EDITING NOTES ON EAW TERRAIN AND AIRFIELD/GROUND TARGET FILES

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A) ********** INTRODUCTION **********

The landscape in EAW is controlled, at least in part, by two files contained in DATA.CDF : EAW.TM and EAW16.HM. While EAW.TM codes for the sequence of the 640x320 (204800) tiles that constitute the EAW landscape, EAW16.HM codes for the height of these tiles.
A tile represents a surface of 16.8 Km2 (4.1x4.1 Km). Therefore, the whole EAW map covers an area of about 2600x1300 Km (1500 x 750 miles).

The nature and location of airbases/ground targets are controlled, at least in part, by four files : Targets.dat, Airfield.dat, Griddata.dat and Tardata.dat.
- Targets.dat contains a complete list of the 302 targets/airbases (162 airbases and 140 static ground targets) with corresponding XY coordinates.
- Tardata.dat also contains the list of the 302 targets/airbases but with extensive infos on the composition of the targets.
- Airfield.dat contains infos about the nature and orientation of the 162 airfields.
- Griddata.dat manages the appearance of airbases and ground targets on the map. In other terms, it says to the program which targets will be displayed in a certain area. In fact,

Griddata.dat looks like a "picture" of the 640x320 tiles matrix but in the 40x20 format.

B) ******** EAW.TM **********

EAW.TM contains 204800 bytes which correspond to the 204800 tiles of the EAW landscape. As a matter of fact, every tile is coded by only one byte.
The EAW.TM bytes form a 640x320 matrix.
Bytes 00d to 639d correspond to the Northern upper row of tiles, from west to east. Bytes 640d to 1279d correspond to the row of tiles just below, also from west to east, and so on ...

There are 68 different terrain tiles provided in the PicPac utility (BN*.PCX files which can be transformed into BN*.TER (low altitude) and LR*.TER (high altitude)) but only 59 of them are used by the program.

Every tile is coded by four values corresponding to four different orientations (north, east, south and west). All these values range from 00 to FA. Values CB, CC, CD, CE ,CF, DB, DC, DD, DE, DF, EB, EC, ED, EE, EF, FB, FC, FD, FE and FF are not used. Changing an existing value with any of these values displays a black tile on the terrain.

The different values are listed thereafter :

Codes defining the nature and orientation of tiles in EAW

	Orientation of the upper side of tiles			
Tiles (BN*.PCX files in PicPac)	North	East	South	West
Cities				
BNALCTY	0A	4A	8A	CA
BNALCTY2	0B	4B	8B	CB
BNALCTY3	0C	4C	8C	CC
BNALCTY4	0D	4D	8D	CD
BNALCTY5	2A	6A	AA	EA
BNALCTY6*	-	-	-	-
BNALCTY7	30	70	B0	F0
BNALCTY8	31	71	B1	F1
BNALCTY9	2E	6E	AE	EE
BNBASE*	-	-	-	-

Coasts				
BNCOAST1	03	43	83	C3
BNCOAST2	05	45	85	C5
BNCOAST3	04	44	84	C4
BNCOAST4	20	60	A0	E0
BNCOAST5	21	61	A1	E1
BNCOAST6	2C	6C	AC	EC
BNCOSTBR	34	74	B4	F4
BNCOSTCT	39	79	B9	F9
BNCOSTRV	37	77	B7	F7
BNCOSTTR	3A	7A	BA	FA
BNCOSTU1	32	72	B2	F2
BNCOSTU2	33	73	B3	F3
Fields				
BNFIELD1	06	46	86	C6
BNFIELD2	07	47	87	C7
BNFIELD3*	-	-	-	-
BNFIELD4	09	49	89	C9
BNFIELD5	08	48	88	C8
BNFIELD6	2F	6F	AF	EF
BNFIELD7	26	66	A6	E6
BNFIELD8	00	40	80	C0
BNFIELD9*	-	-	-	-
Forests				
BNFORST1	1B	5B	9B	DB
BNFORST2	1F	5F	9F	DF
BNFORST3	1E	5E	9E	DE
BNFORST4	1A	5A	9A	DA
BNFORST5	1C	5C	9C	DC
BNFORST6	1D	5D	9D	DD
BNFORST7	29	69	A9	E9
Grass				
BNGRASS	01	41	81	C1
BNGRASS2*	-	-	-	-
Mountains				
BNMOUNT1	16	56	96	D6
BNMOUNT2	19	59	99	D9
BNMOUNT3	18	58	98	D8
BNMOUNT4	17	57	97	D7
Rivers				
BNRIVER1	0E	4E	8E	CE
BNRIVER2	0F	4F	8F	CF
BNRIVER3*	-	-	-	-
BNRIVER4	11	51	91	D1

BNRIVER5	12	52	92	D2
BNRIVER6	13	53	93	D3
BNRIVER7	14	54	94	D4
BNRIVER8	15	55	95	D5
BNRIVER9	10	50	90	D0
BNRIVRBR	35	75	B5	F5
BNRIVRFK	36	76	B6	F6
BNRIVRND	2B	6B	AB	EB
BNRIVRTR	38	78	B8	F8
Roads				
BNROAD1	22	62	A2	E2
BNROAD2	23	63	A3	E3
BNROAD3*	-	-	-	-
BNROAD4	25	65	A5	E5
BNROAD5*	-	-	-	-
BNROAD6	24	64	A4	E4
BNROAD7*	-	-	-	-
BNROAD8	27	67	A7	E7
BNROAD9	28	68	A8	E8
BNROAD10	2D	6D	AD	ED
Water				
BNWATER	02	42	82	C2

(* : not used in EAW)

C) ******** EAW16.HM **********

EAW16.HM codes for the height of tiles (more precisely, the upper left corner (node) of tiles) in EAW. The structure is very similar to the one of EAW.TM. However, the data for every tile are coded by two bytes whose values range from 00h 00h (sea level) to FFh FFh (higher altitude, about 5000 meters).
EAW16.HM is 409600 bytes long and is organized as a 1280x320 matrix.
Bytes 00d to 1279d correspond to the Northern row of tiles, from west to east. Bytes 1280d to 2559d correspond to the row of tiles just below, also from west to east, and so on ...

D) ******** TARGETS.DAT**********

Targets.dat is 9668 bytes big and is organized into 302 chunks of 32 bytes (302 targets) more 4 "end" bytes.

Example of the first chunk (0d-31d) :

2E 01 00 00 31 B5 B6 FD 0D 9C CC E7 5F 1A 00 00
E8 D2 12 00 16 00 08 10 F5 00 00 00 00 00 00 00

and the second chunk (32d-63d) :

00 00 00 00 9A C2 18 FE 9C 6E B3 E7 DE 22 00 00
76 3D 14 00 61 00 41 0B 8D 04 00 00 82 00 00 00

Structure of a chunk :

Bytes 0d & 1d : 2E01 in the first chunk; always 0000 in the 301
other chunks
Bytes 2d & 3d : always 0000
Bytes 4d-7d : X coordinate of the target (see further chapter)
Bytes 8d-11d : Y coordinate of the target (see further chapter)
Bytes 12d-13d : still unknown
Bytes 14d-15d : always 0000
Bytes 16d-25d : still unknown
Bytes 26d-32d : 000000000000 for a target which is not an airbase
0000XXXX0000 for an airbase, where XXXX is so-
called the "A code" in the EAWK3.wdb file. The A
code identifies the different airbases in the
Squ*.dat files (campaigns). For example, in chunk
#2, "82" refers to Morlaix, France.
The "A code" of every target is contained in EAWK3.wdb

E) ******** AIRFIELD.DAT **********

The file is 7132 bytes big. It consists of 162 chunks of 44 bytes more 4 "end" bytes.
The 62 chunks correspond to the 162 airfields available in EAW.
It contains data on the nature, size and orientation of the

airfields.

Example of chunk #1 in airfield.dat (0d-43d) :

A2 00 00 00 00 00 DC 78 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 FF FF 09 00 09 00 09 00
00 01 02 00 07 00 07 00 51 00 00 00

Structure of a chunk :

Bytes 0d-5d : still unknown, sometimes all 00
Bytes 6d &7d : still unknown, never 00
Bytes 8d-23d : always 00
Bytes 24d-39d : still unknown, repeats of 0X 00
Bytes 40d & 41d: so-called "T code" in EAWK3.wdb. This code is specific to a given airfield. Elsewhere, any of the 302 targets in EAW has its own T code.
Bytes 42d & 43d : always 00

The bytes coding for every airfield and the T codes are indicated in EAWK3.wdb

I noted that the exchange of a chunk of an existing airfield (displayed on the map) with the one of an airfield which is not activated,
does activate this latter and desactivates the first one.

This finding was used to move some allied bases from west to east, in order to play with frontlines #10 to 22.

F) ******** TARDATA.DAT **********

Tardata.dat is 122436 bytes big. It consists of 3826 chunks of 32 bytes more 4 "end" bytes. Every chunk corresponds to an element (sub-target) of a given target. Depending on the target, the number of chunks may vary from 4 to 22.

Example of a set of 5 chunks coding for the "Fürth" target (bytes 20224d-20383d):

00 00 00 00 81 00 00 00 04 00 00 00 03 01 00 00
B3 FC FF FF A6 0C 00 00 16 00 00 00 D4 7F 00 00

00 00 00 00 81 00 00 00 11 00 00 00 03 01 00 00
32 10 FF FF E5 38 FF FF 80 01 00 00 00 28 00 00

00 00 00 00 81 00 00 00 11 00 00 00 03 01 00 00

```
F3 CA 00 00 E6 C4 00 00 57 01 00 00 00 58 00 00

00 00 00 00 81 00 00 00 12 00 00 00 03 01 00 00
B3 25 01 00 E5 B4 FE FF 69 FF FF FF 00 88 00 00

00 00 00 00 81 00 00 00 12 00 00 00 03 01 00 00
72 02 FF FF A6 40 01 00 06 05 00 00 00 60 00 00
```

Structure of a chunk :

Bytes 0d-3d: always 00h
Byte 4d: still unknown
Bytes 5d-7d: always 00h
Byte 8d: Code specific to a "subtarget". There are 25 subtargets in total. So far I know, 01 and 02 code for factories, 03 = oil factory, 05 = factory, 05 = the airfield itself, 06 = factory, 07 = RR station, 08 small hangar, 09 submarine shelter, 0A = ???, 11 = AAA, 12 = airfield light AAA, 13 = oil tank, 14 = radar center, 15 = radar tower, 17 = Bunker, 18 = airfield petrol storage, 19 = airfield control tower, 1A = airfield bunker, 1B = airfield large hangar, 1C = airfield small barrack, 1D = airfield mess, 1E = airfield QG, 1F, airfield large barrack and 29 = large hangar. Warning : some of these codes are maybe not correct and have to be further investigated.
Bytes 9d-31d: still unknown but they are likely to code for the relative positions of subtargets inside the main target. Setting these bytes to 00 moves the subtargets to an unique position.

When studying the Tardata.dat file, very odd things occured when replacing some data with others. Managing data in Tardata.dat is probably not so simple as one could imagine ...For example, one subtarget can be changed with an other one, but not all. Some changed subtargets can be viewed on

one side (german for example) but not when playing on the other side (allies). The Tardata.dat structure has to be further investigated.

G) ******** GRIDDATA.DAT **********

Griddata.dat is 6400 bytes big. It manages the appearance of airbases and ground targets on the map.
Griddata.dat consists of 800 chunks of 8 bytes each. It is organized as a 40 columns (40x8=320 bytes) x 20 lines matrix. It is like a "picture" of the 640x320 tiles matrix but in the 40x20 format.

The content of a chunk indicates to the program which airbases/targets are present in a given area. This area is 2304 (48x48) tiles big.

A chunk is in the format :
XX 00 00 00 YY YY 00 00
where XX is the number of airbases/targets coded by the chunk and YY YY is the "T code" of the first airbase/target.

For example, such a chunk :
"00 00 00 00 00 00 00 00" indicates to the program that no airbase/target needs to be displayed within a given 48x48 tiles area.

Another example :
"01 00 00 00 01 00 00 00"
indicates to the program that one airbase/target corresponding to Morlaix, France (01 is the T code for Morlaix) will be present within 48x48 tiles on the map.

Last example :
"03 00 00 00 FC 00 00 00"
indicates to the program that three airbases/targets with consecutive T codes (FC, FD and FE) will be present within 48x48 tiles on the map.

<u>About the 48x48 tiles areas covered by the chunks:</u>

Up to 9 different chunks may code for a airbase/target or a series of airbases/targets at a given location on the map. In fact, two adjacent chunks code for areas which overlap on 32 tiles (i.e. the areas are shifted by 16 tiles).

<u>Correspondence between the 640x320 tiles matrix and the 40x20 griddata chunks matrix :</u>

Columns :
Chunk #1 of one of the 20 lines of the griddata matrix covers columns 1 to 31 of the 640x320 tiles matrix.
Chunk #2 covers columns 1 to 48 of the 640x320 tiles matrix.
Chunk #3 covers columns 17 to 64 of the 640x320 tiles matrix.
Chunk #4 covers columns 33 to 80 of the 640x320 tiles matrix.
....
Chunk #40 covers columns 609 to 640 of the 640x320 tiles matrix.

Lines :
Chunks of the first line of the griddata matrix cover lines 1 to 31 of the 640x320 tiles matrix.
Chunks of the second line of the griddata matrix cover lines 1 to 48 of the 640x320 tiles matrix.
Chunks of the third line of the griddata matrix cover lines 17 to 64 of the 640x320 tiles matrix.
Chunks of the fourth line of the griddata matrix cover lines 33 to 80 of the 640x320 tiles matrix.
....
Chunks of the 20th line of the griddata matrix cover lines 289 to 320 of the 640x320 tiles matrix.

H) ***** XY coordinates and the 640x320 tiles matrix *****

The precise position of targets on the map is coded through the XY coordinates found in targets.dat. The format of these coordinates is similar to the one of frontlines coordinates (frntline.dat).

About the X coordinates :

They range from 00 00 81 FD to 00 00 80 07 that correspond to column #1 and #640 of the 640x320 tiles matrix, respectively.
Every increment of the fourth byte corresponds to 64 columns. For example, 00 00 81 FE will correspond to column #64, 00 00 81 FF to column #128, 00 00 81 00 to column #192 and so on...
Every four increments of the third byte correspond to one column. For example, 00 00 85 FE will correspond to column # 65, and so on ...
Bytes one and two are much less important and correspond to fractions of a column.

About the Y coordinates :

They range from 00 00 81 E4 to 00 00 80 E9 that correspond to line #1 and #320 of the 640x320 tiles matrix, respectively.
Every increment of the fourth byte corresponds to 64 lines. For example, 00 00 81 E5 will correspond to line #64, 00 00 81 E6 to line #128, 00 00 81 E7 to line #192 and so on...
Every four increments of the third byte correspond to one column. For example, 00 00 85 E5 will correspond to line # 65, and so on ...
Bytes one and two correspond to fractions of a line.

I) ********** Files provided in this ZIP **********

- Readme.txt (this file)
- Eawk3.wdb (database file in MSWorks 3.0 format)containing infos about any of the 302 targets in the original EAW configuration : Name of target; T code; A code, bytes in Griddata.dat; bytes in Airfield.dat; line in Griddata.dat matrix; X coordinates; Y coordinates; bytes in Targets.dat; offset in EAW.TM; line and column numbers of the 640x320 Tiles matrix.
- Targetset.zip containing utilities written in MS Qbasic :
  * Convert.bas : utility which converts the XY coordinates of targets from targets.dat into the corresponding tiles of the 640x320 terrain matrix (lines and columns of the 640x320 matrix and bytes in EAW.TM), the bytes coding for the height of tiles (bytes in EAW16.HM) and the corresponding bytes in Griddata.dat.
  * Vertcon.bas : the same as Convert.bas but allowing the reverse thing, i.e. the conversion of lines/columns into the XY coordinates used in Targets.dat.
  * French Qbasic.exe and Qbasic.hlp for running the utilities (if necessary, of course) are included.
- Blankfiles.zip : a set of Targets.dat and Griddata.dat files providing a "no target/airbase" map. These files should be used as a starting material for constructing new maps, adding airbases and targets one by one.

J) ****** Creating a new theater - a practical approach ******

This last chapter deals with the practical way to create a new EAW theater.

First main step : creating a new map.

It is better starting with a EAW.TM file filled with randomly-distributed 02, 42, 82 and C2 tiles. This gives the ocean everywhere. "Ground" tiles should be added, one by one to get islands/continents on the map.
Then, or later, a blank EAW16.HM (all bytes set to zero) should be modified to set the height of tiles.

Second main step : placing new airbases/targets on the blank map.

A practical and simple example :
How to set two airbases/targets on a blank map ?
1) Lille at line #145 and column #209 of the 640x320 tiles matrix
2) Cambrai at line #97 and column #190 of the 640x320 tiles matrix

The way to do :

1) Open EAWK3.wdb and search for the T codes of Lille and Cambrai, as well as the corresponding bytes in targets.dat. T codes are 85 and 88 for Lille and Cambrai, respectively, and the bytes in Targets.dat are 4256-4287 and 4352-4383.

2) Place Qbasic.exe, Qbasic.hlp, convert.bas, vertcon.bas in a temporary folder.
- Open a DOS-windows and set the pathway to the temporary folder. - Type "Qbasic.exe /run vertcon.bas" to run the utility.
- Enter line = 145 and column = 209.
- The utility gives you the offsets in EAW.TM, EAW.HM but also :
  * the corresponding X & Y coordinates as X = 0000C600
    and Y = 0000C2E6
  * the bytes of the adequate griddata.dat chunks. In that
    case, 2984-2991 is the best choice.
- Press Space to run the utility again
- Enter line = 97 and column = 190
- The utility gives you the offsets in EAW.TM, EAW.HM but also :
  * the corresponding X & Y coordinates as X = 00007A00
    and Y= 000002E6
  * the bytes of the adequate griddata.dat chunks. In that

case, 2016-2023 is the best choice.

3) Using a Hex-editor, open the "blank" Targets.dat provided within this ZIP. The targets.dat file has any of the targets set in only one default location (north-west corner of the map).
- Display bytes 4256-4287 (bytes for Lille)
- Type 0000C600 at bytes 4260-4263 and 0000C2E6 at bytes 4264-
  4267.
- Display bytes 4352-4383 (bytes for Cambrai)
- Type 00007A00 at bytes 4356-4359 and 000002E6 at bytes 4360-
  4363.
- Record and close Targets.dat

4) Using a Hex-editor, open the blank Griddata.dat provided within this ZIP. All bytes are set to zero.
- Display bytes 2984-2991
- Type 01 00 00 00 85 00 00 00 (i.e. one airbase/target whose T
  code is 85 and corresponds to Lille)
- Display bytes 2016-2023
- Type 01 00 00 00 88 00 00 00 (i.e. one airbase/target whose T
  code is 88 and corresponds to Cambrai).
- Record and close Griddata.dat

That's done : the two first airbases/targets are now available on the map. This can be checked by dropping both modified Targets.dat and Griddata.dat into the EAW directory and running EAW. Of course, the default frontline (#1) has to be loaded to play Cambrai as Allied and Lille as Axis.

WARNING : depending on the size, complexity (various subtargets) and exact XY coordinates of a given airbase/target, the airbase/target may lie on several tiles. Thus, both convert.bas and vertcon.bas utilities give the main tile (in the center of the 9 tiles patch) which supports the airbase/target, more the adjacent tiles. This is also true for the height of tiles.

Please, give credits to this work in further applications and developments.
Thanks.

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