KCS 231519T USM-99/00234

3070 2323 1430 8943 7803 4212 5942 5937

FFBGG JPOBO VOMCV RGKQU NACHU HWXMH MRJZL UOQMR YBXQI VBJTX
GABTT QYSVB NQMGD OQGJE KWDVO AHYKH CMGKN CPQGY DHJOZ UKCKE
SSTCY MXPRD VCNGQ TQNYP QXDMA FDVWQ ALPPI TGCJN KXQXZ ZOHNM
JNTZA JFNRL VBISL ACFAV WYULD BDHDD BSFSU IADGS HHGMJ KZBYI
MCCPW EARBR OIPYH GICXO PHDDJ COYRM BTUIW OJXYF PSNFX AWOCC
JBSTA KRDYR RPWZQ GYBTO YWBPX MHTDZ LCXXX FFBGG JPOBO

POH DE ZHK 6660KCS 231536T USM-99/00235

3080 2323 1430 8943 7803 4212 5942 5326

FFBGG GAFLH EYEYR BIRXC BYJVP PFKGB UZEHG XYSGQ BGLVL HRPUG
OKGHL JWUHH VTHBL ZGXBO BJZRA EZQEK AWRBD ZSZZK ZREPZ MXPTU
LXRBE JBRDW MYARK KPHBB DYBBN KCMOF TUBMT EZEDH HPMPY AQEBG
OFCAF PQNTV AWAJR BMNST WZOBS ZSCVJ HVFFE WRJBJ UYFYP IUEUZ
LVAIS FBAEL ELSLB HLCVD ROVTE JVGUH QXBKC TXRJR VJLPK FYTRH
WXXXX FFBGG GAFLH

WHN DE ZCA 7120KCS 231448T USM-99/00236

2040 2923 1020 6350 2664 2610 8408 8725

HBJBH HYQHV OQKNY UFVOQ KQIND GUFMW EEBDU VZDUT XMUNY QUBWW
EAXRE OGDUT XFETB NTUFH BQASE WQNUW IZEAZ VYYQD SWDZU DZZYZ
UDIMB GUFMR OMCGU MSVUK CHYRX HURTK UMVDI UAQIB SXOPL LUCNX
UTOZA FFCEY EDURV NYHYD AIRFU KXHUX EQETL JYTAB UEGMU NYWEA
XROSI WAKRT UCULX ZISYT IPUKX DUTKJ OOXRI YHROS IFADN TUBKR
ICUNY HYDUT XGITB PBMCK OWGGU FMCAN UWICY NYOZJ YIQFE FOLIW
ITUCU HEFVM IHASE WQJYT ASYTI ZUDZX KFDPU KXTHL FBETN KORBK
UMVVY YQHYH TSYTI WAKHB YGWMA BRFSU CHURY QETLJ YTAGY BGKUM
VSOFX KORBN YHDSY TIGUF MXXXX HBJBH HYQHV

HCO DE ZIC 6620KCS 231426T USM-99/00237

8037 7823 0940 9942 2664 1918 8219 9042

DAEAD GYKPM UAMKI OZMUA MGYKP FUMRZ YZUSY GWZUB XJYIQ BUXZT
EGBSO NEDUO SFIZG DBQXN ATKVI UFDUT XTIVP MIAOT OIBSU BSLOR
CVIQL NYUFD DMSQE YQZUB XZUGC LORCH AXIPE CTRIC UDIMS ZIQOP
IRGPA NBSYR GNUBO RUCSL ORCFA LUVYD VXITQ JYHFF UMRZY ZUDOE
KRYWL TIICT UBKZI QOTII CXUMR KAESN YGSBY HIWUI CFITA NOVIR
YWLDU YCNOL YBYHI DIMSZ IQOXI DAWAE CDUTX ZYZUT IBVLO FRRIM
DZUGC GUMSR ITLRY LZXID AMUKV FUMRD IGNRY FUWUO HZIQO GIFOZ
UIERI MDNIZ OQYES NADUZ YZUFU MSWIS OKAES GYEKX ICZGU MSVYD
VGYEK RILCR OPFVY DVTTF WTTTK HUXER IMDPI SHXXX DAEAD GYKPM

FSD DE ZIC 6620KCS 231558T USM-99/00238

7067 9723 1510 4775 1871 1963 8741 3728

DAEAD SYDTQ ITKMO TFHAD PPIBR KYBKF UMRGY KPNIN BMABR XYCWV
YZRTO IBQIT KQIAR FUMRJ YYFDI MSJYY FCYTV CYTVB IBFCA FWJYY
FDIMS JYYFQ INDCY TVBIB FCAFW ZIQOJ YYFDI MSFYU YBIBF HOXFF
UMRWI SOKAE SBYCD REATM ULMXX DAEAD SYDTQ

AAA DE CUO 7735KCS 231521T USM-99/00239

2554 5223 1445 8140 5237 4618 7319 6124

IIHFF BKQBC XGYWM UKAZZ URDVN IBMGV MUPWI SCAXE MYVNF CHHDQ
ADLLD UYDUO TQVQN NOXHX LMAFU RIHTR MOXMS VCQPG LOZHD TUUPU
AHVWF UDZAR ACPAH FLUHO XLRLO ZHAKD EPNKW UNRSL LDFBP HIQLL
CPOKD GDSXI WOANT KWFWO OMGMD HKYTT JYVQR DVZKB DBQMY PAKUL
ULXNB VLQCP PFLUG GMCHR ABAEW IGJCJ IOPVC TDDOR BGMEB TVTKE
TAWYU ICXPL AMJFK ZZQJZ CTONM KVDMS TYNPK KYMLR ZQCSF IIHFF
BKQBC

FZX DE GFH 6460KCS 231552T USM-99/00240

5571 8823 1520 6350 3456 4997 0172 7015

CCFII CCUKL QFRGE CGZXT BORJD QTOQA DKJYG ZEDMI WUDJL TSKPY
ZXYPD BHXLZ QSVXT OHZMP XABPG PKIHL PADGI AZCLZ FCJUQ DHIJM
JYTSL HXBDJ RBJBN DQGXP TNDBH RCNOU PTKVB IGQRO ABEYR LKGLE
MFXJG DJLTB NXODR FJRGT XAUMB OXRLC PNCGJ ZXVTB EDEZN GIARB
NKOEU CBDWE QIKUF DWQXR GJLQV JPMRT DJSWN JUDPH QHRIL TQZAM
OBTJA WKNJO MBCND RHMUQ DHKQO PIDBH TVTSI YWOZC GLWPB ILTKZ
TYKAY UFBYG ARMPQ HILJS CNKLX PYVWV CVFIA TMWMC CCFII CCUKL

YWP DE HOU 6140KCS 231437T USM-99/00241

5562 3923 1350 3731 5445 7101 4718 3226

DCGCD ITMBX PJEGU PBICD WASSH WQSDG PWVPK VBTFC ZGCBP PFWKJ
EAMIW MVHIA RSDWE UUZPU IPADQ IMPZQ MAIXY FUQAP UWAUC CQMVA
KABHE RXXBJ OJAMA CLDCR WGAQC RJPFY HHMQC CPHMG QZFKT TWESV
DCGCD ITMBX

MKR DE CUO 7735KCS 231546T USM-99/00242

4534 4523 1505 3749 0665 1549 3278 5326

IIHFF AFMBC ROEGO AYJKP EBBJA MDNOS FBFCZ ACQUE EAVKR YOTXH
JMFSR FJQFG PQGAA BIVFK HBGTQ AX1HZ KKIGT VRYJB MDKRC HMDJJ
XEFAG AAEGD HNHOX DZFYT URHKD KVMBH EKYNZ QPCUG PIESB NPJZX
CYCSX BCADJ IVNPJ BNKIR MKXFN RQZOG JINTI XRERW PEPIA USSJH
FOAER OIZIQ OKNRA CEWUN HJSTY BEPYM OQFSW LDTVK JQASN PYBYI
OZMML IIHFF AFMBC

MKP DE GKW 6100KCS 231420T USM-99/00243

3538 2623 1245 3731 2664 9893 5762 7624

50505 97483 76807 37527 05989 69668 97549 35857 97490 59691
95247 58919 19825 97096 74697 24737 32987 05293 24799 79062
46985 97479 77687 49067 39369 89659 10473 75777 74209 88934
27960 33974 80698 85919 88744 75279 57373 69558 75799 95210
10129 16059 11111 91597 57999 52389 19873 77609 79098 89577
60249 63198 73570 58988 95047 96945 97964 73539 97488 69873
73689 75387 89896 96397 74206 87491 57059 64777 95807 39879
77591 98605 96743 80000 50505 97483

XYR DE OWN 6850KCS 231418T USM-99/00244

9536 8423 1345 8140 1871 5095 8444 4224

JAAAJ CTPIE NOEFR ERRDO AIVIO NEORS ENPIE OYCTD CARQD EPEIV
ENOEE ODEGI VIZZO VEROR GNTII NSONN SZFTI DOTCE VRENP EERDO
AFAOE OMFFU ERROL TMOHD MRSPO SWILF XEOHP RMYDL EADNE TWEPA
AOTTE OHAOC CMCTI MRXEI MYNIN LEABA AWUNY PYTWE ENLRC RDIEE
JAAAJ CTPIE

MRS DE MKP 7320KCS 231509T USM-99/00245

6526 1523 1435 8943 5445 6625 0091 5128

CCFII MMXAR KQWHM ZEMDE WIXJA QSLHX BDJRH JBNDQ VJAGO BRYSE
GKPTW BMRWY CUEGA XRNTQ NEISA LDYHE GRIJT XASVN DQSVX TOKHF
YZGCA ZGEFV BXIME XMZBO QUDPE NQMNE DPHIL PJAMB MGQIJ XBPHB
REORL PIGHG CZXGE PKIHL QSZMO UBFSK PCGQP LDWEQ IKUSJ FXTBD
XTDMO FNXHS CUZCZ VYJLT QZAMJ NANPG CPFIF JDGPA QXXXX CCFII
MMXAR

XYR DE MKP 7320KCS 231553T USM-99/00246

9026 2023 1500 2110 4257 6625 8444 2924

CCFII OOLFC XWRUZ YTWBP MQDEA LMUBD UQNBV JCLTO ELSRV WOUQD
EHJFR XOVKH CWRDH PGIZA MPKUD WGLPA CBMMK LIWTV LEWQW PINHF
UGWCV LNLXQ OKMYF MSAXV OVAME CXPAX EFCRX CCFII OOLFC

XTG DE IZM 6260KCS 231433T USM-99/00247

1018 5223 1400 3749 3698 5815 8156 2729

GBIGB WSDAI WZBZJ PLDZY XHXXQ GPMAO VYRZY PLFNF PAFKT SXZOH
QHEDZ OTKLH LLPES FRGAR FAPMW IPGYJ ZRCUN IPCUS XTEFV YYJMF
ANWAP JUDCI AQJDB UBUQH WHNER GBIGB WSDAI

MLH DE ZZZ 6350KCS 231528T USM-99/00248

3132 1123 1450 3973 1871 8236 4033 8032

FEAFE LLLHI FODZH OWYOY WLYXD XEFSR QMYXT DFKMG ZWTVI EDBAK
ZPJNK PLHAL FEHFE UASGT OSDAI DRVQQ NBXEZ OBNZS KZZWL ATAXF
NFUXA PKDLM SQAFW FSEUK UWXQO NERBB FTHRG UANVY SSXPO LKDET
PFPGN PYSOB RKCHA QOTME OTLN8 FJWUX EKZQU STFJK NDDJZ OAWCC
XKQHV WATQS XPKLJ IKXEI WZYBQ MMPEI QVQBG TAYBQ DVELK SCJVK
JSJUE ZKMPA MFLZX FLCMZ KVEGC XSZGG RWZCN KXAZR UYILF ZEBCS
LKDVS LWRXZ HJITO LVNLQ LVVKR PUHOE PFWGT YTPEG OQHPO MWIYB
WKDTB KBKEO GGGUM HAOCZ ZSSWA KWHFM IBONG TIEBV FEAFE LLLHI

MLH DE ZZZ 6350KCS 231541T USM-99/00249

3142 1123 1450 3973 1871 8236 4033 5211

FEAFE PTDFE DSHHT MXKGX GTSJH TSQKN CKPAL FUWEK TAROF IXCYB
LIIHK AQVLP ZLSSM ADTIA HVKUC XVZKW RHJYP IQBRX SCGXL MWDKJ
FEWRG DFVTU OSKTW XNQBZ YK2KX CKTNU LQOKQ TRLRH WHLQZ MMACB
RJPGP GCZSJ VXZVE AGEOR GBMNT WDPGO FPNTX FQWFQ DWRWP UHDMH
YTNXX ZPKPP NEQHU UUEOB CVFFP RSBXR DRRKI OURRT EIFGV HMSBP
FEAFE PTDFE

GKW DE MKP 7320KCS 230925T USM-99/00250

2035 9123 0620 5504 3456 6625 9399 4811

ECHCE OIQHR LUATR RHAHM EPPDV GSCNT HNCER ETDOL SEHDT ILCMF
SFRTT TIEYR DERDE NRRTE EHATE EYDMA SDAQR OARIU IEBMA AEQET
AYSEE EUBER ELSIB OMHQI PROUB RTESP DLMAA GAHBE XEODD ETLEI
DSMRD SDENE ROOOW SEHER ECFAO ETBYN RHRAL RWCME DHRPO LYFWI
UTIEE CRNOT PHDTO OOBXI ARTEE EETSV ECHCE OIQHR

EOU DE NIO 6120KCS 231585T USM-99/00251

8524 7423 1410 6350 7263 4140 1793 7246

DCGCD KVENR ELDCW NWUVS TGRJH XHMPW JLEOM BVBGW XMKPZ WAGLP
CSSUI ZTDIN QHEYX PLNEM MLPXY PIEYF GCUEC HDSXT FZPJD TYHLN
FVXSE ENRMS GYQAG OGBXW BGTUB EPHXQ JJLBB OKYPJ PURWP RDTVQ
UKKJX OEXZA ZQXVN ALKQW VOMLF WUBBT GCQYQ VOGND CSXGA PHQAZ
VYDBT QIJEM VFNPK KDBON FYKZX FMJKR RWGXH STQIO FVNSX YIBWZ
AQSNF THLSX TZZAU PIZYM YTBLY JFUXS LMKFK CQXRM MJSKB KHYJV
VIZSU QSXMC AKWPQ PHSSY BGNRW HSNOF EIIID OMSFV ZTSWY XJSBJ
DCGCD KVENR

BFV DE FHI 7510KCS 231451T USM-99/00252

7576 1923 1345 0121 7263 6869 5320 7744

DJDJD GYKPV OBVZY LFVOB VHYQW JISCC IPUGA LVJAD QTUSK PIRGR
ELDNI THQUG VJISC CIPUT EKENA ARTEK EMUGS DAOWD AOWQU GVJIB
MHYQW RATNW ACAKC ZKQUC CKOZK JIBMG UIPRI LCNUH UVENI XYICV
AURRY PDTAC YGUIP FANWT EKEXY FZJIB MGAIT FBOWF ANWCE LRHYQ
WJISC JIZKX YFZJI BMGAI TFBOW JIBMF ANWCE LRHYQ WJUFO JIBMB
ETTJI BMCYT VCYTV GUIPF ANWTE KEFOV BXUPK BONQJ IBMKO CNFBO
WFANW CELRH YQWJU FOJIB MGYKP JIBMH YQWFA FPGUI PFANW TEKED
OLQJI BMCYK MHYQW TYTKJ IBMXX DJDJD GYKPV

ZIC DE FSD 6680KCS 231550T USM-99/00253

2596 6823 1435 6530 2664 1161 4726 4505

DAEAD SONEK AAOTI VPQAN FHIVE MAYOL EIWXY KDQIT KKOZK XOCYX
OCYJA FEREA TJUMU DIMSZ IQOQI TKFAF PHYQW CYKMJ AFBRE ATJUM
UFUMR QAEKD IPVDU TXROK AMUAM DOMRR OKAMU AMRON DSOMD JYIFG
IZETI ZTTOI BQITK KAAOZ IQODU TKVOU OHOCL XOGCC IQVQU IXMAM
BVENI TIVPF OWCXX DAEAD SONEK

NIO DE BWO 7990KCS 231427T USM-99/00254

3066 5823 1035 1120 7803 3565 2125 8710

CFIFC CYTVN IRFVU FYNIR FGYKP CAUBR UBRPA WOKUE OLUIT JUHQL
EGUWU QKKUE OSINF VUFYZ IWUSU NDBOO RMAEU QAIBZ ABBFU WBSAN
HDIFM CAUBQ EYQBU TVXYU OZIQO SOMDW YEXNE IYTAY UXUID KAYMM
OXKSO GYTYM GWEOL JAOAL ECQWU BVPOO CJONW BEYDQ IIZLU ITLEG
UXUZU FOZFH EYIVI NHXER FWUBV KUBOD YCFRI EWXUZ UKATG MUCON
UDELJA OAKUE OBOPS DOSXG ARBCA UBMAC SLYMV LOGSZ AHEDE XEREL
DHEYI DOKPJ UTBSU NDBEY IXERP FUWBL ATBWU BVKID MZICA BYBCH
YEKQA IBJAO AXERP FOZFJ YIQZI USDOE KSOMD JONWB EYDCU YBWYE
XHOIR BYBCJ AOAXE RPCAU BXXXX CFIFC CYTVN

FMT DE FZX 7720KCS 231406T USM-99/00255

5032 2123 1115 3731 0611 7741 2620 8424

BGBGE KOZKW UEYNY IUWUE YBETY MUIUD OVANU ERVIY TPBUL SAFAC
EYBGY QVVIY TWICY NYIUM ODQRU WMRAW QXYTN GIQYB IDWKU WFPEB
3MOFB MUIUD YTWZO QNQEI AGALV KEKXM YYILO HTWYK CLYQZ TOXQK
ANAZA YYJIT DWIAN FUFLQ UWTCA ZGHIS GPOTH MBCRP EULCE YEVEA
WKUEO MEQVF IHPSA NHDIF MVIYT QJEVV UGZVE AWHYD KVEAW WIAWF
UFLVI YTLYH RQUCR FINUM UIUGI GFREH NGIGP LYBLP IZPME GVFOP
VQYDM RUWMP OTBSA NHKUW FLIAN DIFMB YYZTE NHDIQ WMYYI GIQYF
UFLSA NHKUE OFYPT LICPK EKKNI SGPOT HBUWY MYYIR IFKDI QWFUF
LSANH MUIUX EGBGE KOZKW

IZW DE WNN 7290KCS 231419T USM-99/00256

8575 3723 1335 9942 1476 5833 3917 6925

FFBGG RADEF JNWHI ACONH SMIKB SZDGO HTNDM LVVBT YKVAQ VZMVB
ZPQVW SOVUD UBPQK NVNEN FILIK VPFII IFUFO FFRBQ HMMUV SDBCY
NZNCL FIMQV BOOLP GBRCL AFWZF XPPSO HGUTK OFIYX BLHUI NYPEI
AVDZY CHNIM YZYZX NRLZK ZYJFU JYACL GIYON HNWFX JYMZV YQMLH
PHEYN FNZZO KTJQP WZSMY JXLOV SCPDT XTSQH NVANQ WXFEO LPYYN
CSXYG XFIOR USQPC HHUEV QURBH BOCCA BABZG FYMVV GWJUB IZDUV
JITMT VUYZG CLIAP AJDIK DLSET FPZBO HXXXX FFBGG RADEF

XTG DE WNN 7290KCS 231537T USM-99/00257

5525 4023 1400 3731 7803 5833 8156 8324

DDHAA ZWSHW XUWSY LEAEK SCIHZ ABNTI ENBUM CVXWP FZDLW LBJZD
TVIOL ZCENX ZIMRY TZNFI HQLQF RIANE QLBZS NFIWN LYLTL QVROQ
KHUTE YISMO SQNFB DUSHB EJZFG PYLGT CVGFX RDJWQ FZUAT SFINT
GISIK GZSMT FUBKE WPQEV CDVQL DZWJZ YXMDT YJIVP FYBJN OLIDG
PRMCN EMDSW LMYXT PJOCP MJYKY FPPSB YWNVS YGGZM ATWWP BEPFN
DFDTL HNLJF XUAIZ ENZXJ YRIST CQQIQ BZTSG ZBBBO SHNFJ WKKUR
BFYBB JPGKT GSIOV SJVFM SJXLN FKLHW YJMMO VAQAS KVETM ATJBQ
WCISF MWJTK EQASO JFTQQ BALOQ AAFXF GTLEK PDSAX SLRXQ CEOOT
WLLBY DDHAA ZWSHW

ZCA DE WNN 7280KCS 231427T USM-99/00258

9572 9123 1345 5161 1871 4717 1081 4326

HBJBH GEBLQ INDHY QWXOC YFAFP PUKXH UXEVA CZFAF PVUNF NUWIJ
YYFKU MVHYQ WWALI DUMQG UFMGO PWKEQ CDEQX TUCUF EFONA TKFAF
PZEAZ NUWIJ YYFKU MVQIN DZUHD DUMQG UFMFU GWCXX RWADB SEWQP
ENDPU YMKUM VFEUC XEECD ATBRO SIMAX NZEAZ XYXRZ IUSVE IEPEZ
QXXXX HBJBH GEBLQ

ZCA DE MXU 6380KCS 231506T USM-99/00259

1576 4223 1420 9969 8423 6616 1081 5936

HBJBH JYIFV OQKNY UFVOQ KQIND GUFMF UGMJY YFGYB GVOUO DURVD
IHOBU VXPEB STAMH QEDVG EMVFE UCVUK CROSI GYKPG YKPQI NDWYZ
SCABI JYTAN OUEZO BYBEW QFUFU GUFMI YMCFE MUMIN AFYYC FUGMP
EBSTA MEQED VGEMV FEUCV UKCRO SIGYK PGYKP GYKPS EWQKA LYGUF
MJYYF CIKPS EQKLA QETEZ UJOBL ZUDZQ EEWKI CODID KVOUO DURVK
AZNCY TVXYG ACYTV NAZQF EUCRI CUTTX OXXXX HBJBH JYIFV

ZCA DE MXU 6380KCS 231528T USM-99/00260

1586 4223 1420 9969 8423 6616 1081 4236

HBJBH JYIFV OQKNY UFVOQ KJYYF GUFMZ UDZDO QVPUK XJYYF NYHTG
YKPVO UODUR VZUDZ DIDKK ICOCY SUBIY CHYRX GUFMT YMCQE YHPUK
XWOZU GOCKS EWQPE NDZEA ZFUWB XAPOM IPCZE AZQEO FBUZB KAZNJ
YYFBE TYRUE UGUFM TYMCM INAPE ZQPUK XFUGM MJOZV EIEPE ZQXXX
HBJBH JYIFV

MKP DE XYR 6070KCS 231456T USM-99/00261

8026 5323 1410 3731 7263 8641 5762 4625

DJDJD TIGAJ IMWJY TASIQ DMAGW TIMFQ ULZVY FXSED XDUQU KIVGC
UVYDU MQLAO CGAZK SEDXD UQUFI XEKER PGIIR GALVG YKPBE TIBET
YLENA TOVOS IQIMU RCQEO XKORB WADBQ OZPFI ZGPIZ PKEDQ JUQXJ
ISCGU PVPII YMAXN JUENX ARQTI MFSED XDUQU TBGBH YQWPA TLJIS
CTBGB TIGAJ AFSZU TPXXX DJDJD TIGAJ

SFV DE FHI 7510KCS 231518T USM-99/00262

7586 1923 1345 0121 7263 6869 5320 8044

DJDJD GYKPV OBVZY LFVOB VGYKP JISCF AWCE LRHYQ WJUFO JIBMH
YQWVE AWJIS CJADQ NAART EKEFO NTWUN GJUFO CERXM OVETI MFPIR
GSEDX QEYQW ADBNE CSDAK SGYBG HYQWK OZKKO ZKGUI PQUSG TEKEJ
IBMQU QEWUN GRALE CIXCK AQDPY YLCYK MSAAV CELRQ EYQJI BMKOZ
KVEAW JIBMM UGSPE BSCER XQEYQ JIBMF AWCE LRHYQ WJUFO JIBMB
ETYJI SCJIZ KTEKE FONTW UNGCE RXMOV HTDMF PIRGS EDXQE YQWAD
BNECS DAKBG YBGXO CIXOC YHYQW JIBMH YQWVE AWJIS CFAVE DENUX
YGAJU FOTEK EFONT WUNGC YKMCY KMHYQ WJIBM HYQWX DJDJD GYKPV

FZX DE VXI 6860KCS 2314547 USM-99/00263

9577 4823 1420 8140 5237 6940 0172 5038

DCGCD ITMBX PJCQU RMEMD YVCXP VRJMN ZYUNF IQBIV FXTGC VSZKS
HZEYW HVMPD DZMAF YFXIK YUHWH QAXFL PYMLP RFJNL PGHZM LXQMG
PLQXW YGGVH STQDI WAJTZ BMLNT MLRLD FUOOG YRZDZ LUZUP ECWND
LOCPV GTERQ HBTMC JVADQ ATLIW WXGVH WKOFD FQSDN ZCXDS JBBDH
KVKUH DFGFA OWVLV YSPMG OVFPK GWLHN AEHCH IYXXX DCGCD ITMBX

XTG DE OAL 7830KCS 231422T USM-99/00264

6054 2023 1250 8943 3456 5086 8156 6309

DDHAA JBZNT PDRTS WY&AU FNAEF FFKJO LQCCW EOOMZ IKDKS VDGAK
ICGRU WXSQW ULOXP ATEQS FMIUL SAHVD FQRNS BNBFP RYRZU ICZRX
MIUNP LWPTN TBQOQ KMIBW WPTRF XBAFB HIZRA FVMPV PUSOW JJLHD
RWIMX RCNIM ENCNI FGWLE QZKFL XHLZZ YQVZF HSWHN QOLIU PRTID
KLIMF OPOFU QQZHX FMUAC RFRRS XONYY BPRVJ PPROD DOHDD ZENYE
NOYGR YLZYX XCKWV CPSUJ LSCJM BNGMQ UBIUM BMBHC XGTLY AMBRP
VVXXX DDHAA JBZNT

WNN DE XTG 7990KCS 231506T USM-99/00265

4026 6523 1325 6530 2664 5653 3395 6129

FFBGG SPMQD POXBM AETXX MLTFC UNINU AIDDQ MTETT QQTVN TSYKX
KLVOV IVYIS QMYQY JLVDX JNIBH QAMPQ KMAHZ VOZSQ HEXCR EBLMM
QLIIL NZNHP JJFHL VXXXF WMCSC SRIIF CSRBT AWXJA YEHPE MCTMX
CSRPF ZYDIP ITZWQ YUXTT MYCDA OASNL HYXMD VXPWG OOEED XMJSZ
FBVBK GASAF NLXET KLJQP NBYLQ OGTUK AKPNV GOOKF LIBMO AASYZ
WCSDC IBFNS BKJGB CRRZR LIOQM MAIEI XHQOH FRCAQ BJSXX FFBGG
SPMQD

LLZ DE DYO 6260KCS 231541T USM-99/00266

6538 5523 1450 8140 2645 9749 4493 9141

IIHFF BKLBC SBWJH KAMVA BXTNU DOMFH QLTUG KNPVA RMMYJ LTLTE
ZQHSC ABLPZ SMULJ MCIBG TCURF VRBMB FWCNA KASHQ DSZUB SLJLV
AXOZO YMRRF PQSAM RCFSD GWKAX TJKIS QZPMK RDSBG CPMIC CFVTU
EXAPE MNMPM VTXGU BGKRY QKXME QXNJP IHDNQ RLJLJ PEGUO YFLSA
WLZDB SAZVH CYJZM PXZAA UNUGU MAUIT JGDMH WFVFX MUTMC BQFYU
NYEUU TQPRU LBYJE KDQPE SUCHF KZKAX KWKAG GSFSE KLPAN FCAHC
NBWMF LPZSM ZPPZA PBKRC ODGWI PMBLO TQDJD MKUCF EPOFZ ITEIU
NWLDR FRRCW SAHNA YYPUM VTJXF UHNUK YTBKB PZCWU TGDAC LCIYG
NLPPZ DAQKB VDCZX LOYNN MDFYW RSFAT KLVQF OLOSG REZQX IIHFF
BKLBC

ZZZ DE DYO 6260KCS 231511T USM-99/00267

5088 4923 1300 9942 7263 9640 8110 8632

IIHFF AHMBC BQYOT XIURX CLKXL OMFFL GXSNJ TJEXM LOPEY UDMMS
PMGDJ XEFWC UNCJZ ZMCIW KUJNM GUYPH GKZOK QEKQM QSZLY PWJXV
SAJCV ZEKMS KBOPV BUNUQ CWFCL MQYLU LXSVU XFMOI TPZQF HTORW
PFNJH RDSWD KKAKC YXFHP SPQVJ AMRLY XDMKB JPYQL PQPPO GZITE
IOUTK CRWAS OCFWO PXSOQ YBABX YRAUM EZHGY PUKXC TFSDJ EMQDM
XFNOO XOPGM XBNNB BWUFV QHUSX DIRHB QGAMT OXBKP ENTOC GNQXC
UKMSW IFIYU RXFMD FQXLS VYLBK VBVUZ UGMFR LJMQO PGNUU MFMRH
XASGR LJUYJ TVNFF BJKGY JGQCP YYAOY HHRAS DSPMY SXGVH UCPFL
VYUEJ FPQVF UZXRQ HCZXX IIHFF AHMBC

ZZZ DE DYO 6260KCS 231404T USM-99/00268

5078 4723 1235 0121 1476 9541 3755 7627

IIHFF EFQBC ZRFIQ GOZXR HP&JF XKHPF EYPUU KQAUV WWOXJ CMIVW
PGLGJ CFWQE IKBQO FWXIU EJUIY ZKKUP MRRPX XEIMM RXWHH DZKJV
ICBGH VBNAK FZMXQ MWFVR WQGDU AAZDO HOSZZ GTJDC APFHM EMQKX
FZPVH JLZQX TDRZT XHGCI DAOGL BRANS MRJCT RUXFB CBQMP QPLNG
SYCUC PMQHL FJPMH GTCOR XOGPH DSRDE HMSLK PIAPE XSDIQ QJTOQ
VXWFO PREGG MVRWI KPBAT TXWXL BQBBC AXMRH RXWCT BRGCT IOLBL
YAUKU VOWWD RKWZV UVOSL YGBSR JTCWR PUYUX SKKXH ECSUD FYZJG
IVPNH KLVCR KJQZN PGAXX IIHFF EFQBC

DYP DE FZY 7735KCS 231452T USM-99/00269

6634 4923 1400 0120 3644 4618 3494 6938

FFBGG KNCBB GPYPF RDBOV KNHZX LACQQ TKDKQ ICIAJ LQCWY IZHBA
RBSQH AFCNC INWDC INGSZ WFHJX CIMEN HAERZ UJBOX LJAVV XHRYN
XHUAK OGWFM DUOUQ XRILB CXNGD IHHDL JFHDM UWKFK YJPTQ EUMSC
DRFUH HFLAM WUHZL BOCYU MBFUW XLIZY CPNLJ OHCAE XYUGA WRERZ
OTFSB QZEZJ WRBIU HGEBT SGTOZ AIHCK ULQAM FDHKQ OOSDY EKAZF
MGVGR GYMJY RHHAB MXHJB YMMRI KFBIA NUQZC TOKRC UULRU KSVSR
RYCMA NQLJB VNIPL VLCLS RTBIW UJOGE RKAWT FFBGG KNCBB

ZZZ DE MLH 6340KCS 231539T USM-99/00270

7206 4623 1330 9942 1476 9109 6644 9540

IIHFF EILBC ISCEO OCENJ PMYQJ FKQOV AGZJR QLAPS HZBKW UXQWO
TUIBW KQFWK VIOVX HWPCH HGQWT LYIDR SXJVW PIXJS YPZGE INHXZ
AKQUI WAEYU CKKTA GGXMH TDHIU NGHYU LDEOH EPZXL LCTKG QXAPF
HICVI LZJJC KLJMG ORDDN IZFFP ZQMEZ UVJKL WIQNW ZULKI TYQNI
ZUKUB XHMRH MQXPS ROBQK LBOZV CDXHQ YABDV BCGCL SRZZL MKIRC
PTAUC SZRVJ ZODUM XDGYI BTOUX YDOAH LQHHB ZWMFT KMUKU DYTQQ
AXIVW VGKLJ PEUPV LUOYA QXQPQ QOZMV NQURS JWNRZ YUYTY XTPJP
UFCYZ KQNQV PJXIH AUSIX YMIXF FFGDP GQPAO WBXBM QCUKC PHMNU
ZRHNM LKMNK YIOZP LLLQC PEYAI UCCQP DKXTK XSZUZ BPZHQ GIGUZ
BICXE ROYEW TPXXX IIHFF EILBC

ZZZ DE MLH 6340KCS 231426T USM-99/00271

7106 4323 1305 2750 4257 9109 6644 8033

IIHFF AKMBC YRDOV CLUDH QDMCI PKGNY AODCN AJWDH RTJTC DNCQH
QUSYM BOGIA TZEAQ NXINR LXZLD EOHEC VQZAE TWIUQ JFBCB UGVBM
PUJSN ZSZJA JYWHN FFHXN XRLJL TZCEU VNOJX VKRIX FHNZC BZJVM
YXVQA RPSRT SQUFR VBPGW PGDKQ RPMXI BUQXF GMUWX WBZHA TVWGU
PKKHT ZUEJU ZEKSF XBZCC DLJHY HCJMD WCJFE OYKDP WORUB BYOMN
XHUGR CLCFF TAUKP UTAMZ ZXTNA QFSXT KTHBM PTWDS KRLAS TWITE
FHBAJ KNVHN KOBOM FGMCA OOLIU APYEQ MTTBC QLBYF HKLJP YKPTZ
RBCOH UGAGH MNCBK PPIBE AQGBL NKXUL SHPNH SLJDX IIHFF AKMBC

ZZZ DE LLZ 7640KCS 231419T USM-99/00272

6086 4523 1330 7753 0889 8146 7094 8032

IIHFF CFOBC GETJN MACQM OARIF VCEGC TPXMD WDZEK QBLJR JVQPJ
BBYZJ MOORY MWMKP FNUBE LHVCV JIIUV KLMLN TTZOF KXMFB ZPLLI
QCGEN UZPAI OHDJR MKACY CPBNZ HKHIB MWNME ERPDA SAQEP UGRBO
SBUYS RILJY NXBSX GMKED ZMUSF LZNKR NJPXB FGHGM QPWOH NFMSW
BMMOD HOLDL XKVGU THOFQ TBNVK CPPAH TLZVW KXIAG HJLFQ WBZYN
OITIC UBLZS BQHPM FMCAY DAJPB BNOFV RURON KMPXA OJTBU SLIUR
QCPYK EEANY LCRXY JPMCA RXRLU MEIKS PZXAU OKJIN PXAIA XPUET
SPIEQ EIKSB IKWZE UBXSP KSCKS TTNTF ETOZB LXXXX IIUFF CFOBC

FSD DE YWP 5455KCS 231631T USM-99/00273

0025 5023 1540 5161 5218 5833 4718 3627

JHEJH IDRGD STCWH FOZZM WKRIU WQKRI MPPZJ VKDOK GNJDY OVXRH
RUEAX PMBGZ XVEQQ VZDAM NQIMX BTCHG PMVQJ XAKYI EHXSW JXKMV
KTOTS OTRYQ MPHEZ QCZOE VRWTX SUYOZ TGPFE RBVEG ROWRI WBYAB
FBUCZ EDULQ RLIFF HELCF JHEJH IDRGD

DYO DE ZZZ 6350KCS 231629T USM-99/00274

4132 1923 1535 9942 8820 6445 7300 5816

IIHFF DFPBC YNZCY JCFJM ULFYX SMKOU QVJIY UBKXN HVMIO SMCCZ
YZGEF OUBWF LZTEP YOEQI LGXVD JKZCQ BEUYY CKIBP IKRZG AZIFA
UEZFA UPIVN QZRUG PJVYZ QOYUF YNFQT NJHFG IYQDC EJQDM ISWMN
XBWLX ZZSNM AJIIV LWXRO AADEH ZSPQE IQVBK WEVMU TMFRK YRQMF
JASXT UYMBI ULOUD SCDSF EPHXN DRGKA OPFWS NNJDY QEJXA JJUAH
VBTJW HCRQR NQRAA GAGZM ZGIZN AZIXX IIHFF DFPBC

NIO DE ZHK 2420KCS 231712T USM-99/00275

3550 2523 1605 6350 5445 4212 8912 4824

FFBGG MSKRA IAPJM SKQIP GYPGZ AHFBW WHAEF PRQXF KZOGB HBTFD
SYMIG KLMBR QZTNO SCIUF CGGNX YVMJP SFKHF IOCMD DJHTH RMSQG
JRDXG CMWFA TBMFX WAJLO XGXON YRPCD RNBGA SFBZO SVOXA SMEEP
JINVV FPTXE LNLDM UCRNN PIRAD NGQTX MKTKT LPKKR LHXSG XDUSB
RRRVS KLREX DNTTZ KUGJA SDTKB LMXXX FFBGG MSKRA

FBG DE POH 7640KCS 231524T USM-99/00276

8556 4823 1355 9942 3456 8146 3313 7001

DDHAA KVLCC OVIWL FXMJV BZWXN VWWDP VGNUM DJBOI EBHVK QFNPY
IGXOM QDBWL WZBBE ARAUS PYVQU YBCFY TJRZI GJUDB BCHTO NIGZZ
KIONJ BFFNC FYQNI RDOMF WJSEP TNOCD JFDII YDPDQ BBWQP SPUVA
WXOMU XHPBA RMJOJ IXCXE QRXPP OYFWM UAZKK PIMQJ JNVZB DLTQR
RUWGC YFYFY RUVBI UCQZL OGBTG NPADF ZDPMC MOUBM SRJZQ HEDHT
RBOVL TQBLD KIDJY YCBGT QDNMQ ARPDG QFUYV DWUSV BOIBK XMVPZ
HGUBL NJWKH GHOOZ XPTFT XYQUP JRABF QKGDT FOEXX DDHAA KVLCC

ZHK DE NIO 4895KCS 231808T USM-99/00277

2582 0023 1725 6530 0611 2124 3151 7301

DDHAA CXIAM EXVMY BUPJG SGYYP JKIFJ QWMCI JECPG UODTK VXZWJ
PUFTJ NWLVF KZZKY OKIKT MOFXY GKVTF YXGMA QJRMJ TCRTE LSBGR
RCSYZ KGFFW CNFMY DLXOH FZFXR HRYMN GTMDY UNWCE AEXUW DCZRX
ISYTA BZUUA VMBCI PUASM VMQOO XEFLX DASIO FFJQN OZXTG BMIHL
VSXMS ABBHC ZLTGU RPBQQ CZJEF QKXKH LRNQD EBMWQ FHCZX LNEPG
XFRVS MITNY BQGOF VANRV MADNA ZJUMC QAMHK QFKGI OXDJY VHMJE
VBFWG SKYLB CKUFG MJHWR WSVZC OAKJQ GNNWN ALTMQ TGNYH AWZPG
XTLQX DDHAA CXIAM

XYR DE SFV 7830KCS 231611T USM-99/00278

8084 3223 1520 1101 1663 5086 8444 5120

EGBEG JMBDE AIJAB QTSRV VXGYM XOFXY CYCWP YKTLI NGWHI SCPKZ
GQGRB NYRAG HSFVK WKYPP VSSYN PGPSQ TEYMU QSRXG SGDZY LKGHP
DVZUO SNXDH GVVXY ILLDU ZCLZP BUCTC ODMWI CKV1S QSYCN YMQGF
JEERN PHUAS MJTYA IVHWG JDSNF RUOMP TRXMN CHAQU LGXZC QZYDQ
MQIBV OZPHA XDTNY KSKAP LZVPE SFASK GTYZD SDTRN LGYIU EGBEG
JMBDE

NIO DE FBG 6830KCS 231618T USM-99/00279

0544 9423 1505 2110 1476 7435 8912 4301

FFBGG UDKRQ BHTEV IHNEE HBVEO OHHDI EKZKL JSBPM REVOV VRXNQ
JESTV TQGGE JEDDM DSVAP PUHUY KUGVA DJUUB UYABR JSPHB EXFQJ
FSNDN MQJXA EUNFJ YHDIY KONUE QLNHO DPCNS NYCXI WSAQV FUNXL
XVMYH AUNAT SDGJZ HWRUK SPTOO HSTDZ QUFHS PJTYA FWTTK VLUXA
ANQNH FFBGG UDKRQ

ZHK DE FBG 6830KCS 231702T USM-99/00280

9034 9523 1610 8943 8820 7435 3151 4835

FFBGG HMTHB QKHND PBFKR JKSBC POGDN EYLMO FRMDS FCNLJ PWWMT
DGBOV KSGDP WVKBK KGTZR IDQLD WKXCY YNEZY YTQGE TALUC AOLSO
XPRII OQDOU EYEYI VWIOD QNLSZ CPAAZ KNWTQ EYVDL IGFQS MZTNO
VMFBT LDRWA TICBN BSUVK CQCMA GMBZF MEKHS JPMPF DAYID UPCGN
OZBUU TFZLU VIZXH QLYVM AMNVF NQCCX FFBGG HMTHB

WNN DE ZCA 7120KCS 231622T USM-99/00281

2050 5523 1540 9518 1871 2610 8408 6303

HBJBH HUXBQ ETLQA GZWAK HDIIP DOFLS EWQMY GRQED VTUCU PUZBZ
EAZVY YQCIE KFAKT KICOZ UDZDO BGPUG UFEHQ SEQKD YLOMY HTBEK
ZKUQZ DEQDM IXLLA QERIC UQEDV NAKAX UNHPO TZZUD ZDUTK GOOVR
AGSNY HTNYV GCIEK BEYDX YXRHA VGGUF MVTYQ FYGLN ECSZE AZSBW
QXOFB KECPT UUMLI KWKUM VDEQX LIKWV YYQNY VQXYC WJUXF GUPMG
IRZHA GSHEQ ASBWQ RICUZ YIDWY LDMIB PWUZT PUZNJ YHPRU LAHUR
YJYTA HBJBH HUXBQ

FHI DE FBP 7940KCS 231745T USM-99/00282

5048 3823 1650 8943 3456 4122 8327 5434

80808 42831 76992 07747 90885 29674 31134 19556 95070 00562
89310 30525 71955 69444 23393 74078 96157 15142 32219 79065
22913 65559 39674 79088 52967 43177 38317 42930 73353 79064
41979 06519 95533 13581 98976 66151 42322 96502 06379 08671
35869 93920 72913 98933 47884 73534 67953 79738 91217 44338
35475 73000 80808 42831

XYR DE OWN 6850KCS 231613T USM-99/00283

9566 8723 1540 3749 6010 5095 8444 3915

JAAAJ BSTLG BREEI OALCP SNTBT IEDNA FFEST VRTTI ODOFA BDBFS
ESBHN COREA ISNET EUENI ONAGK QLPOT ERAOU NNFIH EEIEO RVNAA
OLSGO INQOA NUASO OGCOH RISDM TYONV UNTWO ETFNE OEMRI IALOE
PPTLA RHIMI DPSFC RTESM GTPUO NERVS ENGEN JAAAJ ESTLG

XYR DE VLH 6750KCS 231705T USM-99/00284

2067 2823 1550 6350 3456 1260 8444 5137

68486 47525 52198 56057 58212 31265 20240 12069 28484 85375
72252 45242 80765 05403 62905 29953 02275 48607 75498 95874
99778 02314 47518 98492 24282 41366 20212 87059 02252 86775
29383 75189 84944 82549 80505 01851 22541 15470 84615 15247
63199 50579 55275 11525 07237 00185 60165 24123 10544 68486
47525

IXI DE XYR 6070KCS 231612T USM-99/00285

2536 5623 1535 0120 1871 8641 2611 5523

28082 43730 82251 14513 59827 04042 55218 25904 62795 59121
41347 63382 08214 11423 36094 21223 34903 34092 14112 34856
71460 38225 11957 92652 18541 41348 75414 87360 52637 35262
22421 32329 15870 79270 32956 02161 19112 26521 85445 37210
57325 94375 50046 34421 95795 67423 32862 35444 21575 11958
76193 26323 28200 28082 43730

XTG DE CUN 4265KCS 231754T USM-99/00286

4522 2823 1650 8140 2664 7741 8156 7141

FFBGG JLQHL QLWPU UOUKC HIMIR IZTYA QKCFV JORFB YWXBM YTOFC
WYGNQ IDZRH LONGN LFRWZ OSVOH TZSMY DQRMI NHEGZ HKOKQ AMSRK
MSNXB UMTNM OVLZU NUCIV MQRAZ FHQZQ COPEI WLRGX TKSUR HQTUJ
TZZCQ OTTRF DSQFO HTEQX PYTBC EMYDL HBNFB ZOONM EWNBC TTBSI
OUXYL OJTJR SCSRN MTTIM QMCIV XLSSS GIESZ SQKDR AEGVD WIBJV
MZETU VMWNF WDKNI UQIIO VDSTE GLDCO ROHRS MTTLH MBKSR RIXYO
RGPGK QXQPQ WVPFE OIGUH RASIV FUUTN HEDGB IHUEP AMXXX FFBGG
JLQHL

VXI DE FAX 7720KCS 231658T USM-99/00287

6062 2123 1115 9942 3456 7741 3070 9124

EGBGE KOZKW UEYNY IUWUE YKOZK MUIUS ANEJY IQZOQ NZAHH KOEPH
UXBMU OHXOO KRIRI ZISQP IZPTE BCKUE ONISG HAMXX YTNJI WGKEF
SLYHR QUCRR OWNDI FMFON TBUTV LYQZK EFSKE WITIN OWUDK DIFMM
YYIBO GKPUI WCANU JAHUL YBLKE FSVAI FDYBE WANLV EAWMU IUSAN
BMOCP VIYTF IXBMU COMYY IFIXE JUXFD OBGKA NAZAY YJITD WIAWK
UWFJI YTQOQ FMEBQ ZAYYD IFMMY YIMBG VTENH KUBOS ANHMO DQVEA
WQUCR QOMBN EWMBU TVTYB SXYTN QATMT OXQMU IUFYP TRIFX ZYWRM
YYIPE ULBUP RGELU ROWNQ IYPPO THSAN HMUIU FICKD OBGRO WNLAB
QBUTV DYBER OWNLA BQTOQ IQOSH PIQFH IKTNI SGZOA XTOSL EGBGE
KOZKW

GFH DE FZX 7720KCS 231723T USM-99/00288

3062 2723 1610 6350 3456 7741 6743 5628

DCQCD AVGLE JOFRX ZKZVR YMWGR LFGIK JLPSK IZPOT QAALJ IMPIN
BAYXC IXMUN FCHRO NHOOK XMJQA CIZUU EHZVO KDUYU MMYJM TOFYG
BLLPG ILZKE CPAJO DRUTU OQWUV TPTYA QHBLM VQCVJ TOWIN UGQAZ
RQFLD OVECJ KLMJL YETIS YECZS LXOFX HKSUB FNGLV WMAGT TRDEK
UFQIB PTGGR QFDAF DQGET GSJXY VWXYT WCHWA ELBYV NUBZA ACHAV
MGGCD CPTRO KBADO RCXXX DCGCD AVGLE

XTG DE WNN 5455KCS 231742T USM-99/00289

5545 5323 1630 2110 3456 5833 8156 8018

FFBGG HJKDJ MFFXK CNKUK JHYYJ VKJVY TYLQB XTYJT MOFTH MCTNG
JCKNH LJIOA QQEAV QFTUH JUNNL XIYLS KKUOM IIMVK QZERC BJNMA
AEUUO YFYRP JFKIT YOOUF DWINT DJLVY HVMJH NEZRF WNDIU TSYYC
EJFUP XXREG ZOSDD RORKX UYPED GLSVP NHLMY SZOVP JIRCF SOYXZ
GHPUZ TXVIU YLNEB CKSNL VXRMY GLJHY UAHOA ZQFLM KRYKK XAOCU
KUARA GEZUI AXUAB VNMSB KMTEB YFGVP RZHLP ULVCO QKGYR SIZYZ
QTFZP SMYHB YLPHK KLDZE XVELU EFVCA SYSEK TBMBS SPGFX IGTOS
EGEJX EVPUI PJTEB SSRWF AZUNY UGKIF CGNOG CTXXX FFBGG HJKDK

RBU DE NVT 6340KCS 231602T USM-99/00290

5076 5023 1520 9329 4094 7525 5726 4329

DCGDC DEOFB LMAUN PRYRS JAMWZ JRZRM BADQE XABWQ EFFLY MIZIA
VRUPP FEYZE APBKL LESXW CLHDW JGEIX IIKNL MCYCO KCHBU PXPSI
JYNPC JFYRY CKCEB IMUSE TBWIO JTYQS OJRXS SQFFS RDKQR TIZEK
AUEKH HCMVX YJGOF WINAB BVNDI ZAYFU ATQRZ YVMED TFDCA OBTFJ
RFHOR DCGDC DEOFB

CUN DE WNN 7290KCS 231704T USM-99/00291

3515 5123 1600 2750 5445 5680 2396 6410

FFBGG BHCSF ZICVX BWLJF GLFMG FUWSQ TUAGJ XNTYU MUTNF XCRPE
YLKWB SYLGM DTBMT KYNZD KPSER DROUQ TLKKU XWVCC XUTWH ABRFA
SIZFL SRZCP IWPVL QGKJI JCXBM JTAFR JFNGW NAKUG XKOVA LLGAD
WWBSG BUYKN EDQSU AMYZW ILLEF MLONB LPNHA OEVUV RRHPG RQMKZ
XMEXG CWOHX IRGGG QRVAF GOGSH IWQSB CMKDD FYSCQ KEIOK KFBGQ
AMBFD TEDKF HNOPE IETKZ ZDJKK ICJJW PRRUN NHEQS XNFAG IXILJ
ZWIKR GAXXX FFBGG BHCSF

INJ DE YWP 5455KCS 231754T USM-99/00292

9075 3123 1145 5504 8820 5833 1397 9010

AEFEA FAFPL IFSWA RPLIF SFAFP KYLTP EBSFY PTHIF PXILH DEBIN
UKWQA KCBAE LRUZP NUWIS AOIGO MTVIY THJXE WUMFJ UIRKA YNLIE
RWEQN BAFMM OFSLU OYHIF PCUXA KAYMP YERFU LQROW NMOFS DEGOQ
EZRPA TLGCX EHUPW MUZLK AYMMY UEBUA CBEFL CUYBK YLTPE BSHID
NDAGP HOSAG ELUDE GOHOS APYFB RIASW OLFHE TDBAY EJUHQ BAFMW
IRNDA GPSOQ HFOMT QEOFM OFBDE GORIT LRULA VIYTP EBSCA MTBYN
OJUHQ CUXAZ OQNLE GUXEZ XBAAM LILKK YLTHA TEBIW AMEGD DEGOC
UCFZY PKJUH QVANK WEURP EBSKY LTQXM ZRIAS NOIWH ETDZO QNBUA
ONOIW KOWGC YRTBU ACHYU AXIMI HUXEB OMPQI LBXXX AEFEA FAFPL

MRS DE ZCA 4405KCS 231744T USM-99/00293

1070 6423 1700 5161 4094 9523 2594 4421

EDIED JLPHE XRXBV DWAVD RZACE YSOEW EDNET OYBSI NMSZE NXAGT
NNUEI EDBVD QKASD ZVTOB CRMKB ZAVMR ENAMS LFYFX TCNPV KGNTC
TPMND EONQG ZPDQV HDCXV JBBCB YXXXL XTTXQ VNFXB KFMNE C4ZPM
QOZGG RYEBC VHSYG KJJNS SVORH NPQUZ KEOVX ZZPMP MFMWJ DJEOM
JZPJW YSFVG EDIED JLPHE

UBT DE YWP 7290KCS 231604T USM-99/00294

1035 4723 1520 0120 3698 5833 9803 4413

AEFEA GUVBS IPHRE BUVYK BHIDN NUERF IDLVI GBFYA NTUUM BOIMK
YCLRU VLBON QCUYB PYANM UEQLI CPBYB CVABY XYEYP YANPE ARTUC
UPOFU KYLTN ELACA MTMOT FBYBC DAGPV IGBLO IUSUL BXYDX TAZVD
EGOCU ORPBM CRUEU ZIPNF UCHZE TBFUC HHAFR MEZOK YOWCA ZGWIR
NBOPB HEKUX AEFEA GUVBS

INJ DE YWP 7290KCS 231719T USM-99/00295

9035 5223 1610 0121 7263 5833 1397 7310

AEFEA KOZKL IFSWA RPLIF SCYTV KYLTH ADPHU XETUU MVIPK SULBK
AYMVY DVXOC YQEPG HIZIS ULBXY OHXYE YXAFE GEDNK OVFFA FPSOK
FMOFS MUEQH AVGDI TZCYT VMESG MOFSD EGOKO VFKOZ KDYMP MOFSM
UEQHA VGDIT ZKOZK KOZKK YLTJO CMKOV FXOCY TUUMM OFSMU EQHAV
GDITZ CYTVQ EPGNO XLBEA FQOMB LIFSW EAXHE TDQID UVYBT VUFYC
AMTFI DLHUI QBYBC KOMWX YEYQI LBKYL THADP QOMBB AYEBE PUMIQ
DHAVG VYDVC YTVFA FFFAF PBETY XAFEG UVBHE KUCAM TZAII WYEXS
IVOXX AEFEA KOZKL

EOU DE YWP 7290KCS 231516T USM-99/00296

8045 3123 1145 6350 9054 5833 1793 8510

AEFEA PAFFL IFSWA RPLIF SKOZK KYLTR ITLRU LAVIY TFEBS CAMTF
UIODA IRBUT VMOXL WIVRD AGPLI ERWEQ NVUVO WIRND AQFNY ZLZEX
WXYAU QAHAJ AIVLY ZIPAN EDOXC BAFMS ULBZA NNBOP SNOXL ROWNM
OFSDE GORIT LMAQF CETZV IYTWE URSOK BLUOY RORHR OWNDE GOZIV
TLINZ SULBC OEIFE BSCAM TBYKL DAGPW IRNHI FFRUE UFONT ZEGFN
AQEDA GPBAF MBUWY KYLTD AIRZE XWROR HBAYE MILYB AFMDE GOGUV
BSULB DAGPR OHYXA BAGOH PKOWG TOIBS ULBZA NNHID NMOUG PEBSW
IRNKA YMRIR IRICU NYZLN YZLGU ZFMOF SDEFN PEBBL UYIPE BSVAN
KNAQG CABZK YLTXX AEFEA FAFPL

NVT DE RBU 6620KCS 231623T USM-99/00297

6598 0023 1550 1523 4606 1080 2198 5028

DCGDC ITXCG IZDSQ BDJTW USYLU ZHCZA JNQOV IZXDA GIILY LARRK
HYUZV OISIW GOONJ IHLME QWUXM ZWYKB SBELJ GDXFI HEEEE KPGGP
ABTNL ECKDG LCXHG XQTUX PKXZS VLHXK UQEVA HRMJB NWEUK FDEEU
ZMFYY CERQR RYLKN CJXAV VVACC MLSQW MSSKY ZXBSE DVVQJ ANQJR
DBAYX WYLCD SATWY YDDZT YPJMV ZEMBG THGVV QLVBA DCGDC ITXCG

ZCA DE WNN 7280KCS 231719T USM-99/00298

9592 9723 1605 9942 7263 4717 1081 7818

HBJBH TAYUQ YTGFE TBHUX EVACZ RICUN YHTWI SQDEW DQAYR PUGUH
UXEVA CZQIN DPUKX GYKPW AAYBA VBBUP RKAQD LIHUK IQBBE TTWAA
YPUKX HUXEV ACZJY YFPUK XJYYF RANGB AVBBU PRNUC PTUSK XUVQB
YHICY TVJYY FPUKX HUXEV ACZHY QWPUK XXOCY CYTVB AVBSI BUQED
VNUCP TUSKK IQBJY YFHUX EVACZ GYKPP UKXCY TVGYB GZOFC CEFMF
EHQLA QERIC UBUPR NUCPT USKGE MVFEU CVUKC ROSIC YTVJY YFKOZ
KZOHE JYYFF AFPGU FMFOW CGOGO HUXEV ACZR1 CUPUK XGOOV QINDH
YQWJY YFGYK PPUKX QOAQW AFDPU YMXXX HBJBH TAYUQ

MXU DE EDH 6170KCS 231603T USM-99/00299

5525 0323 1515 5504 7803 6977 2558 4420

DCGCD NTIQX BYPAT TVLHB SJBPG QNJVB JKGSV FYVMQ FHRQR VWXBF
GQDNS GFTJQ GZZLV BOHDA ECPAC BLQQP DACHX WSMGP PZSMY YIUQR
IBJZR PFNOC SCAYG LWNZQ QGKPZ JBIJS DEQSV SATNM IWFVU QIWBM
AIHSB BUXLJ SCUOQ KGOBS RQBRJ LSKTN ORJKH SXUAH XXEPH ZHCJO
VVTIR BZTOH DCGCD NTIQX

SFV DE FHI 7510KCS 231704T USM-99/00300

7596 2623 1610 8943 7803 6869 5320 5744

DJDJD SALFZ IAYHU HPFOM SQYPC BOZCJ IBMFO ZFFYN RPYFS TEGBV
ONGTE KEBAN TFAIS GAZKH OENDU MQLEN AKOZK JYYFF AFPJI SCBAN
TFAIS GAZKH OENWU LEJUF OCYTV KOZKH YQWJI SCBAN TFAIS HOENV
OAUME ETSAH CJUEN QYTGX YGACY TVHIZ IJISC BANTF AISGA ZKHOE
NWAMK QUOCH AMXBY MNJIB MLYCM DUMQX YICRU BRGEL UKEDQ GAZKX
IAXLE FTSAH CJIBM FAFPJ ISCXX DJDJD SALFZ

CUO DE MKR 6355KCS 231733T USM-99/00301

6045 6223 1655 3731 0611 3222 7742 4444

IIHFF EKNBC USYYL KTEPE YXIEG FKQIP KYXVC JBQXG IFYYQ ISLZE
GUEIN GSUBG NZBOR TJBUY SSPLB HIHBG JJHQS CTUVM BXAOR YNVBW
OPVFC TXUHV JYGYG FQOSK MSNLP OGWJL MGIRG UFJUY KGJVQ HWWFW
NLXGT LHSDA YXDLV RYNPR ZFAIH OKGSM QGLJF MJVBW POJTI PLXSP
OMGQP FEBOX IIHFF EKNBC

MLH DE DYO 6260KCS 231612T USM-99/00302

4538 5423 1430 2750 3456 9749 2198 6435

IIHFF EHOBC CTQJF UTLBL WIUUR ICYDX JTWID GWZGR YCFBP FSUQM
DQVPA SCRQZ QFRYQ ITWXH DSBSC NDKUK FUCDZ KJSJC DWCLB SJTAT
ZFXJU ZMHCN KPXAW BWTOZ SYROW WXFEX CXPLK VWKWI HCMRQ RUZQC
BBQBC LBMUO ZGSLA RQTBY WIHUJ KIRGV CUWJX HMKYQ MHNLZ DVRDG
SCETO NIFIO RWBJK ALMMB VAKGH GMMAF VCUWT TWZUX EBOGM INBRT
EVECP TQERR MRIMH EYMKD OPKYK DORPQ RWJCN OMHJN MZFSD RUARS
RAYQG HNIWX IIHFF EHOBC

ZZZ DE DYO 6260KCS 231602T USM-99/00303

5108 5323 1420 6530 2664 5815 7094 7429

IIHFF DKFBC XVRPJ CKGJG ERRXV XGESL JLGFU AOMSO PIUTO JRTVG
TRECZ ZWYRQ AFYZY VQJDR WQVSK JIAMM QYDBX FBUUI EXCCV NZYXE
OMJVZ MJGMP WGFRG BBJDB STKST ZPAEB VTPAW YFAHN XNDTT DFUAW
SHMKI LETLD QOROP RUSZU YKBZK DMVWN VEFRS WEEFX MYLHJ BATTL
NHDUX ZTBMU AAFKO HHNTL SQQCP QXRFW RGXYK ZUMSF SGMUF IXLMS
AGFFX STJVX DIXGJ FRWDE OYVDR PLTMU ZQXSE IBUSZ ESYTB KSATU
VYXCV NKKLI WFNEG UOYFL SAWLZ DBVVT IREGB EVRBG KGAMM XXALH
NDKGR QXXXX IIHFF DKFBC

ZZZ DE MLH 6340KCS 231612T USM-99/00304

7216 4623 1330 9942 1476 9109 6644 9920

IIHFF BFQBC CISCG KGWSA WDQOO KOJVH TDOXP DEAAV TQWZM PFKOZ
KEYQV GQHBU LKLSF TAZRE HULLY KBUBW SDTRA UDLEF EYSLT JRYCX
ZELJZ SZHZX WZPMJ QRJCQ CNHDM XTFPX ZROIG WEKKE QEZZB JZBLJ
NDFRY KNHDC WGRGZ AQUKU GTWUI GWVSJ ZBWPZ KZKIU CCZPY RUNMV
HQWFH UJEYD GCVNT XBMXO SFXKQ WXUYX UYVZA LDGEZ NKAUD HZLIW
ULCXK IPZYJ UPEWZ CDNBC UZBOY IHUSS RTMTT WJDEE PCHIL NUHCW
FJXBQ EZKAX KUJBA TYLNH DDKHT QOCEF NFFUV DWCCY EGKFL FEUNO
XCPRG DINEL EPHUC WJVEJ GDKGK TQBCN CCSMG CKTKG FBQBA UCSZR
VJZOD UMXDG YMRPB SPNRI KFPBQ SLHGA FCEJC WGUVT WLZFZ GEINH
FRJZP SEBUU YMRFX ZHHQI RMSAJ AKCDH SKXXX IIHFF BFQRC

MLH DE LLZ 7640KCS 231613T USM-99/00305

1526 5423 1500 8140 7803 1639 3485 7041

IIHFF DHNBC DSSQL HBBMT WOGPA DMPHQ BIJAK DVZCA PZFNP EJYRP
EWREA QNAGC BVSQI UHQEZ JMULO TNDIC JKUBI PAVCD MTNDF KIFXM
GKKVD TKSKB LXTUJ YNYWQ XIMXG XXCYH KWSYX ALNOD IWQFR LJKUC
ZNLBI QAMXS PPMBL DXTJF FUBPN TWLQE WXAQC RDRZJ WITRK JWERU
GDLVQ MFEIS GCBAL LHGBM UCJQM TZPGA EIQMP ODBHM LDJXV VMZZW
ZNLKO RRZPR GHCTO BHDDK HDHYI QDTHZ ICTLF OVOSZ XRDXY AZBGQ
HIUUK EIUGA NAXLZ KMCOJ UZCHF QGPOU UQAUU FXXXX IIHFF DHNBC

FMT DE VXI 4165KCS 231712T USM-99/00306

7017 5323 1600 3731 2664 6940 2620 7514

CCFII WWGHV AXBAD YBGAY PEKIS HUOEF CBAVF ZTNKG BRXGT WSEDX
MFFUT WQWAB GOPBL EJLSE KGKTP QIRME CZKGL TXFRG CAZDQ WSROM
GQUTR HPENF YKADF YEUGA YPEXM LSKOV AXVOK ZTCTP QWORX PWICT
YWTKL TBJNA PVFPV XDNTE UKTYL NBDQN XSBOK FDHKW QKAIK ABTNJ
PFMLH OATCU FPXLP GCPOV FGILP JFTSM CVDKV KCAMO GYVDT SQNYO
RFFCV TRNEY HCPFA DXMPK LZEOU WCNHG YTBZM LNEFB JQJYG JQTVW
OXRLN TEPGC EPISQ KTSIX ZTKTZ JFJDA QWMLD QHFJU QJYGJ SCWGL
JSXZU IRURL KZTVN CCFII WWGRV

OAL DE XTG 7990KCS 231626T USM-99/00307

5096 7323 1510 8943 4257 5653 9038 6233

FFBGG KAKBN MWHGU DRCFS ZEDYL XWHIS ARKRU QPQYO FMJTC ITGXY
MYQVC YTPPX DEJNU FBWJJ QPHYW LRLEH WFJDO XCDPL SDVZC QFMUG
OADUJ LSQVQ BMVAT XWDHJ RBQXK XVMTI EKLQS EUXMG SYXAJ PZFTM
DRHAH YGGAC WBKYO TEJPB KQGOX PGGMG MBWDQ CTXTN RACPY MYFWB
HHBUG ZBIIT LDUGZ LGTAI YOXMC JNJNL RSWFA KNMHH YHIVO HVEZP
GZIBS OHYOF HXBHS FLELO FQQVB TBDQK YGRNN WSBDY JVTTM RNTAK
FFBGG KAKBN

HDG DE BWO 7990KCS 231642T USM-99/00308

1086 7723 1600 1101 8423 3565 6707 4428

CFIFC BEYDL YHRCU QTZEZ YPIBU DOGMC ERKJR TBZYU PQILB RUODL
YMVCI ENHAY KSUIZ FIQXN IOCDY YBCAU EKERP ZIWUS UNDKI COJAO
AZEZY MAEUS UNDHI TCSIN FZISQ HAGSH TLURU BRSEK DZILI CAUBV
OHBJE YKWAI GNULX KYHQK UEORI XPFEI RSUND KACQN IOCDY YBRYK
YXATS POAPX CFIFC BEYDL

RBU DE OAL 3910KCS 231916T USM-99/00309

1534 4223 1825 9329 4257 5158 6824 5014

FFBGG BSAEE GFXBR YDYYQ YYINR BOAXK XNDDJ UPGNI VAMYL OAVQE
GAZSG UYUKQ PQMGJ YNMQI DHIYF ANGAP ALGOW TVICM CWDFC NDASW
DHPOH BLMNC QETMU STNYW FMBSD LRIRY HDGID DPYFX KWYTQ YOVOW
DUOES YGJMU RLCRQ IHZIM PHUCO MDHYI ROBLK SSFXB EMYLH VRYRN
CHAWK DANUU ATEJA FKTEJ WEQHR XGIVX YKXPH VXXXX FFBGG BSAEE

XTG DE OAL 4795KCS 231834T USM-99/00310

6084 3923 1745 8140 2664 5158 3557 5608

FFBGG YSKPB EFZWB EIRHN CTVSS JPGSW TKNYF JFOQS UTYMV NATGH
BFCCF BYSMN QDANN UDHHI MTHIQ NTLRX ESTHR DFAYS NTXZT ZHHFN
FVQZA FYHNG YLVUO LBFFS YAJHO QRLLT RJFWG XWRFA JUQRQ ERLKX
ZZNWB KFHLE ELNLQ MSJAQ SYMTR EEQCF QSUHE SUTKP QMNND IVUDE
OZDSS JXCRY FQOJF EIGXX NRJBC WMVZS MKLDX GUACF SNHHC MCKFQ
BCEIU UGFUA XKVIK WEXXX FFBGG YSKPB

BWO DE HDG 5045KCS 231802T USM-99/00311

8583 4023 1645 2750 3456 9145 8156 6143

CFIFC GIKSQ ENEZU VRCOP TJAOA POOCX OIBWU DXKOZ KHAWH WAHFM
UCOWU BVMES GVIOI DOEKX YUOXU ZUWUB VVEQM GOGOW UBVNE EUNUU
GMUYK WUBVK OCNVI OIDOE KXYUO XUZUW UBVWY EXNII XHAWH WAHFM
UCOJA OAMUK VQOBR FEVDC YTVKO ZKGYK PMOHU MYXHT YYPCA UBGIK
SWEVL JAOAP OOCKO IEBET YGOGO MAEUF AFPHI BLBET YWYEK NEVLJ
AOAPO OCXOI ESEYS HAWHW AHFMU COMAE UQEDV HIBLH UWDXX CFIFC
GIKSQ

BWO DE HDG 3200KCS 231930T USM-99/00312

8503 4223 1805 2110 2664 9145 8156 7933

DCGCD CMBKA GCZGP IEMBA NIDXM PJKDC BHAPA OZAFJ WDLIE WJEVQ
LVFZY MJCDC GLWTI TMVCO XECEJ RCWNK OUARG BMCGN OKTFL KVMLH
GOZYW YGGVZ QXCEY FBWTT MWLOO UEELQ JOMGQ MCIUV YEWTE JPKQN
DDIHI ZZFCW MMCBB VXCKE ZTBFG JNXNJ IVGWX VSRXB AZBUC KQQAI
ZUBBT RMMJJ OBCCC VKLBZ YCGKR QYGDA ZABWF ZXTWB VVUVB ALSTB
EAKGI AZHOM SIMRO BVMPY YWDCP RGXOX VBHUK MQGIF STCPA GFMNV
EUEKB BFRWD WZZNS FWUQU RAUDI RAKIT VNSDI OLZVD BSHTZ QHQPP
TVKQA NILGI QHEVN RWZGJ LTORL JBCZF QCXXX DCGCD CMBKA

PSD DE MKP 4925KCS 231416T USM-99/00313

3026 2623 1830 9942 0611 6625 1243 8624

95459 65982 84285 42128 24064 31194 79044 28613 88414 51745
77292 82107 93672 16608 41901 16095 46647 32047 80481 64131
24312 82239 04233 27218 02364 54732 81243 61949 44423 84667
43857 72928 21071 39664 73269 22421 70042 33266 46084 84286
97494 83926 46491 24129 28406 42922 98090 04945 10411 61266
46902 12825 65757 72928 21079 09046 12949 60019 25873 28428
39264 64194 79147 27547 68291 01993 01423 32724 79404 12825
89482 72862 31047 30697 45124 12120 45772 92821 07936 14041
40481 29496 00192 58000 95459 65982

GKW DE MKP 3440KCS 231947T USM-99/00314

2066 2623 1830 2750 9054 6625 9399 9632

50505 17376 89111 89159 79059 64879 69880 58689 75493 79404
27059 09897 96573 98809 09873 97479 79689 19873 84099 59889
57724 77529 67457 25977 50591 39673 63973 75960 32685 72975
73738 75799 95249 37059 09897 96573 63999 59889 59156 91969
88531 39696 96974 79796 89152 73789 89696 06945 98797 95919
86057 30577 73047 79669 75696 96915 93597 09870 57059 09897
96573 98847 75260 98895 97489 19803 33268 91789 89696 79698
80698 86372 98970 68913 14247 59590 98873 77597 03373 97905
91759 65988 42915 20494 55777 05909 89796 57398 80477 47752
60988 95974 89198 03300 50505 17376

BWO DE NIO 2240KCS 231845T USM-99/00315

9564 8123 1730 2750 4257 4140 8156 3133

CFIFC DUCGM OXKSO GYTZM CWEOL FUWBN IOCMO CPQOO DJYGO HEUES
AAVTI AUMAE UCUMP JAOAR AUOHY RXJAO AVIOI DIYEP UPCSA OIWUD
XHUIQ FUWBK EKWZO SPZOU RPUPC ZOSPB YYZJE OZWEV STURI CFIFC
DUCGM

FHI DE XYR 2310KCS 231856T USM-99/00316

5536 6023 1810 8943 8820 8641 8327 4625

DJDJD TIGAJ IMWJY TASIQ IMAGW TIMFQ ULZVY FXSED XDUQU KIVGC
UVYDU MQVYT LGAZK SEDXD UQUFI XEXER PGIIR GALVG YKPBE TYHYQ
WLENA TOVOS IQIMU RCGEO XKORB WADBC ESYFI ZGPIZ PKEDQ JUQYJ
ISCGU PVPII YMAXN HADPX ARQTI MFSED XDUQU TEGBH YQWPA TLJ1S
CTEGB TIGAJ AFSZU TPXXX DJDJD TIGAJ

OWN DE XYR 5615KCS 231813T USM-99/00317

1026 5823 1700 9942 5445 8641 3872 6643

JAAAJ EHBED DASLT COIEO IERUR DMCST ATUII CTSTS HRTNT TSEER
ESILS MPHAE ANOSE TUREI TIURO QTROA AGTHE EIQEE EOADP EFTTN
NRRNT HREEN NASBU UDAIN TROAF NBTCQ DIRTD EEICD ASERN EDINN
SQTEP PESOG OANRM ENEDD IEOUU ENTHO CESOO ANESE MSORI EARER
HTTEF PVELI OSANC ETFTE TAURL TESSP LELOS LEIID TYRNE XNTEE
AITAO RLCEO UIHSO ADETY TSOTR NRAEF AHDCR DOAAM NSDUB GUTIT
TASNS HEMSO AIDOP CNITM JAAAJ EHBED

TPY DE BWO 3990KCS 231922T USM-99/00318

2086 7923 1830 9942 7263 3565 9713 5922

CFIFC ZAIIZ UVRSA AVMUK VDUOS KYHQZ AHHJO NWZIW UPEHY SANHK
EKWXA NMEYQ WQEDV WACAM AEUCA YFSET NJIPZ NAWNX YUOZY UPJUH
QCAUB TIAUM AEUBA NHMEE TRIMD WYEKK YGPWU BVVIO IDIYE PUPCS
AOIWU DXDUV ZBAQW ZIWUS UNDWU LEQOO DSEYS JYYFW YEXLY TCJYY
FWENK KYHQV IOIDI YEPUP CSAOI WUDXS OLCCA UBSET NFYUG ZIWUJ
UTBSU NDBYR SMAEU QOIYR OSIHU TAWUL EPOAP CFIFC ZAIIZ

RTJ DE NVU 5950KCS 231802T USM-99/00319

8095 6423 1705 5161 6010 3222 1603 8725

FFBGG ZNTFM NVZPR RBKEY VISFV UFWKK TXLDD JQFTF MWTDZ GQUYD
TSSKQ BOCGU IIITG YXALY NBBTQ AAODQ PSUAQ NNJDP RGINM KRERJ
KGKSU FZEDP HXAST WXMGA FNTFN BUGDZ TTSEL CYKHM RRGJR QRQTO
HKJAL IYUDK SKYST KRTXY MIRGH JSLJR AEPDM THZWI DCQNB ASEKY
BCLYG ELKTB VKXCQ SGJVK AGSMX BMFTG CNCZW FBRQN WUKML LUEFF
BJBWH WRREZ PTBEV CLHLY PZSKA RVTIK NUKNK YAHAE FWMOH HPCJQ
VLOKJ HBERH STANK MLFJA OZKAC HLJEZ NHBRG SAXLF DOSJK AMUVS
LGTRI AHNNK PUJJF LQPGC ZXQYQ HQVNH LRUNY WMBTA EFQPU PFARB
RLDYS PCDJJ LXENJ JDBMK ESWYW FFBGG ZNTFM

POH DE FBG 2910KCS 231956T USM-99/00320

2115 0823 1840 3731 2664 7165 4493 4726

FFBGG LDHSO YPEHD JALFU QSBDZ BRBLX IUJUX IHXDO ANZCU NBRGY
USPUK RZKBV HHBUL EYEPK MOBSR ZKXTZ AGKQS YOAJX BFPJV OSRGG
PECCT KOGMT ZZBIY DBOMW FLEIR DMZMS GOOYM VQIRN FUGYR EHLJK
EYJZY BYVKK OQBTZ ZYCRS UVFXW KJHAW URXCQ XXESR BEBFK WOYZK
SAYLG YLRXU VTMDH XIOHY MJVPO FFBGG LDHSO

VLX DE YBC 3875KCS 231925T USM-99/00321

2101 5123 1815 9518 8423 0027 3061 9125

DDHAA UGZLZ BCNSB OCYSA VTXUT NTJZC EPNPU TPDZO OMZIL GDDQS
RXPJT GSDKF IKXON MYGHQ QSHQR YKSSD TAFXR CSWQY OFPHC YVFTH
LJJRE URQMA WONYO VEXUT DDLLX RDDTU OUZIT LZHNK CAQZU TNKBH
EBGTV QVFSH RFLMO HRQKD VMNBH PXIIB WJMSB UZNPC CBNVG IDEAI
GEPNC SXVES OFBTZ FAIGQ EZWXX OCOQM BAXRB SBRSD LDDEA AGVTF
TZKFK EOMHI EZLTO AXPCH QOEQG ICNWQ SMVLZ AVWCK NTUHD QQSMY
SKNDY SBOJH QVYZH YIMVG FMCWU LCEQA RLNDU FFVBF LNPEN YKBGM
ATEVC LBSOZ GFIPH UHFAX WEUEO MNCZL MAULV GZRMJ LZKQA ARDJP
UYUDT DQILJ XUXIC OMXAQ GEKZA NJDZM YOSFO KJTEJ FBURL DDHAA
UGZLZ

WNH DE ZCA 3160KCS 231910T USM-99/00322

2070 6723 1830 2750 5445 2610 8408 4223

HBJBH FOWCW AWUBE QASEW QQEZR NYXIF ETBPU GUMEE UKUMV HUMTP
RIZCY SULIN ZKOZK QINDF AFPGU FMBAR XVYXQ KUMVH UHFWY XQCYB
ULINZ XOCYQ INDGY KPGUF MNEUK WYXQK UMVTI SMWYX QCYBU LINZF
AFPGY KPKOZ KGUFM GYOTW YXQCY SULIN ZQIND CYTVC YTVGU FMXXX
HBJBH FOWCW

MXU DE ZCA 3160KCS 231904T USM-99/00323

3060 6123 1635 2110 7803 2610 2558 6303

HBJBH HUXBQ RTLQA GZWAK HDIIP DOFLS BWQFI SZWEA XZEAZ VIYQC
IEKFA KTKIC OZUDZ DOBGP UGURI CUNYO ZPUZN WUZTN YHTNE KZKUQ
ZLIHU CEELJ YHPRU LARIC UQEDV NAKAX UNHPO TZZUD ZDUTX GOOVH
AQSNY HTRAE YBEYD XYXRH AVGGU FMVIY QFYGL NBCSZ EAZSE WQXOF
BKECP TUUML IKWKU MVDBQ XLIKW VIYQH YVGXY CWJUX FGUFM GIRZH
AGSHE QASEW QMIZN QYAOF EUCTU CULIW IGOFW ROSIR ULAEU RYJTT
AIXXX HBJBH HUXBQ

HCO DE ZIC 5265KCS 231822T USM-99/00324

8078 0423 1715 9329 8423 1918 8219 6828

DAEAD GUZFZ IQOXI FMZAZ ZXICZ DOIOS UZQNI ZOTIB VVODX NOVIK
IDPZY EZDUO SXADC JYHPN ADUDY ADFIS ZTYXO RITLS IUNFU MRDUE
IRYZO FIURD IMBPA BWGUZ FMEPD ZOFCM ECRRA QKTIB VVODX RYCRZ
OFCQI ARLAL ZMORD SOFXP UDRFU MRROK AFYBO XIDOL ONYGU ZFDAE
KFUMR JYDLB IINDO DITIB VVODX SALFB ONEKA AOZIQ OTIBV VODXK
ARETO IBXIM IFUMR VIBZN OVIQO TITIB VZAII ZYMGT EBWRO NDHYQ
WVYBW MOHUK OHSTO IBBON QZOFC CYWYX DAEAD GUZFZ

FMT DE GFH 5285KCS 231829T USM-99/00325

6521 9123 1750 3731 5445 4997 2620 4616

DCGCD TOVCT OLEVN RUTYN JCNMK ZHHGD PYUPG TGRSA CUXPH ZACMO
PSHBE HJSZN HMRCZ TIQJJ EFOJE PVVZE NJUFL TTBZS YKICP JMCZQ
QFNIM BWXBH OVRGX TFZCP EJLFL ZTWFR XCPKG LOGBV GVYJJ ODYLD
EVHOF VFDYY BTFGS CBABP AXNEK KIFUV APWVY QKLMD UIYYP NPHKY
SVGZP KJDAI OWMVG ILXXX DCGCD TOVCT

MLH DE DYO 2100KCS 231936T USM-99/00326

4548 5823 1700 6530 5445 5815 4259 5534

IIHFF CJNBC IVMSO KMOLI LGJLB WKNSR ELBNK RPIDY EGMDB VEBLY
YTVRH EJNSC LSBZT GDDQM XRRAC SHXPS YGLKW TCZMR UDFUK USTJU
KLDCB SIBXA XLMMW EJQDO ELJJI MIYJG KVUYI BTOUX IBOCN WAJKL
TUHXE UICSU PXKQG AXABD JSDBZ YRKPC IOXGF UHHPA JYTOA BIJKU
XPBWA YNBOX ECVQG LMJIW DKEHX TROUZ NHTUF THBXF PMJOY FJCVD
FNSHH VTZGB QURXH IIHFF CJNBC

ZZZ DE DYO 2100KCS 231910T USM-99/00327

5118 5723 1625 3731 4257 9749 6644 7640

IIHFF BHQBC YJXAF OHGKR QHCZU WLAMV AELVV AMPFR SCABV BPLRE
MTFXS HQTLD KZQDH YBFIR BVHPE XOBOM HHFIN NSVJB PICYF OMNCN
AKLUO RNPFU VDWCC YBGKF LFENN OXCDZ JJHPV IODKB VMEIP QSQXP
OQTDD YXMZC OFMEU VBCUJ LZXSZ KVUKU VUCXZ BAQBM WVBNJ MTGHY
UOOMJ MHDZK JVZPY MQYCO BWAXV SYYOR BHFJQ UQOTX XCGKE TYGDW
JEUKQ NBAPR VVXEH UKXAA YBTTV YLBJV CMDXI ZZBMZ FMMZR DUWOE
QVNMQ LFWMF QUOAX AFBCR QKVIR KCIUO KFCOD PXVSA TPCFE IVOUL
XJDHE SRTDE ZDYKW WDNZX IIHFF BHQBC

YRG DE YBC 3875KCS 231938T USM-99/00328

3031 5323 1850 4775 4094 2511 9939 5235

FFBGG MUPBA XACTV MIGMK DJCBO PNYUE AOMSQ TEJCH YGGOG ILJLS
RMMWU TCEAI CQJOD LHQEU WMFPK JLASW MYUGK TNFXV EGNJM PRHAU
KYYKC KPGLC LMTNG LDRCW ZZYPU BIUIF VHAUU DUOFY KLBKH YNMAC
PYYOA DVQMT PSHSW VAIGR DVXOO FUFWT ZTAGQ VRBUX BPSHI IZMAS
GRFBS CGNYP AEEED GKSZP MGSHA DWRXT GAXSE HBVLE VMHWI VBJXN
FFBGG MUPBA

DYO DE LLZ 4965KCS 231814T USM-99/00329

5516 5923 1715 5161 3644 8146 3917 7231

IIHFF AGLBC NZOOB MQQUU CSMPU HWTUO FBQPO VPOUF DINOM ZVNAK
LSTJO DUZLD YCEFR GPTNH WYHVV IPAAR UUVHU PQQEZ ULNVQ MTNWU
MAYQN KMLPK ULAYV XWMHK QHFRM TINCW FJSDZ ENFMC AWIPF RBPUM
CREZP EDRSQ CUNBJ KJTJL KXVCA XZSAP BZSAR QBJNA SXACD MJZCY
MVCTU NMQTK CBSLO FTEZU NCDKA CWRYI EBPID DQHXS WYWXS ATEJK
TDHVB LEOYO NEWEM KADWW ORBDK GZTDR AJKZZ PVIPU TMLNZ HRCVZ
TTBZX MTNIH ZFAOF XLPRR QXUMQ HGGAN ELOJK YPLGQ LZOLJ MCIHG
IIHFF AGLBC

WPX DE NVT 5945KCS 231902T USM-99/00330

0046 5423 1815 3749 5218 7525 4259 5820

JBBJB GQJCE QZATN KOBAC LYVFP CIYPR HBKPP OGVVZ FUZWO ABVBT
WJCSG BEYCE VBJGM ATEJV JRDXX ICWFY DFXLC ATPBL VRMEP IRXYE
ZJESV XCAFF IZVRG MRMAA YMPBQ SNFZD GFZGM GNKGJ KVSLQ SBCTS
KTANF ZYVHP TXZEB QFLDF XMNCF BLCEG JGVDG LAINH DEOCN JYCFM
DOSTL LLQQE KBHKD VMMSK BEVPU UGAXH WGJWE ORBTW VLIJP TQGUA
XOTBO WDMYS GFIQU DFDGB SPFGP FZNLZ JBBJB GQJCE

WNN DE MXU 2700KCS 232026T USM-99/00331

3526 5823 1935 6350 3456 6616 8408 5821

DCGCD NJMTQ UTOHV QNMCB LYCRR ECGJD FFLET YLIRQ EJMRY YQUDY
ZXEZA JOJJO GWFGA JZFJI MQNQB DNYBE FZLIJ QZAPT FCUSP DUOYA
WCYAZ VXROB TAENB SZCGF TIPSL YRBGK EDMBS GWBIU BQZDX IJGAG
OYTGK CRMTA FMKLG KCNZD QSZDY LIJKX TEPHY LDZIM AWRJY JNPJH
IKRII WBXLU SCIXT EQANK IESTG PTHOU GXIWZ FLJTU PVKUM BJWRR
MYBYT PCAEY GSVEB ZBYAL ZJCVO KYRXX DCGCD NJMTQ

YRG DE XYS 2315KCS 232024T USM-99/00332

5054 2023 1945 2110 5445 4357 1180 5909

DDHAA SYUBE XKVMD HSTNM JYAGH HDXYA DHPGM KQZAR ZTKNH AQYBJ
AORXH LIEGZ JCJUR PVKBQ CKIQE NNCZM TSZBI ULFJO GAGGO SHCOU
VZDOU EMSOF IINFE TRPFH ZRNQK MEJTW OQGPD ZGCBP HSPDJ YWLNP
CFWQL UOWBQ MBXZL JSODF EDWRW OXRKE DAHHF XKGPT SGZWI GYJOO
URHRX KJVYY BTELA UQQLU HZRTP GYHBU VLISH RAMBI GMPNA FXKJL
VXZXS WITXB OSDKV VSBTJ LLFUH KCRNL FDNPQ DDHAA SYUBE

XYR DE SFV 3910KCS 232023T USM-99/00333

8104 4523 1910 9942 3456 5086 8444 5534

DCGCD AQZSQ BJGXT GAQWL XUETZ VLXSJ BYNMT SXMDG MPZRP QQUPB
XZTOA FKWEH MYDOF XSRZC BOBOA INWCU RKGKH KAGPE LKSPO NVGWA
HLNPX KCPPI FTUFP UCHDD ZSKSY UUKYQ NGUYJ LCAGK TONCY QJCBG
QNENB DGWFS GZPGS JEKTK VXGHI SXDEO DXSFT HGBVL QHUPQ OPGCF
KGNHD WFLXT WOWLU IFQVA AMNZM OPSDJ VAKLB XZXFT SVXDW BXCYB
UKXQK NJNOD SZXCX DCGCD AQZSQ

FMT DE FZX 3760KCS 232114T USM-99/00334

5072 3023 2000 5504 4257 7741 2620 6332

EGBGE NUWIW YXCDO QVKOZ KHIZI HIZID IPMJU QYTAG CDIBH DIFMS
YDTKY ZHQUH WMUIU WICYC AZGQI QGROW NFUFL QUBHM OCPVO XRLAW
LNYYI MODQR UWMVO ICXYT NPEBS MEFUQ UVKME BQKAD RKOCN DIBEW
IGCQO VLJIC NDIPM VAPMD IPMPA PPXAB ACYTV JAPSV UNFDI FMFAF
PMUIU DYBEW OIDBE BGHIR ADIPM WOGBZ ENMDI FMHOG PMUIU DYBEM
IVIWO GBXYB VDIPM MUIUX OCYXI TQFYY CRYRF JAPSX OCYDI FMMSB
GXXXX EGBGE NUWIW

HZY DE MKP 3440KCS 232057T USM-99/00335

5066 2623 1830 1120 7263 6625 6473 7014

ECHCE FOAOS MBEDN CNHII XRSRO NVNNR ESSTM CCNRE LELNT EMTPU
AEIOH GEEET DAEED NYPRS NMCTI LDAEE OLOOO COICN RIAET ADHFI
SSPIU TREGD MIMCA UHDAD TPBOE OETAE PAEIE ILREE EKELN EOMMT
ANEEP AAODM SVRAN TITLM SFAOL DSLBC INCSI SACCS DSMLE EMMBL
LEKLF CAIAA ROPOE OCWIA OEOIE TNNCE EDIOO LADIN ECRDM MTHSC
VNGNA GILTE INODT UTURV SIITO CDEEN MLSTN SNTLT AIIRH RHPCI
NNHIK EAICO CVNTE OTSRD IPONH ONOET IIENP ITLPX ECHCE FOAOS

VLH DE XYR 2310KCS 232106T USM-99/00336

6046 6223 2020 6530 1476 8641 7157 3323

JAAAJ TROHO LEAHN INHAI PMUMQ RRNNE DAOIE EERMH RIRIT ORBFR
SCMOS BACMQ UUBAV TOUSN EDEAS TDUTR FWABO ITSEN UOURN EYSBT
KLETA RTBTP KEOBD OITRT TJVEO MCZTU RNSSP OARMI LMEKI OSWEA
XDPBT JAAAJ TROHO

POH DE NIO 2250KCS 232013T USM-99/00337

1092 0223 1840 0121 2664 2124 5942 6501

FFBGG TGHLN ZEHDO IRMRW PZULL ABPBU YPQSP VDZBH LKOWT JEUSL
XPESZ HNURY CLTNW ARYPA MSEWS KHAHU WDUNH DLFCM ABSTN XKASW
SCNPE OCIOK ZLCDJ FRLNH DIXSJ OZEUD REZST HMGFD ASELU SUTSI
DOHER EKNYY YXTDT UNRJO GGPJK ULSRK JZKVS VXMVM EHZWS MDSYD
MZRBB CHBMG JSVSV NEZPZ MTGHF WRNHY WLISH ZSXJH BONFM MOKQQ
EOTMG WILVG QZOGY HOUEO FBWJZ TRPIG QGGRN NHRTG NTKDI RKDOB
BWRLD RIYMQ DCZVH FFBGG TGHLN

FBG DE NIO 2250KCS 232106T USM-99/00338

8052 0323 1810 1561 8423 2124 3313 6049

FFBGG MSJQC TYGNK LPTNE NOWMD ONQHF SYXIT GZRPZ GQRXU HOHVV
VFDRL QTEAQ KRUJS KQZQT WBDOT DXAKN YOFPY BRJHA BDZPO EYJDF
YJODB YNCUU DHCHD PISSD GZHDT OPAEI LOWGK SHKXM PHPKC JKDDJ
NWFGY CGULY WPKZK MDKFO XXGSR XQBTQ BURKL DMCCL IXHJW RIOER
WYIKJ SEJNO ENJXM RPJQN GFSGT PBWJY DKHOD HFFVA BEYFY NZSST
DDZSO CQZVR IERAC SRYHX EGUVK XVAUX RCKIV MDXXX FFBGG MSJQC

POH DE ZHK 2420KCS 232113T USM-99/00339

3100 3223 1950 5504 2664 4212 5942 7033

DDHAA ADEKU VXMAT XMELO BQXXQ NKDLQ LBONY UIPAR OZUFK GXINM
GHUWI KZMHN CHZEF NHQAP RQYKN PYFOQ TWLPT RBMFQ LQQOH SEANX
EQPDA WZZXB PQLYF ABYMJ FJVME GIIJB FUCTP LPTSY WUZZJ YRVFJ
QRWLF LXSCQ PFYJQ TIQGK XMSCJ WAVOI JPEYV HZPNR DWFQP WWRLF
DDKDU MDUQD MNXBQ DUZOY HSYIX NYPAA ARNTT BFAST HPHNC GMUOR
QAULU HBFMM FBYPK VNWRZ HUQTQ ULTOE OMDTB PVGUZ FUEPQ IBQHD
NASLE NOAOF BGNRM MOUWA UCTWP VBYCB ICMJE PWXXX DDHAA ADEKU

MRS DE ZCA 3160KCS 232006T USM-99/00340

1100 7023 1915 8140 4257 2610 0091 5517

HBJBH BYIKP ENDZU DZJUX FSYGW FAFPQ INDQA LDNAE VJYYF JYYFR
UEUGU FMROT KNUWI ROMCT ITNFU KXBYW XGOOV GUVBP EBSTA MHQED
VKIQB CANUD ATERO SIRUQ FXOQM ROSIX YGAKE RPLXF PNOLY XUVQB
YHISE QKDUH MBYHI RUQFX OQMRO SIGOO VGUVB HYQWG YKPQA LDQAL
DQALD PUKXG OOVBU HKCAB UTEBW QINDJ YYFMY SCQAV OROMC RORHK
UMVQU PDGYL QXXXX HBJBH BYIKP

MXU DE ZCA 3160KCS 232019T USM-99/00341

3080 6923 1905 3731 0611 2610 2558 6225

HBJBH QBMDZ YZUFO WCGOO VMESG DITZH IZINA EVJYY FQIND RUEUG
UFMHU XEVAC ZRICU GBMVF BUCVU KCROS IPUKX GSUDC EKDPU KXKUM
VRUQF XOQMR OSINY HTREX QCYKM PUKXH UXEVA CZRIC UKIQB PUKXJ
YIQXO DZPUK XKUMV JIGRS OXPNY HTREX QMESG KUMVJ EZINA TGWIL
GPAGY WILGN YHTRE XQDIT ZMINA FYYCJ ONWPI WMXYX RZYCX GUFMZ
YZUZI USHEQ ASBWQ KUFPM AMBGO GOJEZ LNATK RICUN ECSFY YCXXX
HBJBH QBMDZ

MXU DE ZCA 3160KCS 232158T USM-99/00342

3110 7323 2110 9942 5445 2610 2558 3508

HBJBH DBWDG UGNZE AZXYX RBYEF ZOCZL OTBMA AQJYO VGAAL FEZBZ
AFFTU SKBAA GDESZ HAVGP UKXPA GYJOO XBAAG HYELX UTODA DMGUF
MFTSW BEQAZ UDZMI ZNDEQ XWAKH VTYQD EWDJY OVDUT XBAAG XYXRB
YEFKU MVJOO XDESZ HBJBH DBWDG

EDH DE ZIC 2460KCS 232106T USM-99/00343

9058 0823 1920 0121 9054 1918 5267 6750

DAEAD GUZFZ IQOFI QXNOL YRYFD SYRGS UZQNI ZOTIB VVODX NOVIK
IDPBY GHDEQ XBIDH NAIZN ADUDY ADXIE BZYGB FUZNF UMRDU EIRYZ
OFIUB DIMSP AEWGU ZFMEP DZOFC MECRR AQKTI BVVOD XRYCR ZOFCQ
IARLA LZMOR DSOFX PUDRF UMRRO KAFYB ONOVI JYHPG UZFDA ENFUM
RJYDL BIIND ODITI BVVOD XBALF SONEK AAOZI QOTIB VVODX KARET
OIBXI MIFUM RVIEZ NOVIQ OTITI BVZAI IZYMG TEBWR ONDHY QAVYE
WMOHU KOHST OIBBO NQZOF CCIWY DAEAD GUZFZ

NIO DE EOU 2220KCS 232148T USM-99/00344

4532 4523 2105 2750 2664 7101 2125 3728

CCFII RRZYD HLEJS XZORF POHKU LJTAC UPCAB EFIKL ZRUTD UIFJR
VXGZB USKUB ROKQM ODRHK ZBFVB HKILT QAWBA PJBWV NOEDV DORFE
YINGX IQNUM IZQHX BODFR HVPYQ PXVJR LSDFD MNOBW FECTC YQVHS
XFBRV WUPLX GRJLX FCIBM POXXX CCFII RRZYD

LLZ DE ZZZ 2030KCS 232118T USM-99/00345

1132 4923 2030 0120 8423 4258 5942 8515

IIHFF EJNBC JTCQQ JQIYW HZMVW TSUUS MRQIM TTPKG TWUNU VJMKD
MSKDA FEVGX NBTJL RORWZ VFEOP MNSRG LZFMA JJZOH YJBCL CPCZS
AEXBM VYFNG GDLJD OFINF UBEUJ HCREC KCGNW SUPFJ XMJXP UOXPS
DALJM GIPJH YPEFS YAXMC PQENG SOFEV GCONT PGSEC KCYBM XBMKR
ASURD WUCGA MDGFM MSERU VTRKX JYIWV VASBN DROGE CETBM XMIHG
ZWIZU UFEGN KCKFP KDQYK CRNBT BURBF YBWJZ MCNWC LCFZG EINFW
JWMPD VQUMS ATSKY BCSGD RLLKB UTHAT HVVSR FNLVC CQUQL GBRQB
BIUUW DQCIZ AWIMI JCLNK GHXSR OKYWZ JFEYL ILUDE EJANF LZVIJ
PGOAU BRJWE JBSEN IIHFF EJNBC

DYO DE MLH 2020KCS 232037T USM-99/00346

3556 5523 1830 3731 9054 9109 7300 5622

IIHFF AHRBC JNUEL LPKYQ FKGMB SQRLL NQXFM CJBVI EKKFL YTWDU
EUBYA SDBYT CWUCC BIBAC FKPHQ OZZTB IKRDH HUVLT EATFB LGHCM
TTWPD EUJUT XAMQN YUVZS NNONX MGRKT PIAQX TQDWS MFLBR TVRHT
FNCME XRAPH LCEKG UBMHS EUUPI SAAFB GXKUW KXULE URYZC BGJVV
GCZOV OCSQF NQSOP YRYBW VSKEP MOHOB QBULO TFETI QZLYU QJPVC
VEDEH VUMDZ OLJNZ VWNXX IIHFF AHRBC

GFI DE LAN 3095KCS 232256T USM-99/00347

6065 2723 2210 1101 1871 5644 1324 3725

DDHAA QNRRV NVOJE VIBMM YBHSH GRJTZ TRDUZ YTCFD GEKCE VSROW
CPWYE BYVAA KMUKT JIWNC EXRDA CYXHY MCARJ UXTOS HYGFR PURZK
ZJMPC JBKHL VHHSJ ZTBGN UDMIX MBYUP VCEQM KJHOY KIAXG JDULD
KUACM CQLPR LPCKT SXBSN EQHBJ DDHAA QNRRV

XYR DE SFV 3910KCS 230936T USM-99/00348

8054 0123 0730 6530 7803 5086 8444 6917

DCGCD MJCDC VUKQI OBEJT RQCDS SPTOP MYOMF LLVIV XTCSS QWEIZ
ENKUA XCRVU OFFKU ZCVJF ZLZOZ SIDFM IEVRT GUJWE XPXQZ JQCMH
QXQOI NZQQT DGNIZ EKLSP DUOTD XEBOK FQZDT JAKDZ NHIRV GHKUB
IZMTA GNQQD SZKYB WNTDG QBCPN WCFLT RJHBY UHATD VQHGG LYLZM
AZMFG HBNWD EDYYR WJPGX MFTOQ CCGJL KBWMB KSHCP DPQFR BBQEO
MXAWD VGFKX WJULC SZKVY PKZUA EKVSB IDSNY ALFLU AKVFB STIXB
XAFYA CLESS OWCWX ZLAOP CTGFE QDHTP GWHXX DCGCD MJCDC

FHI DE SFV 3910KCS 231007T USM-99/00349

6564 0123 0730 5504 9054 5086 8327 6914

DCGCD OUARG SRJVG GPISH KINLQ BPFQW GCQYF XKFYD NHYEW TMYEZ
PEZUX UODOC OIHMC CUQAK LPTSU UJLBV NRPFE DKYLJ AUPGX MATPQ
NQJWV GMEFX AQNCH HOLGK WTTCS LFLYQ TECOX TTLNN CUBZT HEITH
QDHTP WFURP QFIKG FFJHI ZMZMP JILWG EWADL QKCKZ BHSCS HHFRL
MXVLX JKMFA FBACC JJZAD OGBSW EMKHK HAVMH FJIWP UZMPK LMKMY
LNRMS ZYNCQ NNCLC LPTKK XOUWQ CFGSV KGOEV JUQMV CTZPS LEJOB
LZPOK QPSXV YESEK ERLVQ OTQIY SPRFR QZJXX DCGCD OUARG

IXI DE XYR 2310KCS 232331T USM-99/00350

2556 6323 2240 5504 8820 8641 2611 5143

68486 51651 42852 51959 58514 50565 16580 31380 08957 22524
52428 07650 50215 79520 22082 95849 79548 45242 13935 84215
26769 29552 41592 18054 11585 38653 66202 12870 56446 52028
54098 02366 50564 46520 28535 46550 51581 07650 56435 84758
21469 07650 56421 52875 56839 12971 57526 67054 40000 68486
59651

NIO DE BWO 3990KCS 232249T USM-99/00351

3106 8023 2130 3731 3456 3565 2125 5019

DCGCD CZWAS KKPIS DFTLZ GMYRS CUSFI ZLJVN SXBXT IGYIA PAIUS
OHVXK CQVHU XYTKV STOQC WCZVH TLYVH TDIAJ UQPJV WOJUE UOZKS
BGOXL MZUAH ZXGYU WVZOL MPAIX LYBRC VZXHU LXLDZ NCVVN UUDTV
JLJNH YLGRM RUPPI CSSVL QBUJZ CFWQB XZBNI WZMWJ AIBXL GKFBQ
YWAZA KOTUT ITMFX QSUQP ETDGV YKDMO RUSKU LXXXX DCGCD CZWAS

FBG DE NIO 2250KCS 232209T USM-99/00352

8072 0523 2035 9942 7803 2124 3313 8001

FFBGG MDCDH SYHNV LSQOP NYFGM ZSPBQ LOQSM UZTHC ZWPRR SAYZY
YIZMM ISOOA WOZOZ HKIVT CZAFO NGJZD GWNJJ YSBIC KZQSG GUZQE
AJEVK DFWHX HMBOZ YNLGO RLWVP VYRSL RGPUJ FEKRQ SONIS ZOYBS
TGHZB FJBKZ DWTML JXBNT ESPUZ QLAYO UFYRX IRYTF JGGEZ GMGSW
QASRR LOQXT UCDIV KXRNL UBFYJ DYHAO GCATG MMDZS BGMXE UJJQK
QUQVR XXOUS ETDQA APOLD IVTQT YCCMN GNQKD NSLSI VTHVK LJDTP
EFBOK OTWIH YUCQE GIAOY HGLBQ ZDTQH ULNGU SWTVV RRUVK VMVQN
GCYUX IPGBS MOEYN RRPJK GLXKS XIWDG UKJPZ OWXLX FFBGG MDCDH

NIO DE FBG 2910KCS 232352T USM-99/00353

0555 1123 2300 5504 7803 7435 8912 3525

FFBGG IQTKD GIKGP ATDCC ITTHB SCKLL VVASU BLISN LKUEU TZXRL
DXPWF IXNRP DSNBR SXBXF ONAQX GFTAL YCCBP QNZQH JEALR UFDKS
ENPYE WJEBG ZXRVB PWPYJ RBWPW BEPKN GZXPO SBJLY NYZFV CXBID
NGRTD QYWJP TZPQX FFBGG OQTKD

NIO DE ZHK 2420KCS 232247T USM-99/00354

3560 3623 2135 2110 9054 9208 4637 4524

FFBGG BVRJD YRSEA OFLIK QVCXV KESEK UGEMD IYJAZ BSETS GXBIM
FSUGW GKNKX LTPMZ YOYER XUOMF XEQOZ HVULR NTRSY TDRPK VGGYU
QMWW LXODU GWTRR RBOJZ AGZCB VZNRR EWCWX KYTLG FTAVJ SAHFX
UMSCP MIYES VRTQD YZBSG ZALET GKFNR EMGCV VTCBL FTATV XEANY
TRVPN VADSL RDKAB FFBGG BVRJD

FBG DE ZHK 2420KCS 232224T USM-99/00355

1530 3523 2040 1120 1476 4212 3313 3601

FFBGG DQFHO ASSEV FWING DINUC XMIFD YWXAU BCQUJ QABIC VTBBY
DBUVB GGBLR AHCDW SVEZY ZNPQE MIWXT EFYPN IEQLR OOZGS EXSFZ
EZEKR GLWEU AGJVO PDVFB EZVTK WNLMQ YHNNL NVUOH EVAZL RVKPU
DHTYK ZNCFO ESNRA ZDTGK FFBGG DQFHO

NVU DE XZJ 3255KCS 232306T USM-99/00356

1134 1023 2220 9329 2645 2683 1676 6327

DDHAA OYUQM YWODH LPCWL FFAJC UBIIT OFADE KVWAF PEYJQ BEBDC
BJXCJ VFBOO XLQYX GUZYJ VFQSX DLYIC JINVB NNPNI SVRJV YYLMR
BJOWN GFZQS CJBUZ DBUXL UQXPJ MROEU ZIUES YNKHT IVMPY VVRYQ
MEFAM NBCZS POLFD QNYXM CFMKQ GQNLO LJBTU QCBNH YODFQ CJWIS
EKQFU QCQCY IOLVM WAMGR ALRJJ LABKK YWZFY YBWAW HFPTY MBIGG
ZEJMR MVTQD GJVOD RLWIP JLAKE MVZAB PLQSN DZGXZ DIYFD MNLIQ
UXLGK DDHAA OYUQM

RCO DE ZIC 2460KCS 232348T USM-99/00357

8108 1123 2235 5504 1476 1918 8219 4330

DAEAD DYOFK IAMXA FECIL QSEIC KAESF AYHFI TATIB VVODX RYUIK
AESZO FCQOW MWURL DOOTJ OQZBI INBUV XTOAT NOVIK IDPZY EZDUO
SXADC JYHPN ADUFY CGKET FGYKP JYYFJ YYFJA FSMET QJUMU FUNRW
ERONO BPTOI BSONE KAAON ETIQE VNZIQ OZUBX DUAEP UZNNO VISQM
DCIPU DAEAD DYCFK

NIO DE POH 3520KCS 232021T USM-99/00358

7596 6423 1900 6530 0611 8146 8912 5331

FFBGG IFUDQ ETNKQ VVPBH JZMIJ ICEQA XLTOC VCPDH OOOBE RDNIF
SCASR DXFKF IDFIK TSTBD CNWLV XUTOY VKONO PRUWN EKMLC SPQBM
LGYSL IVODO SQYEJ TEJMC YTEXH OLRWE YRWJW ZDXBO RZOKH CEOES
QBIDJ MIIKL UYNJJ CEJIH PVFFP DMOOT ORGZD KMEVS ZYWLI MDXAZ
ZCJPB WKFJV ODGQF WYUGZ XVBZS QSZAQ CFNLK QFKXD PTFAE AOHVG
QRXSR FFBGG IFUDQ

FHI DE FBP 4105KCS 231820T USM-99/00359

5068 4023 1735 6530 4257 4122 8327 8320

80808 74793 46985 29293 34311 34195 56995 06732 34363 09091
47956 28930 91479 09147 95257 19556 99729 55114 27774 15937
91445 79227 35979 02217 31398 59472 94411 22346 23605 13422
98947 68537 44195 57696 78785 82833 55946 99396 28723 51282
19707 08783 35269 88158 80669 83733 79169 22739 51774 29892
36507 83227 38973 79897 86769 19744 47479 34692 93443 43180
19729 55119 15959 79141 50722 73780 92869 44594 74376 06677
76279 31932 27384 11932 33142 89345 37657 94137 77201 89799
60900 80808 74793

ZCA DE MXU 2700KCS 230310T USM-99/00360

6536 2923 0215 1561 1663 6616 1081 4313

GEBGE BEMFE EFMOM ZBJHV XBMDG EFCEY BKFPT TMPBE OQDMV BQILV
LLIBE DECQR APQOF MIKOC APPAC BJDYU MDNPT IEPGO NRBTC STDUT
EAOYD GZLRA WFXVH UULJP DKGXW OZMLP BZNOE KCQFE GBVFP VALMO
ALENZ KCSPZ QBJKO KTKBV YPBSI JNFBL MTBEA RYHPB OUOLT QGEVX
JANPN GEBGE GHFME

LYD DE FAX 4265KCS 230751T USM-99/00361

0011 9923 0700 3749 0420 7741 0172 4812

JAAJA OZKGF IGFBD RXBIY BMBJH FDDGL ZDUTN PBDRR MCVPX BHAIK
ZQJTP LPCDD EMSPS WEPQO CZPCS SOIXX BCQUQ OCOUC IUHTT IFBVC
ZLLCR SUYFU BVPRZ DPQML RSEXU MYVUQ SKWBO QBKYB NPKZR FQAGD
ANVKS VWDXS QOVBH UPCQB LWDMF QMWOC HALPR OQQEP XINNY YMPYB
FGERC BENPB SKDYM ENVEJ AZXDJ CVCQG JAAJA OZKGF

FHI DE UNK 6220KCS 231006T USM-99/00362

9037 6023 0920 1120 5445 1972 8327 3220

GIFIG EOUEE MWVLW SFEDS ACIER MAIRE DDTGI OCORE DRYNE NPKIU
ISRRE LSSRR EERTR PTHER MENRE NAPOE VNECR DEFUO DNBRE EGAID
ETAHO CARMI EZORE ORLIE XSEEO WRXOS EIRRT BSELZ ROOVZ OLATW
GIFIG EOUEE

CUN DE IZM 6260KCS 231124T USM-99/00363

2048 3723 1010 3731 1476 5815 0172 5924

DDHAA LUSNJ VLZMR TIRUT HNRST ZAOHL TMVML ZULCV BZSPE HDWWP
IVAOI FHNSF YBDJE CFNZX QLALH ESDRW FNAFZ JSHHK NSAMQ ENBGH
HLINY LGQDQ UPJIA LOJSJ TRAFL VEICT LQEFZ TKGMV FELVE TUCVR
PKTTP APUYV VBSYL QYDCR RECDA YWVBC PXSNT NXHJD QXKLH DXMPT
MFABV TDVLY AZAQZ RNWOW MAGXB GDIHU XXONR JANYD WSNCL HYWZN
XTYJS KNWBL CNPZE EFSMG ADKQP JMADS NTKKK DDHAA LUSNJ

POH DE FBG 6830KCS 231305T USM-99/00364

2064 8323 1130 9942 3456 7435 5942 5722

FFBGG VPEJN FGVIA UKBXX ZXHOC EXHZQ HYFPB SQMLH AWEON THKXF
FTTBW SJLJW WUGCF UOBTB NZLMA WBXGK AZZDR RREBT KBLJK VKDWO
IERNM GKXEY MVSRT XTYRJ ECWVE IMKCH FQQVA MPGVI CFKLJ JOZUX
YBYHR OSCHI CSDLT CVDRY TKVJW FKVWY ZLJQU OYFCJ JMERP SSJKN
LJOOE SMMBM DACMO WDQKQ EKGLC KARWB XRPUN WYOVT VILQR JZGLG
LAETJ SQWFN VZBGG MHCFV FHXXX FFBGG VPEJN

FSD DE ZIC 6620KCS 231537T USM-99/00365

7047 7823 0940 1120 5445 1918 7238 8542

DAEAD GYKPM UAMCI OZMUA MJYYF FUMRZ OFCBE XCRYW LGIFO MUCOZ
EMVBE EXRIW LDYAD KIOZT IBVVO DXRUV LTOIB ROKAN OESNO VIQIT
KJIBM FUMRL IHUZU BXZYG BBIDH PAIPZ IQOBY GHZAZ ZWUGA MUKVN
YGSBY HIWUI CFITA RONDC HRKJE ZLTIV PHADU BINRG IFOZE WVJYH
PDUTX XIDAC YQBZY ZUDIM SRIWL CYACB ISWJY HPTOH ARIMD NIZOR
ONDRY WLVIQ LTIDX BEMRF UMRGO XEHAD FPOUI FIPTR UCSNA TKKID
AUXAE BAHOV ODKNA DUZYZ UBOVI FYGLD IMBMU GSMAE CKYHQ ZIQOR
OKARÒ NDZYZ UDUPK DIGNJ IMWPA XPTIV PHADU XUZUZ IQORY FUKYH
QROND ZYZUF UMRXX DAEAD GYKPM

FHI DE FBP 7940KCS 231558T USM-99/00366

5038 3723 1525 3749 1871 4122 8327 5930

80808 91595 97914 92424 93475 71234 72972 52537 42275 34860
96497 06820 97412 55119 44978 93585 94742 49347 57123 47505
09056 09155 05052 57195 56964 31934 24934 75712 34750 50006
45609 15502 05257 19556 96453 79229 16913 65055 15929 34898
97618 53339 35974 88151 55374 22753 48609 44424 93416 23198
59323 32733 22845 23470 72275 19322 86900 80808 95595

ZZZ DE MLH 6340KCS 231441T USM-99/00367

7116 4623 1330 9942 1476 9109 6644 9227

IIHFF DJNBC TIMBX VKDTX WNUZZ RRJOR EQAIA CZZBV ZGLBM CUBYL
SGDYM LQUBI NOUJN GTAGL QFMJE QHRRM MKPZS MKCKB GWPRK IMTBA
XCAHP WRBAH OCDBW JXMBC MJPGE BHQTF ZFYOZ ZOELG ISUUG UYUIU
ZZPBO UZXCU KMBMR VVFIW REDGA CYZKQ NYHRZ BMCNU TUBRA TPIYY
NEAJA GBNLP IBWQC UKXUE JOBWP ZAWCC YEGGF QACGN UZZLU NIPCF
EGIHO MWZZC PQNTF WOYBM IATKH GLUXL WRNBO QHVPU QVPAS CRQPN
GYKWE IFPBV HYNNA XDROR WZENB ZDDDW EJOQN QJWQZ YAJVN XPCQM
IAPDQ YHAZQ MEKCV FFUXL RMKWQ FIHUS SRJQL YBIUW EIPUB NEVOD
VSOLZ HOMOA RLWNK QBSHI AUMXE FMGRF QOJFM JDBMS IESQJ AXXXX
IIHFF DJNBC

LLZ DE ZZZ 6350KCS 231746T UBM-99/00368

1112 3323 1710 9518 0664 9000 4178 7715

HAIHA FDHDE GCBMX SQCYH KDKVY AXUXQ LSYUZ JQYAD FNFQC PJDXG
VBHDF SGOYC CJNQM FRTNW LJPRT IVDXG QAPHC FWDFO FWQFH WDRHP
WBURI YNAQF XDQAW HVYBH ORKDQ UUVVC YDGBZ BSETV RJLAA QUYXM
WEAPT LEJXE JBIRE BHBRY EUEOS YZLHI QTSHC LGMUL HRZNP PUGLF
TAWWZ BNIDZ RYPZC NBCEL RCRQD LPCBT DBNGL UGWNX BRSLN AYRRM
QUDQB TYDPH HBWKQ ZBAJR OZQAQ EYVKC NQVJQ GRDOY QMSXH CPTKK
GJHSV YNHFA DMREV CYWGR SZZAQ XUQHV SXNHZ KNJKO REGBN XECBC
YDJDK CSZZI LHBPU YIZEX RYHZX HAIHA FDHDE

FBG DE NIO 4895KCS 231913T UBM-99/00369

8042 0123 1825 2750 9054 2124 3313 9801

DDHAA GQNKW NKOLR KSPIX JZJZU VTFRF SBWRS ERQAS YKOLQ GGGWZ
FTGWF DOVGM JUTXL OOOKG SXYNV UJLMB FXHAX BPRHN IZHRT HPBEJ
BWQAW JYFLY JSAMH HIGGW FRENT GKMDO BYTUB CJTAK CRZJC TDFWM
VDPPO NYKJY KQAIR XSTYQ DDRIY SMKXM MPJQM ISLJL PKQFA VOUIZ
AABHC JUWFD DVUAN XFVCI JNADT XROKV EUWPK OUIIN OAOQG GBSVD
KJNBZ KQSWJ IWMKC EIDBG IDGSA AKBFE KCJFW CRKJG ZBVAK GJYAL
VKYEN VKFEN JXAKK TFFSQ IXQUY ZNFOT BXZWO WXXFW IRVJY DCKRN
ZOILE PFIHY XCACD DFEKB XMNTQ IWKRK GVYEW ZTUCW OQFWN BFFJD
HZVKP OXBVE DUYFR JKVEA RRPZO LLJVH CQYBZ DZARL HNMVD NFMBZ
ZRYZW FARUB PNLCC VCWZV SFKQG NZHXX DDHAA GQNKW

NVU DE KVW 2515KCS 232347T UBM-99/00370

4172 8223 2250 4775 6010 7994 3278 7045

DDHAA WGZQK GSPHY OANPD UTUNX RZEHI QHJMZ DXDTG JSJKI ZHUTI
HOAMH FRMLJ QJBKT JOTUO MXEUW RBOSX TYZMR KLZVD IZQOJ GABTH
WFWJT EIKHA UPCWX LCMQX KLXOC JCEUS OOILA MKKUG LMUKT IGPDF
IZAAX WOFAF SOJZI GIQJD HBUWK QDSPF EBNPY UVTEP YYAJR DDTLA
SHMND PPOSO BJAGJ JPCHA ATETB ISTGV QQPZZ HNWBD FBRDM WGLZQ
TQAMW KEIPW QEYGL HLDMM RSEYG UNPOX XDZQB GKTJF TWCTM NJRRK
QJFUQ UYSLF QNBQV KCRSZ SWXBP BZXPK ISTKG GXAEH DDHAA WGZQK

FBG DE ZHK 2420KCS 231902T UBM-99/00371

1520 2823 1745 2750 4257 4212 3313 5701

FFBGG KJDHB ZVQFP RVONA XXERP SEOHO YXRGA UGGOM RSUBN MNODF
ASLJZ YWDWK KEDZU ZABSW JKMQC BQCXR ALSVP OZAOH WEQYY ANNGZ
JJPEE PDHPZ WDTAB HSHMQ BCSIH TOITP YMRBJ TGGSD JSEDT KONIB
MZTFN BGYQC RQWBW IDBYY EKSLF AMIDH UVENV NKEKM FZNCQ FMKKP
WSOUI RSZST RSVXB EHIAF XRWIM USSPI HZEKQ ACFDA XAAOU BAMVL
EUXHB KOXBM GVCCA KXIQM AYSRG FFBGG KJDHB

DYO DE MLH 2020KCS 231921T UBM-99/00372

3526 5223 1705 6530 0611 7525 3917 7616

IIHFF BHLBC MPPGX KVJHB ZJUBI ZIBLQ LAKMX MPQMS DZPWO HDAJB
PQQJV GRKJC PDYJG UPQUP FJXJP AXUNR EJAYB TFHYP JOMUX AASKG
STWKM NMIKU RVHMP AKHYT YNMBQ WZFOG WXFLC YQOVS DGISH QRMLE
WUSRI CYPNW GCZSZ WYRZR QFAQM QXOKI YKBXY CYKLY ZZKBP ONPIT
FKHBW UAQNX GDPCM YWBCW DTPUU HJWVF ORGKZ HPOFD UWXVQ BMHQH
ZUPMW IDXBN NHEDM HTKZL SYCAG DMJDE KPFOJ TMHBC FWTRI VPJKL
SLCMA YAOFA WSGFH DGKWM VBCJL IKSIS CITBQ RQMUR TKCIY IUIKO
ORBOA URDUH SPTDA SJVIX IIHFF BHLBC

NIO DE HOU 2220KCS 232010T UBM-99/00373

4522 4323 1935 6350 3456 7101 2125 5324

DCGCD GMSNW QOUPS AMUYZ RDDYD EAQJC FQPQZ KDGXB JAVJL TPWRM
ERYXM SKGAI SYJFW TBFLR YFUOC DWMXX JHBCY BTFGS CBUZL PSHGL
RIEFD VGPKW YDUOZ IPOJY SXDQG LMNUZ WCHMC ZENFB LAMZC PKNRI
AGPRC GBEWF NBGNL JRVQO AAZKS YGHYX CGEFU BBACC JTTTE LEQVR
UICFD KCPPI VLTUT EXQRT UVEYO SBTTQ DAFJR MNNUH CTURJ VCEPG
MSUPX DCGCD GMSNW

EDH DE MXU 2700KCS 232312T UBM-99/00374

0526 6023 2200 5504 5445 6616 5267 5518

CCFII ZZYTP NEDGQ TAIXB AIBQV MCBYS MVUPM BVKFB CAXDT HDALX
HOLNM ICKIV DYNPV LJFPO YPWOE WQVMC BYSMV UCDBK LJGCQ XDKIM
OPRUY HDWPI TRLMR LJTYF NLKNT XCJAB APDVF GIWBO DYEGK FBPWM
RBUDP GMOKI ATRDF HQBWN UEOPS YOXLV SLIWA JMFWJ YAUMS IGZRZ
MPEFT RWLSW ROEPC GSTAL VJKEC GZOYP YGWGQ UBOIW TKCXW VYZCH
OBTCA DTYPG IWIPZ CCFII ZZYTP

FBG DE ZHK 2420KCS 232309T UBM-99/00375

1540 3823 2225 3731 7263 1774 2549 3622

FFBGG FLIQI HQKMC FBGAM AVBIS MJKOL KNSFG KWIBO UVMUT AZTGY
LVIFB KVYNH MXYFZ IHYFJ RKHIB LZIOL DDBXI THPXL GVBVX TCMFR
RVBPK RRCII QYVXH DWQMB VNJZW RSKBC XVTHB RPIRT DPAOJ LRYFM
YOWPH TCZGG VBZRA GOUKT FFBGG FLIQI

614

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C. Digest of Zendian operator chatter, 23 December

0317T ???/??? ???/3990KCS (BROKE IN)

DE ??? -FTER LAST NIGHTS TRBL THE CAFE FEMINA HR IN LIVORNO IS OFF LIMITS - HENRIKO WAS PULLED IN BY MILPOLS AR

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0332T OAL/ZCA ???/3160KCS

DE ZCA. C ON MY CALL SIGN - SHD BE RHW RPT RHW QTC 1

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0427T GFH/FZX ???/3760KCS

DE FZX I JUST LOOKED IT UP - 333 REGT BASE TRINOME IS 467 - SO HIS TRINOME TODAY IS 824

0429T DE FZX DONT MENTION IT - ANYTIME AR

(OP. NOTE - CALL SIGNS HRD ONLY ON INITIAL CONTACT)

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0532T FMT/VXI ???/2860KCS

DE VXI HELLO - WHERE HV U BEEN LAST 2 DAYS?

0534T DE VXI YES - THATS QUITE A FEW - SAY - I THINK LUNAR CAUSTIC WILL DO THE JOB FOR U - IT WORKED REAL WELL WITH 1 I HAD

0535T DE VXI THATS OK - HOPE IT WORKS AR

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0618T OAL/NVT ???/5945KCS

DE NVT QTC 1561

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0706T DYO/ZZZ ???/6350KCS

DE ZZZ C GR 6-7 WTBDV YPYNF - PLS NOTE THIS MSG TOPSEC

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0738T XTG/IZW ???/6260KCS

DE IZW HEY PLS ASK BARTOLOMEO KARADINO IN 312TH WHEN HES GOING TO COME ACROSS WITH THE 10 SPESMILOJ HE OWES ME - DANKON AR

(OP. NOTE - CALL SIGNS HRD ONLY ON INITIAL CONTACT)

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0811T TPY/BWO ???/7990KCS

DE BWO UR LAST MSG - C GR 58?

DE BWO R - HEY BARTOLOMEO - KLARENCO IS WORRIED ABOUT HIS 10 SPESMILOJ - OPS AT 3 CORPS HAD BIG CHEMIN DE FER GAME LAST NIGHT AND KLARECHJO LOST HIS SHIRT

0813T DE BWO OK ILL TELL HIM AR

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0924T ZZZ/DYO ???/6260KCS

DE DYO QTC 1 URG

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0932T POH/ZHK ???/6660KCS

DE ZHK UR NR 951 - C ORIG 2340?

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0948T ???/YRG ???/7595KCS

DE YRG YES - GR ON MY LAST MST SHD BE 72

0949T DE YRG OH HES NO LONGER HR - WAS TRFD TO 4 CORPS STN AND RODRIGO ASGD YEST TO 62 DIV AR

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0952T ???/FBP ???/7940KCS

DE FBP OUR CALL SIGN YSTDY WAS SAME AS MY BROTHERS INITIALS, WNT

0954T DE FBP YES, AND DID U NOTICE LTRS IN TOP STRIP THAT SORT OF LOOKED LIKE NAME OF A DUTCH PORT?

0957T DE FBP OK OK. SORRY. NO HARM DONE

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1005T FZX/VXI ???/6860KCS

DE VXI C GR 59?

DE VXI R - WHAT U NO ABOUT FIRST ARMY POLICY RE CHRISTMAS FURLO FOR US JOKERS? NIL HRD YET FROM DIV HQ BY US IN 321ST

1007T DE VXI OK OK - DIDNT SAY ANYTHING

DE VXI SORRY - OK NO MORE CLEAR TALK - QTC?

1008T DE VXI R AR

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1005T PVK/AAA ???/6405KCS

DE AAA OUR LEADER JUST CAME THRU ON TOUR WITH GEN CAMPAGIANO - MARSHAL SALASIO COMPLIMENTED HIM ON GEN APPEARANCE AND HIGH MORALE OF EM AT SECOND ARMY HQ

1008T DE AAA YES - AND TO THINK THAT THE AMERICANS WOULD INVADE OUR BELOVED SHORES ON VERY ANNIVERSARY OF SALVO SALASIOS BIRTHDAY - HR CMS WATCH CHIEF - LETS GET OFF AIR AR

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1013T EDH/HCO ???/6030KCS

DE HCO IF OUR REGT MOVED ANY FURTHER WEST WE'D BE IN THE PACIFIC

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1029T INJ/GFH ???/6460KCS

DE GFH NO, FMT IS ON MY RIGHT

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1042T DYO/ZZZ ???/6350KCS

DE ZZZ THINGS SURE ARE HUMMING HR SINCE GEN KIRCHENFALL TOOK OVER - OFF AND EM ALIKE AT FIRST ARMY HQ HV TO STAY ON BALL WITH GORGEOUS GOTTFRIED AROUND AR

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1132T XTG/OAL ???/7830KCS

DE OAL WE IN 23 DIV GETTING DAILY REPLACEMENTS - HOWS YR OUTFIT?

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1235T SFV/MKP ???/7320KCS

DE MKP AFTER COL FULGURITO PUT OUT REGTL ORDER ON PASSES IT LOOKS LIKE I WONT GET IN TO KALEDONIO TO C U AR

(OP. NOTE - OPR AT MKP USES VVV FOR TUNING INSTEAD OF STANDARD ZZZ AS USED BY OTHER OPS)

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1239T ???/MLH ???/6340KCS

DE MLH ISNT YR CORPS SCHEDULED TO BE COMMITTED SOON?

DE MLH OH, ONLY 13 DIV. WHEN?

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1327T NVT/RBU ???/6620KCS

DE RBU ? GR 1-2 UR 623 OF 231240

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1348T HCO/EDH ???/6170KCS

DE EDH SUPPLY JUST GOT SHPMT NEW TYPE OVERCOATS - HOPE WE GET THEM BEFORE CHRISTMAS - HOW ABOUT U BOYS?

1350T DE EDH WELL KEEP HOPING - TELL FERDINANDO I GOT ANOTHER LTR FM HIS SISTER - SHE LIKES HER NEW JOB IN BONAREO AR

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1429T ???/UNK ???/6220KCS (OP. NOTE: BROKE IN)

DE UNK U BOYS IN REGT HQ OUGHT TO GET OUT OF UR EASY CHAIRS AND SEE WHAT GOES ON WITH US COMBAT TROOPS AR

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1519T FBG/POH ???/7640KCS

DE POH OUR CG JUST GOT A BUMP - THOSE 3 STARS SURE LOOK GOOD ON GEN VESPASIANO AND THEY GO BETTER WITH HIS JOB

1521T DE POH NO I DIDNT NO THAT

1522T DE POH SURE I WILL - SOON AS I GET CHANCE AR

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1529T NVT/RHW ???/7120KCS

DE RHW RENALDO GOT GIGGED YSTDY FOR USING WRONG PAD

1530T DE RHW JUST CARELESS, I GUESS

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1537T ???/??? ???/6070KCS

DE ??? SURE, TPY IS JUST EAST OF ME BUT IM NOT ALLOWED TO CALL HIM DIRECTLY

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1548T DYO/MLH ???/6340KCS

DE MLH LUDOVIKO JUST LEFT FOR ARMY HQ TO HELP OUT ON RADIOPRINTER LINK

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1608T EOU/UBT ???/6890KCS

DE UBT I HR OUR REGT WILL TEAM UP WITH U BOYS IN THE 331ST FOR ELIMS IN THE 33 DIV CHESS TOURNEY - HV U HRD ANYTHING RE THIS?

1610T DE UBT SAY HELLO TO NIKOLO FOR ME - WONDERED WHY I DIDNT HR HIM LAST 2 DAYS - SORRY TO HR HES IN HOSP AR

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1805T ZHK/NIO ???/6130KCS

DE NIO QSY 4895?

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1814T WNN/ZCA ???/3160KCS

DE ZCA WHEN U CMG BACK TO ESTAMINO? SURE MISS U SINCE U TRFD TO 212TH

1820T DE ZCA TOUGH - WELL THATS THE ARMY AR

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1848T IZW/CUN ???/4265KCS

DE CUN C CLASS 7837?

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1922T ???/VXI ???/2860KCS

DE VXI MY BUDDY LEONARDO ON MTN PATROL SAYS THE NEW PEMMICAN ISNT BAD AT ALL - GUESS THAT JOBS GETTING POOR LEONCHJO

1923T DE VXI NO I HAVENT HAD ANY IN A LONG WHILE

1925T DE VXI GUESS SO - THINGS TOUGH ALL OVER AR

* * * * *

2024T TPY/HDG ???/3200KCS

DE HDG CASUALS ARVD TODAY FM MY HO-- --WN - WISH I WERE BACK -N VALONO

2026T DE HDG NO I D--T THINK SO - THEY CANT GET AN--HER OPR HR

2027T DE HDG WELL THERE GO SIRENS AG-IN - THOSE AM--ICANS KEEP US BUSY RUNNING IN AND --T OF SHELTERS EVEN IF THEY DONT DROP MUCH XCPT LEAFLETS -

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2107T FBG/NIO ???/2250KCS

DE NIO HR Ø1 AUTHS GOING OUT FOR PRAC TFC

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2219T NVU/XZJ ???/3255KCS

DE XZJ HR THAT 53 DIV IS MOVING UP TMW - WE ARE ALL ITCHING TO GET CRACK AT THE AMERICANS AR

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2248T TOJ/FHI ???/3670KCS

DE FHI STARTING TMW MORN FILE TIMES ARE TO BE GIVEN IN EXACT TIMES, NOT NEAREST 5.

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2312T XYR/VLH ???/2990KCS

DE VLH AHA - THE FALKBEER! WELL - HERES MY ANSWER - 2 EEEEE PEQ4 3KPXP

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D. Callsign listing, 23 December

00143	AAA	AAA	5820	231018	003	251	230940	0120	0420	9262	7319	49	19	IIHFF
00087	CUO	AAA	6405	230806	753	243	230745	3749	1663	9262	7742	37	06	BEGBE
00016	PVK	AAA	2685	230317	602	215	230235	9969	7046	9262	3061	48	08	II4FF
		3												
00221	GXW	BWO	4095	231448	001	668	231400	4775	3058	3565	8156	39	17	JCCJC
00201	HDG	BWO	7990	231350	104	658	231035	2750	9054	3565	6707	91	10	CFIFC
00308	HDG	BWO	7990	231642	108	677	231600	1101	8423	3565	6707	44	28	CFIFC
00038	NIO	BWO	4095	230536	301	640	230455	1561	6442	3565	2125	67	12	CEHCE
00120	NIO	BWO	7990	230913	302	647	230825	9518	6010	3565	2125	49	28	CFIFC
00254	NIO	BWO	7990	231427	306	658	231035	1120	7803	3565	2125	87	10	CFIFC
00351	NIO	BWO	3990	232249	310	680	232130	3731	3456	3565	2125	50	19	DCGCD
00024	TPY	BWO	3990	230337	203	632	230210	5504	1476	3565	9713	59	30	CFIFC
00202	TPY	BWO	7990	231218	205	658	231035	0121	5445	3565	9713	85	10	CFIFC
00318	TPY	BWO	3990	231922	208	679	231830	9942	7263	3565	9713	59	22	CFIFC
		10												
00036	IZW	CUN	4265	230557	952	195	230515	1101	5074	2241	9083	58	38	AGHAG
00121	IZW	CUN	7720	230913	955	202	230740	6530	9054	2601	0956	89	27	DDHAA
00226	IZW	CUN	7720	231449	956	225	231415	1561	3698	7741	3917	35	23	AGHAG
00159	WNN	CUN	7720	231018	254	207	230900	6350	3456	4366	3395	54	42	FFBGG
00286	XTG	CUN	4265	231754	452	228	231650	8140	2664	7741	8156	71	41	FFBGG
		5												
00239	AAA	CUO	7735	231521	255	452	231445	8140	5237	4618	7319	61	24	IIHFF
00242	MKR	CUO	7735	231546	453	454	231505	3749	0665	1549	3278	53	26	IIHFF
		2												
00266	LLZ	DYO	6260	231541	653	855	231450	8140	2645	9749	4493	91	41	IIHFF
00218	MLH	DYO	6260	231358	452	850	231315	0732	5218	5815	4259	74	29	IIHFF
00302	MLH	DYO	6260	231612	453	854	231430	2750	3456	9749	2198	64	35	IIHFF
00326	MLH	DYO	2100	231936	454	858	231700	6530	5445	5815	4259	55	34	IIHFF
00125	ZZZ	DYO	6260	230929	503	832	230900	9192	4803	9541	3755	45	46	ABCAB
00135	ZZZ	DYO	6260	231156	504	840	231105	4775	8820	9749	6644	53	22	IIHFF
00267	ZZZ	DYO	6260	231511	508	849	231300	9942	7263	9640	8110	86	32	IIHFF
00268	ZZZ	DYO	6260	231404	507	847	231235	0121	1476	9541	3755	76	27	IIHFF
00303	ZZZ	DYO	6260	231602	510	853	231420	6530	2664	5815	7094	74	29	IIHFF
00327	ZZZ	DYO	2100	231910	511	857	231625	3731	4257	9749	6644	76	40	IIHFF
		10												
00113	FSD	EDH	6170	230939	452	487	230900	0121	3456	6977	7238	28	41	DAEAD
00299	MXU	EDH	6170	231603	552	503	231515	5504	7803	6977	2558	44	20	DCGCD
00015	ZIC	EDH	2210	230212	153	480	230125	4775	1663	6977	5726	44	37	BGIBG
00126	ZIC	EDH	6170	230809	155	485	230730	1561	3698	6977	5726	34	43	BGIBG
00208	ZIC	EDH	6170	231323	159	492	231145	6530	1476	6977	5726	79	35	DAEAD
00209	ZIC	EDH	6170	231348	160	492	231145	6530	1476	6977	5726	74	35	DAEAD
		6												
00373	NIO	EOU	2220	232010	452	243	231935	6350	3456	7101	2125	53	24	DCGCD
00344	NIO	EOU	2220	232148	453	245	232105	2750	2664	7101	2125	37	28	CCFII
00093	UBT	EOU	4565	230609	952	225	230435	2110	8820	7101	9803	31	23	CCFII
00012	YWP	EOU	2220	230313	552	221	230240	3749	0420	7101	4718	37	28	CBECB
00057	YWP	EOU	2220	230528	554	224	230435	1101	7046	7101	4718	58	39	AEFEA
00177	YWP	EOU	6140	231146	555	236	231100	6530	9054	7101	4718	44	29	CCFII
00241	YWP	EOU	6140	231437	556	239	231350	3731	5445	7101	4718	32	26	DCGCD
		7												

00279	NIO	FBG	6830	231618	054	494	231505	2110	1476	7435	8912	43	01 FFBGG
00353	NIO	FBG	2910	232352	055	511	232300	5504	7803	7435	8912	35	25 FFBGG
00364	POH	FBG	6830	231305	206	483	231130	9942	3456	7435	5942	57	22 FFBGG
00052	POH	FBG	2910	230408	204	468	230320	3749	4257	7165	4493	56	20 FFBGG
00170	POH	FBG	6830	231458	207	490	231415	6350	0611	7435	5942	75	28 DDHAA
00171	POH	FBG	6830	231536	208	493	231445	1120	7820	7435	5942	97	18 DDHAA
00188	POH	FBG	6830	231748	209	503	231705	6530	5445	5121	2666	79	28 DDHAA
00320	POH	FBG	2910	231956	211	508	231840	3731	2664	7165	4493	47	26 FFBGG
00189	ZHK	FBG	6830	231728	904	497	231635	2750	7263	7435	3151	93	01 DDHAA
00280	ZHK	FBG	6830	231702	903	495	231610	8943	8820	7435	3151	48	35 FFBGG
		10											
00359	FHI	FBP	4105	231820	506	840	231735	6530	4257	4122	8327	83	20 80808
00366	FHI	FBP	7940	231558	503	837	231525	3749	1871	4122	8327	59	30 80808
00178	FHI	FBP	7940	231041	501	834	231010	4775	8423	4122	8327	25	34 80808
00282	FHI	FBP	7940	231745	504	838	231650	8943	3456	4122	8327	54	34 80808
		4											
00105	FBP	FHI	7510	230836	852	612	230600	0121	7803	6869	5447	96	22 28082
00106	FBP	FHI	7510	230851	853	612	230600	6530	5445	6869	5447	82	22 28082
00212	SFV	FHI	7510	231332	754	615	231220	2750	1476	7642	6536	60	22 DCGCD
00252	SFV	FHI	7510	231451	757	619	231345	0121	7263	6869	5320	77	44 DJDJD
00262	SFV	FHI	7510	231518	758	619	231345	0121	7263	6869	5320	80	44 DJDJD
00300	SFV	FHI	7510	231704	759	626	231610	8943	7803	6869	5320	57	44 DJDJD
00069	TOJ	FHI	5335	230712	651	612	230600	2110	0611	6869	5609	83	23 80808
00070	TOJ	FHI	7510	230723	652	612	230600	2110	0611	6869	5609	59	46 GIFIG
00025	UNK	FHI	3670	230208	451	608	230115	9942	3456	6869	7904	60	29 80808
00107	UNK	FHI	7510	230804	452	612	230600	3731	4257	6869	7904	71	36 GIFIG
00108	UNK	FHI	7510	230816	453	612	230600	5504	8820	6869	7904	63	42 80808
		11											
00109	FZX	FMT	7340	230823	753	394	230745	0121	2664	8678	1360	65	29 EGBGE
00213	FZX	FMT	7340	231208	755	399	231130	3731	9054	6850	0172	39	17 EGBGE
		2											
00046	HCO	FSD	5805	230549	351	650	230500	2110	7803	1161	8219	34	05 DAEAD
00013	ZIC	FSD	2400	230354	251	647	230310	8140	7487	1161	5726	46	25 HDBHD
00122	ZIC	FSD	6680	230930	254	655	230825	4775	0420	1161	5726	31	22 HDBHD
00157	ZIC	FSD	6680	231037	256	662	231000	4369	5218	1161	5726	35	27 DAEAD
00253	ZIC	FSD	6680	231550	259	668	231435	6530	2664	1161	5726	45	05 DAEAD
		5											
00035	FMT	FZX	3760	230513	501	191	230420	9518	7487	7741	2620	44	18 GHEGH
00162	FMT	FZX	7720	231052	502	210	230945	2750	7263	7741	2620	64	27 CCFII
00255	FMT	FZX	7720	231406	503	221	231115	3731	0611	7741	2620	84	24 EGBGE
00334	FMT	FZX	3760	232114	507	230	232000	5504	4257	7741	2620	63	32 EGBGE
00203	GFH	FZX	7720	231254	305	221	231115	0121	5445	7741	6743	85	24 EGBGE
00288	GFH	FZX	7720	231723	306	227	231610	6350	3456	7741	6743	56	28 DCGCD
00361	LYD	FZX	4265	230751	001	199	230700	3749	0420	7741	0172	48	12 JAAJA
00147	VXI	FZX	7720	231106	601	214	231020	9329	2239	7741	3070	40	18 HBJHB
00160	VXI	FZX	7720	231119	604	212	231000	8943	7803	7741	3070	41	24 EGBGE
00161	VXI	FZX	7720	231138	605	212	231000	8943	7803	7741	3070	66	24 EGBGE
00287	VXI	FZX	7720	231658	606	221	231115	9942	3456	7741	3070	91	24 EGBGE
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00269	DYP	FZY	7735	231452	663	449	231400	0120	3644	4618	3494	69	38 FFBGG

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00329	DYO	LLZ	4965	231814	551	659	231715	5161	3644	8146	3917	72	31 IIHFF
00305	MLH	LLZ	7640	231613	152	654	231500	8140	7803	1639	3485	70	41 IIHFF
00017	ZZZ	LLZ	3520	230236	601	612	230140	9329	5074	8146	7094	80	17 HAIHA
00018	ZZZ	LLZ	3520	230259	602	612	230140	9329	5074	8146	7094	60	28 HAIHA
00060	ZZZ	LLZ	3520	230542	606	617	230355	3731	9054	8146	7094	00	39 IIHFF
00272	ZZZ	LLZ	7640	231419	608	645	231330	7753	0889	8146	7094	80	32 IIHFF
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00153	FHI	MKP	7320	231012	451	600	230925	3731	0611	6625	8327	43	26 DJDJD
00071	GKW	MKP	4925	230634	201	588	230515	8943	7263	6625	9399	75	28 95459
00250	GKW	MKP	7320	230925	203	591	230620	5504	3456	6625	9399	48	11 ECHCE
00314	GKW	MKP	3440	231947	206	626	231830	2750	9054	6625	9399	96	32 50505
00116	HZY	MKP	7320	230815	501	596	230750	9329	1871	6625	6473	26	20 50505
00180	HZY	MKP	7320	231124	503	604	231000	2110	8820	6625	6473	90	28 95459
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00335	HZY	MKP	3440	232057	506	626	231830	1120	7263	6625	6473	70	14 ECHCE
00245	MRS	MKP	7320	231509	652	615	231435	8943	5445	6625	0091	51	28 CCFII
00117	PSD	MKP	7320	230849	301	591	230620	3731	3456	6625	1243	70	24 28082
00313	PSD	MKP	4925	231916	302	626	231830	9942	0611	6625	1243	86	24 95459
00072	SFV	MKP	7320	230725	052	593	230645	0120	3698	6625	5320	69	26 BCEBC
00123	SFV	MKP	7320	230953	054	598	230900	9942	2664	6625	5320	60	34 DJDJD
00152	SFV	MKP	7320	231136	060	607	231040	6530	1476	6625	5320	45	32 DJDJD
00163	SFV	MKP	7320	231004	055	598	230900	9942	2664	6625	5320	73	34 DJDJD
00246	XYR	MKP	7320	231553	902	620	231500	2110	4257	6625	8444	29	24 CCFII
		15											
00301	CUO	MKR	6355	231733	604	562	231655	3731	0611	3222	7742	44	44 IIHFF
00372	DYO	MLH	2020	231921	352	652	231705	6530	0611	7525	3917	76	16 IIHFF
00346	DYO	MLH	2020	232037	355	655	231830	3731	9054	9109	7300	56	22 IIHFF
00063	LLZ	MLH	6340	230718	251	616	230545	2110	7263	7525	5942	58	24 IIHFF
00367	ZZZ	MLH	6340	231441	711	646	231330	9942	1476	9109	6644	92	27 IIHFF
00020	ZZZ	MLH	2020	230347	702	590	230315	3973	7487	7525	7094	90	28 FEAFE
00059	ZZZ	MLH	2020	230551	703	594	230430	4775	2239	7525	7094	63	30 IIHFF
00064	ZZZ	MLH	6340	230659	704	611	230525	8140	3644	4447	0127	96	31 IIHFF
00137	ZZZ	MLH	6340	231008	705	627	230830	8943	4257	4339	8110	70	24 IIHFF
00138	ZZZ	MLH	6340	231023	706	627	230830	8943	4257	4339	8110	56	24 IIHFF
00219	ZZZ	MLH	6340	231354	709	640	231230	5504	3456	7525	7094	53	20 IIHFF
00220	ZZZ	MLH	6340	231337	707	638	231215	1120	5445	7895	9119	84	37 IIHFF
00270	ZZZ	MLH	6340	231539	720	646	231330	9942	1476	9109	6644	95	40 IIHFF
00271	ZZZ	MLH	6340	231426	710	643	231305	2750	4257	9109	6644	80	33 IIHFF
00304	ZZZ	MLH	6340	231612	721	646	231330	9942	1476	9109	6644	99	20 IIHFF
		14											
00155	MKP	MRS	6900	231037	502	832	230940	5504	3456	8669	5762	62	16 CCFII
00151	WNN	MRS	6900	231032	902	833	230945	9942	1476	8669	8408	33	30 HBJBH
00078	ZCA	MRS	4845	230623	753	825	230540	4775	3644	8669	1081	43	38 HBJBH
00111	ZCA	MRS	6900	230927	755	829	230810	1120	2664	8669	1081	43	18 HBJBH
00150	ZCA	MRS	6900	231158	758	838	231100	3731	3456	8669	1081	37	36 HBJBH
		5											
00374	EDH	MXU	2700	232312	052	660	232200	5504	5445	6616	5267	55	18 CCFII
00207	MRS	MXU	6380	231257	151	639	231210	2110	7263	6616	0091	28	32 CCFII
00331	WNN	MXU	2700	232026	352	658	231935	6350	3456	6616	8408	58	21 DCGCD
00360	ZCA	MXU	2700	230310	653	629	230215	1561	1663	6616	1081	43	13 GEBGE
00259	ZCA	MXU	6380	231506	657	642	231420	9969	8423	6616	1081	59	36 HBJBH

00260 ZCA MXU 6380 231528 658 642 231420 9969 8423 6616 1081 42 36 HBJBH
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00369 FBG NIO 4895 231913 804 201 231825 2750 9054 2124 3313 98 01 DDHAA
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00168 POH NIO 6130 231152 104 169 231045 9969 8423 2124 5942 84 01 DDHAA
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00127 RBU NVT 6340 230822 504 619 230600 3731 9054 7525 5726 87 28 FFBGG
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00019 RHW NVT 2020 230242 102 587 230205 4775 2645 7525 1081 36 38 AJAAJ
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00194 WPX NVT 5945 231351 003 644 231310 9969 4606 7525 4259 35 36 JBBJB
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00330 WPX NVT 5945 231902 004 654 231815 3749 5218 7525 4259 58 20 JBBJB
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00067 XYR SFV 4795 230613 801 394 230525 3749 2645 5086 8444 49 31 DCGCD
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7

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00356 NVU XZJ 3255 232306 113 410 232220 9329 2645 2683 1676 63 27 DDHAA

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E. Frequency listing, 23 December

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00005 SFV XYR 2310 230054 351 631 230005 8140 7487 8641 5320 66 30 EGBEG
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00026 YWP UBT 2850 230347 652 493 230310 1561 6010 6832 4718 39 23 AEFEA

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00306 FMT VXI 4165 231712 701 753 231600 3731 2664 6940 2620 75 14 CCFII

00091 XYR OWN 4235 230620 951 681 230605 7932 8423 5095 8444 68 31 JAAAJ

00036 IZW CUN 4265 230557 952 195 230515 1101 5074 2241 9083 58 38 AGHAG
00286 XTG CUN 4265 231754 452 228 231650 8140 2664 7741 8156 71 41 FFBGG
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00186 ALL ZCA 4405 231326 001 035 231210 3749 1663 2610 1081 43 02 JIIJI
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00093 UBT EOU 4565 230609 952 225 230435 2110 8820 7101 9803 31 23 CCFII

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00362	FHI	UNK	6220	231006	903	760	230920	1120	5445	1972	8327	32	20	GIFIG
00101	FHI	UNK	6220	230922	901	758	230900	3749	7263	1972	8327	45	16	50505
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00266	LLZ	DYO	6260	231541	653	855	231450	8140	2645	9749	4493	91	41	IIHFF
00218	MLH	DYO	6260	231358	452	850	231315	0732	5218	5815	4259	74	29	IIHFF
00302	MLH	DYO	6260	231612	453	854	231430	2750	3456	9749	2198	64	35	IIHFF
00125	ZZZ	DYO	6260	230929	503	832	230900	9192	4803	9541	3755	45	46	ABCAB
00135	ZZZ	DYO	6260	231156	504	840	231105	4775	8820	9749	6644	53	22	IIHFF
00267	ZZZ	DYO	6260	231511	508	849	231300	9942	7263	9640	8110	86	32	IIHFF
00268	ZZZ	DYO	6260	231404	507	847	231235	0121	1476	9541	3755	76	27	IIHFF
00303	ZZZ	DYO	6260	231602	510	853	231420	6530	2664	5815	7094	74	29	IIHFF
00363	CUN	IZW	6260	231124	204	837	2310'0	3731	1476	5815	0172	59	24	DDHAA
00132	CUN	IZW	6260	230903	201	824	230640	6350	3456	9749	2396	81	24	DDHAA
00184	CUN	IZW	6260	231318	207	844	231140	2110	9054	9640	1360	70	31	DDHAA
00166	WNN	IZW	6260	231008	308	829	230820	2750	7263	9640	5230	83	11	DDHAA
00247	XTG	IZW	6260	231433	101	852	231400	3749	3698	5815	8156	27	29	GBIGB
			13											
00063	LLZ	MLH	6340	230718	251	616	230545	2110	7263	7525	5942	58	24	IIHFF
00367	ZZZ	MLH	6340	231441	711	646	231330	9942	1476	9109	6644	92	27	IIHFF
00064	ZZZ	MLH	6340	230659	704	611	230525	8140	3644	4447	0127	96	31	IIHFF
00137	ZZZ	MLH	6340	231008	705	627	230830	8943	4257	4339	8110	70	24	IIHFF
00138	ZZZ	MLH	6340	231023	706	627	230830	8943	4257	4339	8110	56	24	IIHFF
00219	ZZZ	MLH	6340	231354	709	640	231230	5504	3456	7525	7094	53	20	IIHFF
00220	ZZZ	MLH	6340	231337	707	638	231215	1120	5445	7895	9119	84	37	IIHFF
00270	ZZZ	MLH	6340	231539	720	646	231330	9942	1476	9109	6644	95	40	IIHFF
00271	ZZZ	MLH	6340	231426	710	643	231305	2750	4257	9109	6644	80	33	IIHFF
00304	ZZZ	MLH	6340	231612	721	646	231330	9942	1476	9109	6644	99	20	IIHFF
00084	OAL	NVT	6340	230648	605	619	230600	1120	4257	7525	5320	87	36	FFBGG
00085	OAL	NVT	6340	230709	608	624	230640	6960	3058	7525	5320	80	37	CJCCJ
00086	OAL	NVT	6340	230714	609	624	230640	6960	3058	7525	5320	36	34	CJCCJ
00127	RBU	NVT	6340	230822	504	619	230600	3731	9054	7525	5726	87	28	FFBGG
00290	RBU	NVT	6340	231602	507	650	231520	9329	4094	7525	5726	43	29	DCGDC
00128	RHW	NVT	6340	230914	104	619	230600	2750	2664	7525	1081	84	32	DDHAA
00129	RHW	NVT	6340	230949	105	619	230600	2750	2664	7525	1081	83	32	DDHAA
00142	RHW	NVT	6340	231046	109	632	231010	9518	5237	7525	1081	35	21	AJAAJ
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00061 DYO ZZZ 6350 230704 406 151 230640 6320 5433 3637 1577 77 21 ABCAB
00228 DYO ZZZ 6350 231412 409 202 231320 5161 9054 6445 7300 90 29 IIHFF
00274 DYO ZZZ 6350 231629 413 219 231535 9942 8820 6445 7300 58 16 IIHFF
00368 LLZ ZZZ 6350 231746 111 233 231710 9518 0665 9000 4178 77 15 HAIHA
00134 LLZ ZZZ 6350 231034 106 181 231000 8121 2645 4104 4754 66 33 HAIHA
00227 LLZ ZZZ 6350 231451 108 208 231415 0732 3644 4258 5942 67 17 IIHFF
00099 MLH ZZZ 6350 230822 304 154 230710 9942 7803 4258 4259 97 32 IIHFF
00139 MLH ZZZ 6350 231051 307 177 230945 8140 8820 4258 4259 91 26 IIHFF
00140 MLH ZZZ 6350 231118 308 177 230945 8140 8820 4258 4259 90 32 IIHFF
00141 MLH ZZZ 6350 231136 309 177 230945 8140 8820 4258 4259 92 19 IIHFF
00248 MLH ZZZ 6350 231528 313 211 231450 3973 1871 8236 4033 80 32 FEAFE
00249 MLH ZZZ 6350 231541 314 211 231450 3973 1871 8236 4033 52 11 FEAFE
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00301 CUO MKR 6355 231733 604 562 231655 3731 0611 3222 7742 44 44 IIHFF

00207 MRS MXU 6380 231257 151 639 231210 2110 7263 6616 0091 28 32 CCFII
00259 ZCA MXU 6380 231506 657 642 231420 9969 8423 6616 1081 59 36 HBJBH
00260 ZCA MXU 6380 231528 658 642 231420 9969 8423 6616 1081 42 36 HBJBH
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00037 CUO AAA 6405 230806 753 243 230745 3749 1663 9262 7742 37 06 BEGBE

00066 FHI TOJ 6430 230730 751 910 230705 5161 3456 0162 8327 53 21 80808
00102 FHI TOJ 6430 230915 752 912 230840 3731 9054 0162 8327 39 35 GIFIG
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00240 FZX GFH 6460 231552 557 188 231520 6350 3456 4997 0172 70 15 CCFII
00176 INJ GFH 6460 231157 402 180 231015 6530 0611 4997 1397 50 18 CCFII
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00183 NVT RBU 6620 231328 656 790 231245 7753 5218 8858 3485 66 36 DCGDC
00297 NVT RBU 6620 231623 659 800 231550 1523 4606 1080 2198 50 28 DCGDC
00175 OAL RBU 6620 231004 852 775 230835 3731 7803 8858 7896 66 29 FFBGG
00197 RHW RBU 6620 231221 452 786 231100 6530 2664 8858 0406 76 33 DDHAA
00196 EDH ZIC 6620 231219 903 778 230940 2750 4257 1918 5267 85 42 DAEAD
00365 FSD ZIC 6620 231537 704 778 230940 1120 5445 1918 7238 85 42 DAEAD
00145 FSD ZIC 6620 231052 703 782 231005 3749 2239 1918 7238 35 30 HDBHD
00238 FSD ZIC 6620 231558 706 797 231510 4775 1871 1963 8741 37 28 DAEAD
00225 HCO ZIC 6620 231438 806 794 231350 1101 3698 1963 3791 39 27 FBHFB
00237 HCO ZIC 6620 231426 803 778 230940 9942 2664 1918 8219 90 42 DAEAD
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00172 POH ZHK 6660 231103 305 016 231015 9942 7263 1774 4754 41 22 FFBGG
00173 POH ZHK 6660 231158 306 019 231100 0121 2645 4212 5942 68 23 DDHAA
00234 POH ZHK 6660 231519 307 023 231430 8943 7803 4212 5942 59 37 FFBGG
00235 POH ZHK 6660 231536 308 023 231430 8943 7803 4212 5942 53 26 FFBGG
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00122 ZIC FSD 6680 230930 254 655 230825 4775 0420 1161 5726 31 22 HDBHD
00157 ZIC FSD 6680 231037 256 662 231000 4369 5218 1161 5726 35 27 DAEAD
00253 ZIC FSD 6680 231550 259 668 231435 6530 2664 1161 5726 45 05 DAEAD
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00198 XYR VLH 6750 231202 204 725 231125 9518 2645 1260 8444 37 23 50505
00284 XYR VLH 6750 231705 206 728 231550 6350 3456 1260 8444 51 37 68486
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00089 MKP PSD 6760 230708 555 851 230600 0121 4257 6607 5762 54 29 ECHCE

00279 NIO FBG 6830 231618 054 494 231505 2110 1476 7435 8912 43 01 FFBGG
00364 POH FBG 6830 231305 206 483 231130 9942 3456 7435 5942 57 22 FFBGG
00170 POH FBG 6830 231458 207 490 231415 6350 0611 7435 5942 75 28 DDHAA
00171 POH FBG 6830 231536 208 493 231445 1120 7820 7435 5942 97 18 DDHAA
00188 POH FBG 6830 231748 209 503 231705 6530 5445 5121 2666 79 28 DDHAA
00189 ZHK FBG 6830 231728 904 497 231635 2750 7263 7435 3151 93 01 DDHAA
00280 ZHK FBG 6830 231702 903 495 231610 8943 8820 7435 3151 48 35 FFBGG
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00244 XYR OWN 6850 231418 953 684 231345 8140 1871 5095 8444 42 24 JAAAJ
00283 XYR OWN 6850 231613 956 687 231540 3749 6010 5095 8444 39 15 JAAAJ
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00263 FZX VXI 6860 231454 957 748 231420 8140 5237 6940 0172 50 38 DCGCD

00148 YWP UBT 6890 231058 654 501 231025 1120 3456 6832 4718 46 38 AEFEA
00149 YWP UBT 6890 231106 655 502 231030 2750 7263 6832 4718 48 37 CCFII
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00155 MKP MRS 6900 231037 502 832 230940 5504 3456 8669 5762 62 16 CCFII
00151 WNN MRS 6900 231032 902 833 230945 9942 1476 8669 8408 33 30 HBJBH
00111 ZCA MRS 6900 230927 755 829 230810 1120 2664 8669 1081 43 18 HBJBH
00150 ZCA MRS 6900 231158 758 838 231100 3731 3456 8669 1081 37 36 HBJBH
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00206 BWO HDG 7080 231312 857 332 231230 1561 5074 9145 8156 53 22 DHBDH
00118 NIO HDG 7080 230917 701 328 230825 8943 7263 9145 2125 45 32 CCFII
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00192 NVT RHW 7120 231219 555 030 231105 2750 1476 2610 4259 93 30 DDHAA
00193 NVT RHW 7120 231237 556 030 231105 2750 1476 2610 4259 73 30 DDHAA
00223 NVT RHW 7120 231543 558 052 231500 1561 2645 8371 3485 48 38 AJAAJ
00174 RBU RHW 7120 231112 752 028 231000 8943 7263 2610 5726 82 37 DDHAA
00190 MRS ZCA 7120 231217 104 029 231020 6350 9054 2610 0091 91 25 HBJBH
00224 MRS ZCA 7120 231451 105 041 231415 9329 3644 2610 0091 38 18 EDIED
00191 MXU ZCA 7120 231352 305 029 231020 6530 8820 2610 2558 85 25 HBJBH
00236 WNN ZCA 7120 231448 204 029 231020 6350 2664 2610 8408 87 25 HBJBH
00281 WNN ZCA 7120 231622 205 055 231540 9518 1871 2610 8408 63 03 HBJBH
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00133 XYR IXI 7130 230923 103 805 230815 2110 9054 0586 8444 54 26 68486

00112 ZCA WNN 7280 230856 954 279 230800 1101 8423 4717 1081 40 09 HBJBH
00258 ZCA WNN 7280 231427 957 291 231345 5161 1871 4717 1081 43 26 HBJBH
00298 ZCA WNN 7280 231719 959 297 231605 9942 7263 4717 1081 78 18 HBJBH
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00291 CUN WNN 7290 231704 351 551 231600 2750 5445 5680 2396 64 10 FFBGG
00077 IZW WNN 7290 230721 854 526 230540 8943 7263 5833 3917 99 20 DDHAA
00256 IZW WNN 7290 231419 857 537 231335 9942 1476 5833 3917 69 25 FFBGG
00257 XTG WNN 7290 231537 552 540 231400 3731 7803 5833 8156 83 24 DDHAA
00296 EOU YWP 7290 231516 804 531 231145 6350 9054 5833 1793 85 10 AEFEA
00181 INJ YWP 7290 231303 901 534 231220 9518 6442 5833 1397 38 20 DFJDF
00295 INJ YWP 7290 231719 903 552 231610 0121 7263 5833 1397 73 10 AEFEA

00204 UBT YWP 7290 231319 102 531 231145 8943 2664 5833 9803 87 10 AEFEA
00294 UBT YWP 7290 231604 103 547 231520 0120 3698 5833 9803 44 13 AEFEA
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00153 FHI MKP 7320 231012 451 600 230925 3731 0611 6625 8327 43 26 DJDJD
00250 GKW MKP 7320 230925 203 591 230620 5504 3456 6625 9399 48 11 ECHCE
00116 HZY MKP 7320 230815 501 596 230750 9329 1871 6625 6473 26 20 50505
00180 HZY MKP 7320 231124 503 604 231000 2110 8820 6625 6473 90 28 95459
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00245 MRS MKP 7320 231509 652 615 231435 8943 5445 6625 0091 51 28 CCFII
00117 PSD MKP 7320 230849 301 591 230620 3731 3456 6625 1243 70 24 28082
00072 SFV MKP 7320 230725 052 593 230645 0120 3698 6625 5320 69 26 BCEBC
00123 SFV MKP 7320 230953 054 598 230900 9942 2664 6625 5320 60 34 DJDJD
00152 SFV MKP 7320 231136 060 607 231040 6530 1476 6625 5320 45 32 DJDJD
00163 SFV MKP 7320 231004 055 598 230900 9942 2664 6625 5320 73 34 DJDJD
00246 XYR MKP 7320 231553 902 620 231500 2110 4257 6625 8444 29 24 CCFII
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00109 FZX FMT 7340 230823 753 394 230745 0121 2664 8678 1360 65 29 EGBGE
00213 FZX FMT 7340 231208 755 399 231130 3731 9054 6850 0172 39 17 EGBGE
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00074 BWO TPY 7400 230722 705 815 230635 1120 3456 2025 8156 54 47 CFIFC
00205 BWO TPY 7400 231256 710 827 231205 4775 5218 2025 8156 36 45 ADEAD
00154 NIO TPY 7400 231024 151 822 230915 9942 7263 2025 2125 51 32 CFIFC
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00100 EOU INJ 7450 230918 452 818 230825 6530 7803 1864 1793 47 24 AEFEA
00110 YWP INJ 7450 230812 754 816 230705 8943 2664 1864 4718 52 21 CCFII
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00105 FBP FHI 7510 230836 852 612 230600 0121 7803 6869 5447 96 22 28082
00106 FBP FHI 7510 230851 853 612 230600 6530 5445 6869 5447 82 22 28082
00212 SFV FHI 7510 231332 754 615 231220 2750 1476 7642 6536 60 22 DCGCD
00252 SFV FHI 7510 231451 757 619 231345 0121 7263 6869 5320 77 44 DJDJD
00262 SFV FHI 7510 231518 758 619 231345 0121 7263 6869 5320 80 44 DJDJD
00300 SFV FHI 7510 231704 759 626 231610 8943 7803 6869 5320 57 44 DJDJD
00070 TOJ FHI 7510 230723 652 612 230600 2110 0611 6869 5609 59 46 GIFIG
00107 UNK FHI 7510 230804 452 612 230600 3731 4257 6869 7904 71 36 GIFIG
00108 UNK FHI 7510 230816 453 612 230600 5504 8820 6869 7904 63 42 80808
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00305 MLH LLZ 7640 231613 152 654 231500 8140 7803 1639 3485 70 41 IIHFF
00272 ZZZ LLZ 7640 231419 608 645 231330 7753 0889 8146 7094 80 32 IIHFF
00182 FBG POH 7640 231356 852 639 231210 8140 2645 1639 2549 83 42 DDHAA
00231 FBG POH 7640 231522 854 643 231315 3731 5445 8146 3313 93 01 DDHAA
00232 FBG POH 7640 231738 858 657 231620 6350 1476 8146 3313 72 01 FFBGG
00276 FBG POH 7640 231524 855 648 231355 9942 3456 8146 3313 70 01 DDHAA
00124 ZHK POH 7640 230917 951 627 230800 2750 7263 2340 3151 77 38 DDHAA
00164 ZHK POH 7640 231112 952 632 230935 6530 8820 6210 9074 00 20 DDHAA
00229 ZHK POH 7640 231528 954 650 231430 3749 6010 2197 8435 81 01 DDHAA
00230 ZHK POH 7640 231556 955 650 231430 3749 6010 2197 8435 66 01 DDHAA
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00121 IZW CUN 7720 230913 955 202 230740 6530 9054 2601 0956 89 27 DDHAA
00226 IZW CUN 7720 231449 956 225 231415 1561 3698 7741 3917 35 23 AGHAG

00159	WNN	CUN	7720	231018	254	207	230900	6350	3456	4366	3395	54	42 FFBGG
00162	FMT	FZX	7720	231052	502	210	230945	2750	7263	7741	2620	64	27 CCFII
00255	FMT	FZX	7720	231406	503	221	231115	3731	0611	7741	2620	84	24 EGBGE
00203	GFH	FZX	7720	231254	305	221	231115	0121	5445	7741	6743	85	24 EGBGE
00288	GFH	FZX	7720	231723	306	227	231610	6350	3456	7741	6743	56	28 DCGCD
00147	VXI	FZX	7720	231106	601	214	231020	9329	2239	7741	3070	40	18 HBJHB
00160	VXI	FZX	7720	231119	604	212	231000	8943	7803	7741	3070	41	24 EGBGE
00161	VXI	FZX	7720	231138	605	212	231000	8943	7803	7741	3070	66	24 EGBGE
00287	VXI	FZX	7720	231658	606	221	231115	9942	3456	7741	3070	91	24 EGBGE
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00239	AAA	CUO	7735	231521	255	452	231445	8140	5237	4618	7319	61	24 IIHFF
00242	MKR	CUO	7735	231546	453	454	231505	3749	0665	1549	3278	53	26 IIHFF
00269	DYP	FZY	7735	231452	663	449	231400	0120	3644	4618	3494	69	38 FFBGG
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00210	NVT	OAL	7830	231353	056	418	231230	9969	5218	5086	4259	65	21 CJCCJ
00211	NVT	OAL	7830	231318	055	418	231230	9969	5218	5086	4259	80	23 CJCCJ
00068	RHW	OAL	7830	230751	302	399	230700	1561	6010	5086	1081	69	21 DDHAA
00214	XTG	OAL	7830	231309	603	416	231200	0121	7263	5086	8156	55	10 FFBGG
00264	XTG	OAL	7830	231422	605	420	231250	8943	3456	5086	8156	63	09 DDHAA
00065	FHI	SFV	7830	230725	652	397	230640	4775	4606	5086	8327	56	18 AIJAI
00103	FHI	SFV	7830	230913	653	401	230730	1120	8820	5086	8327	71	27 DCGCD
00216	FHI	SFV	7830	230942	654	401	230730	3731	4257	5086	8327	84	33 DJDJD
00144	MKP	SFV	7830	231124	408	401	230730	8943	3456	5086	5762	87	33 DJDJD
00114	XYR	SFV	7830	230929	804	405	230845	9518	5074	4726	1801	28	15 EGBEG
00278	XYR	SFV	7830	231611	808	432	231520	1101	1663	5086	8444	51	20 EGBEG
			11										
00366	FHI	FBP	7940	231558	503	837	231525	3749	1871	4122	8327	59	30 80808
00178	FHI	FBP	7940	231041	501	834	231010	4775	8423	4122	8327	25	34 80808
00282	FHI	FBP	7940	231745	504	838	231650	8943	3456	4122	8327	54	34 80808
			3										
00201	HDG	BWO	7990	231350	104	658	231035	2750	9054	3565	6707	91	10 CFIFC
00308	HDG	BWO	7990	231642	108	677	231600	1101	8423	3565	6707	44	28 CFIFC
00120	NIO	BWO	7990	230913	302	647	230825	9518	6010	3565	2125	49	28 CFIFC
00254	NIO	BWO	7990	231427	306	658	231035	1120	7803	3565	2125	87	10 CFIFC
00202	TPY	BWO	7990	231218	205	658	231035	0121	5445	3565	9713	85	10 CFIFC
00158	IZW	XTG	7990	231104	656	649	230900	8943	1476	0946	0956	87	32 DDHAA
00076	OAL	XTG	7990	230714	504	643	230600	2110	9054	3565	5320	61	27 DDHAA
00307	OAL	XTG	7990	231626	509	673	231510	8943	4257	5653	9038	62	33 FFBGG
00265	WNN	XTG	7990	231506	402	665	231325	6530	2664	5653	3395	61	29 FFBGG
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F. Discriminant listing, 23 December

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00061 DYO ZZZ 406 151 230640 6320 77 21 ABCAB HOSHB QNNLN VJHLL FSHIY
00125 ZZZ DYO 503 832 230900 9192 45 46 ABCAB TNVEJ GPMPP ZTZWI ZBQWT
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00205 BWO TPY 710 827 231205 4775 36 45 ADEAD JRTGE RTJOH SCEVX FWIEB

00048 EOU YWP 802 522 230425 8140 51 22 AEFEA BIEIC AMTFI DLTUU MBOIM
00028 YWP INJ 752 812 230240 1120 40 04 AEFEA CAIQF YTXQA OGQAK CFYSW
00292 INJ YWP 907 531 231145 5504 90 10 AEFEA FAFPL IFSWA RPLIF SFAFP
00296 EOU YWP 804 531 231145 6350 85 10 AEFEA FAFPL IFSWA RPLIF SKOZK
00204 UBT YWP 102 531 231145 8943 87 10 AEFEA FAFPL IFSWA RPLIF SCYTV
00294 UBT YWP 103 547 231520 0120 44 13 AEFEA GUVBS IPHRE BUVYK BHIDN
00057 YWP EOU 554 224 230435 1101 58 39 AEFEA HADPX AMLMU COVEN IWIRN
00295 INJ YWP 903 552 231610 0121 73 10 AEFEA KOZKL IFSWA RPLIF SCYTV
00148 YWP UBT 654 501 231025 1120 46 38 AEFEA MOTFS ULBGU VBMUC OWOID
00100 EOU INJ 452 818 230825 6530 47 24 AEFEA NOXLD AZHVO BVBEO TVOBV
00051 INJ UBT 152 494 230500 5504 46 23 AEFEA PASKK AYMWA RPVYD VXOCY
00027 YWP INJ 751 811 230215 9329 64 09 AEFEA WIRNP OZOZO EBXYV PVYDV
00026 YWP UBT 652 493 230310 1561 39 23 AEFEA XYSMB ECHDA IRXYU OKEER
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00226 IZW CUN 956 225 231415 1561 35 23 AGHAG STEFG OCRNT KRNHM WPAPD
00036 IZW CUN 952 195 230515 1101 58 38 AGHAG TPOCG EZNQQ WWUUE MKQHC
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00065 FHI SFV 652 397 230640 4775 56 18 AIJAI FZTGH ROUNV JSOCP YFHDD

00019 RHW NVT 102 587 230205 4775 36 38 AJAAJ LMPDG GZXFI PMDVH XYPSB
00223 NVT RHW 558 052 231500 1561 48 38 AJAAJ QANGF JKHUI ONGDH DJLUR
00142 RHW NVT 109 632 231010 9518 35 21 AJAAJ YZMCC FPHXO NRFGC TYACE
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00072 SFV MKP 052 593 230645 0120 69 26 BCEBC MYYBE GMPKQ WMKUV YVLON

00087 CUO AAA 753 243 230745 3749 37 06 BEGBE PJBGA UDQKX CNXJZ XWOQG

00037 ZCA WNN 951 273 230420 9329 39 09 BFHBF NFIED NSDJD SPYYY JKATT

00015 ZIC EDH 153 480 230125 4775 44 37 BGIBG HTQHI HEFEJ XSYDJ NYUHH
00126 ZIC EDH 155 485 230730 1561 34 43 BGIBG NXUEF MGUHX ISPOY WASLG
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00012 YWP EOU 552 221 230240 3749 37 28 CBECB LJEBA CZMSK BRERC UAYJK

00207 MRS MXU 151 639 231210 2110 28 32 CCFII AAVLZ SWFKZ FQXVH SLOZS
00162 FMT FZX 502 210 230945 2750 64 27 CCFII CCFDT JKNIV AEOKV GLQKA
00240 FZX GFH 557 188 231520 6350 70 15 CCFII CCUKL QFRGE CGZXT BORJD
00118 NIO HDG 701 328 230825 8943 45 32 CCFII DDQHW OKLXF VHXLZ QHXSB
00110 YWP INJ 754 816 230705 8943 52 21 CCFII GGOZS EPIJR TUQKX AWDUN
00155 MKP MRS 502 832 230940 5504 62 16 CCFII GGRIU SDBYJ ICPAX CPXJZ
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G. Callsign listing, 24-26 December

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00528 XTG OFW 6780 241330 054 652 241215 9915 5895 5635 5753 96 28 BCEBC
00531 XTG OFW 6780 241336 055 652 241215 9915 5895 5635 5753 79 21 BCEBC
00468 ZYV OFW 5185 241102 205 644 241020 8339 4833 5635 7779 57 25 95459
00413 ZYV OFW 6780 240808 202 639 240719 0770 0215 5635 7779 42 23 DCGCD
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00564 JKR OGN 6320 241514 351 703 241425 1300 4237 5897 2387 60 33 IIHFF
00378 ZZZ OGN 2040 240200 700 658 240025 2958 1042 5897 3890 27 38 FEAFE
00631 ZZZ OGN 2040 241831 713 710 241710 9915 3436 5897 3890 46 09 IIHFF
00634 ZZZ OGN 2040 241838 714 708 241639 0770 1050 5897 3890 63 18 IIHFF
00532 ZZZ OGN 6320 241337 711 692 241217 1976 5802 5897 3890 35 04 IIHFF
00506 ZZZ OGN 6320 241237 709 682 241142 8339 5661 7471 4295 59 06 IIHFF
00630 ZZZ OGN 2040 241828 712 712 241748 8546 5858 6247 7481 48 21 IIHFF
00669 ZZZ OGN 2040 242158 715 718 242102 4181 6631 6247 7481 62 23 IIHFF
00467 ZZZ OGN 6320 241102 707 669 240843 9915 3212 6247 7481 44 29 IIHFF
00504 ZZZ OGN 6320 241234 708 678 241026 0770 4833 2827 8525 84 13 IIHFF
           10

00449 FNL OHG 6335 241030 603 582 240913 8349 3212 3619 6031 67 42 IIHFF

00404 GKS OLY 7540 240705 851 343 240630 5360 8810 8425 6527 38 23 CFIFC
00478 GKS OLY 7540 241127 853 348 241042 8339 7236 8425 6527 49 22 DCGCD
00584 WID OLY 7540 241559 503 351 241513 3343 4022 8425 8084 61 34 CFIFC
            3

00607 JKR PDV 7660 241704 555 724 241624 8339 6631 6517 2387 25 23 IIHFF
00397 OGN PDV 3500 240558 151 682 240516 9194 7027 4564 2503 34 27 IIHFF
00459 ZZZ PDV 7660 241043 608 698 240943 8339 1050 6517 3890 98 34 IIHFF
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00460 ZZZ PDV 7660 241047 609 698 240943 8339 1050 6517 3890 89 39 IIHFF
00462 ZZZ PDV 7660 241052 610 698 240943 8339 1050 6517 3890 86 10 IIHFF
00387 ZZZ PDV 3500 240417 601 675 240347 1976 5858 6698 7481 56 43 HAIHA
00646 ZZZ PDV 3500 241953 615 727 241853 5576 9234 6698 7481 47 29 HAIHA
7

00635 BEA PJX 2590 241839 255 695 241754 1976 3618 8137 2729 41 17 50505
00473 BEA PJX 6510 241119 252 675 241013 9915 1629 8137 2729 75 41 68486
00572 BEA PJX 6510 241527 254 687 241438 4181 9865 8137 2729 68 46 68486
00489 EUZ PJX 6510 241202 603 681 241310 2939 4022 8137 5627 52 25 68486
00461 XFL PJX 6510 241052 103 671 240957 7395 0215 8137 2251 73 41 JAAAJ
00437 XTG PJX 6510 241008 354 670 240923 5576 9234 0180 0749 52 22 CCFII
00394 XTG PJX 2590 240515 351 667 240440 1715 5661 8137 5753 46 25 DJDJD
00527 XTG PJX 6510 241328 355 676 241238 7302 1042 8137 5753 39 20 DJDJD
8

00577 HDH PPA 7235 241541 603 534 241437 4181 9234 4023 9722 57 23 DDHAA
00548 MJZ PPA 7235 241437 404 532 241335 4154 3212 4023 6239 65 18 DDHAA
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00456 OFW RME 6970 241101 702 773 241026 8349 1629 6995 8570 39 23 ECHCE
00531 OFW RME 6970 241553 703 774 241508 4181 8810 6995 8570 68 20 95459
2

00619 CHJ SSZ 7970 241732 607 492 241512 1300 0215 1224 6527 32 24 FFBGG
00582 VPO SSZ 4475 241554 154 489 241434 4181 7236 1224 4097 71 31 FFBGG
00511 WDT SSZ 7970 241250 057 481 241150 8339 0476 2926 1865 62 38 CJCCJ
00398 WDT SSZ 7970 240601 052 465 240521 0770 9865 2052 3250 49 32 CJCCJ
00452 WDT SSZ 7970 241031 056 472 240946 8725 9637 1224 8390 53 30 DDHAA
00555 WDT SSZ 7970 241452 058 484 241247 9915 3212 1224 8390 62 16 DDHAA
6

00411 AYP UBT 6880 240753 752 849 240713 9987 1629 3899 7913 68 27 HBJBH
00599 AYP UBT 6880 241643 753 854 241532 1300 9865 7011 9489 45 36 EDIED
00509 OFW UBT 6880 241243 502 851 241148 7762 0215 7011 8570 36 34 DCGCD
00578 YKD UBT 6880 241541 902 853 241426 4181 9234 7011 6789 51 42 HBJBH
4

00562 WDT VPO 6640 241511 655 844 241320 7395 5661 7200 1865 76 25 DCGDC
00406 WDT VPO 6640 240723 653 825 240643 3702 1050 0289 8390 34 20 DCGDC
00609 WDT VPO 6640 241707 656 849 241538 8349 3266 0289 8390 82 17 DDHAA
3

00381 GEP VXI 2870 240333 651 507 240302 4181 3618 5202 3098 55 22 CCFII
00525 GEP VXI 6870 241316 653 511 241240 1976 4022 5202 3098 69 31 AEFEA
00558 NCM VXI 6870 241504 153 513 241425 8546 7236 5202 9795 57 27 AEFEA
00658 XBS VXI 2870 242037 054 515 241937 0770 4634 5202 0163 28 35 AEFEA
4

00663 FSD WCB 7660 242112 960 729 242042 2939 2455 0108 0532 83 32 FFBGG
00643 FSD WCB 5225 241923 958 726 241810 8383 9098 6517 1531 71 31 DDHAA
00494 FSD WCB 7660 241213 954 708 241137 1722 0286 6517 1531 55 12 DDHAA
00573 FSD WCB 7660 241529 957 719 241439 3343 2258 6517 1531 38 22 DDHAA
00529 FSD WCB 3500 241333 955 717 241228 4154 3618 7697 9777 59 52 DDHAA
00471 NIO WCB 7660 241108 852 704 241038 1722 0286 6517 4529 55 28 FFBGG
00675 NIO WCB 7660 242353 855 730 242308 9707 1690 6517 4529 78 31 FFBGG

00598	NIO	WCB	7660	241638	854	721	241517	1715	9865	0577	7733	59	40 DDHAA
00396	NIO	WCB	3500	240555	850	683	240522	0371	4022	0108	8499	60	49 DDHAA
00496	XNW	WCB	7660	241216	756	703	241036	4154	8810	9334	1423	83	05 FFBGG
00498	XNW	WCB	7660	241222	758	712	241152	8725	4237	6517	6167	84	26 DDHAA
00501	XNW	WCB	7660	241227	759	712	241152	8725	4237	6517	6167	79	02 DDHAA
00424	ZHK	WCB	5225	240912	002	694	240817	8546	5895	6517	4538	74	47 FFBGG
		13											
00653	SSZ	WDT	2040	242025	605	714	241950	9707	9098	5897	5753	56	31 CJCCJ
00569	SSZ	WDT	6320	241525	603	702	241320	5576	2210	1332	6248	47	24 DDHAA
00677	SSZ	WDT	2040	242358	606	720	242319	4181	6407	7471	7418	84	40 FFBGG
00533	VPO	WDT	5865	241338	504	697	241308	5303	1420	9028	3232	73	44 DDHAA
00587	VPO	WDT	6320	241610	507	704	241520	5576	2210	9028	3232	47	16 DDHAA
00536	VPO	WDT	6320	241350	505	684	241151	7395	1690	5897	4097	39	42 DCGDC
00615	VPO	WDT	6320	241717	508	706	241630	9194	9234	5897	4097	42	22 FFBGG
00500	YLV	WDT	5865	241226	002	672	240958	1715	9865	5897	8390	79	18 JBBJB
00552	YLV	WDT	5865	241448	003	695	241232	0770	1629	5897	8390	85	25 JBBJB
00395	YRF	WDT	5865	240546	101	663	240440	7395	0215	1332	8804	64	29 AJAAJ
00464	YRF	WDT	6320	241057	103	677	241022	7302	2455	5897	9489	43	12 DDHAA
00613	YRF	WDT	6320	241714	105	705	241622	5576	2210	5897	9489	47	27 FFBGG
		12											
00440	GKS	WID	7380	241013	702	834	240923	0770	6407	0397	6527	47	24 ADEAD
00551	GKS	WID	7380	241448	703	835	241347	1800	5661	0397	6527	35	14 ADEAD
00583	OLY	WID	7380	241555	401	839	241520	9987	4833	0397	5078	56	08 CFIFC
00666	XNW	WID	3380	242126	153	841	242018	4181	3212	0397	0497	75	24 DCGCD
		4											
00419	IBF	WPB	6200	240856	901	765	240815	2958	0476	0441	5979	63	43 GIFIG
00557	IBF	WPB	6200	241504	903	767	241414	3343	1629	0441	5979	55	16 80808
		2											
00602	GEP	XBS	6420	241654	555	253	241608	1300	0476	5176	0965	39	09 DCGCD
00476	GEP	XBS	6420	241124	551	245	241019	1715	9865	5455	3098	41	33 AEFEA
00571	GEP	XBS	6420	241526	554	249	241426	9121	0215	5455	3098	80	45 CCFII
00475	NCM	XBS	6420	241120	252	246	241045	5576	1629	5455	9795	53	21 AEFEA
		4											
00483	PJX	XFL	6150	241139	952	688	241038	1715	3618	5211	0983	37	22 68486
00611	FSD	XNW	6450	241713	255	213	241632	9733	0476	0496	1531	29	20 DDHAA
00469	FSD	XNW	6450	241103	252	201	240925	9915	9098	3538	6257	27	34 FFBGG
00429	GKS	XNW	6440	240922	952	482	240839	1715	5895	2638	6527	73	32 CFIFC
00463	GKS	XNW	6440	241055	953	484	241027	9733	7082	2638	6527	59	20 CFIFC
00518	GKS	XNW	6440	241304	955	486	241150	2958	3618	2638	6527	42	23 CCFII
00538	NIO	XNW	6450	241405	805	204	241250	8339	7236	0856	2512	61	39 DDHAA
00600	NIO	XNW	6450	241647	806	210	241610	9733	0476	0496	4529	29	36 DDHAA
00648	OLY	XNW	2640	241959	604	493	241914	4181	1629	2638	5078	36	16 CFIFC
00591	WCB	XNW	5515	241619	105	208	241549	4773	3618	4915	2963	51	25 DDHAA
00667	WCB	XNW	2650	242141	107	216	242116	5576	6407	0496	4538	33	29 FFBGG
00403	WCB	XNW	6450	240703	102	197	240518	4154	1629	0496	4538	65	29 DDHAA
00420	WCB	XNW	6450	240903	103	198	240833	1976	2455	0496	4538	76	07 FFBGG
00604	WCB	XNW	6450	241655	106	211	241620	9733	0476	0496	4538	29	15 DDHAA
		13											
00436	BWO	XTG	4475	241005	003	471	240920	5576	1629	1224	5753	32	40 JDDJD

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00526	BWO	XTG	4475	241326	005	483	241236	7302	1690	1224	5753	48	11 JDDJD
00637	IBF	XTG	3930	241842	658	495	241738	0770	3212	1224	5979	99	49 DJDJD
00638	IBF	XTG	3930	241848	659	495	241738	0770	3212	1224	5979	94	02 DJDJD
00641	IBF	XTG	3930	241853	660	495	241738	0770	3212	1224	5979	86	08 DJDJD
00493	IBF	XTG	7970	241212	654	475	241032	5360	3618	1224	5979	83	43 AIJAI
00603	IBF	XTG	7970	241654	656	493	241540	9915	4022	1224	5979	27	11 CCFII
00651	OFW	XTG	3930	242012	410	504	241902	1715	3618	0144	4475	47	27 DJDJD
00389	OFW	XTG	3930	240422	404	462	240328	8349	5661	1224	8570	29	06 CCFII
00433	OFW	XTG	7970	240946	405	468	240841	4181	0215	1224	8570	56	11 DCGCD
00521	OFW	XTG	7970	241310	411	482	241200	9987	9234	5031	8813	72	22 DJDJD
00670	PJX	XTG	3930	242215	803	508	242150	5790	4237	0144	0181	47	46 CCFII
00642	PJX	XTG	3930	241854	801	501	241809	1976	4833	9929	8543	65	35 DJDJD
		13											
00610	FIB	YEC	7865	241710	302	375	241612	8339	1629	4636	7995	81	26 DDHAA
00392	KOT	YEC	3865	240458	401	371	240420	5360	6631	4636	5014	56	19 FFBGG
		2											
00453	AYP	YKD	6740	241033	951	294	240943	3343	1629	3097	9489	72	26 BFHBF
00530	FMT	YKD	6750	241335	353	576	241240	9707	3212	5987	9137	58	37 DDHAA
00492	MRS	YKD	6750	241211	856	573	241121	8339	1420	4302	2387	94	25 FFBGG
00497	MRS	YKD	6750	241216	859	573	241121	8339	1420	4302	2387	92	21 FFBGG
00434	MRS	YKD	6750	240949	852	568	240843	1715	3618	5987	7454	43	28 DDHAA
		5											
00541	SSZ	YRF	7580	241408	203	087	241143	7395	9234	6724	6248	65	42 DDHAA
00458	VPO	YRF	7580	241042	752	082	240931	1300	3212	6724	4862	59	10 DDHAA
00386	WDT	YRF	3580	240415	551	078	240320	1722	8810	2728	8390	37	37 FFBGG
00432	WDT	YRF	7580	240942	553	081	240832	1722	8810	2728	8390	43	28 DDHAA
00595	WDT	YRF	7580	241627	555	094	241517	0770	5661	2728	8390	28	19 AJAAJ
		5											
00465	IBF	YTG	5535	241059	752	919	241007	9121	7082	8560	5979	52	18 50505
00594	IBF	YTG	7050	241623	753	921	241522	4154	9865	8560	5979	47	36 80808
00608	IBF	YTG	7050	241705	754	922	241632	5360	9234	8560	5979	63	16 50505
		3											
00542	DYO	ZNM	6550	241413	053	741	241248	8349	7082	7110	4097	47	44 DAEAD
00566	DYO	ZNM	6550	241518	054	746	241529	2958	4022	7110	4097	69	27 DAEAD
00414	HOT	ZNM	6550	240813	851	738	240738	5576	3618	7110	4484	42	10 DAEAD
		3											
00659	OFW	ZYV	2620	242041	351	832	241942	2958	6407	8362	8570	75	19 28082
00561	JKR	ZZZ	6330	241510	410	334	241340	1715	3436	6841	2387	44	24 IIHFF
00390	JKR	ZZZ	2050	240427	401	273	240356	0371	3868	8399	2387	46	30 IIHFF
00671	JKR	ZZZ	2050	242303	415	385	242108	8349	7236	3330	2819	34	23 IIHFF
00626	JKR	ZZZ	2050	241812	412	377	241742	9194	3212	8155	7454	53	17 ABCAB
00676	OGN	ZZZ	5875	242355	321	390	242250	5360	8810	4816	0578	44	26 IIHFF
00379	OGN	ZZZ	6330	240249	303	266	240214	2939	9865	4816	0578	55	28 IIHFF
00662	OGN	ZZZ	2050	242109	320	382	241920	9915	6407	8155	1865	43	19 FEAFE
00563	OGN	ZZZ	6330	241513	314	345	241453	1399	6270	8155	1865	76	27 IIHFF
00514	OGN	ZZZ	5875	241259	308	302	241134	2958	1629	6841	8390	28	26 FEAFE
00407	OGN	ZZZ	6330	240733	304	277	240658	0371	3868	8399	8390	46	45 IIHFF
00617	OGN	ZZZ	6330	241725	316	361	241648	5782	2455	8399	8390	57	32 9IHFF
00510	OGN	ZZZ	2050	241249	307	326	241229	9987	3618	6148	9515	91	31 IIHFF

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00524	OGN	ZZZ	2050	241314	309	326	241229	9987	3618	6148	9515	90	22 IIHFF
00393	PDV	ZZZ	2050	240513	101	275	240458	0371	3868	8399	4538	46	20 HAIHA
00426	PDV	ZZZ	6330	240917	103	279	240711	1300	1690	8399	4538	92	11 IIHFF
00427	PDV	ZZZ	6330	240920	104	279	240711	1300	1690	8399	4538	87	25 IIHFF
00430	PDV	ZZZ	6330	240926	105	279	240711	1300	1690	8399	4538	64	37 IIHFF
00441	ZZZ	ZZZ	5875	241015	003	285	240925	9121	7082	8399	3890	87	08 JEEJE
00443	ZZZ	ZZZ	5875	241020	004	285	240925	9121	7082	8399	3890	79	41 JEEJE
00618	ZZZ	ZZZ	5875	241727	007	358	241615	4154	4022	8399	3890	33	14 JEEJE
		20											
00843	MWD	AAA	3285	251825	752	322	251711	4785	2690	2304	9380	70	51 IIHFF
00744	JKR	ALL	6570	251053	054	754	251027	6331	7416	5491	9173	86	33 DAEAD
00861	XGC	BJK	3560	252150	205	138	252009	8745	8604	1099	4123	86	26 DDHAA
00678	YXH	BJK	3560	250244	551	111	250216	6331	6246	8326	3548	43	28 FFBGG
00732	YXH	BJK	7600	251027	556	118	250943	8745	7416	1099	6761	91	18 AJAAJ
00748	YXH	BJK	7600	251103	558	121	251020	7330	2248	1099	6761	67	24 FFBGG
00784	YXH	BJK	7600	251258	560	129	251157	3399	3635	5103	0352	66	32 FFBGG
		5											
00722	GKS	CHJ	4115	251003	002	532	250927	9356	3850	1017	4123	43	29 JDDJD
00701	NOR	CHJ	7950	250852	651	529	250815	2560	5282	1017	4321	47	25 AIJAI
00795	NOR	CHJ	7950	251349	653	544	251240	5315	6246	1017	4321	72	40 CCFII
00831	NOR	CHJ	7950	251709	654	548	251535	3191	2042	1017	4321	88	12 DJDJD
00844	RHW	CHJ	3950	251828	806	550	251743	8311	2826	1017	2710	73	31 DJDJD
00858	RHW	CHJ	3950	252103	807	552	251917	2561	7416	1017	2710	56	40 DCGCD
00692	RHW	CHJ	7950	250755	802	528	250720	1372	5461	1017	2710	42	10 DJDJD
00775	XME	CHJ	7950	251242	406	538	251110	5351	8055	1017	7049	57	49 DJDJD
00789	XME	CHJ	7950	251303	408	539	251122	5531	1070	1017	7049	62	22 DJDJD
		9											
00715	RHW	COG	7610	250947	102	813	250916	5531	7416	7354	2710	82	41 JAAAJ
00740	LYD	DSM	6840	251047	704	848	251028	7330	6246	8795	5546	84	24 ADEAD
00710	XME	DWL	6500	250939	552	858	250918	8311	4662	8353	7049	84	34 95459
00742	HCO	EDH	6170	251051	653	525	251030	9356	6246	6715	1108	73	26 AEFEA
00741	NOR	FDW	6180	251050	903	770	251036	1372	6246	8849	4321	59	08 GIFIG
00728	LYD	FTV	7060	251017	953	496	250936	5315	4662	1008	5546	84	20 CFIFC
00816	LYD	FTV	7060	251559	955	504	251452	3399	0846	1008	5546	59	25 DCGCD
00724	YWP	FTV	7070	251013	104	223	250950	8311	6813	8894	2882	56	27 DDHAA
		3											
00702	UBT	FZX	7710	250858	652	740	250824	1723	8604	0315	0758	27	19 GBIGB
00834	NVU	GKT	7915	251721	204	173	251602	5351	9800	2755	7157	92	19 DDHAA
00718	HIR	GRU	6040	250953	952	303	250820	1723	2042	1107	8976	87	36 BFHBF
00757	HIR	GRU	6040	251138	954	305	251017	5315	0854	0702	9812	32	30 HBJBH
00690	UBT	GRU	6050	250650	851	602	250632	2560	9800	2674	0758	83	15 FFBGG
00776	UBT	GRU	6050	251244	855	612	251115	3399	1070	2674	0758	64	27 EIDEI
00798	VXI	GRU	6040	251400	405	308	251250	1562	0846	1107	8606	46	24 CCFII
		5											

00755 NOR GYM 7340 251132 504 848 251038 3399 8055 0126 4321 67 11 28082

00695 EDH HCO 6050 250824 102 604 250850 7330 7874 2674 6554 49 23 AEFEA
00800 EDH HCO 6050 251406 105 615 251352 2561 0846 2674 6554 67 33 CCFII
00803 TPY HCO 6050 251415 907 614 251226 3399 8639 9640 2837 76 30 CCFII
00853 TPY HCO 2330 252038 909 619 251956 7330 4662 2674 8264 53 30 AEFEA
00725 TPY HCO 6050 251014 904 608 250913 1562 8055 2674 8264 84 28 DCGCD
00768 XZI HCO 6050 251212 805 610 251058 5351 0846 1152 7355 36 16 AEFEA
00822 XZI HCO 6050 251632 808 617 251523 3191 2826 2674 8561 57 39 CBECB
7

00750 GRU HIR 7600 251109 205 122 251022 7782 2826 1099 5375 74 27 HBJBH
00769 GRU HIR 7600 251213 208 126 251115 3399 6813 1099 5375 68 23 BFHBF
00711 VXI HIR 7600 250940 104 114 250847 5531 6813 0009 4899 59 22 HBJBH
00805 VXI HIR 7600 251422 107 132 251243 7782 3850 0009 4899 81 03 HBJBH
00686 VXI HIR 7600 250606 102 112 250538 7123 0846 1099 8606 55 43 HBJBH
00813 VXI HIR 7600 251534 109 135 251450 1309 8604 1099 8606 43 12 HBJBH
00847 WDT HIR 3560 251901 307 137 251726 3191 1070 1099 1045 46 21 CCFII
00719 WDT HIR 7600 250954 303 116 250920 1309 2042 1099 1045 74 33 HBJBH
00859 WDT HIR 3560 252130 309 134 251424 5351 2042 2557 5861 53 34 HBJBH
9

00856 YWP HOT 2380 252050 309 075 251952 1562 4662 0252 1595 65 34 DDHAA
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00731 WPX JKR 6660 251025 904 872 250936 3399 7416 5257 6149 56 23 DAEAD
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01004	EJJ	CUN	7730	261204	053	571	261038	9988	8667	7750	5906	86	28	CJCCJ
01205	EJJ	CUN	3770	262013	058	605	261917	3579	5265	7507	8750	71	44	DDHAA
00976	GXW	CUN	7730	261120	301	565	260917	0149	4473	7750	7328	57	21	DDHAA
01139	GXW	CUN	7730	261607	302	588	261533	2182	1232	7750	7328	66	20	DDHAA
00988	MKP	CUN	7730	261143	603	570	261024	0752	9403	7750	1702	43	34	FFBGG
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00964	GSL	EDH	6160	261101	502	892	261017	0193	5265	3853	5410	74	20	DCGCD
00908	LAM	EDH	6160	260910	752	879	260811	9988	0610	3853	7328	42	35	DCGCD
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01099	LAM	EDH	6160	261422	754	894	261320	8366	2600	8722	7571	92	48	HBJBH
01152	LAM	EDH	6160	261649	755	896	261548	4712	0459	0621	8165	77	15	HBJBH
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00934	MEN	EEZ	6370	261010	253	695	260908	4712	0459	4735	7643	56	24	DCGCD
00951	MEN	EEZ	6370	261038	254	696	260934	0752	2600	4735	7643	82	13	DAEAD
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00984	CUN	EJJ	6280	261133	604	783	261008	0149	6488	2746	0776	45	28	FFBGG
01086	CUN	EJJ	6280	261406	606	802	261321	2182	1232	2746	0776	84	24	CJCCJ
01222	CUN	EJJ	2080	262257	609	815	262202	4712	4473	2250	2530	80	49	CJCCJ
01200	CUN	EJJ	2080	261939	608	814	261824	0752	2832	1422	3890	71	17	CJCCJ
00881	FSD	EJJ	2080	260545	502	767	260526	7103	6001	7976	1928	59	52	DDHAA
01115	FSD	EJJ	6280	261458	505	803	261354	3579	5652	1422	4916	95	34	DDHAA
01187	FSD	EJJ	2080	261849	509	812	261719	6152	7450	2746	7643	54	23	DCGDC
01040	FSD	EJJ	6280	261256	504	796	261215	3766	2457	2746	7643	83	26	DCGDC
01061	GXW	EJJ	6280	261325	106	798	261239	3171	7443	8119	3476	87	15	FFBGG
01174	GXW	EJJ	6280	261758	109	811	261652	6152	7443	1422	4826	36	50	DDHAA
01043	GXW	EJJ	6280	261259	104	791	261138	2182	3230	2746	7328	83	25	FFBGG
01045	GXW	EJJ	6280	261302	105	791	261138	2182	3230	2746	7328	96	38	FFBGG
01138	GXW	EJJ	6280	261602	108	806	261427	2336	5632	1738	8165	78	22	AJAAJ
00891	INJ	EJJ	5585	260724	001	770	260648	5773	2600	2746	5906	50	26	JBBJB
00999	INJ	EJJ	5585	261201	003	785	261032	9988	0459	2746	5906	55	19	JBBJB
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01163	INJ	EJJ	5585	261720	005	808	261526	6945	4283	2746	5906	68	34	DDHAA
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01058	INK	EKC	5590	261324	003	614	261148	6945	6246	2098	7887	72	23	FFBGG
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01214	VRH	EKC	2095	262101	906	618	262002	9988	1889	4546	1234	93	02	DDHAA
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01012	ORI	EOU	6140	261219	704	858	261143	2182	5652	7174	1702	50	20	CCFII
01105	ORI	EOU	6140	261437	705	860	261258	0193	3814	7174	1702	63	11	CFIFC
01166	ORI	EOU	6140	261730	706	863	261628	9988	2600	7174	1702	44	39	CFIFC
00923	XTG	EOU	6140	260956	402	855	260902	6945	7443	7174	3566	82	43	CFIFC
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00915	HPK	FHI	7500	260933	451	278	260904	0319	6246	2296	7274	71	25	AEFEA
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01018	EJJ	FSD	6680	261225	655	910	261140	8366	6246	3772	5636	48	29	FFBGG

00880	EJJ	FSD	2400	260537	651	893	260452	0752	4473	3600	5906	46	18 DCGDC
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01079	GEP	FTV	7070	261357	205	538	261233	0319	7443	1800	1261	69	29 FFBGG
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00900	GEP	FTV	7070	260841	202	531	260715	0149	5652	6418	4439	34	36 DDHAA
00986	HPK	FTV	7070	261139	052	535	261029	3560	8251	1800	4961	53	24 FFBGG
01104	HPK	FTV	7070	261436	053	539	261358	3145	2600	5301	9803	39	27 DDHAA
00916	PVJ	FTV	7070	260937	902	533	260910	6321	2230	1800	8282	76	48 FFBGG
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01204	GSL	FZX	3770	262005	411	601	261846	4712	0610	5428	5654	44	22 DJDJD
00963	GSL	FZX	7730	261100	405	564	260912	9988	1232	7255	7058	91	29 CCFII
00938	LYD	FZX	4275	261018	001	566	260919	7376	5652	7750	0776	59	23 JDDJD
01178	LYD	FZX	4275	261820	003	593	261632	3579	7443	7750	0776	53	35 DJDJD
00993	TDU	FZX	7730	261155	654	574	261103	2182	5426	7750	2701	35	24 DJDJD
01217	TDU	FZX	3770	262120	660	608	262022	3560	0457	7255	3089	87	26 AIJAI
01190	TDU	FZX	3770	261852	658	596	261740	9375	2600	8399	8732	62	50 AIJAI
01030	YRF	FZX	7730	261238	807	572	261054	6945	5265	7750	1180	55	27 EGBEG
01220	YRF	FZX	3770	262239	811	610	262125	2336	0459	5428	2314	63	22 DJDJD
01066	YRF	FZX	7730	261336	808	580	261225	0319	4283	8399	7076	85	41 DCGCD
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01026	FTV	GEP	6740	261232	855	787	261058	3579	6246	0379	3980	76	33 DDHAA
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01046	FTV	GEP	6740	261302	856	803	261212	5962	8296	0801	7346	86	46 FFBGG
01206	FTV	GEP	2980	262013	858	829	261942	6375	4473	3240	9740	45	10 DDHAA
01226	FTV	GEP	2960	262329	859	831	262204	6152	1232	3240	9740	53	18 FFBGG
00918	HOT	GEP	5625	260942	002	775	260811	3579	5652	3240	1261	37	16 FFBGG
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01211	HOT	GEP	5625	262053	004	827	261838	0752	5265	3240	1261	53	36 DDHAA
00968	HPK	GEP	6740	261108	754	780	260923	2336	5265	3240	4961	74	37 FFBGG
01073	HPK	GEP	6740	261345	757	813	261304	2182	6894	3240	4961	91	24 DDHAA
01160	HPK	GEP	6740	261712	758	822	261508	9375	3814	6878	9803	64	32 DDHAA
00890	HPK	GEP	6740	260721	752	764	260527	3560	7443	8272	9876	55	31 DDHAA
01036	PVJ	GEP	6740	261247	956	801	261208	6321	0457	6067	1522	79	28 DDHAA
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01019	PVJ	GEP	6740	261225	955	796	261144	0193	3230	0801	6617	28	03 FFBGG
00905	PVJ	GEP	6740	260856	952	776	260820	7924	3076	3240	8282	48	41 DDHAA
00995	PVJ	GEP	6740	261155	953	784	261017	5369	0459	3240	8282	98	30 DDHAA
00997	PVJ	GEP	6740	261158	954	784	261017	5369	0459	3240	8282	89	26 FFBGG
		18											
00965	SFV	GFH	6460	261102	155	437	261011	9375	0459	8362	0055	73	23 CCFII
00906	SFV	GFH	6460	260907	152	434	260813	2336	7244	6166	1397	67	17 DCGCD
01031	SFV	GFH	6460	261408	156	443	261334	3579	2600	0685	3098	63	08 DCGCD
01032	WPX	GFH	6460	261240	903	441	261145	6945	5652	8362	8318	59	26 CCFII
01179	XME	GFH	2620	261822	758	446	261728	9988	1232	8362	1612	86	27 EGBGE
00940	XME	GFH	6460	261026	754	435	260952	7376	8667	8362	1612	73	22 DCGCD
00872	XME	GFH	2620	260408	751	431	260329	3560	5265	6184	6671	75	26 EGBGE
01110	XME	GFH	6460	261450	757	445	261419	8366	6488	0685	9029	86	34 EGBGE
		8											
00975	EDH	GSL	6480	261120	652	700	261011	2336	1232	8678	3241	80	08 DCGCD

00899	EDH	GSL	6480	260836	651	695	260728	9375	3814	4681	5537	72	30 DCGCD
01094	FZX	GSL	6480	261412	057	716	261321	2182	4473	8678	2323	24	44 DJDJD
01142	FZX	GSL	6480	261613	058	719	261512	3560	6246	9794	3278	83	17 DJDJD
01025	FZX	GSL	6480	261232	055	705	261143	5369	2457	9983	0776	69	32 BCEBC
01203	HMX	GSL	2600	262004	206	725	261902	9988	2600	9983	5618	96	22 95459
01062	HMX	GSL	6480	261326	203	709	261218	0319	5265	9983	5618	73	40 50505
01167	HMX	GSL	6480	261734	205	720	261620	6945	2230	9983	5618	61	02 28082
00907	OFU	GSL	6480	260909	301	697	260813	4712	5652	9983	4312	75	27 28082
01126	OFU	GSL	6480	261524	304	718	261445	0752	7443	9983	4312	84	26 50505
00959	PIC	GSL	6480	261053	502	699	260932	0149	7244	9983	7580	47	37 ECHCE
		11											
01049	CUN	GXW	7620	261310	202	156	261132	5369	5265	9497	0776	83	23 FFBGG
01158	CUN	GXW	7620	261658	203	178	261538	0149	8667	8452	3890	30	26 FFBGG
00928	EJJ	GXW	7620	260959	553	145	260819	3579	2600	8452	5636	64	12 DDHAA
01181	EJJ	GXW	3540	261826	558	179	261732	0149	3814	9497	5906	69	23 AJAAJ
01034	EJJ	GXW	7620	261242	556	157	261151	0319	5652	9497	5906	52	19 AJAAJ
00956	EJJ	GXW	7620	261048	554	147	260907	0752	7443	8407	6806	83	37 DDHAA
01201	FSD	GXW	3540	261941	753	181	261825	6152	0655	3691	7562	69	27 DDHAA
01108	FSD	GXW	7620	261449	752	170	261333	0193	0459	9497	7643	52	25 FFBGG
		8											
01057	GSL	HMX	7540	261324	353	838	261243	3145	3473	5112	5410	78	47 ECHCE
01111	GSL	HMX	7540	261452	354	840	261402	4712	2457	5112	5410	59	04 95459
		2											
01068	FTV	HPK	7530	261340	803	239	261305	3145	6246	9136	4574	28	28 DDHAA
01135	FTV	HPK	7530	261548	804	240	261413	9988	4473	7273	9740	48	22 DDHAA
00947	GEP	HPK	7530	261035	103	235	260954	8366	6001	7273	1261	94	26 DDHAA
00974	GEP	HPK	7530	261118	104	235	260954	2336	6001	7273	1261	95	14 DDHAA
01157	GEP	HPK	7530	261656	107	241	261641	4700	0459	0522	9308	84	23 FFBGG
00879	GEP	HPK	3650	260532	101	231	260428	6945	1889	6832	9993	56	31 FFBGG
01008	ORI	HPK	7520	261212	953	516	261140	7709	6246	9406	1702	98	36 CFIFC
01010	ORI	HPK	7520	261217	954	516	261140	7709	6246	9406	1702	76	27 CFIFC
00914	PVJ	HPK	7530	260932	251	233	260817	0752	2600	2412	6617	49	30 DDHAA
00991	PVJ	HPK	7530	261147	253	237	261032	4712	1232	7273	8282	51	13 FFBGG
		10											
01083	EEZ	HVV	6590	261403	853	768	261255	3145	5265	3844	3287	43	51 DAEAD
00913	MEN	HVV	6590	260931	053	763	260823	9988	7450	3844	7643	85	42 CCFII
01027	MEN	HVV	6590	261232	056	766	261038	6945	1232	3844	7643	87	10 DAEAD
01125	MEN	HVV	6590	261520	057	769	261416	2336	4473	3844	7643	78	43 DAEAD
		4											
00896	YRF	IEO	7150	260830	202	739	260742	6945	7244	8948	1180	52	34 68486
01225	EDH	LAM	3540	262305	108	184	262146	6152	0459	8407	3241	42	04 HBJBH
01097	EDH	LAM	7620	261418	106	169	261312	7709	3473	8452	5537	51	25 DCGCD
01031	EDH	LAM	7620	261240	103	155	261109	0319	5652	9497	6978	61	25 EDIED
01056	EDH	LAM	7620	261321	105	166	261242	1317	8251	9497	6978	62	21 CCFII
00920	EDH	LAM	7620	260947	101	144	260806	3560	2600	5978	7832	46	45 EDIED
00998	PWB	LAM	7620	261201	204	152	261016	2336	7443	8407	2198	64	37 HBJBH
01148	PWB	LAM	7620	261637	207	177	261528	9375	7244	0937	2972	87	33 HBJBH
01212	PWB	LAM	3540	262053	208	183	262003	6945	0250	9497	3728	43	17 HBJBH
01067	PWB	LAM	7620	261340	205	163	261215	7709	3230	9497	3728	71	38 BFHBF
00985	RBU	LAM	4665	261136	002	154	261048	7376	2230	9497	7328	55	35 HBJBH

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Ø1129 YXH LAM 7620 261536 308 175 261455 7709 2457 8452 3737 39 2A GEBGE
00957 YXH LAM 7620 261048 303 148 260924 0752 1232 9497 9443 94 31 HBJBH
00958 YXH LAM 7620 261052 304 148 260924 4712 1232 9497 9443 89 36 HBJBH
00960 YXH LAM 7620 261056 305 148 260924 9988 1232 9497 9443 57 16 HBJBH
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00932 LYE LLA 7655 261008 509 342 260843 9375 6246 5941 2693 58 49 DDHAA
Ø1182 YRG LLA 3535 261831 704 347 261728 0752 6001 5941 5195 73 25 FFBGG
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Ø1064 YRG LYE 7695 261333 403 180 261316 0713 2457 4384 5195 65 33 FFBGG

Ø1128 EEZ MEN 6680 261534 708 919 261420 2336 5632 3600 3287 84 15 DAEAD
Ø1133 EEZ MEN 6680 261541 709 919 261420 9375 5632 3600 3287 92 21 DAEAD
Ø1074 EEZ MEN 6680 261348 706 913 261219 4360 5265 3961 6798 51 26 CCFII
00937 EEZ MEN 6680 261017 704 901 260943 5962 5652 3772 7904 72 29 DAEAD
00927 HVV MEN 6680 260958 802 898 260823 6945 5426 3600 3430 32 24 DAEAD
Ø1155 HVV MEN 6680 261651 806 920 261532 9988 1232 3600 3430 45 20 FBHFB
Ø1189 HVV MEN 2400 261851 808 928 261810 7376 0459 2188 8138 55 32 DAEAD
00982 UBT MEN 5805 261126 001 902 261016 6152 3230 3600 7643 99 28 JFFJF
Ø1013 YLV MEN 6680 261220 905 908 261135 7376 7244 3600 4493 52 22 DAEAD
Ø1037 YLV MEN 6680 261247 906 903 261048 3560 2600 3600 4493 50 11 BGIBG
Ø1107 YLV MEN 6680 261446 908 916 261328 3579 5652 3600 4493 64 30 DAEAD
Ø1151 YLV MEN 6680 261648 909 923 261614 4360 7443 3772 7652 36 26 DAEAD
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Ø1183 CUN MKP 3450 261835 503 803 261730 9988 7450 8713 0776 75 24 FFBGG
Ø1005 CUN MKP 7330 261208 502 789 261117 3145 4473 5671 2323 86 31 DDHAA
Ø1180 NUB MKP 3450 261826 752 802 261711 2336 5265 8713 1612 46 17 FFBGG
Ø1060 PWB MKP 7330 261325 402 791 261214 7709 1232 8713 0767 91 29 DDHAA
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Ø1153 VXI MKP 7330 261650 659 797 261532 0752 2457 8713 9155 43 25 DDHAA
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Ø1116 TDU MKV 6380 261459 903 775 261428 0149 2600 7219 2701 49 35 80808

00969 WID NJG 6410 261109 152 538 261015 3579 5265 7318 6635 49 16 AEFEA
00874 ZNM NJG 2690 260421 651 531 260330 2336 5426 7318 0767 52 29 AEFEA
Ø1035 ZNM NJG 6410 261244 655 539 261143 6945 4473 7318 0767 48 28 DCGCD
Ø1141 ZNM NJG 6410 261613 656 541 261528 3560 1232 5086 2585 85 07 AEFEA
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Ø1159 GKT NOS 7795 261702 205 435 261637 6746 0459 2980 6004 84 15 FFBGG

Ø1100 MKP NUB 6100 261425 452 313 261310 3145 4473 4131 1702 62 24 DDHAA
Ø1208 VXI NUB 2260 262038 957 328 261950 6152 3076 4780 7968 37 23 DDHAA
00962 VXI NUB 6100 261057 953 304 260948 6945 2457 4131 9155 75 09 AGHAG
Ø1150 VXI NUB 6100 261638 955 317 261502 2336 6246 6959 9687 64 19 AGHAG
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00904 GSL OFU 7120 260855 551 861 260826 4360 6246 6823 5410 43 12 ECHCE
Ø1106 GSL OFU 7120 261442 553 863 261348 0752 4473 6823 5410 62 15 28082
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Ø1137 ZJV OHG 6335 261558 305 753 261445 0149 8296 1594 7887 82 13 IIHFF
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01224	EOU	ORI	3450	262303	209	811	262201	3560	7244	8713	5212	54	35 ADEAD
00911	EOU	ORI	7330	260920	202	779	260835	6152	0459	8713	5212	82	30 CFIFC
00935	EOU	ORI	7330	261012	206	785	260906	0149	0250	8713	5212	46	29 CFIFC
00871	HPK	ORI	3450	260353	301	766	260317	9988	5632	8713	7274	72	37 CFIFC
00992	HPK	ORI	7330	261148	305	788	261029	3560	3473	8713	7274	56	15 CFIFC
01102	HPK	ORI	7330	261428	307	794	261329	2182	3230	8713	7274	86	20 CFIFC
01161	HPK	ORI	7330	261714	308	800	261608	9375	6246	8713	7274	43	28 CFIFC
01044	XTG	ORI	7330	261302	106	790	261150	8366	2600	8713	3566	75	26 DCGCD
01196	XTG	ORI	3450	261916	109	807	261822	4712	5652	8713	3566	83	25 DHBDH
01143	XTG	ORI	7330	261613	108	796	261451	2336	7443	8713	3566	91	39 CFIFC
		10											
00952	GSL	PIC	6930	261041	703	781	260956	0149	4283	7859	5410	93	39 ECHCE
00955	GSL	PIC	6930	261046	704	781	260956	6152	4283	7859	5410	79	32 95459
		2											
01080	FTV	PVJ	6000	261357	153	086	261243	3145	2457	8650	5221	51	28 FFBGG
00954	FTV	PVJ	6000	261045	151	081	260916	0149	4283	9460	9740	70	33 FFBGG
01113	GEP	PVJ	6000	261457	305	087	261323	5369	1232	9659	0037	92	40 FFBGG
01114	GEP	PVJ	6000	261457	305	087	261323	5369	1232	9659	0037	92	40 FFBGG
01219	GEP	PVJ	2360	262218	308	089	262109	6152	0610	9460	1261	71	27 DDHAA
01140	GEP	PVJ	6000	261608	307	088	261534	7709	0459	9460	1261	82	26 DDHAA
01088	GEP	PVJ	6000	261406	304	084	261151	3579	9403	8650	9993	36	27 FFBGG
01039	HPK	PVJ	6000	261254	353	085	261203	8366	4473	9460	4961	32	16 DDHAA
01028	HPK	PVJ	6000	261233	352	082	261028	6152	6246	7336	8192	54	39 FFBGG
		9											
01207	EDH	PWB	2560	262016	403	321	261910	2336	7443	0766	6978	63	03 DCGCD
00875	LAM	PWB	2560	260422	951	312	260345	4360	3230	0766	7328	96	31 BFHBF
00876	LAM	PWB	2560	260425	952	312	260345	4360	3230	0766	7328	84	34 BFHBF
00983	LAM	PWB	6520	261131	954	317	261017	9375	6246	0766	7328	37	39 CCFII
01009	MKP	PWB	6530	261213	551	641	261127	6746	5884	1053	1702	96	31 DDHAA
00884	NUB	PWB	6530	260617	352	627	260528	0752	0459	1053	1612	68	38 FFBGG
01144	NUB	PWB	6530	261619	354	652	261507	0149	5652	2737	5988	85	17 FFBGG
01169	VXI	PWB	6530	261740	858	656	261634	6152	5265	9550	0677	43	34 FFBGG
01121	VXI	PWB	6530	261505	857	645	261341	3579	3076	8957	7968	54	26 DDHAA
01001	VXI	PWB	6530	261201	855	640	261115	8366	1232	1053	9155	35	23 DDHAA
01101	YXH	PWB	6520	261427	803	319	261328	7376	8251	0766	9443	65	11 HBJBH
		11											
00878	GFH	SFV	3880	260509	651	215	260426	3579	6246	1864	0262	67	37 DCGCD
00977	GFH	SFV	7840	261120	654	223	261035	6152	0250	0216	7779	48	13 EGBGE
00994	GFH	SFV	7840	261155	655	225	261120	4360	2457	0216	7779	52	46 EGBGE
01112	WPX	SFV	7840	261453	053	229	261354	0149	4473	0216	8318	59	35 CCFII
01218	XME	SFV	3880	262145	556	235	262109	0193	3230	0216	1612	86	29 EGBGE
00888	XME	SFV	7840	260710	552	217	260631	2336	7443	0216	1612	55	25 EGBGE
00926	XME	SFV	7840	260958	553	219	260914	9375	5652	0216	1612	48	33 CIBCI
01170	XME	SFV	7840	261743	555	233	261702	4712	0457	0748	6671	63	41 EGBGE
		8											
00950	YWR	SFW	7845	261037	702	443	260922	6152	7450	1468	8804	67	28 DDHAA
01033	FZX	TDU	7770	261241	756	708	261142	0149	2457	1233	0776	56	09 DJDJD
00980	FZX	TDU	7770	261124	755	706	261035	0752	6246	1549	3278	64	19 DJDJD
00886	FZX	TDU	7770	260650	752	696	260516	6945	4473	8803	3890	58	38 DJDJD
01210	GSL	TDU	3730	262051	603	724	262005	2336	1232	1233	5410	86	34 DCGCD

00939 MKV TDU 7770 261019 453 703 260925 4712 0459 1233 3007 75 24 80808
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00917 ZHY TDU 7770 260937 852 701 260833 3560 0655 1233 8516 35 12 GIFIG
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00946 YRF TTT 7630 261034 102 817 261013 2182 9403 5734 1180 38 04 68486
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01122 ZZZ UMF 6200 261511 512 981 261402 6746 2230 5185 8886 70 39 IIHFF
6

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01052 MKP VXI 6200 261313 108 976 261239 3766 6246 7345 1702 72 07 GBIGB
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01193 MKP VXI 2160 261902 112 986 261658 3579 5652 9767 9407 86 47 DDHAA
01103 NUB VXI 6200 261432 204 980 261351 5369 4473 7345 1612 61 12 AGHAG
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01156 NUB VXI 6200 261656 207 983 261516 7376 6894 9767 9029 48 43 FFBGG
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01154 PWB VXI 6200 261651 309 984 261542 7709 7450 6364 2585 84 10 EIDEI
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12

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00961 UNY XLN 6115 261057 653 479 261011 0193 7244 9857 5005 59 35 FFBGG

01195 GFH XME 2260 261913 508 326 261812 9375 5652 4780 0262 42 32 EGBGE
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01221 GFH XME 2260 262254 510 330 262208 2182 7443 2566 6086 94 29 EGBGE
01136 GFH XME 6100 261550 506 315 261455 0319 3076 4131 7779 58 15 DCGCD

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01055	SFV	XME	6100	261320	307	309	261210	7376	2600	4780	1397	47	08	EGBGE
00866	SFV	XME	2260	260256	301	291	260222	3560	1232	4131	0055	85	27	EGBGE
00867	SFV	XME	2260	260303	302	291	260222	0149	1232	4131	0055	97	25	EGBGE
00971	SFV	XME	6100	261113	305	307	261019	5369	0459	6959	3098	45	34	CIBCI
01199	SFV	XME	2260	261937	310	320	261738	3579	6001	2566	4745	63	19	CCFII
01192	WPX	XME	2260	261856	606	318	261642	3560	0250	4780	0992	75	46	CCFII
00898	WPX	XME	6100	260833	602	299	260735	0149	6246	4131	8318	57	35	DCGCD
01065	WPX	XME	6100	261335	604	310	261231	8366	2457	4131	8318	53	42	HBJHB
		12												
00989	HPK	XTG	7980	261143	701	370	261045	6152	2457	5923	7274	75	25	CFIFC
00919	ORI	XTG	7980	260943	852	367	260902	9375	3230	5923	1702	68	33	DCGCD
00972	ORI	XTG	7980	261116	854	369	261022	3560	6001	5923	1702	83	21	CFIFC
		3												
01134	ZIC	YKD	6740	261544	155	820	261438	6945	2600	3420	0442	53	12	IIHFF
01053	ZIC	YKD	6740	261314	154	795	261142	0193	5265	3240	5906	61	24	IIHFF
01173	ZIC	YKD	6740	261755	156	824	261634	9988	9403	3240	5906	71	36	IIHFF
01048	ZZZ	YKD	6740	261307	624	804	261216	8770	4473	7282	0686	89	22	IIHFF
00929	ZZZ	YKD	6740	261026	612	779	260915	3560	1232	3240	0730	67	21	IIHFF
00869	ZZZ	YKD	2980	260341	603	759	260319	8366	6246	3240	0730	50	11	IIHFF
00870	ZZZ	YKD	2980	260345	604	759	260319	8366	6246	3240	0730	85	35	IIHFF
00948	ZZZ	YKD	6740	261036	612	779	260915	3560	1232	3240	0730	67	21	IIHFF
01016	ZZZ	YKD	6740	261223	620	794	261136	6746	0663	3240	0730	87	25	IIHFF
01123	ZZZ	YKD	6740	261515	629	819	261410	4360	8251	3240	0730	49	47	IIHFF
01082	ZZZ	YKD	6740	261402	627	816	261327	2702	1889	6355	0811	59	40	IIHFF
01145	ZZZ	YKD	6740	261625	632	823	261526	3579	0459	6355	0811	91	19	IIHFF
01171	ZZZ	YKD	6740	261748	634	825	261653	0752	5652	0379	4105	35	45	IIHFF
00987	ZZZ	YKD	6740	261141	616	782	260942	4712	3230	6067	5014	54	18	IIHFF
00924	ZZZ	YKD	6740	260957	609	777	260846	6152	2457	6878	8886	85	29	IIHFF
01003	ZZZ	YKD	6740	261203	618	792	261119	0149	3473	6878	8886	58	27	IIHFF
01209	ZZZ	YKD	2980	262038	633	826	262017	5141	4641	8335	9722	94	20	IAJIA
00944	ZZZ	YKD	6740	261032	611	784	261003	5141	4641	8335	9722	84	41	IAJIA
01085	ZZZ	YKD	6740	261405	628	817	261334	5141	4641	8335	9722	98	44	IAJIA
01132	ZZZ	YKD	6740	261540	630	821	261512	5141	4641	8335	9722	73	30	IAJIA
		20												
01194	EEZ	YLV	3290	261905	452	546	261741	2336	5652	2197	3287	84	41	DAEAD
00889	MEN	YLV	7490	260714	152	531	260638	6746	1889	2197	7643	36	17	DAEAD
00910	MEN	YLV	7490	260915	154	534	260810	3560	7443	2197	7643	35	30	DCGCD
01146	MEN	YLV	7490	261633	157	544	261527	9375	3230	2197	7643	87	33	BGIBG
01051	YXH	YLV	7490	261311	552	542	261153	9988	4473	2197	9443	51	18	DCGCD
		5												
01071	FZX	YRF	7590	261345	356	739	261249	7709	2457	4861	0776	63	28	DJDJD
00864	FZX	YRF	3590	260233	351	722	260200	9375	6488	7075	2323	87	45	DJDJD
01216	FZX	YRF	3590	262115	359	750	262014	3579	4473	7075	2323	69	18	DJDJD
00949	FZX	YRF	7590	261036	354	732	260937	6152	6246	0810	3278	58	45	DJDJD
01184	IEO	YRF	3590	261840	605	747	261742	0149	5652	4861	2378	65	32	JAAAJ
01029	IEO	YRF	7590	261236	603	735	261116	3579	7443	4861	2378	43	19	68486
01076	TDU	YRF	7590	261350	552	740	261315	3145	1232	4861	2701	92	21	DCGCD
00883	TTT	YRF	7590	260614	252	725	260533	9988	2600	4861	9498	94	06	68486
01047	TTT	YRF	7590	261304	254	738	261205	0193	0459	4861	9498	86	09	50505
01165	TTT	YRF	7590	261725	255	746	261621	4712	0250	4861	9498	77	42	68486
01002	VUS	YRF	7590	261201	103	733	261043	6945	8667	4861	9957	65	36	JAAAJ
01124	VUS	YRF	7590	261517	104	744	261428	3560	5265	4861	9957	78	25	28082
		12												

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01109 SFW YWR 7275 261450 603 547 261413 3766 5265 6724 2260 81 38 DDHAA

01175 LAM YXH 2760 261812 658 699 261708 6152 0459 8533 7328 56 49 GEBGE
00945 LAM YXH 6960 261033 653 691 260924 0752 2600 8533 7328 85 30 GEBGE
01020 LAM YXH 6960 261225 655 694 261116 3579 1232 8533 7328 65 14 HBJBH
01075 LAM YXH 6960 261349 656 695 261240 6746 5265 8533 7328 36 38 DCGCD
01176 PWB YXH 2760 261814 352 700 261735 7709 4473 8533 3728 48 14 HBJBH
00894 YLV YXH 6960 260746 051 688 260648 3560 4283 1774 7652 82 24 CCFII
          6

00901 TDU ZHY 6800 260842 502 852 260816 0193 5265 8524 2701 57 45 GIFIG
01164 TDU ZHY 6800 261722 504 854 261640 3579 6894 8524 2701 60 12 80808
          2

01130 UMF ZIC 6280 261537 353 805 261416 3560 6246 7976 2404 25 32 IIHFF
00978 UMF ZIC 6280 261121 352 786 261042 0193 4473 2746 9155 48 51 IIHFF
00996 YKD ZIC 6280 261158 254 787 261048 2336 2600 2746 1261 58 05 IIHFF
00933 YKD ZIC 6280 261009 253 775 260814 9375 8667 7976 9731 93 20 IIHFF
00973 ZZZ ZIC 6280 261118 708 781 260953 4712 2457 2746 0730 37 07 IIHFF
01023 ZZZ ZIC 6280 261230 712 790 261131 3145 0459 2746 0730 46 33 IIHFF
01059 ZZZ ZIC 6280 261325 714 799 261243 6961 2230 2746 0730 88 42 IIHFF
01063 ZZZ ZIC 6280 261329 715 799 261243 6961 2230 2746 0730 93 25 IIHFF
00873 ZZZ ZIC 2080 260416 702 762 260317 9988 6246 1738 5014 43 09 IIHFF
01191 ZZZ ZIC 2080 261853 717 813 261738 6945 4641 5842 7102 35 13 IIHFF
01006 ZZZ ZIC 6280 261208 710 789 261124 7376 1232 8119 8886 75 28 IIHFF
          11

01188 FHI ZNM 2570 261851 806 657 261757 9375 9403 4618 0604 43 13 CCFII
01072 FHI ZNM 6530 261345 804 643 261255 4360 2230 1053 2279 47 27 AEFEA
01213 FHI ZNM 2570 262057 807 659 262006 6945 6246 9550 5735 65 48 DCGCD
00941 NJG ZNM 6530 261027 103 634 260943 0319 2457 1053 5023 93 18 AEFEA
00943 NJG ZNM 6530 261031 104 634 260943 0319 2457 1053 5023 82 28 AEFEA
01050 NJG ZNM 6530 261311 106 642 261220 7376 2600 8957 5320 49 16 CCFII
00979 WID ZNM 6530 261123 904 636 261002 9988 3230 4618 2017 68 32 AEFEA
01011 WID ZNM 6530 261217 905 638 261058 4712 5652 1053 6635 82 33 DFJDF
01127 WID ZNM 6530 261528 908 648 261417 6152 6894 1053 6635 53 36 AEFEA
          9

00909 UMF ZZZ 6290 260911 405 495 260731 6945 0655 5545 0974 49 39 IIHFF
01077 UMF ZZZ 6290 261351 410 564 261216 6746 5652 2962 3494 37 43 ABCAB
01087 UMF ZZZ 6290 261406 413 572 261325 7709 5426 5905 9155 97 14 IIHFF
01092 UMF ZZZ 6290 261409 414 572 261325 7709 5426 5905 9155 89 02 IIHFF
01096 UMF ZZZ 6290 261413 415 572 261325 7709 5426 5905 9155 93 06 IIHFF
01162 UMF ZZZ 6290 261716 417 592 261649 4566 3814 0063 9687 48 19 IIHFF
00868 YKD ZZZ 2090 260308 102 482 260237 0713 4473 5905 1261 45 08 IIHFF
00966 YKD ZZZ 6290 261103 110 535 261016 7376 0610 5905 1261 95 17 IIHFF
00967 YKD ZZZ 6290 261108 111 535 261016 7376 0610 5905 1261 87 30 IIHFF
00895 YKD ZZZ 6290 260817 104 496 260742 7103 6441 3718 6031 91 27 IAJIA
01118 YKD ZZZ 6290 261503 116 580 261428 2702 8296 3718 6031 86 06 IAJIA
01197 YKD ZZZ 2090 261932 117 595 261746 6152 3230 3457 7607 86 23 IIHFF
01038 YKD ZZZ 6290 261253 114 559 261205 8366 5631 0063 9308 36 14 HAIHA
00953 YKD ZZZ 6290 261042 107 523 260953 3579 5265 5545 9993 93 26 IIHFF
00930 ZIC ZZZ 6290 261002 308 515 260910 9988 2600 2962 0442 83 16 IIHFF
00877 ZIC ZZZ 2090 260503 302 485 260418 0149 7443 5905 5906 44 44 IIHFF
01117 ZIC ZZZ 6290 261500 316 582 261433 4350 6488 5905 5906 94 34 IIHFF
01119 ZIC ZZZ 6290 261504 317 582 261433 4350 6488 5905 5906 96 23 IIHFF
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01022 ZIC ZZZ 6290 261229 312 552 261153 1317 0459 3141 7698 68 26 IIHFF
00893 ZIC ZZZ 6290 260739 304 489 260643 0752 6246 3196 8273 55 15 IIHFF
01223 ZIC ZZZ 2090 262301 321 600 262220 4712 4283 3457 9272 39 31 FEAFE
00922 ZZZ ZZZ 5595 260955 001 502 260826 2336 1232 5905 0730 39 38 IIHFF
01017 ZZZ ZZZ 5595 261223 003 548 261138 4360 2230 5905 0730 44 29 JEEJE
01172 ZZZ ZZZ 5595 261752 004 588 261555 9375 7443 5905 0730 91 20 JEEJE
           24
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APPENDIX 9

PROBLEMS--MILITARY CRYPTANALYTICS, PART II

The problems in this appendix are grouped into ten sections, paralleling the sequence of the text, with scopes as follows:

Section A--Repeating-key systems with standard alphabets; Porta and Gronsfeld systems
Section B--Repeating-key systems with mixed alphabets, I; direct symmetry
Section C--Theory and principles of indirect symmetry of position
Section D--Repeating-key systems with mixed alphabets, II; indirect symmetry
Section E--Special solutions for periodic ciphers
Section F--Progressive alphabet systems
Section G--Repeating-key systems with unrelated alphabets
Section H--Polyalphabetic bipartite systems
Section I--Monome-dinome systems with cyclic additives
Section J--Periodic digraphic systems; miscellaneous polyalphabetic systems

The portion of the text which should be read by the student prior to solving the problems in each section is indicated in the section heading.

This set of problems is also available as a separate publication in a loose-leaf book of ten lessons. This book, entitled "Problem Book--Course, Military Cryptanalytics, Part II", contains the cryptograms which for the most part have been arranged in proper worksheet form, obviating the necessity of recopying; and frequency distributions are also appended to reduce the amount of time spent on the purely clerical labor incidental to solution.

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PROBLEMS--MILITARY CRYPTANALYTICS, PART II

A. Repeating-key systems with standard alphabets; Porta and Gronsfeld systems
(embracing Chapters I-IV, inclusive)

1. Solve the following cryptogram and recover all keys:

BYKSJ	HBKFS	IRDCW	JUSGS	DMGLN	TTRPN	FRBLM	HGLST	TEKLX	LCWMH
FICPG	KDEMI	KLAVY	SKACK	IDZYF	BTYTF	GVMHG	LSTAQ	FAELF	JARGE
AZHIQ	RZTWY	SGAVM	SLPZC	NILUQ	TWKFI	WTDAV	ZELXA	SXIRD	XXRHP
BKDMI	LXJOK	QWMOE	YSGAV	MSLPZ	COSFP	AFKZF	LVUGY	SEFVX	GJSOK
USGSP	ZFVSE	KDHIF	VMOWO	LJCWM	FLECA	SVEWM	OEYSG	AVMSB	BGKNI
IRTWO	IQHBN	IPAVF	SKEPJ	VKTML	HTHRH	GEKTT	YGSKX	AEIOW	IPEGD
TPUYF	IXNIO	RRKSY	TWLAF	ZXASI	VDTAR	MECAG	FRXAI	HTSJE	EZELP
ZCNII	AHZSU	ARMOP	SZJGF	HRSPB	RFINN	XAGJF	SIFTS	ZVDWV	OAPBW

2. Solve the following cryptogram and recover all keys:

QDIQR	ZIJQD	VKSJR	WWPTN	JTVZS	COPAK	GDPPD	PUAQZ	XZWNC	PPPJA
OHFUU	EAOAP	BZYME	QJJHD	EVIKJ	EILHQ	CXEMW	YOSKP	UAJQU	PZZGZ
XSXNU	UDPXP	YPEIK	EJAFV	TJKZU	QGEOC	DZBZU	MEDIR	UUQKK	EYVKO
AZUOA	PBZPT	RKHNC	PPPJL	LDEQT	JRWEL	VDNPO	OZGUD	QHGGR	GERAW
YEDPX	VCQFK	AEYLF	ZZDJW	UBOYY	EIKMA	OPQMA	RZPEV	IKJUA	QKZYM
EQWYO	SDVXZ	JORDG	EUPEG	ZNAOE	AVDCQ	RVTNC	OUQKZ	UKDPU	ADDRP

3. Solve the following cryptogram and recover all keys:

40313	71236	39244	43045	21393	61128	39284	33540	45391	03413
29381	31240	25421	13034	25421	24443	29372	91210	21444	01342
34314	31211	29353	34542	39321	23842	34424	24445	40313	33010
40383	43645	25284	21536	32353	32711	28273	71536	39324	34314
29354	03132	39444	44542	38433	33329	45124	31445	40414	34443
39421	24443	45381	31145	25303	74232	34431	53839	32243	21528
34263	31342	34281	54136	34281	12440	29353	31232	21421	24433
38382	93337	41373	11336	35372	62526	24241	13729	21343	31110
40384	44332	43421	34543	32123	23443	35432	91330	38381	11245
35243	21226	20211	11342	36152	52418	29423	31743	25261	23431
28381	31142	26241	01136	42244	04433	26321	01211	40412	93841

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4. Solve the following cryptogram and recover all keys:

ILEKM TXNIF HDBVG OHHDO UGIKH DFEAH BGMYD XZQHR FVWGB VQPHG
TPUBT QIRCZ BMDVM YBGXZ OTEZC LBOHQ YWFOK XVAIT VXHQY FRAAI
YHCOC AGQHD SOKBG AUCUU VSTBS RAWFY SKFPZ NDKIZ AOGKR PVZRC
ESHHK MHHDA XQUID DRASP FKITT AGSDS KZLRT GMAII RXAGG QYOID
EFQWL BMUMU GHQYH RWAIE FMGHQ WVYMD UTNRT GGFPZ GEQBP WIUVQ
GPSHR KITFT ZSBQB PHLSH CAUOX XMSZR HRRVM RAAIF USHHS KVEHE
TIGER QGQNN GAURH KPIMB MUKNQ YHRWA ZYLQC FWVND KIZAO RYHRW
AGBYI TQYXN DKIUG TBLWR WATAB TPRHU DNUGE HXXMP CHOQR UVLWP
VSAUG QHMUY POZYV SUYLX QIEXG CPHML YACFN OXMHQ UOGNY VPRNZ
PFABP

5. Solve the following cryptogram and recover all keys:

SJMWC IEXUB XFDKZ KCRIK GWCJE WCSCI OEYSN JOGMW LJSEY VTKOA
PJCWJ ZHIMO WKKSN NSJYI TVBBW JOXXC AIXKI BMJAU EFJCP USCEJ
UOEKX XMIPA HIEUS JYBCF ELLSL ZVRWP MOHVU QXJJZ WMMKX CPJLG
EPPUJ WHVWJ LKHZV CERDX ZSRKE ALAEF FKAMD KOLIW SLFLL GRQEP
HYXYX PCSCO XAYKC FQAUR WWICU PTEOW ZWRKS JAISN HQPIX EQVGW
OCIFP QNKEA YAXJJ BMJAJ SGHXU RZVKK CRIKG WCJRR BWTBF AYADN
NUYAX IOCHS XZEDK KCFTR NSLZX LSSLJ ICHKR FWLSW ENHVI JCKPK
SQMAI

6. a. The following cryptogram was enciphered with direct standard alphabets; solve it and recover all keys.

PLCAK YWKEU TZNPV LMLTR ESGJN HVWAM EDLYG KGOLN FLXLM CCVZG
YIMAD TYRGL TXVDS KORWF TRRHR RNPYM ADIEE HMYVX

b. The following cryptogram was enciphered with reversed standard alphabets; solve it and recover all keys.

ZIVDB CDFXM NJJBH XVTTC LKOZH IZPVZ OQNTE EGHQM JBAOI MIPDN
NDYDR WAXBU XXOOF NFDQC IZZWU RTRWT RPLQD PVNVG OECFF RYKDA
WLXBU XXBNC LKOZH MKJMJ

7. The cryptogram below was enciphered by periodic polyalphabetic substitution employing direct standard alphabets, with the number of alphabets between 45 and 50. Calculate the observed and expected plaintext and random values of the ϕ's or I.C.'s for each hypothesis and show these data in a diagram; determine the correct period, solve the text, and recover all keys.

NHBRK ECDIT BPQEO XRLKI FFTNO HOEFU MOSIA AVRWU KXXOE WJWCM
SLJST SSIIA JMWZH VLXHZ KCUAA UEISM VTRHQ ICPKK VWMGM VUEFD
BZUOO KIRVD DWVVR YZAZD AHZSZ FWULL EKSMC SWNLE TBJNW CAWSK
LWUHJ XOCUW GZRGN VATLI ISCZL XEHMY EAUGF YVHKJ RJRZH RRGQZ
DNPVH IFFGR OMASI DRLOT QSMKT PIHWJ LPRZF YBUTF UBUOG JIHZL
UGKSP ERKWK VRQGO KLMGX CLXJN

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8. a. The following cryptogram, enciphered with direct standard alphabets, is suspected of containing the probable word GREENVILLE. Solve it and recover all keys.

ODPHN VVMCE WEAVP MGVAC EPVIR KRNRE KZSRW TRRGR JZOYE NVDSI
RRITJ XHYUR EMGVC

b. The following cryptogram, enciphered with reversed standard alphabets, is suspected of containing the probable word NEWTON. Solve it and recover all keys.

XDOAA QUYAQ TQDRU PKVFR EZXHE GREVK XFNZG QUNLO YSNNN

9. a. The following naval message is in the Porta system, and contains the probable word COLLISION. Solve it and recover all keys.

MPHSY XBLAM IZXJK GXKJD WNRQM MGSIR GAKFH MYGVH ETIEX NQXDE
AXMDR KGRXU AYEYX QMSNO EXIMQ SEIWR FGWJR XKDPT EELPA GCWOJ

b. Solve the following Porta cryptogram and recover all keys:

VAMNA ERWRM VBEFX RRBTA ZFKWI RNCKZ QVJWK ANQAU APNFX CNWZL
GRINV AWSOU TRYFR AUUCY QFKFK AWSOU TRZNU NWBVX YBJKS EJURD

10. The following naval message, known to be a Gronsfeld cipher is suspected of containing the probable word DIESEL. Solve it and recover all keys.

XSKFS CUZTS NVBOX UVVCT SMCPK MKKXH QNDLU RKOAX RQEDY RQTNP
UMAHC LXHXX

B. Repeating-key systems with mixed alphabets, I; direct symmetry
(embracing Chapter V)

1. Solve the following cryptogram and recover all keys:

JJYMF NXWQQ YOGHN JVTJF DECMR ABMXE BJLCN XNTEI GIWMT ABLTG
SSETT YMCKT AXETN ZHJPH SIGOF PRHRK WECEP YHMJY CPAZM TBLXK
SIKLF EHJPW NVBEB HWGZF YNGOF PRHRK WEMCN TSHXG NHVCZ NXHVE
TYEPV WCNQE JDEWW KVLJG GEYLF KJMFC SUKDN VOWJK GNWKL NBFPT
DWVRL ABLTW TVGOJ NBCNN TUYTN IALCU WTITZ VCLAU NXETX VNKGO
WRZMT DMKFG BUQCK PMWKF RSZLP AULNA BYAUL JHHMI NECKL POEAI
GHBMP KWXFK NOLOD PKCYT XJZLX KJHKA QOGCR SVLJG NXBJK VXZQE
JSZLP AULNA BECKL PHHMI NQAKN ABLTK WJNNV NCEYU AXGNX VUWWX
OJMWX WXLZW SIMHG PEHKI TIGOL JHBKG SPATT NPWGK ARMVR SXWKF
ITALF MHZNG VEHLF PCLXQ RUBJN IDFDG IJLHR SAMAG SIWMF

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2. Solve the following cryptogram and recover all keys:

TMXHP IVSEI KHRCO SIOYB DTBCO NAQTE XABWP LEJMI VKACF DVBII
HGQGG WECAU OWQPO DWHGL ISUVW IVBIW THJJK VKOYB DTBCO TEJNT
IAOYR MVQAN DFRHI KJJJK OWQPO DWHGY VZJTE FPHWO DWHYI AKSAF
IHJJK LAQEZ BWGIY OZBNY SMHRU MZJZU IVQPS IEJVP AMHHG JWOFG
YASSP SWLPS IECFP ICBFG TEJNK IYTYM VAOHI HSBFW SGBCU MZPYD
IVSGZ INOAQ AKSJH VWQJH OWOHG WZRHO PDDGO MXCTM GGFLR MSACU

3. Solve the following cryptogram and recover all keys:

YRHXR OKSAX XJFZK MWXRF DJFWI TNKYD JAEZC AQOGQ LHXMU ABJSZ
SXURC AZFWI FWGSR UETJX XFOTQ BDIKK KQUYX RYTQO ZJLOY RHXGT
JSRUE AFCUM CZKST TVFZG ELKYU KPRLG LLZTA YTSPZ KMWYM HDCNP
GEGEG LLZEJ HGKLG AXXDR LYTKU JLEGT NKYNX YFOKT KLJRT PGEGE
DJALZ FXTPP PRCEA PXGLW FOXQB RIBZF KXAXX VJCST PPQJS FRCGE
VSZRW AOTGY TXUQJ UTQOZ MOJKS NGLIW CLCZR CYODJ SJPYY FXSFL
DTJYP ROGFX

4. It is suspected that this cryptogram contains the same signature present in Problem 2. Solve it and recover all keys.

18200 32215 10011 41510 20041 20802 07221 12513 16172 50406
22201 71510 20011 02106 20121 00413 18200 71423 07210 30318
12191 70508 10261 21607 20082 42013 25091 21626 25110 52203
19151 10906 22172 20525 20032 20605 22192 21607 04251 10511
24101 00305 18141 12121 19200 61423 25231 21611 12211 02218
12200 52101 25151 72118 25011 00321 14021 12313 13122 50604
25221 62021 14191 31525 07172 12014 09201 71510 20041 02218
23011 42625 17191 70411 26261 62013 17192 50614 26172 21602

5. Solve the following cryptogram and recover all keys:

GMPEM VCYWH OKPZA VQVFN YSWDO JQHZW ADHVF WALPS YUTRW WVVHL
LMMNL BYGMI AOWEU UJHWT NFSHL IGVQN WHOIO JUZFE NVYGM NXXAU
MTONB OYDXB QDQRO JHWEW HJJHG XXZZO QROWT IKIGB KDQJR DSUMR
NNYZO DMXOX NRGVZ IJRYO INJJJ FPWSR FZJOF LLNKE MNZHJ BTTCM
JSKDH BBYUV NRSSY SGBKD QJRQL HKRCV ZQITP NPSKR NMGSV XDVOS
TRCKH HOSXK NVQQX LJVQV FNYSK IAFLJ UEOKY HBLZN OYUUO HGUUS
AMJUB VNYLM VVCYW AWITF GHDTG XLGKJ RBBSJ VHXLG FEYVG GEQQV
GZFCF

6. a. The enemy is still using the components of Problem 1, with the periods varying between 10 and 20. Solve the following cryptogram and recover all keys:

BPLOT CTHQM JTGNB TVRKF MEMMN RMSFG YVRHR KPZOV QNRHI BMEHH
MFFXG NEWNJ HDKGR MMMVW NOFXS JCSPN LHUCP CLWOA

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b. The enemy is still using the components of Problem 2, with the periods varying between 10 and 20. Solve the following cryptogram and recover all keys:

VCZUU PSGZV GDJBT QBXAO NZDHX THXCC NHJIR AJJPS BZHTS BOYRJ
WKJIG PSDGP FBSZZ QDHDS BEYGD GJMJB

7. a. The cryptogram below, enciphered with the components of Problem 1, contains the probable word FLIGHT. Solve it and recover all keys.

LFCET LQTEJ JYWIA BLRIB JWWFV PWRVG TNNFS UIJRT AQOBM TOEYZ
TPEZU RFAFG BAECM DVBBT EPWMA YODAV

b. The cryptogram below, enciphered with the components of Problem 2, contains the probable word NAVAL. Solve it and recover all keys.

SORTH LBSST OVFGN VSIVX HTHHA RYEIK MCDZL JVLFE VJZBM VAHOH
DFWKB QVCEV RWDMN EPOQP OPTOX

8. Solve the following cryptogram and recover all keys:

RCCQN XGSRO VBTLM ERCWA YKWEW BBSGL ESWZK CQSFB SYYTD JKJSZ
UAOYH LAOSD QPZZT FGYCT OZTRT VTITS SMYRS LMZLA RMOMD EWCYX
MTKOZ BPTFI TJLFN CSODE WZYLC JKLPZ YERIP ZTOLB XOGWD RUEWZ
EZGBS HXYEV YOLEM PEIAJ YEFKY ZSRKQ CMGLW CYPKL DSSHF ITNFW
IRRQD LSEJC TAOYH CJNIM PBLZW CGQHP NSFCY WSYMV PAHEM ETHRE
YTQYE SBOCB CLNFJ CAAOY HSBZY HFPYZ TFTFY INVIK ZTMYU TWFVL
CJMZE FVAFT TTFSS RCBFS ROVTI KJYXF UBNKY UTDCB CXIWW RYVTM
DEQFY ZTJTM TYTGB KNWRD DA

9. Solve the following cryptogram and recover all keys:

YWIUP WALRO ZMZXN SUWDO GQJNC GHNBU FFYHV FDNVP QRUTF HOQUT
XHYWW KGDAQ YFDLA PGNDY DIOFL IYXVH FFCFQ FUDTB QXSUF YWQNW
OOVKR EYQJF DJHFN OBSAD KWVOP LHTTD HGBSJ HFHHE TTFTS OCALO
PHDKP OSUFZ WFFBH ZINLH HZPCU SLBBA VHRFD SOOHN BOXBI LNFKZ
JDJQH XJLAM ZLJFJ DBFAR FCAOY YDSVW LILTY WZFJB NJQRV YZUFZ
LEFQU MVFTC

10. The following cryptogram is assumed to begin with the words ENEMY RECONNAISSANCE. Solve it and recover all keys.

ZJOKJ TBKYS XSIAO MFVQF CTWMA VNCDY FCWLL KZZUR CUVIS KKWCH
DOYBL SVNYN TBKYS XSIAO MFVQY ACMXX EFEZM YSM

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C. Theory and principles of indirect symmetry of position
(embracing Chapter VI)

1. Assumptions made in a polyalphabetic cipher of a period of five have yielded the following pairs of plain-cipher relationships. Reconstruct the primary components and recover all keys.

Pairs from Alphabet 1	Pairs from Alphabet 2	Pairs from Alphabet 3	Pairs from Alphabet 4	Pairs from Alphabet 5
AZ	AR	ER	EI	CP
DO	ET	OW	IV	IX
EW	IF	PO	NX	NY
IA	NH	RC	OB	RG
NK	OM	TU	RN	TH
TQ	PL		SC	UJ
	SI			VL
	TN			

2. The following assumptions have been made in a periodic polyalphabetic cryptogram. Reconstruct the primary components and recover all keys.

123456123	234561234	456123456	1234561	5612
YLKLDNPLX	ZEFUROIZG	LVHYKKJK	WHFQDAA	HGLP
ARTILLERY	BATTALION	INFANTRY	CAVALRY	STOP

3. Analysis of messages containing enemy morning reports has shown pronounced stereotypic beginnings, such as "MORNING REPORT FOR TUESDAY DECEMBER ELEVENTH PERIOD OUR ORGANIZATION..." The following is the beginning of a message believed to contain the morning report for Wednesday, December twenty-sixth. Reconstruct the primary components and recover all keys.

JLVKI HHQPU CCEAW QYABK XQIUS GUWXJ TLNOO NWVQV DCXJQ PAFRG
CLURA DLEGE YVPIH...

4. The sequence reconstruction matrices below were made during the solution of three foreign-language ciphers. Reconstruct the primary components and recover all keys.

a.

Ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	F		G	T	B	U	Q	O	N			D	A		R	V	Z	M	I	C	H					L
2	H	N			I				V			C	U	E	A			F		Q						
3	I				Z		H		T					C	E	G		B	D		P					
4					A				H			N			D				U	V		M				I
5	Q		B		F	Z			O			P						C		E						
6	L	O			H									A	G			Q		S						

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b.

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	H		J	M	I	N	O	S	F	T				W			G	L	Y	Z	A			U		
2	U	Z			W			A	E			R	D	F	G	X			H		Y					
3				X	H				S						U	B			L				A			
4	C		D		P	G			Q							S				V		W				
5	X				M		E						B	L		N		J		A	O			F		H

c.

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	C		U		G	Z		P	D	A	B	O	Q	I	S	E	R	J	F	W	L	H	N			M
2	R	G	J	N	H		P		W	Q			F	T	U				L	K			B			
3	W				M		Q		L					U	V		K	B		A						
4				I	P									W	L			Q		B	C					F

5. The following three sets of data were developed during the solution of certain specialized polyalphabetic problems. Reconstruct the primary components and recover all keys.

a.

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1				O	F			K						I	W				T	D		E				
2	L				S		*						M	V		R		C		G					A
3				A	B			G	I						S				Z	*	T		J			
4					G				N				S	J	X						O					W
5	K		S			L			X					U				B			F	*				
6			H		P							G			J			U	A					L		
7	D				*				Q						K	Y				G	R					

b.

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1					J				N						C				X							
2	H				M				S						F			I	Z	7						5
3	D				E							G			R	U				W	B					
4					M	Q			V					Z	I				K	3	4					
5					K							A		W						Y						9
6	7				8				P	L				O		T			3	R						

c.

1	2	3	4	5	6	7	8
A 38	E 27	A 22	F 12	A 45	A 18	A 35	D 12
D 27	G 15	D 25	I 39	C 21	C 28	D 18	G 26
G 28	I 25	E 18	N 19	D 11	E 34	H 26	K 29
O 11	M 24	F 32	O 21	E 30	L 43	I 23	N 37
R 41	O 17	H 13	R 45	L 35	N 13	O 42	T 19
S 34	P 39	L 10	Z 29	O 38	S 31	R 22	U 44
U 36	T 38	P 40		R 34	T 12	S 19	V 14
	Y 43	R 39		Y 16	V 10	U 33	
		T 35				V 44	
		U 20				Y 24	

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6. From the data in the matrix below, reconstruct the primary components and recover all keys:

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	X				C				B					W	K				F							
2			L		Y		T							F				V		G			O			
3					R			U										E							L	
4									H					B	T			Q	K	O						
5	Z	M		V																P						
6					D				L				K		X							Z				
7					S							P			J			H	E							

7. From the data in the matrix below, reconstruct the primary components and recover all keys:

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1					A	G			H				M	K	N				U		W						
2	S								E						J	A				R	U		W			
3			P	W	V			M	I					T		Z			E	F			K			
4				C	B			R	U			D		X					O	L	Y					
5	V		R		J			P								Q			I	S						

8. From the data in the matrix below, reconstruct the primary components and recover all keys:

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	M				F				X						B				N	R	K					Q
2	E			R								V		B					D	Z		H				
3					D			V	W					F	A	O			M	Y	J	L				
4				I	B			Q	S				A										P			
5	T			C										G					A	U	H		W			
6					K				C			Y	J		E											U	
7									O					N		I										

9. From the data in the matrix below, reconstruct the primary components and recover all keys:

∅	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	Q	Z		X	Y	E			C					K	N				A	G							
2				Y		B			H			T			L				C		I	J				
3	H	E		B	D										P				I			W				
4					G		J		T					P						W	K					
5	R			G	F		S					M		O	Q				T	U	N	V				

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10. From the data in the matrix below, reconstruct the primary components and recover all keys:

ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	G				E									N	V			J	L	B						
2	U					T			N		A			D				L	I			Q				
3	R		Y		H				E				C	Z	M				B	I					S	
4			W	G			N		S		T							I		D	A					
5			L		N									U	O			V	D	K						
6				F	S								V	Q				D		O	P					

D. Repeating-key systems with mixed alphabets, II; indirect symmetry (embracing Chapter VII)

1. Solve the following cryptogram and recover all keys:

IOQID ECUYW AYQGZ XMRFS PSXWP JEBEM IHMNZ PFAQI AZPMW TSGMI
VMGGQ EQVOW AKOUD RHBMM PWHEM YSDAG IPNSQ GSMOW WIMNW FTNXE
SGMIV DHEBT HMTRC IHQFL CHWAK OUSSM CMLPG OLDQG QOAAF EMRAH
CWGQT LTARA PGGNS MVPGQ WATLC HEAGH FAQIA ZLJYE JTAEA AJETE
UYTRC IHQTP QKWMP WHSHF WQAGI PNSQG IAFVB QMWKO NMYUE SUHWC
OGOEQ AAKNS WJPLH DAAJE TOIWZ NAZPD YEMZK NZHQT PVTZO GKAYG
YPSFZ EUAMX YSZFA FRDSJ DNJYE VRAEW NJQPR BHIRM TZQEB MFXCU
KCVDS ETXMP CNOIA NLZYA RRAPW IQVPN QIANL ZLGRS HMKXO XFCLA
TMAAJ PNIYC MNMWO SVVRE HZRGN QMRSI NKFDD BKKWP OAEDU APLAY
TPDQD OMPXV CSVAO MAKGP VYIAR ZXDED WAEAG I

2. The following message was intercepted on the same day as that of Problem 1, but due to operational difficulties only the first 160 letters were received. Solve the text and recover all keys.

MRCVP TZVCX SKZWD TIHAP OIUQL WWMZV RRXYV OKZXV IKPWZ JINCP
LVQTZ TIBGM MFJYD JMHKX KHZUZ WIVJO EWNAZ FEVTZ AGNWF AKXTY
LZLRL WLLQX KMFSU WYAEV NZZYJ SZVDF FNXXV ZXCRP OQFSU WLVGY
KIDWZ WCHVX...

3. a. The enemy is still using the components of Problem 1. Solve the following cryptogram and recover all keys:

EHWHB PVDVS WFECY UWHXW UBIVP WYVDU LZICJ WMRID MRMCY KUMIC
ZKWXA VZVMH WBSZB BIMVH

b. The following cryptogram, suspected of containing the probable word CAVALRY, was enciphered with the components of Problem 1. Solve it and recover all keys.

EQXFI YWWUS HZKCP OHHVA VLUMI KDQLP SBUNT EFBWX JDHHA

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4. Solve the following cryptogram and recover all keys:

23G47 7E1ZU AAS9F 8CYRF 6ØYG6 6H477 E1ZHJ SVAF4 1W31Z 6JABY
ZUYGW 6CB7A B6PC4 AQØYT AJ9CZ XC72E GTA7W VDUAY VVY4A 789DY
3G2ØG TOSAY ZUYGW MU8CA B6PC1 4S6F8 CYRF6 E5K27 Z47HE YZ9CA
6M27J I2F64 6M66D Y47WV DDYAC 6FLJM 8HF8C YRF6E 5K2HZ YKA2F
WX1Ø2 ØGTCG RVDX2 4CIQ8 7H2FZ H9RRY QSJYV ZQBOJ R7Z4I U2WGB
YM3UB C4YØB 6YYF4 9BS5M WDY42 4QN8B 71XXX

5. The following five messages were enciphered in the same general system and specific keys. Solve the text of Message No. 1 and recover all keys.

Message No. 1

NRPWH FNDWU RMBNO KBFMJ WGHWM WEZLV UDOIN FJPGK DLASW HHHZN
INUFP EQVWB RSBMQ HKEWN UQXKH ZHBHD NVREE ESZBW WRHEZ TTDTX

Message No. 2

OWYWU ZNDQI AHIWB RRSJG IGHXN LCNFL THTNJ FJRZT WUZSF OJWVH
TQBAP TGNHJ KQADF GZBLL LXMQX EJHOK BPTRJ GDYIS NRLKQ RLRRU
RZEPB IVCMC ENHAX MIZQL KDRAS WTNGK EWNUZ JXCJQ WIBGQ EZPDZ
IQMPE HNHJK QRTKF ENBQD XZFVP HLQDT YAVRE ZAPQF FOJJQ KWCMK
HZHBH DNVR

Message No. 3

MSHZH LASWH FGPEB ABJSX JKMLP MCIRE NWPJI RLMWY WBESC SACJA
TLFXY FGZUJ YMNJX CJYWK MCHAF BPZAH QNWJE WRAIQ XJQVD LLRQU
WJKKN KBGAE JUDLL WCMTG QDRA

Message No. 4

KCEWN UNDRS JZYHF NSFLC BNHBE BKJWG KDTRH QVNVQ PQIMQ IASJB
LLLOT NWZKB YQRJJ QVDDI YTLRM ECWKS XJPGK ZZRWJ IKEEE SALTJ
ZDIPL RLMUC WIJZW DTPEH JJPWQ JGCCB EBRIQ ZAFUH LWFGT ALJUT
ZRCSR EJQXM WRIAG UGFYQ BJIGN DLLFC H

Message No. 5

DQEEW UKBFM JWGHW MNQSJ CBEBR DTBQV SPBIA ADQOC JLKQP TNWZU
LGIFO NLXHX XPBPE ZEHWX BAMRH YQZLS XMQXZ ULSPQ XMGKP ZHSBD
RDHHX RIQZN JMLLL IWODL KQ

6. Solve the following cryptogram and recover all keys:

HHHHH HHHHH PHLLI QCZUF HTTYM HNGLI HHHHH HHHLD LKTXF RBWBD
ZUUHZ HLPHN ENZOA EFTDA QRERE TVLBD ZUZHQ HFVRC WSQJM REILF
LKTXF RVGLD UTECL HBFUC HHHHH HHHYF WANNF UKPQN TTVIK HBNZL
IYKOA XCZEN LHWPA CNZMN AUTKG TLPOF GYKOA TVLEG AZYIF UYRZN
ENSRU GHUUD ZMOVJ EYDFL QQUVL EHDZN AQPOA QHWFA ROPJM HHHRX
EQLPW NHVJH HHHHM RBZZI XNYNH HHHRG EHLXB ZBVEJ ZEPPC ULKFH
CSKAC OKRLD GHYIF UYRZC IVWJQ HHEFT ENHJL ZBZPX EZEUO HHWFG
HXXRH SLQML VLKOV HHDWI VTVOJ BKRMA ARTTF BXFMR CHMZC

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7. Solve the following cryptogram and recover all keys:

EGQYI RKCTJ HRLEP RAAHP CXVCH DHVAJ KAGXU NTSEI KLGMI KAGAD
IVQLJ DRHOI VNMKO DQYYL NNWES DBVBL NBCAU TTOMP MRWLX KAGZP
NTSCA KLGRV TTOFP IMOEO SMHSL MNGND DQGML HWCTJ HRLII LHCCL
RKGTJ DJGRP CQOWX DNMOT NMPUM HWKAJ ZTPUJ ITNOT NBGII MACID
VQPIU OWCNP VBGKI NNKAI BVZIP FVOOC DHGLM VTJEZ DHVDI NRGSG
MUWMU TNWOZ KSGWJ IVQND DRHJA VNMPL FWWLR ZRCTG KAZKI ZAHTV
HACES KGHEQ ETQZI MCCRJ KSGLU LFHON HMPII MNQOX KSHSL VKGCJ
KBZZI OQKLT MUGMX NTXNO ZAZZP FWCTG KAZSP UVQEY HMPCR RABAY
HYGTL MKNIJ DTJUU UVQIJ XTJHI LXCRO LVPZJ ITNBL NAGUN KWWNQ

8. The following cryptogram is suspected of ending with the signature "TRAMPLER COL INF." Solve it and recover all keys.

GLIGV MQMUO LVZGG LRGQS BZPZB GSRHC KYWNF JSPKP XXBSZ YYKIC
XZWPY GZRIG VTRCW NBYRF MRIGS OUZWN LVGLH UZJBT YPGXG QBIZC
ZYKFT RMNYY FTZRX QPSQM EOFYP HGLIG VMKMW NYYKI GDXGQ BTJNX
KPXBL QKOQK GHKCA FKWJP QLEXF MRBCG LNMGW AGLQL WNBYF KHWSA
WZQLD SBWIY PGXGQ BIZMS YYKXT ANBAX EZICB ELKWS IJBPT JJOZG
RUPNQ FGNJK RCJBP TSQQZ GZKHI CJBPT JJPGG GBHQP JZPYR NNXVJ
RTENP WNJPY EQGOH GQTUS XNZES PGSRJ RSYKF BAQOU YFKHQ KXVKJ
VDESG MNGAZ BKXII QPXKQ TMWOF YPHLN ZZERG GGSAB MY

E. Special solutions for periodic ciphers
(embracing Chapter VIII)

1. Solve the following isologs and recover all keys:

Message "A"

ARZKK VCQPY IOQMO YTRWP KTIBV PKRNR BZZSX YVJJW PNWDM HXVNK
KATUL JMAJP NPDEQ HSTJI FTVND EXOVP KRZMA KRJIU LJMAL RLRXK
IFABK JQOBR IWJEB PQLOL SRZOD ADOLE EJWDK OE

Message "B"

GVRHF RAITM CVKWS MOCSH PPCJQ HPZEC MSROT IQBOT JHSMY CTREC
PEQEH BYEDW EHIXK PLKOD YGQZI XTVQH PZUDG CNFCE HBYEH CHVEH
COGEP FKVMV LTDBM HUIIU LVRJN FNFQX WSSMP JW

2. Solve the following isologs and recover all keys:

Message "A"

JKSRB WNXQK WIYWB FJQOV IIASJ ZXWKE BICQO HODSU JSCSV IPCKQ
MAHQO WATYD PIPMI QTBIB XLN

Message "B"

YXAES CIQFU UMLRX DYMVO YPGOY AFVZH JNZRV DNQAN YEFJJ PWEZN
OCXMV PNCEA UHIUK MZRYV MID

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3. Solve the following isologs and recover all keys:

Message "A"

UPSJE RYQST YPQML NYASN ZKHDP CRKYX KYLBN NCEBW IKQRU EBPFX
ROPVP STQWP LPQKX WKPZM XNOXK

Message "B"

RXPCF WAJSW VUAPW RNUTI WIVET CXSXH CHCSD YBNBZ DWBVF SDLAE
PLDUT SZYMY EXHEZ SJIZP LHASV

4. Solve the following naval text isologs and recover all keys:

Message "A"

SFMJI ISCEV JJMFS VEJIP CZUMX IFVZC MEMFS IFERT AIFZP MBCGI

Message "B"

HKDAX LMMMS ATRAZ EAAFY KDPJJ XKFVR XKXKA NPSYI RXKIU EVCWN

5. Solve the following isologs and recover all keys:

Message "A"

KOIPQ IHGIS PQOKD MPVKS YKEQV SKPUS EPPSF KPEEE PYVXB PISWY
ETDQS PIMXK HGFTJ GOGJT XIEQE HPGCG OEOBE YETEW JEEEP UUMDK
AQVOL MB

Message "B"

KOIPQ IHGIS PQOKP STIHN ENHQP QEQIM CUDTB XRVMF QIEQL RIYCC
FFOWP GDOTG RPUVO COSUG OGGUT FLIOO UUQNK UFFOQ UIMFQ IBYAS
HSPQB CTV

6. Solve the following isologs and recover all keys:

Message "A"

AFYJV LREWO DUWEZ USEYN KBNFW OCXWX HKBTZ BQRPN BGCNS XXIWX
HESEY NKBNP KFRCB APEVR DGFLN QWRMJ BBYSB BWRPZ HDGTX VBMMD
KFWHB ZCNKD DRFRT

Message "B"

TPKDM PPYFF DMGAP EREOU XPORD WPYQL XMIGG YQYYE BVZPR ZIKFG
LPUIF PBGJG DUPDA KYDSE QKBOZ CFJEA ETFIM GDEQW LZZAE TBWJQ
PRUQA EQNWG GAPEI

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7. Solve the following cryptogram and recover all keys:

RNXDB RFEPU PLCHK CSDNO WSJIS UCYHK XFHVV NBCZO LBMEO EJHDH
MFVLY ZFULO EJHDA TLCRK PBHCN UBBIM MVWWO KOFXL HZMDX RZSKA
TZBWS WVXNN CVXIH WSXAS TBZHV RZTLN PMBIU EWJPO CVDPX YVMGU
XRXIL MPAIT MVMGU XBCZO LMFPU WFTPR RUAWV NCCJN MOURK TCQHD

8. Solve the first five of the 25 message beginnings given below and recover all keys:

1. LHTDH BNFPH WGVPN...
2. CHUSN LNBUW RGMCM...
3. CVDBV JGZFM SDVKP...
4. IPVVC ZGBHG QQHLK...
5. VVNOJ QIHYF HRJSX...
6. WHSFJ QFMCA ULMEC...
7. SSOGH RGLFR PGULQ...
8. WHCQD MRGUO GRMSW...
9. WHRDJ KXDMF HGRCK...
10. XHQHH LNBUW RGMCJ...
11. GVNCF QNGGB CPBVE...
12. GVBZC SMVHR FKHJJ...
13. WHWCK TNMCZ DFDJF...
14. LHZKG FUVXH DXDQL...
15. LCKDH WNFBH GRHLK...
16. XDHBC JDDDD KGVKY...
17. SPHHR JGOEP VNUWH...
18. GVZMD SROFB VCVQM...
19. QIKFD QFFYA CDMWI...
20. BVNOF GNFPH WGVPK...
21. IDHOU JXGKB VQUSD...
22. WHQHW QFBFW SGHXR...
23. ZTVOD AXWHM CRYQD...
24. WHTDH SBHBR CFSKI...
25. WDAHU MDWCC LGJSX...

F. Progressive alphabet systems
(embracing Chapter IX)

1. Solve the following cryptograms and recover all keys:

a. POTAE TRRHU TUJXO QEGRE EXXLZ JZCOO TVSSS KKCWD TXGVJ HJVTS

b. OLGCE YEKEQ SRJZL BSIGE FNFRL RZEGJ USWUA UBRNR BHJMG

c. SDNQR UMYUC AIXEX UWOLO UARCX BMQVT HEZJI YMMIJ

2. The following cryptogram is suspected of beginning with the opening phrases "ATTENTION ALL SHIPS STOP." Solve it and recover all keys.

ZSUJS XDXXC XYLNP SPQHD YJFTY YQAQQ UTLNC YGZPV MBQPF RUGXG RMBDD

3. Solve the text of the first of the following messages and recover all keys:

Message No. 1

CTHHW GXUFW OHQZV NIEBQ SPQKE UECNY QAUMZ DBSZI ENXGZ ZUJAY
EMROM HBFFT YFRTT KVBTE IHFVT WALZO IRCLQ GHSFF WVDXV SKRSO
OSUKA EMMDI TBCSK TJFSM FOHXF COQLU MWMXL RCJHU JGPGC NXYNT
BEEQE JJKAX

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Message No. 2

YVRDP LQQMP KCONU YRJVE NDDGX MHOGY NIBLF AZPGX TQDFV VTZLV
XZAIG ZSBSA VLGLZ CLYHX MJYHW RYDZI QXWLH EZGZD QNPEW IPEMT
SHQEW WNYON DTFFB CBPVR TSNTU DSHIE CQIFA GFNUE JPNSZ YD

Message No. 3

QBZAY RACLI FKXTR BRRJT KORAA LACCH ITIXE PGXJS NBQNQ BDWFF
MINNT OVRGI LSWQW YRNRV VPBGH XDIVN MFGUG POJRM VKHHX KEABG
GYIZJ KRYZZ LIWED FVVTX SQEER FRMXV QBJFZ KGLWY RLTEN XSORM
ZVNUI ZDAKP QWRFX WLURB OVYWX FCQFF DWUYI OGUNV ZMHMO QSQLL
FUDWF FVZJB TOVRI XEPUK BSEZH OTLXW EFKKV MRBKR GMDEY GAEYY
WJOPL ZNUWG DRROG SFJXQ FBJVP PGNYP XCZTW IWRCH MZOSO IEQPG
UWLZY UNAJY AKQHX HMCNC ZQHBB MMBQZ EIMOV FOVHO KA

Message No. 4

XKOTI ANZUC HKKPC TQWCJ HEHRR SOHMN IOJZJ SGQEX VGYHW RYDZI

Message No. 5

BLOME VRHTP SEFYY KUJHV ZGZOO XWRIE BTJXW KDKPL GLNNE QSUEE
KHPOE VLQRS OVILY UKTNV FIEQL SHHTL KY

Message No. 6

XGFFU FVRHT PSEFN PCOBE DDBJZ MEURU EWWNY LWUYI XPCBH OIFBJ
AHBQK UDZUZ DLZNN MIPBB FXDDM RSCZF ITAWS OFLZN NMJKR LQOSW
BJVIB CRG

4. Solve the first 100 letters of the first of the following cryptograms and recover all keys:

Message No. 1

PHCOK NQAQL JQGOX GRXNE KPRFY GXYGG OKAYG GJDJO XGBXQ TGSIT
NBQOZ TDKPY UOODS ZLLQZ MAVPJ TUPWF MJBLR JXCED UTSWR QJCHJ
YTYLO HYQXI RVORW BGSZC HZPPD XFRXB QOTDX DTZOR ODINV TVOQT
ITVRV MAPMJ GNTBM OSVVI DAAYZ DVQKT HBGHH VONHC MOSQW QYWRQ
TJHQK YHPBN FXEJE WQJUP TJXCH WLJMV RZTMW JOV

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Message No. 2

PHCOK NQAQL JQGOX GRXNE WLLTN BWLLD KAGHJ BEHBR ENWJN AOPTN
YBSOI DXXDE NXCTO IRMDH PTFQA AVUOQ DTUUT WHQVP KSPLZ YLCET
VZCKZ HLTDE JZRRT MUGRY AXKPI GFBNC GOTVO XNCHJ WUDOY SCYFE
WPTEN TNQTB OCCIX TODDM XCGPP AWVXL NGIDU ILKAI KFAPR IYOTG
QAEPR TUMQN SDGCR WAFAQ GNXMW CTBVQ KYGCL ECWZY RKULJ TKGPD
AFMTV XKNCU ODFOZ PTZWE TSYIP NSVTB MFXZV CMQTB QTHIH CEDUT
SFRLV FDILK JUODF IILDQ HJLVG JPFBB MTGBK LACZF IWVKF INNYE
ELXMG QUKWP RNVLY XUQUN JYCAO GUKVW BBJLT UORCJ WFXDO CRHMZ
ZDZTD SCQEW IUFRN WJPOG DWCHJ BDBKO GAQYR YIOET AUPZU MOXEY
ICYGF QSYAZ UWHST ASURO ULAXN CLRWW KFRFV OXJTQ KPKLQ FPUGK
PZKLV PQJVQ CZDEW XRKNV KQIBI WRCSF EVUJY WDWFN OUYZC KAMMZ
VKNYT BEHRG NEBQN AYVZD NMOTT TXPSY SCEJK ZGMIY ATFKG BVLOY
UXFPG DIBQU DNELN XUCHS LT

5. Solve the text of the first of the following messages and recover all keys:

Message No. 1

QGPQT RQZFS HVGDD QAPBG ZEUVM QVTCM TMNYO HVYFI ZRTHQ GXPYN
PESOJ GWEPQ EKUFX LVZNB VMWKM DPZOT PIWEN FSBJO KCDYT DPQRM
NBNQL FSVXU UTDVZ KQZQF ERUVJ UZXCB RKGNM RNQHS KCIDL ERHUA
TDBGX JMQUI MRYSX SIMEN DEZUL TFXDE VAJJU UMOSD HXXXX

Message No. 2

QFLTO BBYZJ WGFCT KSTVD TBUUN HYTLP JAXIV NQBKO IYDXY NCGUM
WJDUM HBAXE DWFYB SXKMO HQVSL URQDM GRQRW KERKH GFHKD AHZXS
KVINY RHKIS GYAEX QJVXD KXFZE LWNRY OYGAK AWTAN ELFHE NLLYP
WYDXG DXXXX

Message No. 3

JDGJM ZJLKK AUQJV BINXK EVNLF BYAEX LVOUV ZSISF HVSHN ZYNHU
WNINZ AMGXN LVASQ ESLNR JKHNB LSJRZ EYRJZ ZVKTV OUAOX

6. Message "B", believed to be an isolog with Message "A", was transmitted in answer to a request for a repetition. Determine the cause of the cryptographic error involved, solve the text, and recover all keys:

Message "A"

VVSIO PPYYD JJGCW OMMJL RVEUH KXZYP PBSLX DIOAA XOMAL HMNZB
SJUHN KLTZZ FRHAO ATNDH FZLWD XXOOK NWZUG UGEQO OQGGO HXUCK
ZWCTU NUFFN SC

Message "B"

VYYPL ACJLX OBDCT FUXVW GJAMW IXATX ZQOTK XDTZA ZFUEY NCOPT
NFUOS RVJIK WIYXH AHSLJ SITNX PRHOM SOGDR EKAJT HQELJ JGGPC
PSZWU QZNQW OP

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G. Repeating-key systems with unrelated alphabets (embracing Chapter X)

1. Solve the following cryptogram and recover all keys:

FPDNX SLAFI ITGSD WLICX ZMAXT ADRLS TMXXL ZYPTY MHCOA XOAIA
RTYNN LDFIU JOBOR PZPNY EIWRN MRVOP NXOSN ZRXAQ JOTMR HTLWR
AWWSX ALWWO BOITQ PDRLI CXZCO LCSWB EIWRN MINXM XXOZI ARTDZ
LRWRZ JJICX TOTDB RKPBP LCYSU NWHPZ KEBNL NLSBT IUJOB WRJJS
DOWSL WBFTG NZBRA XJNCI OBWSA GAMFP CXPIT IETAA GXDNX SLAFI
ITGSC LRMLR SGEOO PWRMH COAXO ARRLL WZZIV COTTC DWIUJ NAIYV
UPSLT NLNQI FYJPH QAXTP OMINX XKNIU JOOXI SWLCC PJJRL HEOWB
TLTNL ZBAPL UPNLD BARKN TZFNA CNLJR LHAGT YDTYS

2. The enemy is using the system illustrated in par. 75 of the text. Solve the following naval intercept and recover the order of strips used in the encryption:

NPYGN DVPWR PSCFD XYRGU JEQAS JNYMQ AJUSX XLIIM ESFFO OAOIN
YUIAN VARZB ICDDL BRGCN HAWSS XEZFN CMMJE DVFNK NVMGA UALJD
DLICA IKLOM BNSAS JNYMA HRISN GZKFL RTRZV TJPGZ QOLDO GAINO
XCCWU JEGPN HESWI OLDOC YZKOJ HTKPS XEZFN NQGGA HTKPL WWDSN
DZKOT QEFWH ODYMR NGSDO GWWPV AXSSP NTUUX YDHMM TTDOI QXXOR
PTKPQ OEFAN JTMJP TTXXX

3. The enemy is still using the system illustrated in par. 75 of the text. The following cryptogram, intercepted on an administrative net, is suspected of beginning with a stereotype; solve it and recover the order of strips used in the encryption:

KURGD WFPMH ZOKUN AWYET JKTCL MGMMT SVKTK XUDLO XUEJU LOPTX
MTGBU DFKSI IYKQY XJKUV MTLSX KEYDH UBEJU LOPTH UDDYU LJYSC

4. The enemy is still using the system illustrated in par. 75 of the text. The following air intercept is suspected of containing the probable word BOMBERS; solve it and recover the order of strips used in the encryption:

XJOAK SIYOH XBSVJ OVERK MAUWB LEMDT SYNTQ CGUJT BXYJQ VNPSE
RGEMT HOJJY NOUKZ QWCMP KPSAC WAZRA PSYOP SJOED CGFJX KPSAC
WAENZ FYNSV STUED OYFNI

5. The following cryptogram was enciphered by means of the device illustrated in Fig. 84 in the text. Recover the plain text of the message, and establish the numerical key for the order of strips.

IFCYM DOBKB YJVAV UBORU BDOME BYDEU CNESJ SGUHW GONYN OMDMO
ZCJUE MSQEM HEBSA LVUKB XOUKE RSPAU GWACY RGYDI

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6. The following five messages, intercepted on 16 December, were enciphered with the Aggressor ZEN-40 cipher machine described in par. 77 of the text. Solve the messages, and submit the plain text to Message No. 5.

Message No. 1

BABAX HYNVG RCWTL HCLSU JFSVX BJZPW HYQTY MPPER VMAUN XMZXX
RRZPW HMKCE AJGAJ TAEHI DXZKC DBSIP GGDCT AXGSS MNMTD WMZER
UWCZP QBNNP PPFHO MDTLD YUXBC VDVGT MCWUP ERNDR BYJUF TRJNZ
DDTLW HBDVE MVXQR MUKSZ QDZYO BPRYX GHZAN MYBIG BCPSP GPZIM
QTPPW JCUSS MLZVZ GTCCR XOSAX RKZRZ ZBJIN EPZVZ GICQN XOYNL
LLSRW DBJVN XSLUZ BUKSZ QLOOG LXTWP HMKRA URNZC QYAHX TRIBQ
LXTRK MAYMF BDGTD HJEMD VCKZZ NRRHT KWZGP IYLUO YWNJF WHZIR
DYZYU GDZAS FOPWY FXNMU JCPAO XKLQG VAQCA PTXNG BSKJD DCFVC
XZGMD

Message No. 2

VEVEX OSELD LVQUX HYVGG GKMYT IESUJ FSVXG LGBUR YPXNF PGTDQ
NEIHI

Message No. 3

JUJUX LHCLS UYCHT LOJZH VJYLV AUVWT WSYLV OTLDA CXWRO MRQDN
PPPFH OMDTL DCLJS NLXSI YVAZM FBDNI HQIEK TQDYB LHDVQ GLTHK

Message No. 4

PEPEX GTDHJ EMNXN ZXUYL TMKMY DWMUV WTWSY LBOPN YERTJ VQWJA
QSNMV VVOAY KQYKV FZXLP GKKZH JCWRN LAGAM MZLWZ DHGEH

Message No. 5

NONOX LUAEZ IBVSN KKLWZ QRTVI EAPOI RPJDX NKGWO QJDBC TGROB
MLCHB

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7. Solution of ZEN-40 traffic for 17 December yielded the matrix given below. In this matrix, Alphabet 1 is the alphabet used to encipher the 1st, 26th, 51st,... letters of each BABAX message of the day. Using the matrix below, complete the matrix for 16 December, and show the plugging for 17 December in terms of the matrix for the 16th.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
A	P		P	P	L	I	R	I		Y	T	L	U	M	F	Y	X	Y		W	Y		M	D	Y
B	X			I	P		Y	M	I	W					X	P	I	L		Q				U	P
C	F	W	I	Q	Y		U		T	I		Y		I	D	L				P	F		U		
D	H	E		S					Z		S	S	N		C			S		Z	N	J	G	A	J
E	Q	D	X		X	R	T	X		F	I		L	W	U	F	U	Q	Q	I	P	U	X	I	L
F	C		G	O	G	G				E		H		K	A	E	N	V	V	J	C			K	
G	M	M	F	R	F	F	W		M	X								M	R		W		D		U
H	D	Q			R	L	L		U	U	R	F	I	X	L	I	L				M	I	Y		
I			C	B	K	A	V	A	B	C	E	N	H	C	J	H	B	K		E	K	H	V	E	
J	U	L	L			M				R	P	T			I	U			T	F		D	T	T	D
K					I								R	F	T		W	I	U	R	I			F	
L		J	J		A	H	H	S		S	O	A	E	S	H	C	H	B	N			S	Z	O	E
M	G	G	N			J	N	B	G	N	Z		V	A	Z	O	Z	G	S	N	H		A	S	O
N	Y	T	M	T	U		M	U	Q	M	Q	I	D	T	R	X	F		L	M	D	X	R	Q	W
O		X		F		Q		R	W	Q	L	X	W	P	P	M	P	R	Y	U	U	Q		L	M
P	A		A	A	B		Z			Z	J			O	O	B	O		Z	C	E		S	V	B
Q	E	H		C		O	S		N	O	N							E	E	B		O		N	
R	S	S		G	H	E	A	O	S	J	H	V	K	V	N	S		O	G	K	Z	V	N		
S	R	R		D	W	Y	Q	L	R	L	D	D	T	L		R	T	D	M			L	P	M	
T		N		N		Z	E	Z	C		A	J	S	N	K		S		J				J	J	Z
U	J	Z	V		N		C	N	H	H			A		E	J	E		K	O	O	E	C	B	G
V		Y	U				I		X			R	M	R				F	F			R	I	P	
W		C			S		G		O	B			O	E			K			A	G			Z	N
X	B	O	E	Z	E			E	V	G		O		H	B	N	A					N	E		
Y	N	V			C	S	B			A		C				A		A	O		A		H		A
Z		U		X		T	P	T	D	P	M				M		M		P	D	R		L	W	T

8. a. On 18 December there was intercepted the following Aggressor message, suspected to begin with the words REQUEST CONCURRENCE. Solve the text, and recover the plugging in terms of the matrix for 16 December.

BABAX SOOJS QIKTW KVIIV ETHQW KYEQB ZSSGD RLMQX ECRUQ XVUVV
URQRC FAQYF RQSKV OBZHV RQHYJ TGSXT VMSLS TRSKI DRHIY CUUHZ
CUSNN

b. On 19 December the Aggressor message given below was intercepted. It is suspected that the message has a stereotyped beginning of the form "TO COMMANDING OFFICER (number) REGIMENT", where the regiment involved is one of the first 20 regiments, from FIRST to TWENTIETH inclusive. First determine the correct full crib, then solve the remainder of the plain text, and recover the plugging in terms of the matrix for 16 December.

KIKIX ZNDEU AYVNM OFNAW NIOVN VGCNO HZLJW JCIZE XHIES VBOVA
NBFJD YZUPM AIGWY CHIGW NZOIS AHWJG SFUBT BXKPO OINPV EPKTW

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9. The following beginnings of 35 messages, intercepted on administrative nets, have been encrypted with a complex cipher machine which generates a large number of alphabets. It is furthermore known that an enciphered word spacer is used in the cryptosystem. Since the messages bore identical indicators, it is assumed that the messages are in flush depth; the repetitive phenomena confirm this conjecture. Solve as much of the texts as may be necessary in order to read the plain text of the first five message beginnings, and submit the plain text of these five beginnings.

(1)	WJWHZ	KQDEC	MAJAD	FWYLD	LSDAH	MYCXE...
(2)	CLCCY	IULPB	OLLUV	OIAVI	LCLME	JLXUU...
(3)	FAODB	QVSQE	DCWHP	ZDEXQ	KQOGC	LGYQZ...
(4)	NWOAE	KEJTK	QSITC	REKFG	SJDJE	WXYIZ...
(5)	CLODE	WHOQE	WHZFP	BEQEP	FVDDK	XHFJJ...
(6)	RVMSS	WXLTZ	XHHVQ	WIHFQ	OGMJX	WLMEC...
(7)	AFGKD	ZFOQX	GLVTE	OZFBB	PCQPF	NAFSL...
(8)	NWSSE	NYJTK	QEVZQ	EEZJD	NRDNF	IEFLJ...
(9)	UQVKD	GXTFW	IAMTH	KJSTD	TNONF	KNXWP...
(10)	CLZAE	QRLVS	CQPDV	ADQXK	PFSZH	NOMWI...
(11)	NWKWY	GRTSE	PQCXQ	WIHFB	PGBGG	JWRXI...
(12)	ITMMX	ZEUBE	XHZFP	NWZEH	NMSAH	AVFTV...
(13)	VODUE	WSETO	MLWTC	JCGYN	PSNQY	MDFAJ...
(14)	QLDZK	WXBFK	XSWEX	BHZYU	PUQVK	ONMHF...
(15)	UQJSD	LRLJR	HEEYN	OHEQR	USDZR	ARTWR...
(16)	YQAYG	WHJFK	XSMCQ	UEZDP	LLRGR	JVXLF...
(17)	CLKAG	KFFSP	DQCYF	OWHSQ	WUKKD	KDBEJ...
(18)	ZJULY	ZFFRN	CHPAR	UMLAD	MSDZR	AWBJW...
(19)	IGVYR	ZEJTK	QSCJP	WASBU	VRYGY	WTVJW...
(20)	CLODE	ZVFHE	DHVKD	DAZPD	YSLCX	ALYIE...
(21)	FKZDP	LUTFO	EQSVX	HZZYE	PTCOZ	IYDGM...
(22)	ITMMW	HXDKX	QPVGF	OATKM	VUQBL	JLXMT...
(23)	GLJGV	NEGNN	OEVVX	BMKQU	TPFGN	HWKZM...
(24)	PLNAE	GHMDD	CQMHM	AJZJJ	PLWNF	AMFMQ...
(25)	OLUDE	GMLVR	KGHAC	DYLXN	PLWFX	LYWWS...
(26)	RJDBZ	JVFHE	MEVDW	YXXXQ	QOIOX	AOBSZ...
(27)	NWWWY	MMBFT	ISQIM	UCVXB	YBYOL	CERPY...
(28)	YRMDN	FURFR	HBCFN	JCGYN	PBOEL	IEKWM...
(29)	VHNZN	LRJUP	DQFUP	BEVYN	KREWZ	ALYIE...
(30)	ULJSS	WXLRK	QFWEO	NXQWO	KEQGE	KYMIL...
(31)	CLCCU	IVJTK	QEVJD	UCQCH	WQSOF	ALBHJ...
(32)	YLYDE	WOMYD	ZPEAN	NCSFR	NRMAF	ADPSD...
(33)	ITMSD	XHTFK	XSGLD	OFSSR	YNRMD	TYSWT...
(34)	CLHME	TVFHE	KQMDH	NHWSD	PGBGG	MCCAF...
(35)	ZJUJZ	VVMYT	HFVHN	UEAHR	ENIOY	JVDAJ...

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10. Solve the following isologs which were enciphered with two different groups of random, unrelated alphabets.

Message "A"

JLRAZ	HGZMZ	GZLNW	UJCMY	YPRNB	HJCZJ	TGMVI	IDBMZ	GDROS	WYZYL
UGPMM	HHLGA	HVLIF	QMMSJ	DMFDV	UMHOY	UGUPA	SDZMN	LLZOX	EGBHH
LLBQS	UOUZX	OVYCB	TBRQG	DMRJI	QLEDL	DTRVI	KEZYR	WGCZJ	TPDJB
TGYHN	DDUSJ	DMFQG	UJFSB	HMRIS	UVPFI	DHFGG	DKLVG	VWCDL	XULVL
LPRFJ	EWKDR	VPHQX	NVBPB	TGBQX	LHTQY	OGLZI	TPCOY	UDZMN	HVCZJ
TPLVG	VWCDL	XULVL	LPRFJ	EWMMV	ULLIV	LMMDU			

Message "B"

AJWGX	HMUDF	ZITOS	BXFHO	AJMQM	JRTUM	ISSRP	PYJDF	ZPMAA	USDRJ
WBJOB	JZFBJ	NDRSF	LIXCN	PQYSB	BIQJO	WBOER	UNDPW	TJCNU	FMJEY
XHNMA	BKMZH	SHTSM	OSBXD	HOWAP	LNKWR	PUMJD	XODRL	HBUFJ	OAHJR
ISXVQ	OYACN	PQYMC	BXPQS	VQMGW	SDAKO	HBNIS	OAMVD	OFZSV	VRVNJ
RJMTJ	HOYMP	JGTFU	KHJAB	IRNMO	FZITO	SBXFH	OATOQ	MLCHQ	HHHON
IETJC	NUFMJ	EYXHN	MABKM	ZHSHL	RNMZE	XQXSQ			

H. Polyalphabetic bipartite systems
(embracing Chapter XI)

1. Solve the following naval intercept and recover all keys:

42570	87490	95477	48668	61622	39542	82230	62423	81187	80647
05230	53574	53620	99181	96693	63528	40630	99160	06107	98660
50105	88197	41230	48659	42630	87445	91677	63560	97500	99167
42290	97123	53470	97495	96672	98114	62922	99567	01177	80960
57187	37462	01233	68168	60922	49241	32233	48178	67101	43645
91580	60410	61421	89267	45692	53460	53527	90492	92471	83978
81637	37645	42170	93679	53907	88142	82292	92978	57130	68680
97183	58110	57131	88480	42430	80910	81100	68435	41433	48574
87535	33147	47193	48574	50480	99597	42290	97123	41525	89535

2. The enemy has been using a Nihilist system with keys up to 30 dinomes in length. Solve the following cryptogram and recover all keys:

93394	87876	86977	84454	68773	43853	37845	08695	57579	56955
77587	57665	65766	68933	65333	98678	58853	05394	68288	66785
69576	77676	60656	72236	73597	77530	85645	84687	78849	95767
66687	85644	22578	65978	63486	76539	34596	78569	87477	57760
35674	56695								

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3. The enemy has been using a Nihilist system with keys up to 30 dinomes in length. Solve the following cryptogram and recover all keys:

63268	63767	56475	96248	57744	96467	57697	84867	64445	56868
79472	64257	58857	75744	47886	02846	42556	86889	59294	94448
58547	64837	38558	83759	83457	74877	60454	94455	38757	94737
57687	82936	55625	93855	88375	96367				

4. Solve the following modified Nihilist cryptogram and recover all keys:

83246	05488	84539	73862	89553	06393	55595	49672	56937	70389
57266	35454	28529	96432	86566	49965	48249	56530	82706	22494
40748	68746	52542	64054	96662	65346	93678	43822	54346	05687
02447	54003	97845	92482	34298	38884	64555	79258	74665	25467
60560	89253	55770	26663	28459	44627	56669	32287	38847	88470
24525	72873	96666	47538	85668	42656	72265	78278	62538	74673

5. Solve the following cryptogram and recover all keys:

33946	34720	30519	60051	98505	18766	68363	13446	11034	24487
43001	08449	10965	73429	14079	94858	12054	46028	23067	21523
68145	63189	13081	78172	69221	61545	66734	15207	67159	73220
63929	26027	13021	79484	41305	91507	70484	34528	88869	33879
05782	36825	35899	12220	30519	60070	04047	48571	75963	28110
61869	49375	48519	03543	18312	48011	80561	84682	82567	31822
07043	74312	31503	18024	57114	65478	54187	92849	15932	98883
61534	00442	66019	18870	27019	05357	11000	08402	13714	65877
65543	54734	17576	21025	67679	36527				

6. The enemy has been using additive keys between 10 and 15 dinomes in length. Solve the following cryptogram and recover all keys:

41701	90597	76725	80721	11075	44674	07405	73556	20130	78118
44070	25691	38221	74357	41983	47929	76449	79603	81068	67168
88131	64746	13517	82913	34054	26556	55147	24625	81214	41161
85161	64265	52444	10859	26140	09007	30162	80943	51308	91223
82063	23909	49259	81522	88332	66564	42467	65353	28283	31732
41369	62001	41877	26016	31652	83974	49685	19972	24556	31686
33374	28227	58287	09810	14483	19072	78611	96722	92264	43729

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7. The following cryptograms were enciphered with the syllabary square and coordinates illustrated in Fig. 101, in conjunction with an 8-digit cyclic additive. Recover the additive sequence and submit the plain text to Message "B".

Message "A"

48899 07938 73675 71360 84873 89386 64896 88197 16112 18273
27721 58559 75870 07395 02602 06164 90489 50257 82679 36670
87024 65598 02048 96126 29260 58888 35487 93830 03870 11229
90403 64396 00513 24993 90042 99335 26664 31733 62682 39555
46551 11353 99893 77191 95025 06467 34930 20978 23039 07938
73675 71320 61649 07032 64385 80873 50887 70293 46581 44802
81903 48177 02934 65805 88077 21821 73280 34678 73219 21686
45380 50580 81159 80250 17658 73178 72645 96085 70819 32310
73068 64986 57971 05781 82106 68263 58280 60060 18621 06536
90431 18057 02114 76042 21162 72308 43357 67063 44751 08402
10375 72305 88883 54879 38300 38727 93376 74071 82458 94298
87003 77287 38468 43081 34106 98502 13539 08931 82139 38387
89467 44502 70950 21671 04184 69386 86305 59502 04937 20804
01353 03809 24450 98972 73325 56397 89059 08704 59329 29691
55138 92426 5713

Message "B"

81353 22816 57772 73178 04781 22866 57139 98610 17629 97875
63408 95064 23648 95982 87045 93253 48075 50291 17656 93882
31805 17540 94476 14127 93489 81290 07870 27002 53762 98286
76412 34802 28230 08130 89135 39089 39433 84675 59207 04802
04896 12445 11940 27364 32494 99672 87448 94490 47874 00813
78771 06628 21246 09963 93065 20081 30895 38693 55109 23415
2657

8. Reconstruct the plain text of the following cryptogram which was enciphered with the syllabary square illustrated in Fig. 101 (but with unknown coordinates) and then superenciphered by a 14-digit cyclic additive.

31902 31274 82175 89569 65675 15668 75529 25950 10946 17039
83832 28419 22846 12476 33272 61108 83508 57574 12844 66610
87161 25950 10946 17039 83207 95647 32733 30521 24770 24888
57839 48195 20141 46533 90793 98679 64778 33618 74115 40805
96898 72418 81844 99243 11835 35742 37046 68622 22072 36790
79473 30712 89957 12161 69125 83716 59734 26505 30795 67541
94899 03095 69577 03666 86222 20723 67903 93911 84761 39576
94702 90888 60556 88332 49551 86531 72200 59895 12496 63248
88578 30390 32760 62021 00245 57304 24575 26424 25132 03929
90781 60201 26684 82317 08468 21789

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I. Monome-dinome systems with cyclic additives
(embracing Chapter XII)

1. The two messages below are known to have been enciphered by additives from 25 to 30 digits in length. Determine the correct period, showing the δ I.C. calculation for Message "A" confirming this period; solve the texts of the messages, and recover all keys.

Message "A"

84487	87282	04146	75217	38872	14493	48491	98022	66292	72796
57822	89370	89441	29688	21057	63760	81858	87270	77563	11717
45185	32991	38991	27876	85455	89707	98551	79260	18477	04156
42238	92763	13007	29821	29865	41224	96608	23650	21522	13303
56213	62296	47851	87451	08789	64230	16170	41467	58411	52182
26752	51998	16069	66165	73132	77099	93798	91136	25234	50910
11409	54636	07797	60622	16298	73650	41787	69808	39722	40048
17891	84621	91619	34838	98027	74740	83381	16056	28812	23915
29775	84939	27100							

Message "B"

84487	87282	04938	25598	73900	69841	25792	80222	47713	57518
59016	62199	00080	68230	71089	06697	88806	38956	57064	43825
60485	72022	25611	53698	86323	84089	67385	75133	33476	60406
22315	76795	17705	96601	05569	68418	14610	51555	25803	96308
86942	55636	53951	74757	70919	35959	16728	64549	55272	79402
16164	80008	15348	07517	35816	99694	33955	87698	00594	92835
83375	87020	07391	42004	17802	79560				

2. The following two cryptograms have been enciphered at different starting points along a keying cycle of 30 digits. Determine their correct superimpositions, showing the ξ I.C. calculation confirming the superimposition; solve the texts of the messages, and recover all keys.

Message "A"

03743	23504	41880	60428	72230	85539	28370	91035	63687	87570
62628	32223	28057	54179	06716	45449	91478	55296	93221	76728
58807	00025	45627	34192	03601	49435	19427	65545	51327	86123
43370	23577	60691	96078	77774	30063	03601	40575	79115	67575
55319	53092	53870	30673	08851	56493	66979	65219	39986	79520
39188	66436	01472	24218	84817	90529	53077	96644	48378	32813
03686	94472	64206	53810	87972	35079	18011	85370	44623	16939
41326	35723	55122	64751	14346	90574	39628	48071	23935	79535
53213	40570	91224	86170	35622	23097				

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Message "B"

94786	26566	74745	13124	25735	85238	06054	84966	33700	93277
65149	38162	41295	16782	44809	95282	46710	32147	99107	28225
52311	37185	42315	36418	97919	01081	97692	98467	55856	44719
15211	91819	75499	60214	80712	52114	84526	27329	53344	70773
66720	86216	46729	12765	93215	14484	41702	66214	45327	28023
29408	73284	62780	38261	50620	85144	06884	25715	94069	32701
26603	86961	05753	61943	93390	96466	91351	94269	24200	78282
49315	95290	38419	25789	94953	69657	60359	48019	97205	66882
69293	15334	40512	03466	55228	89225	50349	56583	54701	56520
40206	08318	64226	63342	97400					

3. The enemy has been using a fixed monome-dinome matrix with invariant coordinates, in conjunction with additives varying from 40 to 50 digits in length. The matrix recovered cryptanalytically is the following:

	9	4	8	1	2	7	6	5	Ø	3
-	R	E	P	U	B	L	I	C		
Ø	A	D	F	G	H	J	K	M	N	O
3	Q	S	T	V	W	X	Y	Z	.	

Solve the message given below and recover all keys.

66027	78940	97324	21440	23195	80287	74318	97991	87472	64536
62482	70394	94344	33432	71402	33739	14670	24684	23660	03738
31011	80794	65391	31440	23195	85386	44273	00065	36030	69640
38360	76728	24738	57063	44825	80146	37183	04625	06298	90308
28337	90688	34000							

4. The enemy is still using the same matrix and coordinates as in Problem 3, in conjunction with additive sequences from 40 to 50 digits long. Solve the following message, suspected of beginning with the word CRUISER, and recover all keys.

58013	60288	16972	82030	17836	93292	01369	93997	43850	62253
99102	61874	33187	46031	40042	31798	91654	37776	59676	80403
58189	74483	84748	94413	38744	87970	09926	15610	05528	69000

5. The enemy is still using the same matrix and coordinates as in Problem 3. Solve the following messages, suspected of being isologs, and recover all keys.

Message "A"

00589	93906	44731	02895	14974	86770	94330	65158	76009	35134
64211	24146	53648	38207	47076	80779	18433	14330	15794	61194
00653	43552	02359	76862	75391	77195	92805	95211	52602	15218
35866	76686	32078							

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Message "B"

88103 35902 64351 64411 96110 20532 10338 25918 52867 71752
86697 82140 33028 76681 65830 46917 92435 54570 39936 25576
88415 87752 64311 72024 33515 31571 14405 71297 50288 99870
17004 32486 70016

6. The enemy is still using the same matrix given in Problem 3, but with a different set of coordinates; the additive sequence employed is between 40 and 50 digits long. Solve the following message, suspected of beginning with the words OPERATION ORDER NUMBER..., and recover all keys.

47638 41814 61394 73436 32874 73183 85963 09141 76547 48496
16123 83156 86132 33484 61786 23631 47928 96068 81916 16901
49393 18089 46814 35713 87787 47164 09849 77645 47059 44252
28921 66842 71380 05418 13129 89418 17613 68047 81965 19893
93236 64377 44711 77234 97566 63014 93938 47579 14393 23664

7. Message "B", believed to be an isolog with Message "A", was transmitted in answer to a request for a repetition. Determine the cause of the cryptographic error involved, solve the text, and recover all keys.

Message "A"

63894 47107 17679 77442 67018 70800 79179 41870 32254 87525
35339 51157 41925 46798 78875 68333 05065 83285 68566 57326
61071 19254 67473 42590 41789 66159 39367 03463 29122 72492
47547 74734 24341 74024 22322

Message "B"

63894 45343 34582 39205 94105 92663 24075 85451 87151 75385
15937 47196 21311 44757 18263 62293 85451 87151 34924 51541
48372 75977 74154 68233 35283 04690 23921 55803 69516 62311
66531 78633 03533 64964 41312

8. Solve the following isologs, suspected of beginning with the word MOVEMENT, and recover all keys.

Message "A"

64058 08567 87669 38948 04171 80250 87539 54997 46629 21214
64926 91576 59201 87442 46214 04108 18878 35654 37975 83884
63694 78844 89271 67511 83412 51459 42789 72720 06899 78739
60668 88220 52368 76318 04526 47579 09590 68510 37191 68642
56528 37848 15155 06817 12852 40390 38535 59012 34016 29356
97873 96066 55439 45374 90712 05710 02250

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Message "B"

90657	24475	37594	20789	06683	56543	79750	98245	14974	23036
64352	51492	40051	70934	20316	55374	47160	57798	62743	18386
45894	11404	71862	42504	32696	61600	69318	01942	10224	55564
10840	08263	18350	35493	03875	65989	24617	21449	59305	01129
39078	55068	19411	05076	20351	75218	79550	61775	27938	40799
45556	41084	77433	71973	16620	55645	94090			

J. Periodic digraphic systems; miscellaneous polyalphabetic systems
(embracing Chapters XIII and XIV)

1. Solve the following cryptogram and recover all keys:

IQFNP	QJHSI	FAYTI	UVMOD	DLRFI	QCFWY	JUPYY	JEOSL	JUPYY	EOOUV
BFDQE	BMTHK	ARZDD	KLJUV	GLHLT	YNESK	MOMGY	RMUHE	QBDVQ	LWGKU
KBAWZ	WVRTL	FSRRY	QSIUW	FWZUG	UUYUK	UZQUY	WWDSM	AZLBR	QWSKS
FEGRY	QPYUW	FWZBZ	TEBFS	PQZRY	SOHCL	RYCEI	KWSIE	FAGFW	NDQNK
AQYYY	FWVNB	DIDQN	WJKHR	JUKUP	YWKQQ	NSQBN	WMWRP	FSRCD	FTBUW
JUNCI	RWVNU	SLAGR	UHBUW	FWZRJ	XUKHE	BPZDR	UJESR	QBIWK	PDOFC
PQDLS	UOLUL	XTYEE	BMTJR	TQKDA	SOUIO	AOSFN	LVUEU	IYAKO	ZHUPE
JBYYG	QHNTO	KUVDI	LSJGX	YUHHG	NZZFU	EYYDQ	BUOVF	LKENN	SMRSY
TUQBN	WMWRR	ELYHA	AMRSR	QBIWK	PBHEN	SLPYP	QSRHR	KNCEI	KSJGX
TWAVH	ZLCVB	FEGRY	QPYUW	FWWOP	YMKNV	DGOKG	JHOHM		

2. a. The enemy has been using a cryptosystem involving a multiplicity of Playfair squares. Solve the first five of the following message beginnings:

(1)	GESKA	KLTSF	BDNSO	QDUPD...	(26)	ZKBTL	SRETC	NLTUV	KLCUD...
(2)	BRMKK	SRXXV	ZSUTV	PUDYL...	(27)	URMVK	TYMFH	ISKPB	NMDKA...
(3)	ACQMQ	NSFHC	ISDBS	LPUTM...	(28)	DPMVE	QDIRH	FHISC	TWCGA...
(4)	BGQPL	XIOSF	HZEAN	LDADW...	(29)	ZKBTL	SDIRH	FHISV	KLCUD...
(5)	AHSKD	EGZQF	XMILZ	ODADW...	(30)	EGXBX	EXIMF	LSVTL	YRHRK...
(6)	CYIFH	BZQUL	TDBNO	ACPZP...	(31)	EGXBX	EXIZP	PUULL	IZWMD...
(7)	BRGLE	OKRRY	CIXEH	RONFP...	(32)	QCETE	LONTD	SVGNK	EZWDP...
(8)	SKYPH	LYSID	ICAOW	OQXIU...	(33)	QCQOE	DLELF	HCPVV	PAEKP...
(9)	KSTNG	XHZYS	BDOAA	OWOCR...	(34)	EGQOG	CRTSF	OVSPU	LHRSF...
(10)	KSTNI	XMZSF	PILNF	TUIIR...	(35)	CGNGX	ZRTSF	XPUWI	SFLUI...
(11)	STBTL	NGKLT	VIULR	ESAVG...	(36)	STBHX	RDELY	BPPON	LZXIU...
(12)	STEGO	BAXHF	TDSNC	HPDTR...	(37)	STVGK	ZRTFU	YDZHS	LPUCR...
(13)	ZKLSK	TLYED	PBWCI	UAFMT...	(38)	HITSQ	KDIDI	LIVAE	WRVIU...
(14)	EHTDQ	NSFUB	LNFTU	LDOSA...	(39)	SKYVT	ZFVTD	HCCWI	SQAKA...
(15)	STZOK	TGBIF	VFGXI	VFSER...	(40)	WTUIH	RXTOV	DTNYL	IIVNG...
(16)	IWPQG	RXRLE	FTKRS	PHRCS...	(41)	HKHSK	SAKLT	SDKUM	LRHRU...
(17)	WPREF	XMDXR	LTCIH	MLACR...	(42)	CQETU	NEWXI	HFIZO	ZRVIU...
(18)	WPREF	XMZVF	ISKUO	AASME...	(43)	BPKCR	TSFOV	EOUIY	SWTDA...
(19)	BRMEZ	XZWPZ	NBLTC	IHMIE...	(44)	QPQER	TSFDE	TDWCV	QAQRC...
(20)	STZOX	YXIMK	ESVBG	EVRQZ...	(45)	GCPTZ	XMFMF	LZUKL	IERPG...
(21)	STQAZ	QYSBC	ZPFOU	LRDIF...	(46)	EGMYQ	KTLMK	TDWCM	HTOAP...
(22)	QSEQE	LIDTL	ISKUE	KZWGA...	(47)	EGOBA	IRQET	DNPOB	EPDOG...
(23)	DRSHZ	QYSDE	OTOVD	UHRDE...	(48)	HNZOX	QWYCZ	ESULR	HITKD...
(24)	GWQHY	ZSFEV	XLZHD	USKFA...	(49)	EGEOU	NELDH	PTKUR	EKEAF...
(25)	CQETU	NEWXI	LZUKO	VLWUD...	(50)	QSHKR	KRQET	DLBUO	AASME...

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b. Reconstruct the method of square generation employed in Problem 2a, above, and solve the plain text of the following message:

GESKA KLTSF BDNSO QDUPD VAEPY HVEEI EWLEA HAQMP VHRYD TZOTU

3. The two following messages, known to be isologs, exhibit rather incongruous phenomena. Determine the nature of the general system in both cases, submit the plain text of the first 100 letters, and recover all key words.

Message "A"

IHMEW HYOCF HDEYN DHCHH FEKBB CEDTQ DVHKQ SAYTC PEIYT YEITN
AEKDK KMQGI PBYRL IHVFB CYQHG LCLQX ACCNB AEDIM IHRTC YTDTN
PBMUL LIITE DHRTW DHMDL ESMQT SYPOG HLCZI DSOPL IHCVN ICLBT
RDITI AHVFB TZBDP IALQL DHITL IDAFN KMQGI AHQHG GAHGL VMYDB
ACKDH IHMEW DVHIF YTDTN HCMZC OZPFL FGKBD DVHIB MYEGF EAHGH
LKHYC HYKDN YQXTL FEYRL IHVFB CYYQG PIEHF LKHTL HCQYT EQHTL
YNOCD DXAHP CICSC VDSKP BPHBL CEDDD HCQEH LKHIP GXHTL YNMFK
BPHBL HCMLP TYXDF GCGUG YXPHT MKOCD CDMQP EQMUO TLCVN RZCKF
MDGAL VTHTQ SAITE DHRTW XPOKL OSHIC HIDXL CMDEL QIFOQ SANGX
QEYAC QNOCD CDITM MKXYF PEXDF VTHTC VEBWB EFAHG VUAPK FEKBG
CFQIC OHQHG LCOVX QEDTM MCITE

Message "B"

CPOOD UAJMF FEMTT KWJCF ELGDG TAQFH UZEVD MCMCK AGMEZ DOMZG
SHZFC ZMGDS MUKUS VWHUT GSRLF BGCIS CHJKG AKQFM CZZUT DUQZG
DUOFS DOMBP CPZZD CFUDA AGCBR USUNF UHOHM CEONC SFCOT KYASR
WSMDT VKHUT ONQMQ COCUA TFMZA OUWCG ZMGDS AERSD USGSV WKMTG
SGZFF CPOOD UWZVD DUQZG KTOEE GECLS QBGMO UWZVT SZKKP AVGCF
FZZOC USZMO LUMAC CSKZA VWHUT HSBXF ODVCZ MUZSC KGZNU LSZTC
UCJYB FZFCY BCJMK FZTAY BFGES HHQOB VGENF FZZSM ROZMV XXCYM
BFGES TTCNO UDMYZ CSYZQ LVJDU MBJYD DTCBN DMOZR OFCGG SZOVB
KUWGV BZZLG TSMBU CPZZD LFOZS AZZCE PKFAO HFYQS WLQBD GVGRS
TDBGT FCJDQ DKMBA FWDED EDMMZ BZZLV OXPEG SEFAD ZHYEU ESGDD
NKZGD AERHQ FGCIS THQBA DSMFW

4. Solve the following cryptogram and recover all keys:

PBTDF RBMFR EKIFS BBGCQ AOACH GIQAG ASNGD OGUND CKCON REBUR
TXLXD RPADS EELLD NPXCL BATFE VADCD NSBQB IOACC SULNE UUKMQ
IUVIN REFQO OTCON FTRUO LQUGS ENUPD NUFMM EEFLX OQTPD STCKD
ITHMT NEFLE DNFLH SUTDS IWBET LMBRH NORPA ESHGZ ETBYD NECRD
DPPCK IWBQD PUBPA ESFQR UAAEX TIBQD HACBU UBTRD RTURN PCTMC
ESFAI

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5. Solve the following cryptogram and recover all keys:

BFSQQ PUXGO AOEID MGUTL NOKTX PEOFZ ATDCE JQKNX YBRRE RFZKH
DIXYH KVSIO YWXEQ SJPYT GTEBO HMIUT GCISC WAEQE IJJKM XWUCR
ERHSQ OEOJM DXGOA OEIDE DFOUY RFSQS TFYWX EQSPI VXPSO SEKFK
FFLRS RVYUQ VEOAE HAEQE AAXRK FYFFA JRFAQ SCIUW FEEUN WJHMT
DHSIH THQPF NHQIT NRSIL FKUQE RTREW TTGBS NKOFT USLZJ KUUJL
TQDYV

6. The enemy is known to be using a Baudot system incorporating two key tapes of lengths between 21 and 35, the tapes consisting of alphabetical characters only, without any of the six function symbols. From analysis of previous traffic, it is known that the first four letters of each message constitute the indicator; a single space is used between all words, and a message center idiosyncracy is the use of the doubled 3344 for the carriage-return/line-feed operation.

a. It is suspected that one of the messages intercepted in the morning contains the probable word REPORT. Solve the texts of the morning messages; and, after correctly juxtaposing the third message along the keying cycle, recover the plain text to this message.

Message "A"

RDA DE IZX 0930Z 17 DEC

IVIVP LWPZX ENO5C UBHVZ EEKWF MFN8F 57SDK XEB4F VD7F9 CTUMV
YEYUV QXI5H HCW4C KSKO5 YIMHC FHBWC C859G KXVPH I8AVS SUUO7

Message "B"

RDA DE IZX 0945Z 17 DEC

IVIVU PEHKV FVCIU NINAP E8WP3 RIVEF UMGEN UZIWN GI5TY IZVEZ
UD7US 73E4Z 3YVLW XOOLZ GM85E DNNRC SQ7OB 8IGGM NQ7MZ S54TQ
8YXG3 HISII

Message "C"

IZX DE RDA 1425Z 17 DEC

BMBMY XYY97 PFPCJ HBU84 NZY3G HKLVZ BR3WE SARU4 STZ8G GHKSG
VSU5S 7NN8C L8HVP HUZB4

b. Recover the original key tapes and reconstruct the indicator system from the preceding problem, and solve the text of the following message:

Message "D"

IZX DE RDA 1510Z 17 DEC

JRJRF UE5YC C9NJV U9DM4 OOZDE NJLUI U7I5I ZWPL8 LK8PN 854PC
MDZ9E DY44U 3NYF8 JIWAD FTOKE 3ZYWT 8ZVNJ BSKRB

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7. Solve the following cryptogram and recover all keys:

IOPTP TUCIE XJPFU GHPXQ JXWIS FJAGN IEUNN PGHCJ CEXBY HERJN
GZLHU GYJBB JDGIV PBOFJ GIPEN PFJFO AXJXZ FEMJD TYVXG BODRJ
DNLIJ IIXZJ INODZ XNJXX JRBTN VJREZ IMJTX WEVJM KHFOE NRPJE
OJCHB GFHAT DVJXY WWCJX OYGFJ REZIM JVFBP JVIAF GTTPH XJXWT
TJIMG TQJIV JMKXJ ZEHDL HXNKJ XBJOE YROSV VVXNJ HPRJA ECVTP
BMJVF BPJVI RFIVA XIJVL FVOOJ CSJQB UHJTP WUXIK TPYEY JIVJM
GLNRS NNEJX AJREF MNJHZ JDTYV XGBOD RJVOI JPHIW GOFJF YNPDF
GJHER PYSNJ ALCLK OJVNJ CAYVJ EUNNP GHJRT EZJUH UKFEN VJLAW
JLTWX

8. Solve the following cryptogram and recover all keys:

VJFVY DARDW NALGS MALYK AAQNT OSSCM LWPKS URSKI KSHVC NAZKT
LHOBW OAYDT SPPOS TTNUN ISPPD LEOYV IOUQB VAPSH KSHVC NAUSY
THCXS PALYK AAQNT OSSCO VHCBN OJECQ MSDQM FKGCJ LLSXC IABXL
ILHPS JBJEV THYGH NANEM SOXNQ AROJV KPUYY DUARW KJYEW ORESX
RLDGS MAUYX UHOBW OAZKT LHCXS PAODI YJPWJ JUGGN KWAKM LLQCV
NOAIY JZHYQ IQBZC IARKC YGQGP CAALL JQBPQ NCIPW KZXVS LHQAO
KAQNQ UKFWX RBVQY FKGCZ YDLEI NARNL AQSOX LKUCZ YOXEN OGFDL
HAESQ UKFWE KQQNQ KUPRN RIXVQ OJDNL ISUSQ JRFFN USPIS JABXB

9. Solve the following cryptogram and recover all keys:

NMGYO OZIOZ AYMLZ POCUZ LRMBP JGHOH FBLGF TASFX EWUCK HVCMR
RFECF NRBFC XGGQE PXDYR ZGLZA YBHND WCAZA KFRYI NZHNY KLMYD
MEWER YNWPZ YSHBG WGJCT SEGYB VBQRF AHMPD TBPGL WMHFM OYROJ
DAMEC NNLSM PAXDP FYKBA YDWCW XRYCN NCYGZ EOGDJ COGAT IHVOP
QGDFI PXYAB UGNAM AAHRZ AQNUG FNFIG MGAYB OMFMF OLOOH BFGQF
AHMPD TBPGL WMHFM OYPHO UZLLF KGAVF PEOZL NFYMA QTVYN ZURBN

10. Solve the following cryptogram and recover all keys:

GUOAC LFWBP CQSFO TYSQH DFXEH HUXXQ KDXYS CMTJN HDUBC FXWAP
HTHCI PNSBO EIIAV LSRXE WGCHL HXDSC OWGXP GVDJL MKOFH YBWJN
HOUSL GUOAF KHTIS LOXWY IZDFJ KOMWB KWSQJ GINKC KGMSI ZHSEC
GDYVS XTXKO MHJWC IJSIC LRWXU HETZL ONXIW DOXQI MZDMA BSXAR
JESQY PEZTK BSQAA VMHGY EEDUA BMOZP HSOBY DZNIH HIUAV QSTMW
TXTMM GNOQS MWULP EESUJ KGDYV RSPIB BVJXQ WJODY HGOHW MZDML
YNJKS HLPXN MVNEN FVKLS XMFOB ZVTMV GCDMO DTXEU TZMYL EFDXB
KBKQY NJSFO JLEQT IWXBY EZLNL FNKAT KTKQY LYLIN HIUAT KJBTY
LHYWD INXXS HVFXB PVLXL ONXMH SSYWY MGDWO MVOJD DLFMO HGUGP
BIKIO MJOIY ZENEP BNXFJ YHHII OJVWT AJGMY LMSLC LMQWC IJNSV
JAMEN NJOWU FRFBS OBBKD PZNEC HSXAQ LAMTV HJDTV OEFQY DAODI
QZDMJ TJIES KFMIX NOSTO BDTBC PSBXN SPZZS HXZAV QSKVW POSBC
IFDIX IPXOI FPLIO JJQDV WSQXA NOUXH BWODS MRWOP HEFWU FRFBS
OBBKD PZNEC HSXAQ RMOBY EZYGL KNZQQ VSHMU SHTBV IXDBF DMFIW
SCSEM MSKYC LKMIB HRYEH BCWBI DUXCU HGCGP HXZNV YAMUB ZVUMY

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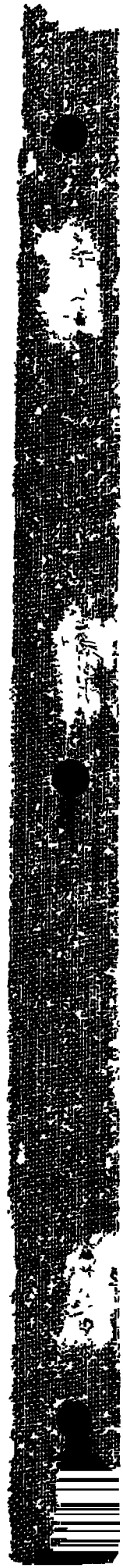

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