Recovery of Plain and Cipher Components in New-Type Kryha Using Word Spacer

Ueber die Neuen Kryha-Chiffriermaschinen Methoden

At the end of 1941, certain modifications were introduced in the enciphering procedure employed which render inapplicable several of the methods of attack previously described and add somewhat to the security of the system.

1. While continuing to use the same plain component for an entire month, the cipher component is changed at irregular intervals; this change occurs two or three times in the course of a month. This development adds very little to the difficulty of solution.

2. In addition to changing the pattern of depressed screws daily, as had been done previously, the total number of screw-stops employed now varies daily within a range of 20 to 30. Thus we are no longer dealing with a cryptogram employing a constant length of 20.

3. Messages enciphered with identical screw settings now use different initial settings of the plain and cipher components; this juxtaposition is now indicated by the first letter of the cipher message and is authenticated by the last letter which is two places beyond it in the normal alphabet. The initial indicator letters usually follow each other in normal order, in successive messages on the same day. It is thus evident that identical plain text beginnings will no longer produce identical cipher-texts, but rather isomorphic texts. This property will be used later in recovering the cipher component.

4. Messages almost always begin with the enciphered serial number preceded and followed by ZZ. The method of encipherment is to replace the integers as follows:

   ```
   0123456789
   OKEQZHSBLV
   ```

5. The most significant of the changes in enciphering procedure is that which introduces the element of key interruption into the system. At the end of each word, the letter J (appearing with "-" dash on a single tab) is enciphered as a word-separator. After each such plain-text J the operating lever is depressed twice instead of the usual once. Thus, the first letter of the next word instead of being enciphered at the setting it normally would, is enciphered at the one following it.

   It is obvious that the method of recovering the cipher component previously described as well as the reduction of the cryptogram to monoalphabeticity depended entirely on the fact that the jump-pattern was strictly periodic (the series of integers giving the distance between successive active screws). This procedure of depressing the operating lever twice after each word separator partially destroys this periodicity; hence, the methods of solution previously used are no longer applicable.

The methods of solution now to be described will be developed for two cases, namely; (1) with the cipher and plain components known, (2) with the cipher and plain components unknown.

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The following nine messages, representing a day's traffic, have been enciphered with unknown components:

```
                5     10     15     20     25     30     35
I.       YNEFT BEIGN WQMCL VNXDP AAYWC TPLBW ETRWW

II.      ZSIAQ WAPND SCPMS PIJZC CNYJO SGLUB ZQJYX

III.     AGOHK MAEZJ GJPZX AOTAV IZDXS OOSSK NSNGE

IV.      BHQVG CKJLQ KPPZX CFXTM LIRQA KRNDE JXBMK

V.       CQWSO YFLTP QTSYQ UJLRB GOTUD SGRAY TJSGR

VI.      DEZJB CGGOH EHSOY DINPB DHKNN CKRXN ASDVH

VII.     EVSXH QPUPY VPXQV OMKGC CEAAW OJXAN ETNHB

VIII.    FZXLC BWOYQ ZYLVZ HGWEP SOJAB SNNCW TQHOQ

IX.      FZXLC BHOYZ GQWZH DQODW AFJFT DABXM HWJIK
```

As stated before, the identical plain text beginnings of these messages produce isomorphic cipher-text beginnings. This being the case, by taking letters in corresponding positions of the isomorphic patterns of each set of two messages, the set of pairs as derived may be combined into chains, by the principles of indirect symmetry, to form the cipher component. The first nine letters of each message are repeated here, the portions known to be isomorphic underlined.

```
                1 2 3 4 5 6 7 8 9
I.       YNEFTBEIG

II.      ZSIAQWAPN

III.     AGOHKMAEZ

IV.      BHQVGOKJL

V.       CQWSOYFLT

VI.      DEZJBCGGO

VII.     EVSXHQPUP

VIII.    FZXLCBWOY

IX.      FZXLCBHOY
```

It will be noticed that the indicator letter is underlined as part of the isomorphic text. This is because the initial setting is such that the indicator letter is always opposite the same letter on the plain component.

Taking message #1 in combination with each of the other eight messages, the following sets of related pairs are derived:

I - II	I - III	I - IV	I - V	I - VI	I - VII	I – VIII
YZ	YA	YB	YC	YD	YE	YF
NS	NG	NH	NQ	NE	NV	NZ
EI	EO	EQ	EW	EZ	ES	EX
FA	FH	FV	FS	FJ	FX	FL
TQ	TK	TG	TO	TB	TH	TC
IP	IE	IJ	IL	IG	IU	IO
GN	GZ	GL	GT	GO	GP	GY

In addition to the above, three other sets of pairs may be derived by pairing columns 1 and 2, 2 and 3, and 8 and 9. Columns 2 - 3 and 8 - 9 may be paired because each column represents the same plain-text letter Z; columns 1 and 2 may be paired because they have been obtain[ed] at the setting of plain and cipher components. These pairings are as follows:

1 - 2	2 - 3	8 – 9
YN	NE	IG
ZS	SI	PN
AG	GO	EZ
BH	HQ	JL
CQ	QW	LT
DE	EZ	GO
EV	VS	UP
FZ	ZX	OY

Noting that sets I – VI, 2 – 3 and 8 – 9 give identical pairs, we combine these to give the following long chains:

(1) VSIGOYD; UPNEZ; FJLTB; HQW

Combining chains (1) with those of I – VIII, we obtain

(2) VSIGOYDFJLTBC; UPNEZ; HQW

From I – IV we note that YB = FV, proving the thirteen-letter chain of (2) to be complete. Also from I – IV we find that the two smaller chains may be combined as follows:

(3) UPNEZ...HQW..; VSIGOYDFJLTBC

From I – VII we have FT = XH, placing X after Z in (3); from I – II, we have GF = NA placing A after X. From I – III we have FT = HK placing K after W in [in] (3). The two chains of (3) will therefore be:

(4) UPNEZXA.HWQK; VSIGOYDFJLTBC

M and R are the two missing letters. From I – II and I – III, we can also form the chain:

YZGNS

Combining this with (4) we obtain the complete chain:

(5) YZGNSUCKTQJ$^{M}_{R}$DXOEIPV$^{M}_{R}$BWLHFA

By decimating (5) at an interval of 3 to the left, the keyword sequence which represents the original cipher component is obtained:

PORTUGALMIXJKSZFWVEDQCNYHB

The cipher component now being known, we may proceed as in the preceding section and convert all of the message[s] to the same initial setting of the components, using message I as a base:

```
                5     10     15     20     25     30     35
I.       YNEFT BEIGN WQMCL VNXDP AAYWC TPLBW ETRWW

II.      YNEFT BFIGR NUIVN IEQYU UGAQX NZWSH YTQAD

III.     YNEFT BYIGR NRVGO YEQYM PGXOU EEUUT SUSNI

IV.      YNEFT BXIGE XHHKM DSMOA GLPEU XPQVW IMYAP

V.       YNEFT BVIGR NGFBN ASIUO LTGAC FLUMB GSFLU

VI.      YNEFT BIIGR NRVGO YSPUT YRWPP BWAZP XVYCR

VII.     YNEFT BGIGR NGFBN ASVXP YYJJC AWFJO YMOTU

VIII.    YNEFT LHIGR NGFBN ASHPM CIDZL CUUTH JRAIR

IX.      YNEFT LAIGN SRHNA ORIOH ZYDYJ OZLEW AHDVQ
```

Picking out columns 5 and 6 [6 and 7?], which represent the last two digits of the serial numbers:

	6	7
I	B	E
II	B	F
III	B	Y
IV	B	X
V	B	V
VI	B	I
VII	B	G
VIII	L	H
IX	L	A

We observe that the column 6 letter changes from B to L between messages VII and VIII, indicating a change in the tens digit, implying that the G in message VIII represents the digit 9. The I in message VI represents 8, and so forth! Since message VIII and IX have the same indicator letter, they cannot be arranged in order of serial number, hence we can only say that H in message VIII and A in message IX represent 0 and 1 in some order. B and L in column 6 must represent two consecutive integers, 1 and 2, or 2 and 3, etc. Converting the numbers we have assigned to column 7 to their literal equivalents we obtain:

I	$E_c = Q_p$
II	$F_c = Z_p$
III	$Y_c = H_p$
IV	$X_c = S_p$
V	$V_c = B_p$
VI	$I_c = L_p$
VII	$G_c = V_p$
VIII	$H_c = O_p$ or K_p
IX	$A_c = O_p$ or K_p

Since these cipher-text letters have all been obtained at the same setting of the components, their plain-text equivalents may now be placed in the plain component, giving us the following values:

```
Cipher: PORTUGALMIXJKSZFWVEDQCNYHB
Plain:        VO  LS    Z BQ    HO
               K                  K
```

Since the B and L of column 6 represent consecutive digits, we set B_c equal to each literal equivalent of a digit in turn, and observe whether the plain-text equivalent of L_c represents the digit which follows in the normal order. We find only two possibilities: $B_c = Z_p$ (= 4), $L_c = H_p$ (= 5); or $B_c = K_p$ (= 1), $L_c = E_p$ (= 2) [?]. Of these, the former seems far more likely to be correct. Hence it will be considered first.

If our assumption for column 6 is correct, the plain text of message I now reads as follows:

```
Cipher: NEFTBEIG
Plain:  ZZ..ZQZZ
```

It should now be possible to locate the starting position of the selector wheel. By determining the distance which the cipher wheel must be moved to give the successive plain-text values, we find the

jumps to be:

```
Cipher: N  E  F  T  B  E  I  G
Plain:  Z  Z  .  .  Z  Q  Z  Z
Jump:      4     19     10  6  4
```

On the basic jump sequence we find this sequence:

```
Hole:  48  49  50  51  52   1   2   3   4   5   6   7   8
Jump:   4    3   3   4   5   4   3   4   3   3   3   4
                       19               10       6
```

This being the only portion of the basic jump sequence which will fit, we conclude that the starting point is hole 48 and that screws 48, 49, 2, 5, 7 and 8 are depressed.

Knowing our location on the basic jump sequence, our assumptions for the plain text following the serial number is limited by the size of the jumps following hole 8. This knowledge is of considerable assistance in recovering the remainder of the plain component.

In messages II, III, V, VI, VII and VIII we notice the two-letter repetition RN in positions 10 and 11, followed in V, VII and VIII by a six-letter repetition (GFBNAS) and in messages III and VI by a five-letter repetition (NRVGOY). These repetitions suggest plain-text FJ (fuer) followed by the name of the addressee. Such names commonly used in the past have been FEDER, DISAM, JUWEL, and GARBE. Assuming RN to represent FJ we attempt to locate the setting at which these letters were enciphered. The probable jumps after hole 8 are limited to the following:

```
              Hole:  8   9   10    11    12   13
Jump from hole 8:    3   7    11    14    17
                 Rc =    Z    .     H     .    .
                 Nc =    L    .     B     .    H
                 Ec =    V    L     .     .    .
```

Obviously, R_c cannot represent F_p at holes 9 or 11. Taking the remaining possibilities in order, we tentatively enter F on the plain component under R_c when the cipher component has been moved seven spaces to the right of the setting $G_c = Z_p$.

Since almost every day's traffic contains at least one message beginning ATLANTAVI, we next assume that this sequence appears in one of the remaining messages I, IV and IX. Message IV may be immediately eliminated since $R_c = F_p$ then $E_c = L_p$. Since messages I and IX fortunately have the same letter, N, in position 10, we may assume $N_c = A_p$ without deciding which, if either, of the two messages contains ATLANTAVI. Thus A may be entered on the plain component which will then have this appearance:

```
Cipher: PORTUGALMIXJKSZFWVEDQCNYHB
Plain:  BQF   HO      VO  LS  A Z
              K       K
```

Now we assume in message I

10	11	12	13	14	15	16	17	18
N	W	Q	M	C	L	V	N	X
A	T	L	A	N	T	A	V	I

Since we do not yet have the letter T in the plain component, we determine what the total jump is from position 10 to position 12 to give $Q_c = L_p$. We find it to be 24, which is possible, being the length of the total jump from hole 10 to hole 17. From position 12 to position 13 ($M_c = A_p$) we find the jump to be 16 which is possible (to hole 19) but not likely because of its size. At these two positions the other messages yield the following plain text:

Position	10	11	12	13
Jump:		24		16
Hole:	10		17	19
Cipher:	N	W	Q	M
Plain:	A	(T)	L	A

I	N	W	Q	M
	A	(T)	L	A
II	R	N	U	I
	F	(J)	L	
III	R	N	R	V
	F	(J)	.	
IV	E	X	H	H
	L	.	A	.
V	R	N	G	F
	F	(J)	S	
VI	R	N	R	V
	F	(J)	.	
VII	R	N	G	F
	F	(J)	S	
VIII	R	N	G	F
	F	(J)	S	
IX	N	S	R	H
	A	.	B	.

The setting for the column 12 of messages II, III, V, VI, VII and VIII will be the same as that for column 13 of the other messages since, it will be recalled, the J in these messages causes a skip in the hole sequence.

Going through the same procedure for the other possibility (that ATLANTAVI occurs in message IX)

```
Cipher: N S R H N A O R I
Plain:  A T L A N T A V I
```

We obtain these results:

Position	10	11	12	13
Jump:		16		8
Hole:	10		15	17
Cipher:	N	W	Q	M
Plain:	A	.	.	H

I	N	W	Q	M
	A	.	.	H
II	R	N	U	I
	F	(J)	E	
III	R	N	R	V
	F	(J)	B	
IV	E	X	H	H
	L	.	V	A
V	R	N	G	F
	F	(J)	.	
VI	R	N	R	V
	F	(J)	B	
VII	R	N	G	F
	F	(J)	.	
VIII	R	N	G	F
	F	(J)	.	
IX	N	S	R	H
	A	(T)	L	A

For several reasons, the second possibility looks more likely: the jumps are of more reasonable size, and the letters which follow FJ in messages II, III, V, VI, VII and VIII suggest names which have been frequently used in previously read traffic. For example, FJF(EDER) in message II, and FJB(ISAM) in messages III and VI.

Continuing with this possibility, we set $O_c = A_p$ for position sixteen and find that in messages III and VI $O_c = A_p$ in corresponding position fifteen, giving B..A. for the five letter repetition. This strongly suggests the word BISAM. If this is true, $G_c = S_p$ in position 14 of messages III and VI with a corresponding jump of 7 from position 14 to 15. At the same time, the position of T in the plain component is fixed, since $A_c = T_p$ in message IX when $G_c = S_p$ in III and VI. Messages III, IV, VI and IX will then have the following decipherment:

```
          10 11 12 13 14 15 16
III        R  N  R  V  G  O  Y
           F (J) B (I) S  A (M)

IV         E  X  H  H  K  M  D
           L  .  V  A  .  A  V

VI         R  N  R  V  G  O  Y
           F (J) B (I) S  A (M)

IX         N  S  R  H  N  A  O
           A  T  L  A (N) T  A
```

We may now establish the jump between positions 10 and 11, and also locate J in the plain component by reference to message IX above. The jump between positions 10 and 11 is found to be 7 which brings us to hole 12.

Deciphering message IV with the letters and positions now known, we obtain J…L, suggesting JUWEL, which fixes the position of W and E in the plain component. We now have recovered this much of the plain component:

```
V O . E L S T . A . Z . B Q F J . . H O . . . . . W
  K                                 K
```

From this point on, the solution follows in a straightforward manner. The complete plain component is found to be:

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

The pattern of the depressed screws is as follows:

```
48-49-51-52-2-5-7-8-10-12-15-17-20-22-24-29-30-32-33-37-38-40-41-44-45-47
```

The decipherments will be found to be:

```
I.    ZZ3643ZZ AUCH J F J SCHENKCHE J TRANSIT J

II.   ZZ3644ZZ F J FEDER X EUER J SCHREIBN J SECH

III.  ZZ3645ZZ F J BISAM X EURE J UEBERWEISG J BA

IV.   ZZ3646ZZ LEVATAVIZZ58ZZ SEBASTIAN J AU

V.    ZZ3647ZZ F J JUWEL J MELDN J FOLGENDE J STI

VI.   ZZ3648ZZ F J BISAM J BETR J HAIFISCHAKTIO
```

VII. ZZ3649ZZ F J JUWEL J EUER ZZ3226ZZ U J ZZ12

VIII. ZZ3651ZZ F J JUWEL J ZWISCHN J ZWEINUL J A

IX. ZZ3650ZZ ATLANTAVI ZZ392ZZ ECHRISTI J E

Solution when components are known

On September 11, 1942, the following messages from Sofindus (Madrid) to Hisrowak (Berlin) were received: (Only the first 35 letters are shown)

I. QDVJT ZXVNP YQCCQ NMTMK SNMOQ AJVOG EERZK

II. RBHLN ODHAP DSMFL RRMOR SFVNM IZFBG HAQBI

III. SAMEO RXMGD LGGVV RRADM VCJOO PXAZB FZMCB

IV. THAQU PMAMH QYYYL BCTSI MUNZV UZFJV MLNIU

The messages have been arranged in sequence as shown by the initial indicator letters.

It is known from previously solved messages that the components in use are:

```
Plain:  GONDELFAHRTXIMZWSJUBVYCKPQ
Cipher: MUSIKANTEXHVRQFBDPLJWGOZYC
```

In order to reduce the message to the same initial juxtaposition of the components (taking the first message as our base), two strips bearing the cipher component are slid against each other until Q (the initial indicator of message I) is over R (the indicator of message II) and the values in the upper strip are substituted for the corresponding values in the lower. The converted messages are as follows:

```
          5      10      15      20      25      30      35
I.    QDVJT ZXVNP YQCCQ NMTMK SNMOQ AJVOG EERZK

II.   QDVJT ZPVNL PIUBJ QQUZQ IBRTU KYBDO VNFDK

III.  QDVJT ZWVNU INNOO ZZDUV OHKTT SWDEM CEVHM

IV.   QDVJT ZNVND JKKKY GAQEX NTRIP TIWCP NYRXT
```

The identical beginnings of the four messages now become apparent. The five-letter repetition disregarding the indicator letter) followed after an interval of one letter by a two-letter repetition must represent ZZ followed by four-digit serial numbers differing from each other only in the last digit, followed by ZZ. Since only ten of the 26 letters represent digits, if the seventh letter of each message is converted to a plain component equivalent and the plain component sequence is completed, the correct generatrix should contain only those letters which may represent numbers.

```
XPWN
ORIP
NTMQ
DXZG
EIWO
LMSN
FZJD
AWUE
HSBL*
```

```
RJVF
TUYA
XBCH
IVKR
MYPT
ZCQX
WKGI
SPOM
JQNZ
UGDW
BOES
VNLJ
YDFU
CEAB
KLHV
PFRY
QATC
GHXK
```

The underlined generatrix HSBL represents the digits 5 – 6 – 7 – 8, which is obviously correct. The text of the first message, insofar as it is now known, is as follows:

ZXVNPYQ… DVJTZXVN… ZZ…HZZ

We are now in a position to determine a portion of the jump pattern. Setting D of the cipher component against Z of the plain component, we find that the cipher component must be moved five spaces to the right in order to set V_c equal to Z_p. Thus the first jump of the cipher wheel is 5. The exact size of the next four jumps cannot yet be determined since the plain-text is not known. We can, however, determine the total of the four jumps; moving the cipher component until $X_c = H_p$, we find that the total jump is 22. Similarly, the next two jumps are found to be 4 and 5 respectively. The pattern of the first seven jumps, as now determined, is:

```
Plain-text position:  1   2   3   4   5   6   7   8
Jumps:                  5       22          4   5
```

We now refer to the basic jump-pattern (shown on page 12) and attempt to locate that portion of the pattern which is consistent with the fragment we have recovered. Following hole 43 we find the pattern to be as follows:

```
Hole:  43   44   45   46   47   48   49   50   51   52   1
Jump:     5    3    3    3    3    4    3    3    4    5
                          22
```

No other portion of the basic pattern will yield the proper sequence of jumps. The starting point is now determined to be at hole 43. Usually at this point, it is possible to determine the exact jumps between hole 44 and 51. This is done simply by finding what groupings of the seven basic jumps will produce a plain-text series of three successive digits. In this case, however, we find that there are four possible groupings of the basic jumps which will meet the above condition; these are:

Jumps	3-3-10-6	3-3-13-3	3-6-10-3	3-6-7-6
Plain-text:	Q S S H	Q S B H	Q B B H	Q B S
Numerical equivalent:	3 6 6 5	3 6 7 5	3 7 7 5	3 7 6

We therefore go on to the cipher text after the serial number.

It is assumed that the next jump after hole 1 will be at hole 2, or hole 3, or hole 4, etc. Taking each such assumption in turn the tenth column of cipher letters, PLUD, is deciphered giving the following results:

	Hole:	2	3	4	5
Jump from hole 1:		4	7	11	14
Col 10.	P	D	F	T	M
	L	E	A	X	Z
	U	M	S	V	K
	D	N	L	R	I

Fig. 1

Familiarity with common beginnings suggests hole 3, with plain-text FASL, as the most probable choice for the next stop. However, hole 2 is not unlikely, so both will be assumed correct in turn and column eleven will be deciphered in a like manner. Using hole 2 from fig. 1, gives the following

	Hole:	3	4	5	6
Jump from hole 2:		3	7	10	13
Col 11.	Y	M	J	V	K
	P	F	T	M	S
	I	U	C	Q	N
	J	H	I	W	U

Fig. 2

Combining each of these columns with the column under hole 2 in fig. 1 gives

DM	DJ	DV	DK
EF	ET	EM	ES
MU	MC	MQ	MN
NH	NI	NW	NU

Since none of these gives promising digraphs, hole 3 in fig 1. is used to give:

	Hole:	4	5	6	7
Jump from hole 3:		4	7	10	13
Col 11.	Y	J	V	K	G
	P	T	M	S	B
	I	C	Q	N	L
	J	I	W	U	Y

Fig. 3

Combining each of these columns with the columns under hole 3 of fig. 1 gives:

```
FJ  FV  FK  FG
AT  AM  AS  AB
SC  SQ  SN  SL
LI  LW  LU  LY
```

The column of digraphs

```
FJ
AT
SC
LI
```

is clearly the correct choice since F followed by word separator J is the abbreviation for the word “fuer” and AT suggests the frequent beginning ATLANTAVI representing “Atlantik Avis”.

Assuming this to be true, the jump pattern will be:

```
                  A   T   L   A   N   T   A   V   I
Jump pattern:     4   9   4   7   4   3   13  4
```

Reference to the basic jump pattern shows this sequence to be possible with the following series of active screws:

```
(43 44 45   51 52 1)  3  4  7  8  10  11  12  16  17
```

The other three messages are then deciphered using the above jump pattern. It must be remembered that each time a plain-text J is encountered, the next active stop is to be omitted. This is illustrated in the decipherment as obtained thus far: *(note: some characters may be missing at RHS)*

```
     5   3              4   5   7   4  13   7   4   3   13  4
     43  44  45         51  52  1   3   4   8   10  11  12  16  17
I    D   V   J   T   Z  X   V   N   P   Y   Q   C   C   Q   N   M
     Z   Z   Q          H   Z   Z   F   J   B   I   S   A   M   X

     5   3              4   5   7   4   9   4   7   4   3   13  4
     43  44  45         51  52  1   3   4   7   8   10  11  12  16  17
II   D   V   J   T   Z  P   V   N   L   P   I   U   B   J   Q   Q   U
     Z   Z   Q          S   Z   Z   A   T   L   A   N   T   A   V   I

     5   3              4   5   7   4   9   4   7   4   3   17
     43  44  45         51  52  1   3   4   7   8   10  11  12  17
III  D   V   J   T   Z  W   V   N   U   I   N   N   O   O   Z   Z   D
     Z   Z   Q          B   Z   Z   S   C   H   I   R   M   J   H

     5   3              4   5   7   4   9   4   7   7   13  4
     43  44  45         51  52  1   3   4   7   8   10  12  16  17
IV   D   V   J   T   Z  N   V   N   D   J   K   K   K   Y   G   A   Q
     Z   Z   Q          L   Z   Z   L   I   F   T   J   U   N   S
```

Note the effect of a plain-text J on the jump pattern and the active stops.

Now the overlapping process is continued aided by context until the pattern of active screws repeats itself. This complete pattern is:

```
43-44-45-47-49-51-52-1-3-4-7-8-10-11-12-16-17-19-22-23-24-27-31-33-36-39-40-42,
```

And the complete plain-text for the first 34 letters in each case is:

```
I:    ZZ 3765 ZZ F J BISAM X PORTPARTIEN J P J EINS

II:   ZZ 3766 ZZ ATLANTAVI ZZ 512 ZZ OLGA J ZWEI E

III:  ZZ 3767 ZZ SCHIRM J HANSEN X VERLADGN J ATL

IV:   ZZ 3768 ZZ LIFT J UNSER ZZ 3764 ZZ X VERANLA
```