NOTES ON EAW EDITING

Revision: 14 September 2003

INDEX

Introduction

These notes are the result of a lot of detective work, trial and error, and guesswork, by me and a great number of other EAW fans. They have been collated by me since 1999, originally for my own use. They are a synthesis of everyone's knowledge of EAW that has been shared to date, and are intended as a freely available reference work for anyone interested in editing EAW, the greatest WWII flight sim yet made.

If anyone else reading these notes wants to try their hand at editing EAW, give it a go and let me know. Cooperation is the key. But PLEASE back up anything before you do. And, as the saying goes, if you cannot add and subtract in hexadecimal, you shouldn't be hex-editing.

Charles' EAW Site
http://www.users.bigpond.net.au/CharlesEAW

AIRCRAFT
There are 30 aircraft, 20 flyable and 10 non-flyable. The Aircraft Codes are as follows:

00 P-38H
01 P-38J
02 P-47C
03 P-47D
04 P-51B
05 P-51D
06 B-17F
07 B-24D
08 B-26B
09 Hurricane
0A Spit Ia
0B Spit IX
0C Spit 14
0D Typhoon
0E Tempest
0F Mosquito
10 Bf 109E
11 Bf 109G
12 Bf 109K
13 Bf 110C
14 Bf 110G
15 Me-410
16 Fw 190A
17 Fw 190D
18 Me 262
19 Ju-88A
1A Ju-88C
1B Ju-87
1C He-111
1DV1

THE *.FLT FILES
The full names of the *.FLT files, which also relate to the *.3DZ files, are as follows:

109E.FLT
109G.FLT
109K.FLT
110C.FLT
110G.FLT
190A.FLT
190D.FLT
262A.FLT
B24A.FLT
B26A.FLT
BB17.FLT
H111.FLT
HURR.FLT
J88A.FLT
J88C.FLT
JU87.FLT
M410.FLT
MOSQ.FLT
P38H.FLT

P38J.FLT
P47C.FLT
P47D.FLT
P51B.FLT
P51D.FLT
SP09.FLT
SP14.FLT
SP2A.FLT
TEMP.FLT
TYPH.FLT
V1V1.FLT

WEAPONS
There are 21 (15h) original types of weapons. The Weapons Codes are as follows:

00=No weapon
01=100lb bomb
02=250lb
03=500lb
04=1000lb
05=50kg
06=100kg
07=250kg
08=500kg
09=45 gal droptank
0A=75 gal
0B=108 gal
0C=150 gal
0D=165 gal
0E=200gal
0F=300 litre
10=M10 4.5" rocket
11=60lb rocket
12=HVAR 5" rocket
13=WGr21 mortar
14=R4M rocket
(15=Hs-293 rocket bomb)
(16=Fritz-X missile)
(17=Panzerschreck rocket)
(18=SD-10 frag. cannister)
(19=50 gal Napalm)
(1A=SD-2 bomblet)
(1B=20 lb Incendiary)
(1C=10 kg Incendiary)
(1D=Okha)
(1E=Cannon pod)
(1F=Twin cannon pod)

(= new weapons added by me in “Enemy Coast Ahead” or ECA Control Panel)

In CAW the following weapons changes have been made:
15= Mk 13 Torpedo
16= Type 91 Torpedo
18= Depth Charge
1E= US Torpedo rack
1F= Japanese Torpedo rack

THE STRUCTURE OF EAW

EAW has its data in files in a series of library Compact Data Files (*.cdf). The constituent files can be extracted with Paulo Morais' CDF Extractor from EAW Online. An individual file in the EAW directory will be used by EAW in preference to the original in a CDF file. The CDF files are:

CDF File	Size	Contents
3d.cdf	4.66 Mb	3D shapes and cockpit views (*.3DZ), and textures (*.TPC)
cockpits.cdf	19.9 Mb	Cockpit views of flyable aircraft (20x *.CPT)
data.cdf	1.36 Mb	Aircraft and weapons data
flt.cdf	38.6 Kb	Flight models (30 x *.FLT files)
fonts.cdf	1.01 Mb	
grbrief.cdf	9 Mb	
menu_eng.cdf	36.9 Mb	
movies.cdf	284 Mb	Movie files
music.cdf	1.38 Mb	
pic.cdf	25.1 Mb	Pictures, incl hangar pictures (*.MPC)
sound.cdf	1.14 Mb	
sound16.cdf	2.38 Mb	
speech1.cdf	9.94 Mb	US speech *.SND files
speech2.cdf	11.3 Mb	UK speech *.SND files
speech3.cdf	11.8 Mb	German speech *.SND files
sprites.cdf	244 Kb	
terrrain.cdf	7.57 Mb	
text_eng .cdf	164 Kb	Text string files (93x *.STR) for text within the sim
ukbrief.cdf	9.63 Mb	
usbrief.cdf	11.4 Mb	
wsound.cdf	8.87 Mb	
wsprites.cdf	23.9 Mb	

EAW NUMBERING

Most EAW files use the Intel low-byte/high-byte format for numbers i.e. 3E8 is stored as E803.
Some (e.g. the *.FLT files) use a combination of short, long and float format (byte = 1-byte integer, short= 2-byte integer, long=4-byte, float=4-byte).

Hex to Decimal numbers are:

1 - 9	**A**	**B**	**C**	**D**	**E**	**F**
1 - 9	10	11	12	13	14	15

For hex-editing I use Hex Workshop from Breakpoint Software (http://www.bpsoft.com), which has a Hex-Decimal calculator, a Data Viewer, and a Base Converter (Intel Hex-Decimal). The Windows calculator (Scientific mode) converts Hexadecimal-Binary etc

OTHER CHARACTERS

When hex editing text strings, the ASCII characters for German vowels with an umlaut are:

Lower case	a	84	e	89	o	94	u	81
Upper case	A	8e	E		O	99	U	9a

EAW RESOLUTION

As of v1.1, EAW recognizes higher resolution settings in the EAW.INI file, specifically the "Width=" and "Height=" settings. Your video card needs to have enough frame buffer memory to support any new settings, otherwise you will get an error message when trying to fly a mission. If this happens, you can always restore the settings to the default 640x480. The settings are:

640 x 480
800 x 600
1024 x 768
1280 x 1024

The viewing area will not be the same as it is in 640x480, depending on the resolution setting. 800x600 mode will have slightly more viewing area, while 1024x768 mode will show slightly less. There is no loading progress screen (the fuel gauge screen), though the mission will still load as before. Static cockpits are not available--you are automatically switched to the virtual cockpit. Text (subtitles, HUD data) are proportionally smaller, so you may need to squint at the higher settings. The main benefit, of course, is a sharper resolution and better ability to see targets at further distances. It is an unsupported enhancement because not all video cards support it, and EAW really wasn't designed for those modes, but it is an interesting enhancement nevertheless.

CREATING NEW FLYABLE AIRCRAFT

A basic new flyable aircraft requires 3 things:
1. Hangar picture (*.MPC)
2. Out-of-cockpit view file (*.CPT) and 6x Virtual Cockpit view files (5x*.3DZ & 1x VCG_xxxx.DAT)
3. Assigning the aircraft to a squadron so it can be selected to fly, e.g. the Ju-87 Stuka to, say, EGr210 (in SQGR40.DAT)

COCKPITS.CDF: 2D COCKPITS

This file contains 20 *.CPT files, of variable length but each approximately 1 Mb. These are the out-of-cockpit views for each flyable aircraft, used in 640x480 mode only. When creating a new flyable aircraft, take a suitable existing *.CPT file and re-name it (e.g. P191VIEW.CPT [Bf-110] is re-named P261VIEW.CPT for the Ju-88C). The 2D cockpits are not used at resolutions greater than 640x480.

P001VIEW.CPT	P38H
P011VIEW.CPT	P38J
P021VIEW.CPT	P47C
P031VIEW.CPT	P47D
P041VIEW.CPT	P51B
P051VIEW.CPT	P51D
*P061VIEW.CPT	B17F
*P071VIEW.CPT	B24D
*P081VIEW.CPT	B26B
P091VIEW.CPT	Hurricane
P101VIEW.CPT	Spitfire I
P111VIEW.CPT	Spitfire IX
P121VIEW.CPT	Spitfire 14
P131VIEW.CPT	Typhoon
P141VIEW.CPT	Tempest
*P151VIEW.CPT	Mosquito
P161VIEW.CPT	Bf-109E
P171VIEW.CPT	Bf-109G
P181VIEW.CPT	Bf-109K
P191VIEW.CPT	Bf-110C
P201VIEW.CPT	Bf-110G
*P211VIEW.CPT	Me-410
P221VIEW.CPT	Fw-190A
P231VIEW.CPT	Fw-190D

P241VIEW.CPT	Me-262
*P251VIEW.CPT	Ju-88A
*P261VIEW.CPT	Ju-88C
*P271VIEW.CPT	Ju-87
*P281VIEW.CPT	He-111
*P291VIEW.CPT	V-1

* Not present, but needed if new flyable aircraft introduced.

EAW POINTS SCORING

HarryM compiled the following chart of the points scored for destruction of the various targets in EAW:

EAW ARTWORK

The *.3DZ files contain the definition of the geometry data for the planes and are linked to a texture file. They refer to files with PCX as the file extension, which do not exist. There is, however, a file of the same name (e.g. P109EV.TPC) with TPC as the file extension. Microprose' utility PICPAC.EXE creates TPC files from PCX files, enabling new aircraft skins to be created. The *.3DZ files can be edited using Paulo's utilities 3DZ2BMP.EXE and 3DZ_MAP.EXE, and Alessandro's 3DZ Studio and Converter programs.

The size of the aircraft skin files in PCX form is 256 x 256 pixels.
The size of hangar pictures (see page 9) is 640 x 480 pixels.
The size of the map pictures is 1536 x 1280 pixels (or 1536 x 768?)
The size of the 2D cockpit files (*.CPT) is 1286 x 4869 pixels.

There is a wealth of learning on editing 3DZ files, and far too much to set out here, but the best works are by Paulo and Cord Hartmann, and are available on Cord's site (http://eaw.thrustmaster.com/frames.html).

One particular problem which is worth recording here, because it relates to the ordnance loadouts, is the "ordnance displayed in the wrong place" problem with new or converted 3DZs. The problem is perhaps worst with the PAW F4F Wildcat files. Put these in the P47C or D slot in EAW, and go to the single mission arming screen. You will see the 200 gallon tank or a single bomb under the left wing, but nothing under the fuselage, and other similar mismatches.

The cause of this is as follows. Ordnance hardpoints are coded in the PxxxxF.3DZ file, as to their position in 3D space, plus they are given a code number. This code number is then used by the file LOADOUT.DAT to determine which hardpoint a given bomb (or rocket or tank) is displayed on.

In EAW the convention for code numbers in the 3DZ files is:
1. Inner left wing
2. Inner right wing
3. Centreline
4. Outer left wing
5. Outer right wing

In PAW the convention for code numbers in the 3DZ files was different:
1. Inner left wing (same as EAW)
2. Inner right wing (same as EAW)
3. Outer left wing
4. Outer right wing
5. Centreline

Not all aircraft 3DZ files have 5 hardpoints coded, though. The EAW P47C and P47D do, as does the PAW F4U Corsair. The PAW F4F has only 4 (numbered 1-4), with no centreline point. Thus, when the EAW file LOADOUT.DAT has a load for the fuselage (hardpoint 3), the PAW F4F 3DZ displays this under the left wing.

When converting or working on any PAW 3DZ file, it would be preferable if everyone kept to the EAW hardpoint convention set out above. This simply involves changing one byte in the 3DZ file (5 becomes 3, for example, for the centerline hardpoint). It would make ordnance-load displays a lot more accurate.

An associated problem is that the PAW hardpoint Z coordinates are generally too low, so that bombs etc appear to "hang in space" below the wing or fuselage, rather than being attached. This requires some adjustment to the hardpoint Z coordinate in the 3DZ file, not in LOADOUT.DAT.

VIRTUAL COCKPIT FILES
3D.CDF has the various 3D files, including the Virtual Cockpit files. Five are needed, as follows:

Single engined aircraft	
Pxxxx**U**.3DZ	Geometry and textures for the wings (single engine)
Pxxxx**V**.3DZ	Geometry and textures for the inner left part of the cockpit
Pxxxx**W**.3DZ	Geometry and textures for the inner right part of the cockpit
Pxxxx**X**.3DZ	Geometry and textures for the instrument panel
Pxxxx**Y**.3DZ	Internal (from cockpit) view of propellor (stopped and rotating)(F1 and F8 views)
Pxxxx**Z**.3DZ	Geometry and textures for the gunsight
Twin engined aircraft	
Pxxxx**V**.3DZ	Geometry and textures for the inner left part of the cockpit
Pxxxx**W**.3DZ	Geometry and textures for the inner right part of the cockpit
Pxxxx**X**.3DZ	Geometry and textures for the instrument panel
Pxxxx**Y**.3DZ	Geometry and textures for the wings (twin engines)
Pxxxx**Z**.3DZ	Geometry and textures for the gunsight

xxxx is the code of the aircraft as per the *.FLT files.
The files **VCG_xxxx.DAT** (from DATA.CDF) are also needed. They contain the definition of the Virtual Cockpit gauges. Rename the files using the relevant code of the non-flyable aircraft.

3DZ FILES
The full list of 3DZ files Pxxxx?.3DZ (from Paulo) is as follows:

Non-flyable Quad engine (BB17, B24A)
A Top Turret
B Ball Turret (Absent from B24A)
C
E Left Wing Close Range
F Body
G Right Wing
H Shadow
L Left Wing Broken
M All Middle Range
N Nose art
R Right Wing Broken
S All Long Range
T All Dot Range

Non flyable Twin engine
(B26A, MOSQ, H111, J88A, J88C, M410)
F Left Half Close Range
G Right Half
H Shadow
L Left Wing Broken
M All Middle Range
N Right hand side only - Near Range
R Right Wing Broken
S All Long Range
T All Dot Range**Non-flyable Single engine**
(JU87)
F All Close Range
H Shadow

L Left Wing Broken
M All Middle Range
R Right Wing Broken
S All Long Range
T All Dot Range

V1
(V1V1)
F All Close Range
H Shadow
M All Middle Range
S All Long Range
T All Dot Range

Flyable Twin engine
(P38H, P38J, 262A, 110C, 110G)

F Left Half Close Range
G Right Half
H Shadow
L Left Wing Broken
M All Middle Range
N Right hand side only - Near Range
R Right Wing Broken
S All Long Range
T All Dot Range
V Left Cockpit
W Right Cockpit
X Control Panel
Y Internal View of wings
Z Gunsight (Absent from 110C, 110G)
Includes Top of Pilot Chair for 262A

Flyable Single engine
(P47C, P47D, P51B, P51D, HURR, SP2A, SP09, SP14, TYPH, TEMP, 190A, 190D, 109E, 109G, 109K)
F All Close Range
H Shadow
L Left Wing Broken
M All Middle Range
P Propellor & Spinner static and dynamic views (include nose for P51B)
R Right Wing Broken
S All Long Range
T All Dot Range
U Internal View of wings
V Left Cockpit
W Right Cockpit
X Control Panel
Y Internal View of propellor static and dynamic
Z Gunsight (Absent from P51D, 190A, 190D, 109E)
Includes Top of Pilot Chair for P51B, SP2A, SP09, SP14

Converting 1942 Pacific Air War (PAW) files to EAW
The format in PAW is similar. In EAW the 3DZ files are the 3D shapes, and the TPC files are the aircraft skins. The reference in the EAW *.3DZ files is to a PCX file, which does not exist in EAW - it is the TPC file of the same name. (This is a coding hangover from PAW, which does use *.PCX files)

In PAW the skin file is *.PCX, but this is not a regular PCX file, but obviously a Microprose file, with the same format as the EAW *.TPC files. The EAW *.TPC files are 256x256 size, but the PAW *.PCX files are only 256x128 size Using the corresponding PAW skin file, and re-naming it, gives an error message about "File the wrong size". For EAW, the *.TPC files have to be drawn from scratch over the PAW 3D shapes. The PAW 3DZ files are easier to convert. Change the internal reference to PxxxxTEX.PCX and change the file name itself as follows:

PAW file name	
xxx.3DZ	Main external picture (left half for 2 or 4engined planes)
xxx_HALF.3DZ	(Right side, for 2 or 4-engined planes)

3xxx.3DZ	Medium distance picture
3xxx.3DZ (again)	(Right side, 2 or 4-engined planes only)
23xxx.3Dz	Long distance picture
123xxx.3DZ	Dot picture
xxxxVRTL.3DZ	Cockpit and view of wings
xxxxWNG0	Left wing
xxxxWNG1	Right wing

xxxx can be one of:
A5M2,A6M2,AVEN,B17_,B25_,BETY,CRSR,DAUN,DVST,FRNK,HLCT,HLDV,KATE,MAV_,P38_,P39_,P40_,P51_,PBY_,TONY,VALL,WILD

EAW ORDNANCE 3D SHAPES
The following *.TPC files are found in 3D.CDF. They give the 3D shape of the various ordnance in EAW.

ORD00 100lb bomb US/UK
ORD01 250lb bomb US/UK
ORD02 500lb bomb US/UK
ORD03 Odd bomb shape untextured – not used
ORD04 1000lb bomb US/UK
ORD05 100kg bomb GR
ORD06 250kg bomb GR
ORD07 500kg bomb GR
ORD08 1000kg bomb GR - textured – not used
ORD09 M8 Triple bazooka tube support US
ORD10 60lb Quad rail support UK
ORD11 WGr21 twin tube support GR
ORD12 R4M rack GR
ORD13 twin MG151 gun pod GR – not used
ORD14 75gal drop tank US
ORD15 108gal drop tank US
ORD16 150gal drop tank US
ORD17 165gal drop tank US
ORD18 200gal drop tank US
ORD19 300litre drop tank GR
ORD20 Odd tank-untextured- not used (now Ju87 pod)
ORD21 M8 rocket US
ORD22 60lb rocket UK
ORD23 WGr21 rocket GR
ORD24 R4M rocket GR
ORD25 50kg bomb GR
ORD26 45gal drop tank UK
ORD27 single MG151 gun pod GR – not used
ORD28 WGr21 single tube support GR
ORD29 60lb single rail support UK
ORD30 60lb twin rail support UK
ORD31 HVAR rocket US
ORD32 triple HVAR rail support US
ORD33 5 HVAR rail support US

GROUND OBJECTS
TPC Files
HarryM worked this out. The ground objects files in EAW are in 3D.CDF. The ground objects are skinned with TPC files, and come in two sizes, 256X256, and 128x128 pixels. The file naming convention is as follows: Grnd01.tpc for the high resolution file, and Grnd01s.tpc for the low resolution files. HarryM did all the work on this . The *.TPC files are numbered 01 through 12.

Grnd01: little white church, oil storage tank+damaged, oil plant, armaments plant
Grnd02: cntrl tower, barracks, briefing room, ammo bunker, radar station, hq, o-club, + damaged versions.
Grnd03: deciduous trees, german staff cars, german half tracks, + damaged versions.
Grnd04: german trains
Grnd05: hangars, fuel barrels, warehouses
Grnd06: rail yard, parachutes
Grnd07: pine trees
Grnd08: crash craters, destroyed fuel barrels, destroyed arms factory
Grnd09: shadows, trees (?), large single elm tree
Grnd10: farm, white mansion- undamaged only

Grnd11: city buildings
Grnd12: 3D forest

Ground object 3DZ files
In most cases there are 4 files per set:

tmod##_D.3dz
tmod##_H.3dz
tmod##_L.3dz
tmod##_S.3dz

D = damaged
H = main picture
L = long distance view
S = shadow

The texture reference is the particular TPC file (even though they say PCX, they mean TPC) that the main "H" shape refers to. The other files D, L, S may reference other TPCs, the shadow files always seem to point to Grnd09.tpc. In the interest of time I only catalogued the main file tex reference. There may be some stuff hiding, if you look at TMod39_D.3dz, you're in for a surprise. To replace a set, simply rename the set to the ones you want to replace. For example, to replace Panthers with Shermans, extract the Sherman files (TMod56) and rename them to be Tmod55, drop into the EAW directory. You don't have to change any of the texture references inside the files.

3D file set	Shape	Tex reference
Tmod01_*.3dz	factory	grnd01.PCX
Tmod02_*.3dz	factory	grnd01.PCX
Tmod03_*.3dz	refinery	grnd01.PCX
Tmod04_*.3dz	factory	grnd01.PCX
Tmod05_*.3dz	(not used)	
Tmod06_*.3dz	factory	grnd01.PCX
Tmod07_*.3dz	RR Station	grnd06.PCX
Tmod08_*.3dz	warehouse	grnd08.PCX
Tmod09_*.3dz	u-boat pen	grnd04.PCX
Tmod10_*.3dz	v-1 launcher	grnd02.PCX
Tmod11_*.3dz	Bridge	grnd07.PCX
Tmod12_*.3dz	Susp bridge end	grnd07.PCX
Tmod13_*.3dz	Susp bridge	grnd07.PCX
Tmod14_*.3dz	Bridge roadbed	grnd07.PCX
Tmod15_*.3dz	Short bridge	grnd07.PCX
Tmod16_*.3dz	Long bridge	grnd07.PCX
Tmod17_*.3dz	Heavy Flak	grnd04.PCX
Tmod18_*.3dz	Light Flak	grnd04.PCX
Tmod19_*.3dz	Oil tank	grnd01.PCX
Tmod20_*.3dz	Radar control	grnd02.PCX
Tmod21_*.3dz	Radar tower	grnd04.PCX
Tmod22_*.3dz	3D Forest	grnd12.PCX
Tmod23_*.3dz	Fort	grnd02.PCX
Tmod24_*.3dz	Fuel Dump	grnd02.PCX
Tmod25_*.3dz	AC Tower	grnd02.PCX
Tmod26_*.3dz	Ammo bunker	grnd02.PCX
Tmod27_*.3dz	Hanger	grnd05.PCX
Tmod28_*.3dz	Barracks	grnd02.PCX
Tmod29_*.3dz	Mess hall	grnd02.PCX
Tmod30_*.3dz	Headquarters	grnd02.PCX
Tmod31_*.3dz	Briefing Rm	grnd02.PCX
Tmod32_*.3dz	Tree	grnd09.PCX
Tmod33_*.3dz	Trees	grnd09.PCX

Tmod34_*.3dz	Tree	grnd09.PCX
Tmod35_*.3dz	Trees	grnd09.PCX
Tmod36_*.3dz	Tree	grnd03.PCX
Tmod37_*.3dz	Trees	grnd03.PCX
Tmod38_*.3dz	Tree	grnd07.PCX
Tmod39_*.3dz	Trees	grnd07.PCX
Tmod40_*.3dz	3D Forest	grnd12.PCX
Tmod41_*.3dz	warehouse	grnd05.PCX
Tmod42_*.3dz	3D Forest	grnd12.PCX
Tmod43_*.3dz	Locomotive	grnd04.PCX
Tmod44_*.3dz	RR Tender	grnd04.PCX
Tmod45_*.3dz	Box car	grnd04.PCX
Tmod46_*.3dz	Tanker car	grnd04.PCX
Tmod47_*.3dz	Flat car	grnd04.PCX
Tmod48_*.3dz	Car w/Panthers	grnd04.PCX
Tmod49_*.3dz	Flak car	grnd04.PCX
Tmod50_*.3dz	Fuel truck	grnd03.PCX
Tmod51_*.3dz	Open truck	grnd03.PCX
Tmod52_*.3dz	Truck	grnd03.PCX
Tmod53_*.3dz	Halftrack	grnd03.PCX
Tmod54_*.3dz	Kubelwagen	grnd03.PCX
Tmod55_*.3dz	Panther	grnd04.PCX
Tmod56_*.3dz	Sherman	grnd03.PCX
Tmod57_*.3dz	Transport ship	grnd05.PCX
Tmod58_*.3dz	Small church	grnd01.PCX
Tmod59_*.3dz	City bldgs	grnd11.PCX
Tmod60_*.3dz	City bldgs	grnd11.PCX
Tmod61_*.3dz	City bldgs	grnd11.PCX
Tmod62_*.3dz	City bldgs	grnd11.PCX
Tmod63_*.3dz	Cathedral	grnd10.PCX
Tmod64_*.3dz	Farm	grnd10.PCX
Tmod65_*.3dz	Manor house	grnd10.PCX
Tmod66_*.3dz	Large chateau	grnd10.PCX
Tmod67_*.3dz	Windmill	grnd10.PCX
Tmod68_*.3dz	Chateau grnd10.PCX	
Tmod69_*.3dz	Parachuter	grnd06.PCX
Tmod70_*.3dz	(not used)	
Tmod71_*.3dz	(not used)	
Tmod72_*.3dz	Destroyer	grnd04.PCX

PIC.CDF: THE *.MPC HANGAR PICTURES

This file contains 20 *.MPC files, of variable length but each approximately 200 Kb. These are the hangar views for each flyable aircraft. When creating a new flyable aircraft, take an existing *.MPC file and re-name it (e.g. HNGR20.MPC [Bf-110G] is re-named HNGR26.MPC for the Ju-88C).

HNGR00.MPC	P38H
HNGR01.MPC	P38J
HNGR02.MPC	P47C
HNGR03.MPC	P47D
HNGR04.MPC	P51B
HNGR05.MPC	P51D
*HNGR06.MPC	B17F
*HNGR07.MPC	B24D
*HNGR08.MPC	B26B
HNGR09.MPC	Hurricane
HNGR10.MPC	Spitfire I
HNGR11.MPC	Spitfire IX
HNGR12.MPC	Spitfire 14
HNGR13.MPC	Typhoon
HNGR14.MPC	Tempest
*HNGR15.MPC	Mosquito
HNGR16.MPC	Bf-109E
HNGR17.MPC	Bf-109G
HNGR18.MPC	Bf-109K
HNGR19.MPC	Bf-110C
HNGR20.MPC	Bf-110G
*HNGR21.MPC	Me-410
HNGR22.MPC	Fw-190A
HNGR23.MPC	Fw-190D
HNGR24.MPC	Me-262
*HNGR25.MPC	Ju-88A
*HNGR26.MPC	Ju-88C
*HNGR27.MPC	Ju-87
*HNGR28.MPC	He-111
*HNGR29.MPC	V-1

* Not present, but needed if new flyable aircraft introduced.

TEXT STRING FILES (*.STR)

Text strings are found in the *.STR files, in TEXT_ENG.CDF. They are the simplest files to edit. STR files include pilot names (AMRLNAME.STR etc), squadron names (SQNAMEGR.STR etc) and so on. STR files have a common format, as follows:

pppp Pointer to end of file (EOF = Pointer + 8)
nn00 Number of text strings
Then the pointers to each string:
    p100 Pointer to 1st text string (add 8 to find string)
    p200 Pointer to 2nd text string (add 8 to find string)...etc...
Then the text strings themselves, each separated by 00.

To change a text string, type the new string over an existing one, replacing any unrequired letters with 00. Alternatively, if a longer word is needed, add bytes to the file, and then adjust the pointers (including the EOF pointer). Paulo's utilities DUMPSTR.EXE and BUILDSTR.EXE now automate this task.

Text string files which I have amended include:
BRTLNAME.STR }

GERLNAME.STR }	Last names for squadron pilots (the first names are in BRTFNAME.STR etc)
AMRLNAME.STR }	
PNAMES.STR	Plane names displayed in flight
SQDESCGR.STR }	
SQDESCUK.STR }	Narrative history of squadrons displayed when choosing squadron
SQDESCUS.STR }	
SQNAMEGR.STR }	
SQNAMEUK.STR }	Names of squadrons displayed when choosing squadron
SQNAMEUS.STR }	
RADIOTXT.STR	Text of in-flight messages (incl gun desc. eg "20mm Cannon")
TARNAMES.STR	List of names of places. At byte 0a43 after ZWICKAU is a list of airbases
TARTYPES.STR	Generic target type names e.g. "Barracks", "Airfield" etc

WORKING WITH EAW SCREENS

Stephen O'Leary (Pilot Officer Prune) put the following notes on editing EAW screens together (the full document can be obtained from Prune at http://www.geocities.com/tedetedetede/EAW_Prune.html):

General principles

Almost all the screens are edited using the same basic method, which may be outlined as follows:

1. Start EAW and go to the screen you want to work on.
2. Take a screen shot using the key specified in your eaw.ini file.
3. Close EAW.
4. The screen shot appears as scrn####.bmp in your EAW folder.
5. Open the screenshot in a good graphics editor (I prefer Paint Shop Pro 7 [PSP]) and save it in your working folder under a more meaningful name.
6. In PSP, save the screen palette using Colors|Save Palette.
7. Increase the colour depth to 16 million colours using Colors|Increase depth.
8. Save the work as a .psp file, which preserves layers etc.
9. Work on the screen. As far as possible, get your colours using the eyedropper rather than the colour palette, because this reduces the chances of getting strange colours later. Alternatively keep a 256-colour copy open and use its palette to select colours for the 16-million version.
10. When finished editing, save the .psp file in case of further editing. Then convert back to 256 colours using Colors|Decrease depth.
11. Apply the saved palette.
12. Save the result as a .pcx file.
13. It is a good idea at this stage to test for the presence of colour index 0, which can cause display problems. Open the palette using Colors |Edit palette, ensure it is set to "palette order" using the pull-down menu, and find colour 0 (top left-hand corner). Double-click this colour and choose a distinctive substitute (bright green works well). Click on OK until the dialog box closes. Examine your work. If there are any areas of colour 0, substitute another similar colour to avoid problems. Save the result.
14. Convert the screen using PicPac, and test it in EAW.

Prune's full notes also have specialized notes on Squadron selection screens, Mission Parameters screen, Career Nationality screen, Editing the sprites, Briefing screens, and The map. I include only the notes on the ones I have done, namely Aircraft selection screens.

Aircraft selection screens

Screen name:	Picpln*.pic	(* = a/b/g)
Text:	Picpln*.mnu	(* = a/b/g)

To edit the screens:

1. Take a screenshot of the screen you want to use as a basis.
2. Save its palette. Each nationality's screen seems to have its own.
3. Edit as usual.
4. Use PicPac to convert the .pcx file into picpln*.pic. Test it.
5. It is likely that there will be areas of false colour. This happens where the .pcx file used black (0,0,0), but it also affects some other dark colours. If this happens, follow the remaining steps below.
6. Take a screenshot of the new version.
7. DO NOT convert it to 24-bit. Work only in 256 colours from now on.
8. Using only colours which have not been affected, replace the false colours with similar shades. Colour replace, paintbrush, flood fill and others are all useful for this.
9. When it looks OK, save it as a .pcx file, run it through PicPac and test it again

FORMAT OF THE *.FLT FILES

Jeff D provided this information (short=2 byte integer, long=4 byte, float=4 byte, all C style). These figures are still very provisional:

Byte # (h)

	//Engine data	//Example
00	short number_of_engines //i.e. 1st two bytes	
02	short engine_type //00=PROP, 01=JET, 02=ROCKET	
04	float engine_altitude //	Engine best at this altitude (e.g. P38H=22k feet, P38J=25k feet)
08	float	Lower Altitude Section of Engine Performance. It represents Engine Power (HP) Loss Rate from Best Altitude down to Sea Level. The more you set a negative value, the more your engine will loss HP from Best Altitude to sea level. It seems progressive meter by meter flying down and down. It ranges from 0.00 (P38H, Hurri, Spit I and V1) to 0.02 (Bf109K) and 0.09 (Tempest). Also reduces time to lift-off
0c	float	Upper Altitude Section of Engine Performance. The more you set a negative value, the more your engine will lose HP from Best Altitude up to Ceiling. Ranges from 0.00(V1) to 0.0001 (Me262), –0.039 (Hurri) to –0.041 (Spit I), –0.101(P38H), –0.106 (Bf109K) and –0.1121 (Tempest)
10	float number_of_blades?	3 blades=0.006, 4= 0.007, 5=0.009, Jets=0
14	float min_throttle	Engine torque multiplier (64 for all except jets, which are 25.6)
	//Flight control data	
18	(3 floats: max, min, rate) Throttle	(P38H= 256, 0, 128)
24	(3 floats: max, min, rate) elevator	(P38H= 128, -108, 256)
30	(3 floats: max, min, rate) flaps	(P38H= 3, 0, 0.7)
3c	(3 floats: max, min, rate) ailerons	(P38H= 128, -128, 426)
48	(3 floats: max, min, rate) rudder	(P38H= 128, -128, 275)
54	float max_altitude	(P38H= 40,000 feet) Above this power goes to zero
58	float max_velocity	Approx 1.5 x real max speed, see full notes below
5c	float max_AOA	(B17 0.24, 110G 0.27, P47D 0.28, 109E 0.29, P38 0.30, Spit I, 190A & P51D 0.31)
60	float critical_mach	(P38, Hurri 0.65, B17&110G 0.7, Spit I, P47 0.75, P51D 0.8)
64	float max_g	Usually 9
68	float min_g	All= -3.0, except Hurr and Spit 1=0; max neg. g. for engine
6c	float unknown	Rotational Inertia (related to size) (Bf109E 7.1, P47 9.09, P38 10.5, Bf110 11.1 etc)
70	float mass_empty	Multiply by 32.2 factor for combat weight in lbs
74	float mass_fuel	
78	float unknown}	
7c	float unknown } Inertia x, y z (?)	
80	float unknown }	
84	float torque1}	
88	float torque2 } Torque y,z,x (?)	
8c	float torque3 }	
	//Bunch of coefficients for the flight equations : see detailed analysis below	
90	(5 floats) drag stability	
a4	(8 floats) sideforce stability	
c4	(6 floats) lift stability	
dc	(9 floats) roll stability derivatives	
100	(6 floats) pitch stablility derivatives	
118	(9 floats) yaw stability derivatives	
	//The following section TIMES FIVE--lookup table data	
13c	long size	Always 0a00=10 (5 Data curves. Each block is 0a00 0000, then 13 floats)
	float delta_x	10=number of data points, at end of block. First 3 values may be data spacing

and range of values
float inv_delta_x
float zero_x
float Table[10]

//The following section TIMES SIX--weapon data : see below (p. 15) for more detail
254 (3 floats) position x,y,z Gun flash position x, y & z co-ords
float secondary_position_x
float secondary_position_y
float muzzle_velocity 80% of real values
float rate_of_fire 1 second burst of fire for this weapon
float dispersion Very Important: reduces or increases effect of guns
float eject_position_1 //
float eject_position_2 //
short yaw
short duration of tracer or range

//Landing gear data
35c float height
360 float pitch (in Radians: 1.57 radian =90 deg.)(P38=0.063, B17=0.118, 110G=0.18, P51=0.19, 109E=0.24)
364 (3 floats: max, min, rate) gear_control
//This part times THREE (one for each gear)
float n
(3 floats) position x, y, z
//This part times SEVEN
(3 floats) damage position x, y, z
//This part times TWO
(3 floats) wing position x, y, z
40c //This part times FOUR
(3 floats) engine position x, y, z 4 Smoke positions
(at bytes 40c, 418, 424 and 430 – the 1st two are the jet exhaust points)
43c //Hit boxes/spheres
//This part times EIGHT Coordinates (x, y, z) and radius of hit boxes
(3 floats) hit locations x, y, z , plus float Radius

The known offsets here are:
1) 43c Single engined planes: engine (including oil & fuel lines). Multi engined planes: no effect
2) 44c Pilot
3) 45c Collision area: gun fire doesn't damage it. When disabled one can ram other planes without any damage. When enabled: collision can cause any damage independently of other hit boxes (e.g. even with pilot hit box disabled ramming a plane can kill the pilot)
4) 46c Tail section (incl. rudder and elevators)
5) 47c Right wing incl. hydraulics (four engined planes: inner right engine and wing)
6) 48c Right wing incl. aileron (four engined planes: outer right engine and wing)
7) 49c Left wing incl. hydraulics (four engined planes: inner left engine and wing)
8) 4ac Left wing incl. aileron (four engined planes: outer left engine and wing)
4bc long unknown
long radius_z
float engine_hit_points
These are quite similar to the damage table in PLANES.DAT. N.B. Byte 4a0 is the Microprose right wing error (inability to damage the left wing - the Y-coordinate is wrongly made the same as the right wing)

//This part times FIVE
4c8 (3 floats) position_of_weapons launch x, y and z coordinates of Weapons launch stations

BEST ALTITUDE / LOWER ALTITUDE / UPPER ALTITUDE

One of the most important sets of numbers in the *.FLT files is the Best Altitude / Lower Altitude Section / Upper Altitude Section numbers at bytes 04, 08 and 0c. Daniele Pasqualini discovered this. Byte 04 is "Engine best at this altitude" (e.g. P38H=22k feet, P38J=25k feet). Byte is the Lower Altitude Section of Engine Performance. It represents Engine Power (HP) Loss Rate from Best Altitude down to Sea Level. The more you set a negative value, the more your engine will lose power from Best Altitude to sea level. It seems progressive metre by metre flying down and down. Byte 0c is the Upper Altitude Section of Engine Performance. The more you set a negative value, the more your engine will lose power from Best Altitude up to Ceiling. Positive values can be set, with sometimes unpredictable results. Rotational Inertia seems to be linked to overall aircraft size, and seems to be a measure of how quickly an aircraft can turn. A full analysis is as follows:

BEST ALTITUDE / LOWER ALTITUDE / UPPER ALTITUDE

*.FLT Byte #	**P38H**	**P38J**	**P47C**	**P47D**	**P51B**	**P51D**	**B17F**	**B24D**	**B26B**
	HURR								
04 BestAlt	22,000	25,000	34,000	34,000	22,000	25,000	25,000	25,000	15,000
	6,000								
08 Lower	0	0	0	-0.015	-0.018	-0.148	0	0	0
	0								
0c Upper	-0.162	-0.105	-0.133	-0.116	-0.060	-0.029	0	0	-0.051
	-0.039								
54 Ceiling	40,000	44,000	44,000	44,000	42,000	42,000	38,500	32,000	23,500
	33,200								
6c Rot.Inert.	10.5	10.5	9.09	9.09	8.08	8.08	21.25	23.5	13.9
	8.6								
70 Mass	450.31	467.0	362.4	381.4	250.6	263.4	1087	1087	745.3
	184.5								
74 Fuel mass	55.9	76.4	56.8	68.9	50.3	50.3	523.6	611.8	248.8
	20.5								
9c Power	3592.1	3592.1	5073.1	5363.0	3529.1	3599	2268.7	2268.7	3781
	1947								

*.FLT Byte #	**SPIT1**	**SPIT9**	**SPIT14**	**TYPH**	**TEMP**	**MOSQ**	**109E**	**109G**	**109K**
	110C								
04 BestAlt	6,000	21,000	16,000	13,750	17,000	13,000	14,000	16,000	16,400
	14,000								
08 Lower	0	-0.014	0	-0.075	-0.092	0	-0.023	-0.014	-0.022
	-0.023								
0c Upper	-0.041	-0.113	-0.102	-0.12	-0.0112	-0.089	-0.047	-0.070	-0.068
	-0.085								
54 Ceiling	34,000	38,000	42,000	31,800	36,000	34,000	36,000	35,000	36,000
	32,000								
6c Rot.Inert.	7.8	7.8	7.8	9.29	8.94	10.5	7.1	7.1	7.1
	11.11								
70 Mass	160.6	213.9	238.2	317.4	327	450.3	151.7	196.1	211.8
	399.7								
74 Fuel mass	19.0	19.0	25.8	28.7	30.2	55.9	19.7	19.7	19.7
	62.4								
9c Power	1947	3319	4521.7	4100.2	4373.6	2990.3	2048	2775	3686
	2048								

*.FLT Byte #	**110G**	**410**	**190A**	**190D**	**262**	**J88A**	**J88C**	**JU87**	**H111**
	V1V1								

04 BestAlt	16,000	16,000	15,000	20,000	30,000	5,000	14,400	5,000	5,000
	3,000								
08 Lower	-0.015	-0.040	-0.045	-0.020	0	-0.034	-0.018	-0.037	0
	0								
0c Upper	-0.121	-0.066	-0.052	-0.107	-0.0001	0	0	-0.040	-0.042
	0								
54 Ceiling	36,300	32,800	36,000	37,000	37,600	26,200	32,400	26,200	26,300
	7,000								
6c Rot.Inert	11.11	10.5	7.796	7.71	8.69	13.9	13.9	8.87	15.8
	4.69								
70 Mass	417.7	450.3	213.9	268.6	355.9	621.1	667.7	228.5	621.1
	124.2								
74 Fuel mass	62.4	55.9	19.0	25.78	81.99	131.5	131.5	40.4	139.4
	24.8								
9c Power	2988.7	2867.4	3403.1	4033.3	9.453	2079	2249.8	2252.9	2252.9
	3.15								

*.FLT Byte #	**Hs123**	**Ta183**
04 BestAlt	4,000	22,970
08 Lower	-0.043	0
0c Upper	-0.047	-0.0001
54 Ceiling	29,500	39,500
6c Rot.Inert	6.14	7.687
70 Mass	120.5	201.6
74 Fuel mass	20.5	80.24
9c Power	1604	13.6543

Note (for example) that the Me262 is virtually the same at all altitudes. The B17, B24 and V1 are exactly the same at all altitudes. The Spit I and Hurri have good low altitude performance, but (with a gravity feed carburettor) are poor at altitude. The Bf109E should (perhaps) be better at altitude – more like –0.03 than –0.047. And query why the Bf110C has engines that fade more at altitude than the Bf109E – they both had the same Daimler-Benz engine.

SOME PARTICULAR FLIGHT CHARACTERISTICS

Use Jeroen's EAW AircraftEdit to change the FLT files, if not hex-editing manually.
Paulo has noted the following:
Byte 98 Flaps Drag. Change from approx –0.1 to –1 to simulate dive brakes when flaps fully extended
Byte 9c Power. Nearly linear to rated power. Increasing this increases acceleration.
Byte a0 Gear Drag. Increase from -12 to –20 to simulate more drag from gear when extended
Byte c8 Lift (also e0 and 104 h) Wing area. Increasing the absolute value (e.g. -600 to -700) increases lift.
Bytes f0&f4 Roll related to engines (1, 2 or 4 engines)
Bytes 12c&130 Yaw related to engines (2 or 4 engines the same)

Sideforce (ac, b0 and b4 h) are engine dependent.
Lift, Roll and Pitch Sections (c8, e0 and 104 h) seem to be proportional to wingspan/wing area.
In general a more negative values results in a more negative stability. So if you were to change the roll stability and increase that value your aircraft will be rock steady when rolling but it will take some time to complete the roll. The values in the first few rows always have more effect than the values in the lower rows of the sections, as they are zero most of the time.
Sometimes a value sets the movement rate and a row below that will that movement stable (e.g. Roll dc and e0 h).

MAXIMUM SPEED DATA IN *.FLT

The figure at byte # 58 regulates maximum speed The number is not the exact speed in MPH or in KPH,

but feet per second. (1 mile = 5280 ft / 3600 secs per hour = 1.467). The correlation is nearly linear. The equation is approximately:
EAW number = Real airspeed in mph x 1.467
Real Airspeed = EAW number x 0.682
The figures are as follows (**Dec=decimal value** of Float variable, **MPH=Maximum speed** in m.p.h. (according to Microprose figures in EAW "View Objects"):

Plane	**Float**	**Dec.**	**MPH**
109E	0c42 ff43	510.5	348
109G	c590 0d44	566.3	387
109K	60c5 2544	663.1	452
110C	d3fd ff43	512.0	349
110G	2b97 fb43	503.2	343
190A	fa63 1344	589.7	408
190D	b85e 2144	645.5	426
262	4cc7 4644	795.1	542
B24	e7fb de43	446.0	303
B26	d5d8 ce43	413.7	282
B17	79d9 d943	435.7	287
H111	d93e c843	400.5	252
Hurr	37c9 e743	463.6	316
J88A	4861 cd43	410.7	280
J88C	561e e443	456.2	311
Plane	**Float**	**Dec.**	**MPH**
J87B	e9d6 ad43	347.7	238
M410	e132 0d44	564.8	388
Mosq	715d 0b44	557.5	380
P38H	a2d5 1744	607.3	414
P38J	4a3c 1c44	624.9	414
P47C	81cd 1e44	635.2	419
P47D	2be7 1f44	639.6	436
P51B	d500 2144	644.0	439
P51D	0e45 2044	641.1	437
Spit 1	3d32 0244	520.8	355
Spit 9	4ea2 1544	598.5	408
Spit 14	d34d 2444	657.2	448
Temp	7f1a 2244	648.4	435
Typh	8cc4 1a44	619.1	412
V1	33b3 1244	586.8	420

Paulo says that the EAW flight model is complex. There are 5 extremely important curves that establish the relationship between current Mach number with overall drag and lift, and aileron, rudder and elevator effectiveness for the complex flight model. The simplified flight model common to novice settings and AI, use fixed values to replace those curves. The only purpose of the maximum speed parameter is to block any further acceleration resulting from available excess power for a certain flight condition. It was probably meant to limit AI flight model behaviour but it is also enforced on the complex flight model. The two power parameters represent the slope and variation of slope above critical altitude of power with altitude. The base power is given in the drag section (the larger numerical value of the group).

FLT FLIGHT MODEL ANALYSIS TABLE

The next four pages contain a table of FLT flight model analysis, listing some of the most important factors for comparison:

*.FLT Byte #	**P38H HURR**	**P38J**	**P47C**	**P47D**	**P51B**	**P51D**	**B17F**	**B24D**	**B26B**
Drag 90	-4.209 -2.146	-4.159	-2.970	-3.032	-1.888	-1.888	-12.26	-8.23	-9.37
stability 94	-.0003 -.0004	-.0003	-.0004	-.0004	-.0005	-.0005	-.0000	-.0001	-.0000
98 Flaps drag	-0.115 -0.153	-0.115	-0.167	-0.167	-0.148	-0.148	-0.875	-0.649	-0.348
9c Power	3592.1 1947	3592.1	5073.1	5363.0	3529.1	3599	2268.7	2268	3781
a0 Gear drag	-12 -12	-12	-12	-12	-12	-12	-12	-12	-12
Sideforce a4	-193.6 -92.2	-203.2	-216.2	-220.9	-169.1	-179.3	-709.5	-772.7	-444.1
stability a8	2.240 1.63	2.240	2.188	2.188	1.182	1.300	22.22	15.882	5.39
ac	1.255 -0.597	1.317	-1.401	-1.432	-1.096	-1.162	0	0	-2.87
b0	-1.255 0	-1.317	0	0	0	0	0	0	-2.87
b4	0 0	0	0	0	0	0	0	0	0
b8	0 0	0	0	0	0	0	0	0	0
bc	-0.132 -0.062	-0.138	-0.147	-0.150	-0.115	-0.122	-0.483	-0.526	-0.302
c0	0 0	0	0	0	0	0	0	0	0
Lift c4	-37.34 -21.3	-42.03	-33.70	-35.7	-21.91	-23.05	-256.3	-258.0	-125.0
c8 Wing Area	-988.9 -683.8	-988.9	-811.1	-811.1	-612.6	-612.6	-4125	-3293	-1857
cc	2.558 1.22	2.558	-2.084	2.084	0.139	0.139	18.14	39.24	-3.23
d0	-20.29 -8.78	-20.29	-16.06	-16.06	-8.46	-8.46	-159.3	-74.72	-52.3
d4	0.1662 0.033	0.1662	0.0961	0.0961	0.0599	0.0599	0.272	0.1277	0.229
d8	-19.94 -18.1	-19.94	-15.82	-15.82	-18.14	-18.14	-122.9	-150.8	-54.3
Roll dc	-75.17 -65.2	-75.17	-112.4	-112.4	-62.12	-63.11	-707.9	-271.2	-97.4
stability e0	-328.1 -153.6	-328.1	-160.6	-160.6	-97.29	-97.29	-5605	-5923	-981.0

derivatives e4	281.57	281.57	113.5	113.5	57.489	57.88	4748.4	5651	741
	125.1								
e8	3.0055	3.339	1.78	1.78	0.968	0.968	23.02	25.51	6.60
	1.64								
ec	-0.045	-0.045	-0.038	-0.038	-0.026	0.028	-0.332	-0.250	-0.072
	-0.03								
f0	7.825	7.825	-9.29	-9.56	-7.756	-7.756	0	0	-8.02
	-5.76								
f4	-7.825	-7.825	0	0	0	0	0	0	-8.02
	0								
f8	0	0	0	0	0	0	0	0	0
	0								
fc	0	0	0	0	0	0	0	0	0
	0								
Pitch 100	15.019	7.410	2.616	0.890	2.182	1.494	-257.1	-150.4	-45.21
	3.37								
stability 104	-1513	-1513	-859.0	-859.0	-372.0	-372.0	-11873	-3402	-2975
	-292.1								
derivatives 108	-117.9	-117.9	-109.3	-109.3	-37.02	-37.02	-2003	-468.0	-436
	-38.9								
10c	-368.3	-368.3	-298.4	-298.4	-111.7	-111.7	-5327	-2068	-1314
	-119.4								
110	3.949	3.949	2.14	2.14	1.004	1.004	24.93	7.145	6.69
	0.744								
114	-1.647	-1.647	1.906	1.906	2.018	-2.018	-53.73	-22.10	-8.24
	0.874								
Yaw 118	275.3	282.94	249.86	252.86	103.28	110.06	4443.7	3651	826
	159.2								
stability 11c	-10.78	-10.78	-7.108	-7.108	-3.37	-3.37	-205.9	-107.9	-40.0
	-6.95								
derivatives 120	-164.4	-168.9	-149.2	-151.0	-61.68	-65.73	-2653	-2180	-493.7
	-95.2								
124	-0.014	-0.016	-0.008	-0.008	-0.002	-0.02	-0.109	-0.127	-0.03
	-0.009								
128	0.313	0.313	0.192	0.192	0.124	0.137	3.02	2.489	0.563
	0.153								
12c	28606	28606	0	0	0	0	44281	54833	37228
	0								
130	-28606	-28606	0	0	0	0	20563	24853	-37228
	0								
134	0	0	0	0	0	0	0	0	0
	0								
138	0	0	0	0	0	0	0	0	0
	0								

*.FLT_Byte #	**SPIT1 110C**	**SPIT9**	**SPIT14**	**TYPH**	**TEMP**	**MOSQ**	**109E**	**109G**	**109K**
Drag 90	-1.569 -3.085	-2.352	-2.529	-1.714	-2.034	-3.282	-1.513	-1.675	-1.404
stability 94	-.0004 -.0003	-.0004	-.0004	-.0004	-.0004	-.0002	-.0007	-.0007	-.0007
98 Flaps drag	-0.116 -0.264	-0.116	-0.116	-0.179	-0.204	-0.209	-0.118	-0.102	-0.102
9c Power	1947 2048	3319	4521.7	4100.2	4373.6	2990.3	2048	2775	3686
a0 Gear drag	-12 -12	-12	-12	-12	-12	-12	-12	-12	-12
Sideforce a4	-90.34 -120.3	-105.7	-117.4	-99.44	-135.8	-219.2	-66.00	-70.36	-71.89
stability a8	0.8017 1.3848	0.8017	0.957	1.5604	2.0397	2.561	0.2955	0.2893	0.2893
ac	-0.585 -0.779	-0.685	0.761	-0.644	-0.880	-1.42	-0.427	-0.456	-0.466
b0	0 -0.779	0	0	0	0	-1.42	0	0	0
b4	0 0	0	0	0	0	0	0	0	0
b8	0 0	0	0	0	0	0	0	0	0
bc	-0.061 -0.082	-0.072	-0.080	-0.067	-0.092	-0.149	-0.045	-0.049	-0.049
c0	0 0	0	0	0	0	0	0	0	0
Lift c4	-14.82 -37.45	-19.64	-19.12	-17.93	-21.95	-41.13	-12.19	-11.83	-11.83
c8 Wing area	-573.5 -1112	-573.5	-574.0	-756.1	-774.3	-1211	-472.6	-468.8	-468.8
cc	1.2734 5.5641	1.2734	1.2396	1.0827	0.6662	2.908	0.2557	0.5193	0.5193
d0	-7.143 -18.78	-7.143	-7.392	-10.05	-11.37	-29.39	-5.999	-5.856	-5.856
d4	0.0357 0.0411	0.0357	0.0268	0.0387	0.0426	0.137	0.0445	0.0414	0.038
d8	-18.03 -38.61	-18.03	-18.03	-18.70	-20.00	-28.46	-11.01	-13.17	-13.17
Roll dc	-55.74 -99.59	-55.74	-56.01	-76.74	-75.52	-50.27	-44.16	-33.24	-33.24
stability e0	-92.42 -411.1	-92.42	-92.42	-168.9	-162.8	-439.0	-57.80	-58.59	-58.59
derivatives e4	58.432 321.79	58.43	58.786	127.19	107.58	303.32	36.411	35.832	35.832
e8	1.216 3.1875	1.2163	1.2163	1.5613	1.584	3.1067	0.5845	0.5819	0.5819

ec	-0.015	-0.015	-0.023	-0.030	-0.036	0.0163	-0.008	-0.007	-0.008
	-0.03								
f0	-5.761	-7.522	8.7792	-8.36	-8.634	-7.139	-5.908	-6.877	-7.927
	-5.908								
f4	0	0	0	0	0	-7.139	0	0	0
	-5.908								
f8	0	0	0	0	0	0	0	0	0
	0								
fc	0	0	0	0	0	0	0	0	0
	0								
Pitch 100	7.1987	7.8169	9.7707	4.432	4.4328	11.533	4.563	3.8988	4.925
	8.222								
stability 104	-383.5	-383.5	-419.9	-357.1	-420.8	-2323	-302.5	-300.0	-300.0
	-1280								
derivatives 108	-30.48	-30.48	-34.08	-45.58	-55.55	-216.9	-25.4	-23.54	-23.54
	-104.3								
10c	-98.77	-98.77	-111.2	-142.6	-169.7	-659.8	-86.11	-82.95	-82.95
	-347.2								
110	1.0356	1.0356	1.0078	0.857	1.0732	4.8787	0.8125	0.765	0.720
	2.976								
114	0.4407	0.4407	0.4407	1.3118	4.0424	-2.226	0.9264	1.4945	1.4945
	-2.589								
Yaw 118	81.234	88.734	104.93	178.85	210.59	341.87	42.482	42.906	43.429
	284.56								
stability 11c	-3.642	-3.642	-3.646	-7.221	-7.438	-19.37	-2.240	-2.249	-2.249
	-16.88								
derivatives 120	-48.51	-52.99	-62.66	-106.8	-125.7	-204.1	-25.37	-25.62	-25.93
	-169.9								
124	-0.004	-0.004	-0.004	-0.007	-0.007	-0.014	-0.002	-0.002	-0.002
	-0.015								
128	0.111	0.111	0.1883	0.1829	0.219	0.233	0.0671	0.0657	0.657
	0.2736								
12c	0	0	0	0	0	22454	0	0	0
	14076								
130	0	0	0	0	0	-22454	0	0	0
	-14076								
134	0	0	0	0	0	0	0	0	0
	0								
138	0	0	0	0	0	0	0	0	0
	0								

*.FLT_Byte #	**110G V1V1**	**410**	**190A**	**190D**	**262**	**J88A**	**J88C**	**JU87**	**H111**
Drag 90	-6.309 -0.794	-3.166	-1.965	-1.854	-4.73	-5.555	-4.65	-5.098	-6.913
stability 94	-.0003 -.002	-.0003	-.0006	-.0006	-.0005	-.0001	-.0001	-.0003	-.0001
98 Flaps drag	-0.264 -.0006	-0.249	-0.078	-0.079	-0.160	-0.441	-0.441	-0.217	-0.478
9c Power	2988.7 3.15	2867.4	3403.1	4033.3	9.453	2079	2249.8	2252.9	2252.9
a0 Gear drag	-12 -12	-12	-12	-12	-12	-12	-12	-12	-12
Sideforce a4	-132.9 -27.44	-278.7	-117.0	-108.3	-209.3	-275.9	-288.1	-190.9	-248.2
stability a8	1.384 0.269	4.808	1.464	1.133	1.496	6.72	6.72	2.04	7.351
ac	-0.861 0	-1.806	-0.758	-0.702	0	-1.78	-1.867	-1.23	-1.608
b0	-0.861 0	-1.806	0	0	0	-1.78	-1.867	0	-1.608
b4	0 0	0	0	0	0	0	0	0	0
b8	0 0	0	0	0	0	0	0	0	0
bc	-0.090 -0.018	-0.19	-0.798	-0.739	-0.142	-0.188	-0.196	-0.130	-0.169
c0	0 0	0	0	0	0	0	0	0	0
Lift c4	-53.6 -6.4	-46.55	-22.12	-17.95	-17.42	-106.0	-96.6	-45.04	-106.8
c8 Wing area	-1112 -183.5	-1144	-551.1	-538.5	-674.1	-1820	-1820	-880.8	-2413
cc	5.56 -0.818	2.602	-0.870	0.277	0.807	1.17	1.17	2.54	-1.244
d0	-18.78 -1.893	-24.6	-8.92	-7.805	-9.75	-46.3	-46.3	-14.4	-66.15
d4	0.041 0.003	0.087	0.0498	0.0606	0.0379	0.135	0.135	0.06	0.15
d8	-38.6 -0.131	-36.3	-9.258	-9.69	-21.78	-50.14	-50.14	-22.4	-55.4
Roll dc	-99.59 -2.69	-157.6	-64.81	-58.03	-77.17	-284.8	-284.8	-117.9	-545.6
stability e0	-411.1 -7.29	-413.8	-78.32	-75.18	-142.9	-1006	-1006	-214.7	-1658
derivatives e4	321.79 4.199	352.73	60.077	53.27	116.9	789	789	139.9	1261
e8	3.187 0.558	2.913	0.899	0.965	1.283	5.182	5.182	1.27	9.254

ec	-0.030	-0.061	-0.027	-0.030	-0.027	-0.149	-0.149	-0.04	-0.131
	-0.006								
f0	-7.137	-6.991	-7.61	-8.29	0	-5.95	-6.19	-6.19	-6.19
	0								
f4	-7.137	-6.991	0	0	0	-5.95	-6.19	0	-6.19
	0								
f8	0	0	0	0	0	0	0	0	0
	0								
fc	0	0	0	0	0	0	0	0	0
	0								
Pitch 100	11.709	-2.408	1.516	4.738	2.145	-56.08	-50.54	-5.501	-15.06
	3.24								
stability 104	-1280	-1711	-374.5	-453.3	-587.6	-3323	-3323	-806.0	-3694
	-253.6								
derivatives 108	-104.3	-186.0	-51.95	-41.53	-51.4	-418.7	-418.7	-59.06	-669
	-3.79								
10c	-347.2	-544.0	-155.4	-121.7	-140.2	-1070	-1070	-222.0	-1680
	-15.12								
110	2.976	3.85	0.988	1.19	1.41	6.97	6.97	1.69	7.757
	0.608								
114	-2.589	-3.64	0.173	0.314	-14.56	-14.7	-14.7	-0.14	-26.06
	0.07								
Yaw 118	300.83	531.82	129.95	110.21	140.58	1005.1	1029.3	181.08	1318
	14.15								
stability 11c	-16.88	-16.27	-3.62	-2.96	-5.67	-43.07	-43.07	-10.86	-75.83
	-0.18								
derivatives 120	-179.6	-317.6	-77.6	-65.8	-83.9	-600.3	-614.7	-108.1	-787.5
	-8.45								
124	-0.015	-0.013	-0.004	-0.003	-0.005	-0.02	-0.02	-0.005	-0.04
	-0.001								
128	0.273	0.362	0.177	0.201	0.1247	0.881	0.881	0.224	0.899
	0.051								
12c	20540	21245	0	0	65.82	17979	19450	0	18146
	0								
130	-20540	-22245	0	0	-65.82	-17979	-19450	0	-18146
	0								
134	0	0	0	0	0	0	0	0	0
	0								
138	0	0	0	0	0	0	0	0	0
	0								

*.FLT__Byte #	**Hs123**	**Ta183**
Drag 90	-2.146	-2.842
stability 94	-.00049	-.0005
98 Flaps drag	-0.153	-0.161
9c Power	1604	13.65
a0 Gear drag	0	-12
Sideforce a4	-92.2	-209.4
stability a8	1.639	1.296
ac	-0.59	0
b0	0	0
b4	0	0
b8	0	0
bc	-0.063	-0.125
c0	0	0
Lift c4	-21.3	-15.86
c8 Wing Area	-583.8	-613.5
cc	1.22	0.807
d0	-7.78	-8.88
d4	0.033	0.038
d8	-18.7	-19.8
Roll dc	-64.81	-71.2
stability e0	-78.32	-130.2
derivatives e4	58.43	102.9
e8	1.216	1.183
ec	-0.03	-0.023
f0	-5.76	0
f4	0	0
f8	0	0
fc	0	0
Pitch 100	3.38	19.53
stability 104	-292.1	-534.7
derivatives 108	–38.9	-47.5
10c	-119.5	-140.2
110	0.745	1.21
114	0.874	-1.46
Yaw 118	159.3	128.6
stability 11c	-6.96	-5.18
derivatives 120	–95.13	-76.96
124	-0.009	-0.004
128	0.154	0.1202
12c	0	0
130	0	0
134	0	0
138	0	0

GUN DATA IN *.FLT

Paulo Morais decoded the FLT data related to aircraft guns. The file format for guns starts at byte #254 h (596 d), and is follows:

6 groups of 2c (44 d) bytes (one for each possible gun group) made up of the following 12 blocks:

1. 4 bytes (FLOAT) **Gun flash x coordinate** for first pair of guns in group
2. 4 bytes (FLOAT) **Gun flash y coordinate** for first pair of guns in group
3. 4 bytes (FLOAT) **Gun flash z coordinate** all the guns in group
4. 4 bytes (FLOAT) Gun flash x coordinate for second pair of guns in group
5. 4 bytes (FLOAT) Gun flash y coordinate for second pair of guns in group
6. 4 bytes (FLOAT) **Muzzle Velocity** (MV) }
7. 4 bytes (FLOAT) **Rate of Fire** (ROF) } (see detailed analysis below)
8. 4 bytes (FLOAT) **Dispersion** }
9. 4 bytes (FLOAT) x offset from flash for empty shells for first pair (0 = no shells)
10. 4 bytes (FLOAT) x offset from flash for empty shells for second pair (0 = no shells)
11. 2 bytes (WORD) Yaw
12. 2 bytes (WORD) Tracer duration or range

Note: x is the longitudinal axis of aircraft, y is the wing axis and z the vertical. The positive sense of the axis is not the same for all aircraft. Paulo Morais' file ALL_FLT.TXT contains a full dump for version 1.1 of EAW.

GUN CHARACTERISTICS: MUZZLE VELOCITY and RATE OF FIRE

EAW only provides for 4 types of guns (light MG, heavy MG, 20mm cannon and 30mm heavy cannon), but allows for different types of each to be carried by different aircraft. EAW also has a number of errors in weapons characteristics (the figures are generally too low, both as to muzzle velocity and rate of fire). Low muzzle velocities make for exaggerated trajectories (i.e. rounds falling away too early). The rates of fire too high exhausts ammunition loads too soon). The data is as follows:

German weapons	Muzzle velocity			Rate of Fire (per second)	
Calibre	Real MV		EAW MV	Real	EAW ROF
Weapon	m/s	f/s	f/s		
MG17 7.92 mm755	2477	1981.6	20	20	
MG81 7.92 mm	730	2395	1981.6	25	10
MG81Z 7.92 mm	730	2395	1981.6	25	10
MG131 13 mm	730	2395	1896	15	15
MG/FF 20 mm	570	1870	1520	6.667	8.67
MGFF/M 20mm	690	2263	1520	8.667	8.67
MG151 20 mm	740	2427	1840	12.5	13.3
MK108 30 mm	505	1656	1320	10	8.33
MK103 30 mm	860	2820	N/A	7	N/A
37 mm A/T	760	2500 (est)		2.333	N/A

Japanese weapons	Muzzle velocity			Rate of Fire
Calibre	Real MV		EAW MV	Real	EAW ROF
Weapon	m/s	f/s	f/s		
Type 89 7.7 mm flex	750	2460		15	
Type 92 7.7 mm	750	2460		10	
Type 97 7.7 mm	750	2460		16.667	
Type 98 7.92 mm730	2460		25		
Ho-103 Type 1 12.7mm	796	2610		15	
Ho-103 Type 3 13.2mm	790	2590		13.333	
Type 99/1 20 mm	555	1820		8.166	
Type 99/2 20 mm	750	2460		12.5	
Ho-3 20 mm	820	2690		6.667	

Ho-5 20 mm	750	2460		14.166
Ho-105 30mm	750	2460		7.5
Ho-203 37 mm	575	1886		2.166

Allied weapons	Muzzle velocity			Rate of Fire	
Calibre	Real MV		EAW MV	Real	EAW ROF
Weapon	m/s	f/s	f/s		
Browning .303 cal	792	2600	1920	20	19.167
French 7.5mm MG		2590		28	
ShKAS 7.62mm	825	2700	-	30	(22.5 synch)
UBK 12.7 mm	850	2788	-	17.5	(13.3 synch)
Browning .50 cal	868	2850	2200	12.5	13.3
French 20mm cannon		2500		8	
MkII(*) 20 mm	880	2887.1	2256	10	13.3
MkV (*) 20 mm	840	2755	2256	12.5	11.667
ShVAK or B20 20mm	800	2624	-	13.3	-
NS 23mm	690	2263	-	9.2	-
M4 37 mm	610	2000	-	2.333	-
Oerlikon 40mm	853	2800 (est)		3	-

For conversion: 1 metre=3.28 feet
Bomber hand-aimed guns (e.g. Ju88A, B17 waist) are HALF the usual ROF.

The positions of the Muzzle velocity (MV) and Rate of Fire (ROF) figures in the FLT files are:

1st Gun Group	Byte # 268
2nd Gun Group	Byte # 294
3rd Gun Group	Byte # 2c0
4th Gun Group	Byte # 2ec
5th Gun Group	Byte # 318
6th Gun Group	Byte # 344

Changing the figures as set out above makes most fighter gun fire more lethal, because more rounds are fired per second. In dogfights, the "on target" ability of all guns is enhanced (because of the increased muzzle velocity), so less deflection is necessary. As of "Enemy Coast Ahead" Version 1.2 the muzzle velocities and rates of fire of all fighter aircraft now correspond with the actual data. Different weapons of the same calibre (e.g. the 20mm MG FF and MG 151) now have quite different firing abilities. Daniel Haeni did most of the research for this.

Gun Ranges

The ranges (byte #12 in each gun group) of the guns is as follows:

	Hex	Decimal	
Flex MG17 7.9mm	54	84	
Flex .303 cal MG	54	84	*derived
Flex .50 cal MG	5b	91	
Flex MG131 13mm	6a	106	
Flex MG81 7.9mm	87	135	
7.9mm MG17 7.9mm	87	135	also ShKAS 7.62mm, and Japanese 7.7mm
.303 cal Browning MG	8c	140	
.50 cal Browning MG	98	152	also UBK 12.7mm, and Japanese 12.7mm
20mm HispII or MGFF	b0	176	also ShVAK and B-20 20mm, and Japanese 20mm
13mm MG 131	b1	177	
20mm Hispano V	b2	178	also NS-23 23mm
30mm Mk108	cb	203	also Japanese 30mm
20mm MG151	db	219	
37mm and 40mm	db	219	

GUN CHARACTERISTICS: DISPERSION

This is an important figure. Dispersion is the maximum radius of bullet dispersion at some distant point, presumably linked to a random number. There are larger values for wing mounted guns, smaller ones for nose mounted (there are some real anomolies here, like the large figures for the nose mounted guns for the Bf109E, and the Spit IX MGs). To check this Paulo reduced this values to near zero in the 4x20mm equipped Hurricane IIc. The result was a systematic 12+ He111 or 10+ Ju88 bombers downed from distances higher than 600ft firing very sort bursts. Applying the reverse treatment, big values, result in having to close to 100ft to be able to down a single bomber.

The positions of the Dispersion figures in the FLT files are:

1st Gun Group Byte # 270
2nd Gun Group Byte # 29c
3rd Gun Group Byte # 2c8
4th Gun Group Byte # 2f4
5th Gun Group Byte # 320
6th Gun Group Byte # 34c

Gun GrpByte #	**P38H HURR**	**P38J**	**P47C**	**P47D**	**P51B**	**P51D**	**B17F**	**B24D**	**B26B**
1st (270)	0.5 4.65	0.5	3.3	3.3	3.36	3.31	1.5	1.5	1.5
2nd (29c)	1.575 4.9	1.575	3.825	3.825	3.525	3.48	1.625	1.625	1.625
3rd (2c8)	1.7 ----	1.7	----	----	----	----	1.625	1.625	1.625
	----						2.599..	3.84...	2.325...
	SPIT1 110C	**SPIT9**	**SPT14**	**TYPH**	**TEMP**	**MOS**	**109E**	**109G**	**109K**
1st (270)	4.11 0.545	2.33	3.22	2.3499	2.805	2.5	2.65	1.627	1.627
2nd (29c)	4.93 2.63	5.18	2.3625	----	----	0.5	2.425	0.5	0.5
3rd (2c8)	---- 2.775	----	----	----	----	----	----	2.60	2.60
	110G V1	**410**	**190A**	**190D**	**262**	**J88A**	**J88C**	**JU87**	**H111**
1st (270)	0.545 ----	0.611	1.599	1.599	0.60	2.675	0.625	4.15	2.5
2nd (29c)	2.63 ----	0.569	1.31	1.486	0.75	2.8	2.7	2.5	2.5
3rd (2c8)	2.77 ----	----	2.60	----	----	2.5...	2.625...	----	3.47..

Note the generally pro-U.S. figures here (U.S. guns are generally much more concentrated than German and British ones). For ECA Version 1.3 I have made a number of changes to dispersion, as follows.
All bomber flex guns(B17, B24) are now 2.5

Bf109E nose MGs:	2.65 -> 1.627	(as per the Bf109 G & K)
added nose cannon		0.5 (as Bf109G&K)
Bf110C and G's :2nd group:	2.63 -> 1.5	(as P38)

	3rd group:	2.77 -> 1.7	(as P38)
Ju88C	2nd&3rd groups:	2.7 and 2.625 -> 1.7	
P51B	Same as P51D		
Mosq	1st grp: (MGs)	2.5 -> 1.575	(as P38)
Hurr	1st grp	4.65 -> 3.3	(as P47C)
	2nd grp	4.9 -> 3.825	(as P47C)
Spit I	1st grp	4.11 -> 3.3	(as P47C)
	2nd grp	4.93 -> 3.825	(as P47C)
Spit IX	2nd grp (MGs)	5.18 -> 2.3625	(as Spit XIV)

PLANES.DAT
This crucial file is 6484 h bytes long. It controls the guns, ammo and other things on an aircraft. File format is:
1e00 0000 1e (30 d) aircraft

Then 30 x sub-files, each d8 bytes in length. The sub-file format is:
0x00 0000 Aircraft code e.g. 0100=P38J, 1400=Bf-110G etc

then 50 h bytes... See below

The 1st 4 Bytes in PLANES.DAT

The first 4 bytes of the 50 h block after the aircraft code are bit-coded bytes, as follows:

Byte	#1	#2	#3	#4	
P38H	15	96	61	04	
P38J	""	""	""	""	
P47C	05	22	a0	10	
P47D	""	""	""	""	
P51B	""	26	80	04	
P51D	""	""	""	""	
B17F	22	02	20	23	
B24D	""	""	""	""	
B26B	12	02	20	23	flyable B26B (1696 2023) now (1602 2023)
Hurri	05	25	44	00	
Spit I	""	45	"	""	
Spit IX	""	45	"	""	
Spit 14	""	45	42	""	
Typh	""	25	60	10	
Temp	""	""	20	""	
Mosq	12	01	""	""	flyable Mosq change to (1595 2000)
109E	85	44	40	00	
109G	""	""	80	""	
109K	""	""	""	""	
110C	95	14	a0	01	
110G	""	""	""	""	
410	93	""	""	""	flyable Me410 change to (9514 a001)
190A	85	20	""	00	
190D	""	24	80	""	
262	9d	a0	""	""	
Ju88A	92	04	20	13	flyable Ju88A (9614 2013) now (9604 2013)
Ju88C	93	""	""	""	flyable Ju88C change to (9504 2013)
Ju87	82	04	30	01	flyable Ju87B (8644 3001) now (8604 3001)
He111	92	04	00	13	flyable He111 (9610 0013) now (9604 2013)
V1	c0	00	"	00	

Thes bytes control plane type, nationality, engine-sound, damage and other things, as follows. The bytes are bit coded.

NOTE “Attack Plane”. This must be set for planes that can fly bombing missions in campaigns and be escorted.

PLANES.DAT: THE BITS COMPRISING THE 1st 4 BYTES

First Byte		
FIGHTER	00 00 00 01	
BOMBER	00 00 00 02	
FLYABLE	00 00 00 04	
JET	00 00 00 08	
TWIN_ENG	00 00 00 10	
QUAD_ENG	00 00 00 20	
V1	00 00 00 40	
GERMAN	00 00 00 80	
Second Byte		
BRITISH	00 00 01 00	
AMERICAN	00 00 02 00	
INLINE ENG.	00 00 04 00	All but P47, B17,24&26, Mosq, 190, 262, V1
GEAR_BACK	00 00 10 00	P38, 110
PI_GEAR_IN	00 00 20 00	P47, P51, Hurri, Typh, Temp, 190, 262,
GEAR_OUT	00 00 40 00	109
GEAR_CENTER(Nose)	00 00 80 00	P38
Third Byte		
CR_PROPS	00 01 00 00	Only P38
CCW_PROPS	00 02 00 00	Only Spitfire 14
GRAV_FED_CARB	00 04 00 00	Spitfire 1, Spitfire IX and Hurricane
DIVE_BOMBER	00 10 00 00	Only Ju87
ATTACK_PLANE	00 20 00 00	P38&47, B17,24&26, Ju87&88, add H111, Temp, Typh, 110, 410, 190A
ANGLE_FIGHTER	00 40 00 00	P38, Spits, Hurri, Typh, 109E,
ENERGY_FIGHTER	00 80 00 00	P47, P51, 109G&K, 110, 410, 190D, 262,
Fourth Byte.		
DEFENSIVE_GUN	01 00 00 00	1 or more defensive guns
MULTI_CREWED	02 00 00 00	3 or more crew
COMBAT_FLAPS	04 00 00 00	P38H and J, and P51B and D
AUTOMATIC_SLATS	08 00 00 00	Nil. But now the Bf109E, G &K, Bf110C & G and Me262
ARMOR	10 00 00 00	P47 C and D, Typh, Temp, Mosq, Ju88 A and C, He111
HEAVY_ARMOR	20 00 00 00	B17, B24 and B26
Thus, e.g. the P38H is	15 96 61 04	

The next four bytes in PLANES.DAT are as follows:
Bytes # 5-6 **Year of entry in service**
Bytes # 7-8 **0n 00** (**Crew No**.) where 01=Ftr and V1 02=Mosq, Bf-110 C&G, Me-410, Ju-87
04=Ju-88 A&C 05=He-111 07=B26 08=B-24 0A=B-17

Then a series of **15 x 4 byte** blocks (long integer). The data for each aircraft in the first 8 of these 15 x 4 byte (long integer) is set out on the following page:

1. **Stall speed**
2. **Cruise Speed**
3. **Corner Speed**
4. **Max Speed**
5. **Empty weight** in lbs (displayed at the loadout screen)
6. **Fuel burn rate** (16.16 x number) . Max188 doubled all of these figures for his LowFuel Modification
7. **Weight of internal fuel** (displayed at the loadout screen)
8. **Maximum range**

Then the **viewing distances** for the various 3DZ models (where 21 units = 1 foot)
9. Viewing Distance Close (uses the F.3DZ model)
10. Viewing Distance Medium (uses the M.3DZ model)
11. Viewing Distance Far (uses the flat-texture S.3DZ model)
12. Viewing Distance Line (uses the line-only T.3DZ model)
13. Viewing Distance Max (uses dot only)
14. Default distance to view object externally
15. Radius

The **EAW default** for viewing distances are as follows:

	Hurri, P51 etc	**P38, Mosq, Me410**	**B26, He111**	**B17, B24**
Close	5,250	7,350	8,400	10,500
Medium	15,750	22,050	25,200	31,500
Far	47,250	66,150	75,600	94,500
Line	141,750	198,450	226,800	283,500
Max	680,400	833,490	952,560	1,190,700

In ECAPanel I changed the first three figures to 75,600, 75,601 and 75,602.

Max188 used the following figures (basically doubling the EAW figures, except capping the Dot and Max figures for the bombers) for his View Distance Modification (http://www.xmission.com/~mmagleby/eaw/).

	Hurri, P51 etc	**P38, Mosq, Me410**	**B26, He111**	**B17, B24**
Close	10,500	14,700	16,800	21,000
Medium	31,500	44,100	50,400	63,000
Far	94,500	132,300	151,200	189,000
Line	283,500	350,000	350,000	350,000
Max	1,020,600	1,250,235	1,428,840	1,786,050

As of **ECAPanel v3.8** I have changed these five figures to:

	Hurri, P51 etc	**P38, Mosq, Me410**	**B26, He111**	**B17, B24**
Close	75,600	75,600	75,600	75,600
Medium	85,050	85,050	85,050	85,050
Far	94,500	132,300	151,200	189,000
Line	350,000	350,000	350,000	350,000
Max	1,020,600	1,250,235	1,428,840	1,786,050

Most modern PCs are far above the original specs for EAW, and so these changes should not be a major frame-rate problem.

A/C	Stall spd	Cruise sp	Corner sp	Max spd	Wt empty	Burn	Wt fuel	Max range
P38H	10780	19030	32450	36410	14500	67	1800	36,044,800
P38J	11110	19690	33440	36300	15040	75	2460	45,875,200
P47C	10780	20020	32450	36190	11670	145	1830	32,768,000
P47D	11220	20240	33550	37840	12280	145	2220	41,287,680
P51B	10340	19800	31130	39050	8070	75	1620	62,259,200
P51D	10560	20240	31680	40260	8480	75	1620	62,259,200
B17F	9460	18150	28380	28660	35000	50	8430	157,286,400
B24D	10670	21010	32120	29870	35000	50	9850	183,500,800
B26B	10450	17050	31460	29650	24000	70	4005	75,366,400
HURR	8360	14760	25080	29590	5940	65	660	18,350,080
SPIT1	8360	15400	25080	33110	5170	65	612	19,660,800
SPIT9	9460	15950	28270	35310	6888	70	612	19,005,440
SPIT14	10010		16830	30140	37510	7670	97	830
19,660,800								
TYPH	10780	20240	32230	41030	10220	98	924	26,214,400
TEMP	10450	19360	31240	39600	10528	98	972	32,112,640
MOSQ	11440		28710	34210	36300	12000	70	4200
133,693,440								
109E	9240	17270	27720	35860	4886	83	634	17,694,200
109G	11000	18590	32890	37290	6316	89	634	17,694,720
109K	11440	20020	34320	43670	6800	98	634	17,039360
110C	10120	18590	30250	34210	12870	83	2010	28,180,480
110G	10120	16520	30250	30360	13450	89	2010	26,214,400
M410	11880	22110	35640	39160	16000	111	3000	62,145,560
190A	11770	20460	35420	39820	6393	106	830	21,626,080
190D	11220	20350	33660	39930	8650	100	830	22,937,600
262A	12760	33000	38390	55000	11460	280	2640	19,660,400
J88A	9680	18150	29150	28880	20000	50	2120	68,157,440
J88C	10120	19470	30250	29320	21500	55	2120	79,953,920
JU87	8250	14650	24750	27450	7360	50	700	32,112,640
H111	8580	15290	25630	27780	20000	44	2244	83,886,080
V1	20900	33000	40700	49500	4000	200	800	15,728,640

PLANES.DAT: DAMAGE

Starting at **byte #48 h** in each aircraft data block is a group of 12 single byte integers (short integer). In Paulo's opinion, supported by testing, is that these bytes are the number of "hit points" that some areas of the aircraft can sustain before failing.

1 - Fuselage mechanicals, fuel & hydraulic lines, Elevators & Rudder Not a critical failure.
2 - Pilot . Catastrophic failure.
3 - Fuselage structure. Catastrophic failure.
4 - Tail section. Catastrophic failure.
5 - Right wing structure. Catastrophic failure.
6 - Right wing mechanical parts. Aileron damage. Not a critical failure.
7 - Same as 5 for left wing. Catastrophic failure.
8 - Same as 6 for left wing Ailerons. Not a critical failure.
9 - Engine or leftmost engine.
10 - Right engine (bimotor) or inner left engine (quad)
11 - Inner right engine.
12 - Right outer engine.

The following is a complete decimal dump of the damage area of PLANES.DAT

US	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
P38H	20	15	26	18	36	16	36	16	12	12	0	0
P38J	20	20	26	18	36	16	36	16	15	15	0	0
P47C	23	20	43	33	38	26	38	26	27	0	0	0
P47D	23	20	43	33	38	26	38	26	27	0	0	0
P51B	15	20	26	24	28	17	28	17	15	0	0	0
P51D	15	20	26	24	30	18	30	18	15	0	0	0
B17F	48	60	99	99	99	42	99	42	24	24	24	24
B24A	34	40	85	63	64	40	64	40	24	24	24	24
B26B	28	30	75	42	50	32	50	32	24	24	0	0

UK	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
HURR	12	10	24	22	26	17	26	17	10	0	0	0
SPIT 1A	11	8	16	17	21	13	21	13	10	0	0	0
SPIT9	12	15	18	17	21	13	21	13	15	0	0	0
SPIT14	12	20	18	20	24	13	24	13	19	0	0	0
TYPH	20	20	38	16	36	25	36	25	20	0	0	0
TEMP	21	20	40	27	38	23	38	23	22	0	0	0
MOSQ	21	20	80	54	41	40	41	40	24	24	0	0

GR	1	2	3	4	5	6	7	8	9	10	11	12
109E	11	10	20	13	22	13	22	13	11	0	0	0
109G	12	15	24	13	24	13	24	13	14	0	0	0
109K	12	20	24	13	24	13	24	13	16	0	0	0
110C	16	10	25	26	32	18	32	18	17	17	0	0
110G	17	20	25	26	32	18	32	18	21	21	0	0
M410	24	20	27	36	40	23	40	23	20	20	0	0
190A	17	20	34	22	25	14	25	14	24	0	0	0
190D	17	20	34	22	25	17	25	17	26	0	0	0
262A	15	20	30	25	30	13	30	13	10	10	0	0
J88A	26	15	36	34	34	30	34	30	17	17	0	0
J88C	28	20	38	36	34	30	34	30	20	20	0	0
JU87	13	15	18	17	18	12	18	12	10	0	0	0
H111	23	15	40	34	32	28	32	28	16	16	0	0
V1	10	10	10	10	10	10	10	10	10	0	0	0

I have now changed the Bf110C wings (5 and 7) from 32 (20 h) to 26 (1a h) and the engines (9 and 10) from 17 (11 h) to 12 (0c h).
The Fw190A3 has the following positions reduced:1 (17 to 16 d), 3 (34 to 28 d), 5 (25 to 24 d), 7 (25 to 24 d) and 9 (24 to 21 d). For EAW v1.2 (ECA v1.4 et seq) I have increased all armour levels by 50%.

PLANES.DAT: GUNS

After the damage byte is:

0x00 0000 Number of gun positions e.g. 0300 for P38H and J (Maximum is 8 positions)
Commences a4 bytes from start of block

then a series of 6 byte chunks, one for each gun

0n00 0p00 0t00 aaaa 0s00 0x00 where 0n=**Number of guns**

0p=**Position** Fixed: 0000=None
0100=wing 0200=nose
Defensive: 0300=tail
04=Top turret 0500=Rear cabin
0600=Top 0700=V Rear
0800=v Front 0900=belly turret
0a00=left waist 0b00=right waist
oc=nose flexible od=Front turret

ot=**Type of guns** 00=None
02=.30 cal MG, 7.9mm MG
04=.50 cal/13mm MG
0c= 20mm cannon
18= 30mm cannon

aa=**Ammo** in reverse order e.g. f401=500 d

0s= **Sound** 00=.30 cal MG
01=.50 cal/13mm MG
02= 20mm cannon
03= 30mm cannon

0x=**Smoke** 00 or 01 (smoke or no smoke)

Only the first 3 groups are utilizableby the player in the flyable aircraft, and each group is limited to 4 guns. Paulo Morais' file PLN_DAT.TXT contains a full dump of all 30 aircraft gun groups. Use Paulo's utilities DUMP_PLN.EXE and PTCH_PLN.EXE to change gun groups. The code 'ot' for the gun type also sets the gun destructive power. Higher values to simulate other guns can give spectacular effects. You can try to use 30h(equal to 2x the 30mm cannon value) for the 50mm cannon that equipped some Me410 versions. The downside is you can't get a meaningful text string (the in-flight text is in RADIOTXT.STR, and there are only 4 types per nationality), and the sound is limited to one of the 4 available sounds.

Then after all 6 x 6 byte gun chunks (including, usually, 1 or more 0000... ones):

UBYTE Max hit locations ? }Most fighters c611 fa5f and bombers 380e fa5f
UBYTE Max engines per plane? }All German planes 380e de58 or 380e fa5f
UBYTE Pitch limit?
UBYTE Yaw Limit

4 bytes nnnn nnnn Aircraft name e.g.110c, m410, mosq etc. Commences a4 bytes from start.
30h bytes 0000 All zeros.

To change guns, for example to fix the Bf-110G so that it has 2x20mm cannon and 2x30mm cannon:

1138 0400 0000 4 gun positions, no change
113c 0400 0200 0200 e803 0000 0000 (4x7.9mm MG in nose, 1000 rounds each)
1148 0200 0200 0c00 4501 0200 0000 (2x20mm cannon in nose, 325 rounds each)
1154 0200 0200 1800 8700 0300 0000 (2x30mm cannon in nose, 135 rounds each)
1160 0200 0500 0200 2003 0000 0000 (2x rear flex 7.9mm MG, 800 rounds each)

AMMUNITION COUNTS

When changing ammunition loads, some common loads are as follows:

1000	E8 03
900	84 03
750	EE 02
500	F4 01
475	DB 01
450	C2 01
400	90 01
350	5E 01
334	4E 01
313	39 01
300	2C 01
250	FA 00
220	DC 00
200	C8 00
150	96 00
140	8C 00
120	78 00
100	64 00
80	50 00
60	3C 00
50	32 00

LOADOUT.DAT
This file is 9728 d bytes (2600 h) long. It controls the bomb and rocket loads on all 30 aircraft. The format of LOADOUT.DAT is:
b400 0000 b4 h = 180 d records, each is 2c bytes (44 d) long
1st group of records
152 actual records for the various aircraft follow, then 28 blank (all zero) records. Presumably there can be expansion here. Then:

2nd group of records
9600 0000 96 h = 150 d records, each 0c bytes (12 d) long, 5 for each aircraft. These controll which loadouts are available for which missions in Campaigns.

The 1st group of records (2c bytes long) have the format:
ac00 Aircraft code e.g. 0000=P38H, 0f00=Mosquito. Then 21 d 2-byte blocks as follows:
0n00 Number of blocks

0w0x 0n0x 0d00 **46**00

0w=Weapon type (see Weapons codes on p.2, e.g. 03=500 lb bomb)
0x=Rack Image displayed (WEAPONS.DAT 2nd rec's – also on p.34)
e.g 09=4x60lb rocket, 0c=R4M rack
0n=number
0x = Position of Image (controlled by PxxxxF.3DZ)
0d00=initial firing delay (usually 00, 10 or 20)
4600= firing delay between weapons (0300 for R4M, 23 and 46 for 60lb rockets)

The **Rack Image codes** are:

Description	Image
00 Nothing	Nil
01 Simple Mount	Nil
02 Simple Mount	Nil
03 Internal	Nil
04 Rocket Tube	M10 x3
05 Rocket rail	HVAR x3
06 Rocket rail	HVAR x5
07 Rocket rail	60 lb x1
08 Rocket rail	60 lb x2
09 Rocket rail	60 lb x 4
0a Rocket tube	WGr21 x1
0b Rocket tube	WGr21 x2
0c Rockets	R4M rack
0d Gun pod	*20mm gun pod
0e Twin gun pod	*Twin gun pod

Position of Image
In EAW the convention for the ordnance load hardpoints is:
1 Inner left wing
2 Inner right wing
3 Centre
4 Outer left wing
5 Outer right wing

In PAW the convention for the ordnance load hardpoints was a little different, viz:
1 Inner left wing (same as EAW)
2 Inner right wing (same as EAW
3 Outer left wing

4 Outer right wing
5 Centre

P51B (Aircraft Code 0400)

1.	0000	0000 x 21	No load
2.	0200	0a01 0101 1000 0000 0a01 0102 2000 0000 0000 x 12	2x75 gal tanks, outer wing position
3.	0200	0b01 0101 1000 0000 0b01 0102 2000 0000 0000 x 12	2x150 gal tanks, outer wing position
4.	0200	0301 0101 1000 0000 0301 0102 2000 0000 0000 x 12	2x500 lb bombs, outer wing position

Ju-87B (Aircraft Code 1b00)

1.	0000	0000 x 21	No load
2.	0500	0802 0103 0000 0000 0000 x 4 0000 x 12	1x500 kg bomb

Mosquito (Aircraft Code 0f00)

1.	0000	0000 x 21	No load
2.	0200	0203 0200 0000 4600 0203 0200 0023 4600 0000 x 12	4x250 lb bombs, in bomb bay, time delay in dropping

Change this to:

2.	0400	0203 0200 0000 4600 0203 0200 0023 4600 1107 0401 1000 0000 1107 0402 2000 0000 0000 x 4	4x250 lb bombs, in bomb bay, time delay in dropping 8x60 lb rockets on inner wings

Tempest (Aircraft Code 0e00)

1.	0000	0000 x 21	No load
2.	0200	0901 0101 1000 0000 0901 0102 2000 0000 0000 x 12	2x45 gal tank
3.	0200	0201 0101 1000 0000 0201 0102 2000 0000 0000 x 12	2x250 lb bomb
4.	0200	0301 0101 1000 0000 0301 0102 2000 0000 0000 x 12	2x500 lb bomb
5.	0200	0401 0101 1000 0000 0401 0102 2000 0000 0000 x 12	2x1000 lb bomb
6.	0200	1109 0401 1000 0000 1109 0402 2000 0000 0000 x 12	8x60 lb rockets

Me-410 (Aircraft Code 1500)

1.	0000	0000 x 21	No load
2.	0400	0603 0200 0000 4600 0603 0200 0023 4600 0000 x 12	2x100 kg bombs
3.	0400	0000 0000 0000 0000 0000 0000 0000 0000	4x WGr21 rockets

		130b 0205 1000 0000	
		130b 0206 2000 0000	
		0000 x 4	
4.	0100	1603 0103 0000 0000	1x Fritz-X rocket
		0000 x 16	

Ju-88C (Aircraft Code 1a00)

1.	0000	0000 x 21	No load
2.	0200	0603 0200 0000 4600	4x100 kg bombs
		0603 0200 0023 4600	
		0000 x 12	
3.	0400	0000 x 4	6xWGr21 rockets
		0000 x 4	
		130b 0305 1000 0000	
		130b 0306 2000 0000, 0000 x 4	
4.	0100	1503 0103 0000 0000	1x Henschel Hs-293 rocket bomb
		0000 x 16	
5.	0100	1603 0103 0000 0000	1x Fritz-X rocket
		0000 x 16	

P47D (Aircraft Code 0300) The P47 has the most loadout options (22)

1.	0000	0000 x 21	No load
2.	0100	0e02 0103 0000 0000	1x200 gal centre tank
		0000 x 16	
3.	0500	0000 x 4	2x75 gal tank, outer wing
		0000 x 4	
		0000 x 4	
		0a01 0104 1000 0000	
		0a01 0105 2000 0000	
4.	0500	0000 x 4	2x108 gal tank, outer wing
		0000 x 4	
		0000 x 4	
		0b01 0104 1000 0000	
		0b01 0105 2000 0000	
8.	0500	0302 0103 0000 0000	3x500 lb bomb
		0000 x 4	
		0000 x 4	
		0301 0104 1000 0000	
		0301 0105 2000 0000	
10.	0500	0e02 0103 0000 0000	200 gal centre tank plus 2x500 lb bombs
		0000 x 4	
		0000 x 4	
		0301 0104 1000 0000	
		0301 0105 2000 0000	
17.	0500	0302 0103 0000 0000	3x500 lb bomb plus 6xM10 rockets
		1004 0301 1000 1400	
		1004 0302 2000 1400	
		0301 0104 1000 0000	
		0301 0105 2000 0000	

22.	0500	0302 0103 0000 0000 1206 0501 1000 0000 1206 0502 2000 0000 0000 x 8	1x500 lb bomb plus 10xHVAR 5" rockets

LOADOUT.DAT : 2ND GROUP OF RECORDS

There are 150 records at the end of LOADOUT.DAT, 5 for each aircraft. Each is 0c bytes long.
They control ordnance availability in Campaign missions. The format is :

0x00 **0m0n** 0102 0304 0506 0000 **om** =Mission type 00=Escort 01=Ftr Sweep
(0x00=Aircraft code) 02=Bomb 03=Intercept
04=Interdiction
(NB 1940 aircraft only have 01, 03 and 05)
on= Number of Loadout options for that Mission type
ff=All option available
0102 0304 etc....= Loadout options 1, 2, 3, 4 etc....

0x00	0002 0001 0000 0000 0000	Most fighters: P38H, P38J, Spitfire IX, Spitfire 14,
	0102 0001 0000 0000 0000	Typhoon, Tempest, Bf109G&K, Fw190D.
	02ff 0000 0000 0000 0000	Bf110G
	0302 0001 0000 0000 0000	Bf110G same except 0303 0001 0200 0000 0000
	04ff 0000 0000 0000 0000	Bf109G same except 0304 0001 0203 0000 0000
0x00	0001 0000 0000 0000 0000	Early fighters: Hurricane, Spitfire Ia, Bf-109E, Bf-110C
	0101 0000 0000 0000 0000	
	02ff 0000 0000 0000 0000	
	0301 0000 0000 0000 0000	Me262 same except 0302 0001 0000 0000 0000
	04ff 0000 0000 0000 0000	
0x00	0001 0000 0000 0000 0000	Light bombers: Mosquito, Ju87, Ju88A, Ju88C, He111
	0101 0000 0000 0000 0000	Me410, V1
	0201 0100 0000 0000 0000	V1 same except 0201 0000 0000 0000 0000
	0301 0000 0000 0000 0000	Me410 same except 0301 0200 0000 0000 0000
	0401 0100 0000 0000 0000	V1 same except 0401 0000 0000 0000 0000
0x00	0007 0000 0000 0000 0000	Heavy bombers: B17F, B24D, B26B
	0101 0000 0000 0000 0000	
	0201 0100 0000 0000 0000	
	0301 0000 0000 0000 0000	
	0401 0100 0000 0000 0000	
0x00	0007 0001 0203 0405 0600	U.S. fightersP47C&P47D 0005 0001 0203 0400 0000
	0107 0001 0203 0405 0600	0105 0001 0203 0400 0000
	02ff 0000 0000 0000 0000	02ff 0000 0000 0000 0000
	0307 0001 0203 0405 0600	0305 0001 0203 0400 0000
	04ff 0000 0000 0000 0000	04ff 0000 0000 0000 0000
0x00	0003 0001 0200 0000 0000	U.S. fightersP51B&P51D 0004 0001 0203 0000 0000
	0103 0001 0200 0000 0000	0104 0001 0203 0000 0000
	02ff 0000 0000 0000 0000	02ff 0000 0000 0000 0000
	0303 0001 0200 0000 0000	0304 0001 0203 0000 0000
	04ff 0000 0000 0000 0000	04ff 0000 0000 0000 0000

The solution to the ordnance loadout/lockup problem is simply to change the new machines to be like (say) the Spit IX. The Ju-88 has 2 loadout options only (Guns i.e. No Load, and Bombs). The Mosquito likewise has only 2 options (although this can be changed by increasing the number of loadout options), and the Me-410: 3 options.

MISSION FILES (MISNxx.DAT)
There are Mission files: MISN40.DAT MISN43.DAT MISN44.DAT MISN45.DAT
Presumably these affect the aircraft available in missions in the various years.
Each file is 60 d bytes long, divided into 3 equal chunks of 20 d bytes.

MISN40.DAT
0400 0000 [090a 1013 0000 0000] ff80 ff40 0000 0000 04=4 flyable aircraft.
Types=Hurri(09),Spit 1(0a), 109E(10), 110C(13)
ff etc= probability (?) of appearance
0500 0000 [091c 1319 1b00 0000] ffff 2080 4000 0000 05= 5 aircraft
Types=Hurri, He111, 110C, Ju88A, Ju87
ff etc=probability as bomber(?)
0200 0000 [1c19 0000 0000 0000] ff80 0000 0000 0000 02=2 aircraft
Types=He111, Ju88A
ff=probability as bomber (?)

MISN43.DAT
0800 0000 [0200 obod 1116 141a] c440 ff40 ffc4 4020 08=8 flyable aircraft.
Types = P47C, P38H, Spit9, Typh, 109G,
190A, Ju88C
ff etc= probability (?) of appearance
0800 0000 [0206 080d 0f16 141a] ff80 ff40 ff80 8040 08= 8 aircraft
Types= P47C, B17, B26, Typh, Mosq,
190A, 110G, Ju88C
ff etc=probability as bomber(?)
0600 0000 [0607 080f 1a15 0000] ff20 8080 ff40 0000 06=6 aircraft
Types= B17, B24, B26, Mosq, Ju88C, Me410
ff=probability as bomber (?)

MISN44.DAT
0800 0000 [0204 o10b 0d16 1115] ff80 40ff 80ff ff20 0 08=8 flyable aircraft.
Types = P47C, P51B, P38J, Spit9, Typh
190A, 109G, Me410
ff etc= probability (?) of appearance
0800 0000 [0204 0608 0d0f 1615] ff80 80ff ff80 ff40 08= 8 aircraft
Types= P47C, P51B, B17, B26, Typh,
Mosq, 190A, Me410
ff etc=probability as bomber(?)
0600 0000 [0607 080f 1a15 0000] ff80 8080 ff40 0000 06=6 aircraft
Types= B17, B24, B26, Mosq, Ju88C, Me410
ff=probability as bomber (?)

MISN45.DAT
0800 0000 [0503 0c0d 0e17 1218] ffff ff80 80ff ff20 08=8 flyable aircraft.
Types = P51D, P47D, Spit14, Typh
Temp, 190D, 109K, Me262
ff etc= probability (?) of appearance
0800 0000 [0305 0608 0d0f 1615] ff80 80ff ff80 ff40 08= 8 aircraft
Types= P47D, P51D, B17, B26, Typh,
Mosq, 190A, Me410
ff etc=probability as bomber(?)
0600 0000 [0607 080f 1a15 0000] ffff 8080 ff40 0000 06=6 aircraft
Types= B17, B24, B26, Mosq, Ju88C,
Me410 ff=probability as bomber (?)

WEAPONS.DAT
Controls the weapons characteristics. The names are in WEAPONS.STR. The format is:
2000 0000 20 h = 32 d records, each is 18 h (24 d) bytes long. Then 2 groups of records:

1st group of records
21 actual records for the various weapons follow, then 11 blank (all zero) records. There can be expansion here (see below). Then:

2nd group of records
1000 0000 10 h = 16 d records, each 08 bytes long. These determine the weapon displayed.

The **1st group of records** (18 h bytes long) have the format:

1 3 5 7 9 11 13 15 17 19 21 23	
0000 (ffff) 0000 0000 0000 [ffff] 0000 0000 0000 0000 0000 0000	No weapon
0101 0000 0400 0008 0000 [ffff] 8214 0000 1405 6400 0000 0000	100 lb bomb
0201 0100 0800 000c 0000 [ffff]d020 0000 320f fa00 0000 0000	250 lb bomb
0301 0200 0c00 0010 0000 [ffff] 1e2d 0000 6419 f401 0000 0000	500 lb bomb
0401 0400 1400 0014 0000 [ffff] a041 0000 c832 e803 0000 0000	1000 lb bomb
0501 1900 0400 0008 0000 [ffff] 8214 0000 1605 6e00 0000 0000	50 kg bomb
0601 0500 0800 000c 0000 [ffff] d020 0000 2c0f dc00 0000 0000	100 kg bomb
0701 0600 0c00 0010 0000 [ffff] 1e2d 0000 6e19 2602 0000 0000	250 kg bomb
0801 0700 1400 0014 0000 [ffff] a041 0000 dc32 4c04 0000 0000	500 kg bomb
0904 1a00 0a00 0000 0000 [ffff] 0000 0000 0000 5000 3601 0000	45 gal tank
0a04 0e00 0c00 0000 0000 [ffff] 0000 0000 0000 5000 fe01 0000	75 gal tank
0b04 0f00 0e00 0000 0000 [ffff] 0000 0000 0000 5000 df02 0000	108 gal tank
0c04 1000 0e00 0000 0000 [ffff] 0000 0000 0000 5000 df02 0000	150 gal tank
0d04 1100 1400 0000 0000 [ffff] 0000 0000 0000 5000 fc03 0000	165 gal tank
0e04 1200 1800 0000 0000 [ffff] 0000 0000 0000 5000 6004 0000	200 gal tank
0f04 1300 0c00 0000 0000 [ffff] 0000 0000 0000 5000 5005 0000	300 litre tank
1002 1500 0102 1e03 d200 [ffff] 2706 0000 0a14 2800 0000 0000	M10 4.5" rocket
1102 1600 0102 1e04 d200 [ffff] 3408 0000 0c1e 5500 0000 0000	60 lb rocket
1202 1f00 0103 2d06 d200 [ffff] d809 0000 1028 8c00 0000 0000	HVAR 5" rocket
1302 1700 0102 140a d200 [7805] 6810 0000 0c0a b400 0000 0000	WGr 21 rocket
1402 1800 0003 2d02 d200 [bc02] 0d02 0000 0418 0a00 0000 0000	R4M rocket

1502 1200 0102 0014 bc02 [bc02] 0a041 0000 6419 4c04 0000 0000 * Hs-293 rocket

1602 0700 0103 0010 bc02 [bc02] 0040 0000 6419 9402 0000 0000 * Fritz-X rocket

1702 1600 0103 1e04 d200 [ffff] 3408 0000 0a14 2800 0000 0000 * Panzerschreckrocket

1801 0e00 0100 2002 0000 [ffff] 0852 0000 6e19 2602 0000 0000 *SD-10 cannister

1901 0f00 0100 000c 0000 [ffff] 495c 0000 64e19 f401 0000 0000 *500 lb Napalm bomb

1a01 ffff 0100 f401 d200 [ffff] f401 0000 8102 0500 0000 0000 *SD-2 bomblet

1b01 1800 0100 f401 0000 [ffff] f401 0000 8102 1400 0000 0000 *20 lb Incendiary

1c01 1800 0100 f401 0000 [ffff] f401 0000 8102 1600 0000 0000 *10 kg Incendiary

1d02 1200 0103 0030 dc05 [ffff] 0060 0000 6419 6412 0000 0000 *MXY7 Okha

1e00 0000 0400 0000 0000 [ffff] 0000 0000 1405 6400 0000 0000 *Underwing gun pod

1f00 0000 0400 0000 0000 [ffff] 0000 0000 320f fa00 0000 0000 *Twin gun pod

This data in WEAPONS.DAT is interpreted, mostly by Paulo, as:

Byte

1-2 1=Weapons code
2=Type (00=none, 01=bomb, 02=rocket, 04=fuel tank)

3-4 Code to image of weapon on rack and after firing/dropping (code numbers are from the ORDxx.3DZ files listed on page 6 e.g. 06=250 kg bomb, 1a (= 26d) = 45 gal tank) ffff = nil image

5-6 5=Negative quantity multiplier (e.g. 0c for 500 lb bomb,change to o2 to increase sqn stockpile)
6=Initial relative forward speed (You can make bombs or tanks behave as rockets)

7-8 2 bytes (int) is Impact Damage.

9-10 2 bytes (int) (only for rockets) time length of rocket motor exhaust

11-12 2 bytes (int) (only for German rockets), self destruct time/distance – all others ffff

13-14 2 bytes (int) is Blast Damage.

15-16 Null

17-18 2 bytes (int) Flight performance penalty

19-20 2 bytes (int) Empty weight (lbs)

21-22 2 bytes (int) Full Fuel weight (lbs), only for drop tanks.

23-24 Null

In the original, the WGr21 rockets seemed to fly forever without exploding. Replace the 6th value (7805) (=1400 d) with the R4M value (bco2) (=700 d) and they explode sooner. I now use 9001 (=400 d), which makes them explode at a range of about 2,000 - 3,000 feet, which seems about right.

The Henschel Hs-293 rocket bomb (500 kg warhead) and Fritz-X rockets can be carried by the Ju-88C, and the Fritz-X by the Me-410. They are useful for anti-ship missions. To find ships, fly to Southampton or Portsmouth (for Allied ships) or Emden (for German ships). There should always be a convoy of 1-3 DD's and 2-8 merchant/troop ships. In June 1944 there are also Allied ships off the coast of Normandy. The Fw-190A and Me-410 can carry the Panzerschreck rocket (6 under each wing). The Panzerschreck is a light 54mm anti-armour (not air-to-air) rocket.

For CAW I have added torpedoes, as in Moggy's "Midway" and depth charges:
The first two are the "invisible" torpedo
1502 1400 2003 001c 0000 [4006] 1824 0000 9065 d007 0000 0000 * Mk 13 Torpedo (formerly Hs-293)

1602 1400 2003 001c 0000 [2004] 1e2d 0000 9065 d007 0000 0000 * Type 91 Torpedo (formerly Fritz-X)

1801 2600 0100 0011 0000 [ffff] 5f37 0000 6419 5802 0000 0000 * Depth Charge

1e02 2400 0000 0015 0000 [ffff] 0000 x 6 * US Torpedo rack (shows up as a short Allied torpedo)

1f02 2500 0000 0015 0000 [ffff] 0000 x 6 * US Torpedo rack (shows up as a long Jap torpedo)

In the 2nd part of WEAPONS.DAT are the racks:
0d 08 24 08 78 00 0000
0e 08 22 08 78 00 0000

This gives weapon types:
- 15 US Mk 13 torpedo (short)
- 16 Jap Type 91 torpedo (long)
- 1e US rack
- 1f Jap rack

In LOADOUT.DAT the torpedoes are loaded by:

US 15 0d 01 03 (for internal torpedoes e.g. the Avenger) 15 03 01 03
1e 03 01 00

Jap 16 0e 01 03 (for internal torpedoes e.g. the Avenger) 16 03 01 03
1f 03 01 00

WEAPONS.DAT

2nd group of records (Weapons pylon data) (this block of data starts at byte 304 h)
There are 16 blocks, each 8 h bytes long, which have the following format:

	Description	Image	Weight, drag	Type
0000 ff00 0000 0000	00 Nothing	(No image)	Nil	
0101 ff00 0000 0000	01 Simple Mount	(No Image)	Nil	
0201 ff00 0000 0000	02 Simple Mount	(No Image)	Nil	
0300 ff00 0000 0000	03 Internal	(No Image)	Nil	
0402 0906 8200 0000	04 Rocket Tube	(Image 09)	06 82	M10 x3
0508 2000 0000 0000	05 Rocket rail	(Image 20)	Nil	HVAR x3
0608 2100 0000 0000	06 Rocket rail	(Image 21)	Nil	HVAR x5
0708 1d01 2800 0000	07 Rocket rail	(Image 1d)	01 28	60 lb x1
0808 1e02 5000 0000	08 Rocket rail	(Image 1e)	02 50	60 lb x2
0908 0a04 a000 0000	09 Rocket rail	(Image 0a)	04 0a	60 lb x 4
0a02 1c04 3c00 0000	0a Rocket tube	(Image 1c)	04 3c	WGr21 x1
0b02 0b08 7800 0000	0b Rocket tube	(Image 0b)	08 78	WGr21 x2
0c04 0c04 9600 0000	0c Rockets	(Image 0c)	04 96	R4M rack
0d02 1b04 3c00 0000	0d 20mm gun pod	(Image od)	04 3c	*New 20mm gun pod
0e02 0d08 7800 0000	0e Twin gun pod	(Image 0e)	08 78	*New Twin gun pod
0f02 1404 3c00 0000	0f 37mm gun pod	(Image of)	04 3c	*New Ju87 37mm gun pod

Thus **0n ot mm dd dd** 00 0000 where:
0n =**Number** (0 to c) in 1st block in LOADOUT.DAT
0t= **Type** 00=Nothing (internal)
01=Simple mount (bomb/tank)
02=Rocket tubes (M10, WGr21)
04=Rocket rack (R4M)
08=Rocket rails (60 lb, HVAR)
mm=**Image** ff=No Image
dddd = **Weight and Drag penalty**

In 3D.DAT there is a group of files ORD00-33.3DZ that contain the geometry definition, and pointers to BOMBS.TPC (the texture file), for the 34 different images for ordnance (weapons and mounts).
The coordinates for ordnance location are inside the main geometry definition file for each plane (PxxxF.3DZ). The five groups of coordinates at the end of the FLT file only define the launching point.

In decimal the above figures are:

No.	Type	Image	Weight	Drag		Type
0	0	255	0	0	0	
1	1	255	0	0	0	
2	1	255	0	0	0	
3	0	255	0	0	0	
4	2	9	6	130	0	M10 x3
5	8	32	0	0	0	HVAR x3
6	8	33	0	0	0	HVAR x5
7	8	29	1	40	0	60 lb x1
8	8	30	2	80	0	60 lb x2
9	8	10	4	160	0	60 lb x3
10	2	28	4	60	0	WGr21 single
11	2	11	8	120	0	WGr21 double
12	4	12	4	150	0	R4M rack
13	2	27	4	60	0	*20mm gun pod
14	2	13	8	120	0	*Twin gun pod

15	2	20	4	60	0	*37mm gun pod

SQUADRON ALLOCATION IN CAMPAIGNS
The squadrons available in campaigns are as follows:

German 1940

Squadron	Aircraft	Base	Start
II/JG 2	Bf-109E	Beaumont le Roger	Aug 40
III/JG 2	Bf-109E	Le Havre	Aug 40
II/JG 26	Bf-109E	Marquise	July 40
III/JG 26	Bf-109E	Caffiers	July 40...now I/KG 51 (Ju-88A)
II/JG 51	Bf-109E	Wissant	July 40
III/JG 51	Bf-109E	St Omer	July 40...now III/StG 2 (Ju-87)
II/ZG 2	Bf-110C	Guyancourt	Aug 40...now II/KG 53 (He-111)
II/ZG 26	Bf-110C	St Omer	July 40
EGr 210	Bf-110C	Abbeville	July 40

German 1943

Squadron	Aircraft	Base	Start
II/JG 1	Fw-190A	Woensdrecht	Apr 43
III/JG 1	Bf-109G	Deelen	Apr 43...now III/ZG 1 (Me-410)
II/JG 2	Bf-109G	Creil	Apr 43
III/JG 2	Fw-190A	Cormeilles	Apr 43
II/JG 3	Bf-109G	Schipol	Aug 43...now I/NJG 1 (Ju-88C)
I/JG 11	Fw-190A	Rheine	Apr 43
II/JG 26	Fw-190A	Vitry	Apr 43
III/JG 26	Bf-109G	Wevelghem	Apr 43...now I/KG 51 (Me-410)
III/ZG 76	Bf-110G	Plantlunne	Aug 43

German 1944

Squadron	Aircraft	Base	Start
II/JG 1	Fw-190A	Le Mans	June 44
III/JG 1	Bf-109G	Beauvais	June 44...now III/ZG 1 (Me-410)
II/JG 2	Bf-109G	Creil	June 44
III/JG 2	Fw-190A	Creil	June 44
II/JG 3	Bf-109G	Lechfeld	June 44...now I/NJG 1 (Ju-88C)
III/JG 7	Me-262	Lechfeld	Nov 44
I/JG 11	Fw-190A	Rheine	June 44
II/JG 26	Fw-190A	Guyancourt	June 44
III/JG 26	Bf-109G	Villacoublay	June 44...now I/KG 51 (Me-410)
II/JG 300	Fw-190A	Frankfurt	July 44

British 1940

Squadron	Aircraft	Base	Start
1 Sqn	Hurricane	Northolt	July 40
41 Sqn	SpitfireI	Hornchurch	Aug 40
43 Sqn	Hurricane	Tangmere	July 40
74 Sqn	Spitfire IHornchurch	July 40	
85 Sqn	Hurricane	Martlesham	July 40
111 Sqn	Hurricane	Croydon	July 40
303 Sqn	Hurricane	Northolt	Aug 40
501 Sqn	Hurricane	Croydon	July 40
610 Sqn	Spitfire I	Gravesend	July 40
1 (Can) Sqn	Hurricane	Northolt	Aug 40

British 1943

Squadron	Aircraft	Base	Start
1 Sqn	Typhoon	Biggin Hill	May 43

56 Sqn	Typhoon	Manston	May 43
64 Sqn	Spitfire IX	Hornchurch	May 43
181 Sqn	Typhoon	Gravesend	May 43...now 141 Sqn (MosqVI)
303 Sqn	Spitfire IX	Newchurch	May 43
401 Sqn	Spitfire IX	Kenley	May 43
611 Sqn	Spitfire IX	Biggin Hill	May 43

British 1944

Squadron	Aircraft	Base	Start
121 Wing	Typhoon	Holmsley South	May 44
122 Wing	Spitfire IX	Detling	May 44
124 Wing	Typhoon	Hurn	May 44
132 Wing	Spitfire IX	Funtington	May 44
143 Wing	Typhoon	Hurn	May 44.now 140 AnzacWing(MosqVI)
144 Wing	Spitfire IX	Ford	May 44
150 Wing	Tempest	Newchurch	May 44

U.S. 1943

Squadron	Aircraft	Base	Start
4th FG	P-47C	Debden	Apr 43
20th FG	P-38H	Kings Cliffe	Nov 43
55th FG	P-38H	Nuthampstead	Oct 43
56th FG	P-47C	Horsham St Faith	Apr 43
78th FG	P-47C	Duxford	Apr 43
352nd FG	P-47C	Bodney	Sept 43
353rd FG	P-47C	Metfield	Aug 43...now 323rd Bomb Grp (B26)
354th FG	P-51B	Boxted	Dec 43

U.S. 1944

Squadron	Aircraft	Base	Start
4th FG	P-51B	Debden	May 44
20th FG	P-38J	Kings Cliffe	May 44
55th FG	P-38J	Wormingford	May 44
56th FG	P-47D	Boxted	May 44
78th FG	P-47D	Duxford	May 44
352nd FG	P-51B	Bodney	May 44
353rd FG	P-47D	Raydon	May 44 ... now 323rd Bomb Grp (B26)
354th FG	P-51B	Boxted	May 44
357th FG	P-51B	Leiston	May 44

SQXXXX.DAT e.g SQGR40.DAT

There are 8 SQXXXX.DAT files which allocate squadrons:

SQGR40.DAT	(and SQGR43.DAT and SQGR44.DAT)
SQUK40.DAT	(and SQUK43.DAT and SQUK44.DAT)
SQUS43.DAT	(and SQUS44.DAT).

The format is the same. Each file is comprised of a number of blocks, one for each squadron (e.g. 9 German squadrons in 1940), each 7c (124 d) bytes long. The format of each block is:

00-01	9x07	Year.	9407h=1940, 9797h=1943, 9807h=1944
02-03	om0d	Start date	Month/Day (00=Jan, 04=May, 06=July, 07=Aug, 0a=Nov, 0b=Dec)
04-05	bb00	Air Base	e.g. 08=St Omer, 3c=Le Havre
06	aa	Aircraft code	see page 2, e.g. 00=P38H, 10=Bf-109E, 1b=Ju-87
07	0n	Establishment of Pilots	
08	0p	Establishment of Planes	
09-0b	ffc800	3 bytes - (maybe pilot experience and morale?)	
0c-0d	03 00	Number of possible squadrons/staffels that one can be assigned to	
0e-12	pp pp pp pp pp	5 bytes - Probability (out of 100 h) of mission types: Escort/Sweep/Bomb/Intercept/Interdict e.g. 80 80 00 00 00= 50% escort, 50% sweep 10 40 b0 00 00= 6% escort, 25% sweep, 68% attack 00 40 40 20 60=25% sweep, 25% bomb, 12% int'cept, 37% interdict	
13-15	uu uu uu	Unit sign/Unit designation/Unit long description	
16-19	0d 17 18 19	Squadron/Staffel designations	
1a-1b	02 02	Number of airfield moves/number of aircraft updates (4+4 max)	
1c-2b	(4x 4 blocks)	Airfield changes. Probability/Mission number in 25/Airfield number (the ffff [65535] value is a mystery. It only happens in UK43-44, and may mean move to continental provisional airfields??)	
2c-3b	(4x 4 blocks)	Aircraft upgrades. Probability/Mission number in 25/New Aircraft e.g (Spit9->Typhoon->Tempest)	
3c-5b		20 h (32 d) bytes of unknown flags.	
5c	(8x 4 blocks)	Weapons stockpiles. Weapon code/First mission available/Amount	

The alternative staffels you could be in in a particular Gruppe (see the number just before the mission probability types for quantity of choices). e.g. in SQGR40.DAT, III/JG 51 has 3 choices (byte 278=03). Then starting at byte # 16 h are the name references: od 17 18 19.
These are references to the squadron names 0d, 17, 18 and 19 in SQNAMEGR.STR, namely III/Jagdgeschwader 51, Staffel 7, Staffel 8 and Staffel 9 respectively.

The first plane update is at byte # 2c.
e.g. 8017 1200 = upgrade to Bf-109K,
0000 0000 = no upgrade (e.g. all German squadrons in 1940).

Remember that the stockpiles are affected by the "negative multiplier" in WEAPONS.DAT.

The airbase code are set out on the following page. The names are in TARNAMES.STR. This list is in two parts, the second starting at 0a43 after ZWICKAU, which appears to be a list (not properly ordered, however) of airbase names.

AIR BASE CODES are as follows:

00	Horsham St Faith
01	Halesworth
02	Boxted
03	Debden
04	Raydon
05	Leiston
06	Vitry
07	Wevelghem
08	St Omer
09	Poix
0a	Beaumont le Roger
0b	Grimbergen
0c	Schiphol
0d	Deelen
0e	Woensdrecht
0f	Florennes
10	Cambrai
11	Beauvais
12	Chievres
13	Eindhoven
14	Evreux
15	Cormeilles
16	Guyancourt
17	Villacoublay
18	Rosieres
19	Jever
1a	Juvincourt
1b	Laval
1c	Le Culot
1d	Luneburg
1e	Oldenburg
1f	Plantlunne
20	Paderborn
21	Nordhorn
22	Drope
23	Bissel
24	Stade
25	Parchim
26	Merzhausen
27	Nidda
28	Vannes
29	Altenstadt
2a	Brandis
2b	Quakenbruck
2c	Achmer
2d	Rotenburg
2e	Salzwedel
2f	St. Dizier
30	St. Trond
31	Pommsen
32	Borkheide
33	Juterbog
34	Lobnitz
35	Twente
36	Wissant

37	Wunstorf
38	Kaltenkirchen
39	Briest
3a	Le Bourget
3b	Rhein-Main
3c	Le Havre
3d	Giebelstadt
3e	Kirrlach
3f	Malmsheim
40	Echterdingen
41	Martlesham
42	North Weald
43	Rochford
44	Northolt
45	Hornchurch
46	Gravesend
47	Manston
48	Biggin Hill
49	Kenley
4a	Tangmere
4b	Eastchurch
4c	Detling
4d	Croydon
4e	Middle Wallop
4f	Hawkinge
50	West Malling
51	Duxford
52	Lympne
53	Westhampnett
54	Hurn
55	Ford
56	Holmsley South
57	Thorney Island
58	Chailey
59	Bodney
5a	Funtington
5b	Selsey
5c	Merston
5d	Newchurch
5e	Needs Ore Point
5f	Leipheim
60	Lechfeld
61	Neuberg
62	Leipheim
63	Munich
64	Oranienburg
65	Chaumont
66	Le Mans
67	Audembert
68	Marquise
69	Caffiers
6a	Abbeville
6b	Bremen
6c	Brunswick
6d	Chartres
6e	Dortmund
6f	Amiens

70	Amsterdam
71	Dusseldorf
72	Frankfurt
73	Berlin
74	Wiesbaden
75	Hamburg
76	Tours
77	Hannover
78	Bonn
79	Brussells
7a	Kiel
7b	Caen
7c	Konigsburg
7d	Leipzig
7e	Lille
7f	Cherbourg
80	Magdeburg
81	Mannheim
82	Morlaix
83	Nuremburg
84	Creil
85	Paris
86	Pilsen
87	Rennes
88	Reims
89	Rheine
8a	Rostock
8b	Darmstadt
8c	Diepholz
8d	Metz
8e	Cuxhaven
8f	Munster
90	Stuttgart
91	Lubeck
92	Laon
93	Freiburg
94	Alconburg
95	Rattlesden
96	Framlingham
97	Knettishall
98	Nuthampstead
99	Chelveston
9a	Kings Cliffe
9b	Metfield
9c	Bassingbourn
9d	Wormingford
9e	Shipdham
9f	Hethel
a0	Great Dunmow
a1	Andrews Field

CAMPxx4x.DAT e.g. CAMPGR40.DAT

The structure of the CAMPxx4x.DAT files has been fully set out by Emil in his (July 2002) notes on campaigns (http://www.emil.free.fr/home.htm). The following is a superficial analysis of the first part of the files only.

There is one of these files for each campaign. They are each 3708 d bytes long. The file format is:
Byte # (h) (all discovered so far are shorts)

00-01 Year } Campaign commencement date 9407=1940, 9707=1943, 9807=1944
02 Month } 00=Jan, 04=may, 06=July, 07=Aug, ob=Dec
03 Day }

04 Briefing language and art (8000 h =German, 0001= British, 0002=American)
06-07 Always 0000
08-09 Attacking side. 1940 campaigns are 8000, all others are 0002 :German/US offensive ? Or controls fighter sweeps? (8000 eliminates fighter sweeps?)
0a-0b Always 0000
0c Campaign type. 1940 campaigns have 0200, 1943 - 0300, and 1944 - 0400
0e-of Attacking base 1940 campaigns have 1A (Calais), 1943/44 have 0A01 (London)
10-11 Attackers capital 1940 have 0A (Berlin), 1943/44 have 0A01 (London)
12-13 Defender's capital. 1940 have 0A01 (London), 1943/44 have 0A00 (Berlin)
14-15 Number of available squadrons number in the corresponding SQxx4x.DAT file (e.g. in CAMPGR40.DAT this is 09, and in SQGR40.DAT there are 9 German squadrons in 1940)
16 Number of special events (max. 32)
17 Number of special missions (max 32)
18 Number of campaign's phases (max. 25)
19 Phase length in days. 1940 campaigns are 07, 1943/44 are 1e.
1a A mission every ... days (normal campaign setting doubles this value). This is sometimes affected by some other byte, because in the BOB (British side) between middle August - middle-September missions happen every two days, not three as at the beginning or end.
1b Number of types of available planes defined at offset 33c

1c Here begins part of the file that describes campaign phases. The entire part consist of 25 chunks, each 32(d) bytes long. 1940 campaigns use only 10 (d) of them. The entire part is 320 h (800 d) bytes long.

Targets in England

Object Nr.	Hex Code	Target for Escort Missions	Target for Bombing Missions
00	00	Random target	Random target
01	01	-	-
02	02	-	-
03	03	-	-
04	04	Aircraft factory	-
05	05	Airfield	Airfield
06	06	Ammo factory / Shipyard	-
07	07	-	
08	08	Shipyard	-
09	09	-	-
10	0A	-	-
11	0B	-	-
12	0C	-	-
13	0D	-	-
14	0E	-	-
15	0F	-	-
16	10	-	-
17	11	Heavy Flak (no Briefing)	Heavy Flak
18	12	Light Flak (no Briefing)	Light Flak
19	13	-	-
20	14	Radar Station	Radar Station
21	15	Radar Station	Radar Tower
22	16	-	-
23	17	-	-
24	18	Fuel Dump (Airfield)	Fuel Dump (no Briefing)
25	19	AC Tower (Airfield)	AC Tower (no Briefing)
26	1A	Ammo Bunker (Airfield)	-
27	1B	Hangar (Airfield)	-
28	1C	Barracks (no Briefing)	Barracks (no Briefing)
29	1D	Mess Hall (no Briefing)	-
30	1E	-	Headquarters (no Briefing)
31	1F	Briefing Room (no Briefing)	-
	EE	Ship Convoy	Ship Convoy
	EF	?	?
	FF	Fighter Sweep	Fighter Sweep

Targets on the European mainland

Object Nr.	Hex Code	Target for Escort Missions	Target for Bombing Missions
00	00	Random traget	Random traget
01	01	Oil Refinery	-
02	02	Ball Bearing Plant	-
03	03	Chemical Plant	-
04	04	Aircraft Factory	-
05	05	Airfield	Airfield
06	06	Armament Factory	-
07	07	Railyard	-
08	08	Shipyard	-
09	09	U-Boat Pen	-
10	0A	„Noball“ Site [works only sometimes, don’t know why]	-
11	0B	-	-
12	0C	-	-
13	0D	-	-
14	0E	-	-
15	0F	-	-
16	10	-	-
17	11	Heavy Flak (no Briefing)	Heavy Flak
18	12	Light Flak (no Briefing)	Light Flak
19	13	Oil Storage (no Briefing)	Oil Storage (no Briefing)
20	14	Radar Station	Radar Station
21	15	Radar Station	Radar Tower (Radar Station)
22	16	-	-
23	17	Fort (no Briefing)	Fort (no Briefing)
24	18	Fuel Dump (Airfield)	Fuel Dump (no Briefing)
25	19	AC Tower (Airfield)	AC Tower (no Briefing)
26	1A	Ammo Bunker (Airfield)	-
27	1B	Hangar (Airfield)	-
28	1C	Barracks (no Briefing)	Barracks (no Briefing)
29	1D	Mess Hall (no Briefing)	Headquarters (no Briefing)
30	1E	Headquarters (no Briefing)	-
31	1F	Briefing Room (no Briefing)	Briefing Room (no Briefing)
41	29	Warehouse (no Briefing)	-
	EE	Ship Convoy	Ship Convoy
	EF	?	?
	FF	Fighter Sweep	Fighter Sweep

Some notes:

- These are the working Hex-Codes for use at bytes 25 to 32 of the campaign phases chunks in camp**4 *.dat.
- “Target for escort missions” are the targets that the bombers you have to escort can be ordered to attack, “Targets for bombing missions” are the targets you can be ordered to attack
- The words in parenthesis are the targets you are told to attack in the briefing, if there is written “no briefing” in parenthesis you will be told nothing in briefing, but you see what target to attack in the map. Seems there is no speech file for these targets.
- How does EAW handle the bytes 25 to 32 of the campaign phases chunks? My experience is that EAW looks at these bytes and takes the first byte that works as a target code: E.g. if byte 25 is 0B it will not work, cause 0B is not a valid target code, so EAW looks at the next byte (byte 26) and so on till it finds a working code. If there is no valid code at bytes 25 to 32 EAW will order you to perform a ‚fighter sweep‘. On the other hand I’m not sure about what’s happening when EAW finds more than one valid target code at bytes 25 to 32. I suppose that the bytes 25 to 32 are chronologically arranged

so that target codes at the first bytes are used at the beginning of the campaign phase and the last bytes at the end of the phase.

- Some target codes in detail:
  00 orders an attack on a randomly chosen target. ☺
  FF forces EAW to order a fighter sweep
  EF remains a mystery. EF is used in the original camp**4*.dat files, so it should have a meaning, but I was not yet able to get to know what it is standing for. ☹
- Unfortunately the targets for the interdictions missions are not coded at these bytes of camp**4*.dat. Changing of bytes 25 to 32 showed no influence on that.
- As written above I don't think that bytes 26, 28, 30 and 32 have something to do with the target area as Charles assumes in his EAW notes.
- I had a try with all possible Hex-values (00 to FF) so there are no more surprises and no need to try them all again... ;)

THE EAW WORLD

Moggy and Dom worked all of this out. A more comprehensive set of notes on this topic, from which this is drawn, can be found on Moggys website (http://www.soft.net.uk/isis/download/download.htm) under "Moggy's Notes", and in Dom's "Editing Notes on EAW Terrain and Airfield/Ground Target Files".

EAW.TM and **EAW16.HM**
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.

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.
- **AIRFILED.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.

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-res) and LR*.TER (high-res)) 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.

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 ...

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.

TARGETS.DAT
Targets.dat places the principal markers for all target locations - towns and airfields, by setting the coordinates in the EAW world and then determining how many actual targets there will be at this location.

The first four bytes in the file are the header. The number "01 2E" in the header is equal to the number of lines or target locations in this file (302). Each line constitutes a "record" for each target location whether town or base.

The first 8 bytes (0-7) are the cooordinates in the EAW world - see DOM's notes for an explanation of how this works.
The next 8 bytes (8-15) are as yet unknown in purpose though 10-11 are always null
Bytes 16-17 identify the record (or line) number in targets.str and therefore the name of the target location
Byte 18 is unknown.
Byte 19 fixes the numbers of records (or lines) pertinent to this target location in tardata.dat, and therefore the number of actual target mods in this location.
Bytes 20-21 identify the commencing record (or line) number in tardata.dat.
Bytes 22-23 are always null.
Bytes 24-25 identify the Airbase code if the location is a base, or is null if the location is a town.
Bytes 26-31 are as yet unknown.

By changing the coordinate values (bytes 0-7) in targets.dat you can move the whole target location and all relevant target mods controlled by tardata.dat at that location with it. This is subject to any adjustments you may have to make to griddata.dat (as DOM's notes explain) if the move is a large one. By changing byte 19 you can allow for an increased number of target objects at the target location, and specify the new objects in new records in tardata.dat.

TARDATA.DAT
Tardata.dat sets out the airbases and actual target objects at each location with respect to the target sites determined in targets.dat. Tardata.dat in effect sets up a local version of the EAW grid, and using that grid places the airbase, buildings, AA guns, and other objects, and fixes their orientation.

The first four bytes in the file are the header. The number "0E F2" in the header is equal to the number of lines or target objects in this file (3826). With 3,826 records or lines of 32 bytes each, each record deals with a single ground target. This file does not deal with non-target ground objects such as trees, farms, and city buildings etc, which are placed by EAW_TTD.DAT.

Bytes 0 has values 01, 81, 09 or 89, and byte 1 has values 00 or 01. The function of these are unknown.
Bytes 2-3 are always null.
Byte 4 contains the tmod file number (in hexadecimal foemat) and therefore identifies the target type. In the illustration above, in the first two records the value at byte 5 is 07, and tmod07_*.3dz is the train station. Byte 5 is always null, as are bytes 6-7.
Bytes 6 and 7 are always null
Bytes 8 and 9 are the record or line number of the target location from targets.dat.
Bytes 10-11 are always null.
Bytes 12-19 contain the two groups of coordinates for placing the target in the local grid system with respect to the main target marker placed by targets.dat.
Bytes 20-23 are unknown.
Bytes 24-25 set the orientation of the target with 00 00 being north, and 0080 being south.
Bytes 26-27 (many are null) are unknown.
Bytes 28-31 are always null.

In working with tardata.dat you can change the number, type, and position of target objects at any given location. You can add lines to tardata.dat by changing the number of records set in the header bytes. In doing that you may need to change the numbers of targets for each location, and the starting record number for each location which values are stored for each location in targets.dat as explained in the relevant section above.

FRNTLINE.DAT
Dominique Legrand ("Dom") (legrand@cri.univ-lille1.fr) worked this out. The file FRNTLINE.DAT (in DATA.CDF) contains a total of 20 predefined front lines (20 blocks of 600 bytes). The first one is located in the channel. It is used in the 1940 and 1943 campaigns (static campaigns). The 19 others are the different front lines of the 1944 campaign, from Normandy to Germany. EAW will use it in both campaign and single mission modes.

FILE STRUCTURE OF FRNTLINE.DAT
The file is 12,000 (dec) bytes long and consists of 20 blocks of 600 bytes each.

Each block contains the data of a particular front line :
- block #1 : default front line used in the static 40 and 43 campaigns, as well as in the beginning of the 44 campaign.

- blocks #2-20 : 19 front lines used in the dynamic 44-45 campaign from Normandy Front to Eastern Germany.

STRUCTURE OF A BLOCK :
Each block consists of 9-27 patterns, each coding for the coordinates of one point of the front line :
The first pattern codes for the down or right end point of the front line.
The last pattern codes for the upper or left end point of the front line.
A total of 29 patterns (points) are possible for one front line.

Structure of a pattern (20 bytes) :
bytes 0-7 : coordinates of a point. These data are coded (code unknown at the moment).
byte 7 : E9 to E4. Always E4 for the last pattern of a block. First pattern : E7 in blocks #1-6 and E9 in blocks #7-20
bytes 8-15 : always FF FF FF FF FF FF FF FF
byte 16 : either 00 or 01. This byte determines whether the point is connected to the following one with a blue (or red) line on the mission maps. 00 : no line; 01 : line. (Points located in the sea have byte 16= 00)
bytes 17-19 : always 00
End of a block : a repeat of sixteen bytes set to FF.

The structure of a block can be edited to create new front lines, combining yet-existing point coordinates or creating new ones (?).

Aircraft availability in CAMPxx4x.DAT

Then at Byte # 33C are the descriptions of aircraft availability. I am not completely sure what these files do, but they do control enemy aircraft appearing in missions. For example, in CAMPGR40.DAT at byte # 37c the Ju-87 is as follows:

1B 00 **04 FF 2C 01** 00 00 **00 00** 00 00 **00 00** 00 00

The relevant parts are:

1-2 Aircraft code (see p.1) (e.g. 1B = Ju87)
3 Withdrawal date, by phase (see above) (04 =4th phase)
4 Replacement plane (FF =none)
5-6 Probability of plane appearing in a mission AT THE START OF CAMPAIGN (2C 01 =300)
7-8 Always 0000
9-10 Prob of plane appearing after MID-CAMPAIGN date byte#3 (00 00 =none, as its withdrawn)
11-12 Always 0000
13-14 Prob of plane appearing after mid-campaign date IF the plane wasn't available at the beginning of campaign. (00 00 =none).

To make this a little clearer compare the above example to the Ju88A in 1940:

Type	1	3	5	7	9	11	13	15
109E=1000	19ff	c800	0000	1000	0000	0000	0000	
110C=1300	19ff	6400	0000	0800	0000	0000	0000	
Ju88 =1900	19ff	0000	0000	0c00	0000	0000	0000	
Ju87= 1B00	04ff	2c01	0000	0000	0000	0000	0000	
H111=1c00	19ff	9001	0000	0c00	0000	0000	0000	

In this case the Ju88A is available at the start but has no chance of appearing as bytes 5&6 are blank. But when it does appear in mid-campaign '0c' the probability is 600. It serves to the end of the campaign (phase 19 h =25 d) and therefore has no replacement = 'FF'. The bytes after FF seem to refer to probability of appearance in missions. If you look at the numbers, you'll notice the bigger ones tend to appear more frequently. For example:

He-111s (9001=400 d) are more than Ju-87s (2c01=300 d). Hurricanes (2c01 =300 d) are more than Spitfires (6400 =100 d) . The 1940 campaign has no plane replacements but 1943 and 1944 campaigns do. The P-47C has the P-47D's ID in the fourth position. The P-38H has the J model. The P-51B has the D model. The FW-190A has the D model, etc....Curiously the Bf-110G has the ME-262 as its replacement.

At offset 580h are possibly the bytes that probably control escort type for bombers, but I haven't yet worked on them much.

CAREER0x.SVE
This information was worked out by Nick Bell. The files CAREER0x.SVE contains the data concerning each career pilot. It is found in the SAVEDATA subdirectory. (The 00 is the 1st pilot you created, 01 the 2nd and so on. This will change as you delete career pilots so just look at the top of the file where your pilot's name occurs.)

Changing Planes in a Career
It is possible to change one plane for another during a career. This works with planes on the same side only. If you change for an enemy plane your ground staff will shoot you up before you take off! Go to byte 00022fb6 h. If your present plane is a P51 it will be 04, and if a Bf-109E, 10. Change the aircraft code to the plane you want to fly.

Changing Pilot Names
In the same CAREER00.SVE file a little further down, at byte 235a5 h, are the names of all the pilots in your squadron. Just change the names to your liking by re-typing them.

Changing Aircraft Replacement Rate
Offset 143297 d (22fc1 h) in CAREER00.SVE is the byte for aircraft replacement, which sometimes is set at zero (e.g the British 1940 and 1943 campaigns). It can be changed from zero to a large number.

Changing the current number of planes
Losses? The current number of planes is in CAREERxx.SVE near the end. Search for your staffelname and in among the next 'set' of hexvalues after it should be 06 (at offset 00022FC1 ?). Change it to 0C.

Nick Bell (nbell@icdc.com) has also created a small editor for CAREER0x.SVE. It is available from his web page (http://www.photohosting.com/users/HKL/hkl.htm). The following is part of the TXT file that goes with it.

Edit Squadron Data
Remember that changing your squadrons aircraft to enemy types will cause your airfield AAA defenses to fire at you while on the runway. I've found that moving my Allied squadrons to France or Belgium after the invasion in 1944 was a pleasant change of pace and shortened my flying time considerably. There is no problem with escorting 8th AF formations flying out of England if you move to the mainland. The program recalculates the rendezvous point with the bombers to a point over Europe. You don't have to fly back to England to meet them.

Edit Pilot Data
Fatigue and Morale: Let me start by saying I presume these are the pilot fatigue and morale values. Fatigue increases every mission. It increases a lot if the pilot bails out, and drops between missions if the pilot doesn't fly. Setting the fatigue level to 0 improves the AI pilots performance, and apparently makes them much more likely to survive bailouts.

Morale increases a variable amount based on the success of the mission. Mission failure causes the morale value to drop. The most visible thing I've noticed with setting the morale to maximum (255) is that the AI pilots are more willing to engage for longer periods. As an Allied player this is useful, as it keeps the escorts more in the fight. As the German, this might not be such a great solution, as the AI pilots hang around longer and have a tendency to get shot down more as they make ineffective passes with MG's only. Setting the German pilots to low(er) morale makes them make a few passes at the bombers and then the head home. This lessens their casualties, but doesn't help them down bombers, either. Experiment and let me know what you think is a good value.

Sorties and Kills: Apart from being able to credit yourself kills you "know" you got, I have read that some players feel that AI pilots with very high sortie and kill counts are better. (note that although I know where the data is in the career file, I do not consider worth the time/effort to hack and code and editor for the pilot log, so changing your kill count is only on the scoreboard).

Rank: Along with fatigue, rank determines who flys and what position they fly in. Note that promotion points are also tracked. They are stored in one of those Unknown data types. I just haven't bothered to figure it out. When I have set all unknown values to the maximum, pilots get promoted very quickly, so it's there somewhere.

Pilot Status: I've never seen Wounded or Rescued on the Squadron Status Board, but they're in there. Not sure of the effects. Would be interesting to see if wounded pilots "heal" over time. Note that Allied and German Pilots use different values for the same status. It might be interesting to put an enemy pilot in your squadron and see what happens. In any case, you can easily rescue/recover or bring back to life your favorite pilots.

According to the Microprose, selecting an 'easy' campaign gives the player better squadron members. In comparision between AI pilots created in easy campaigns vs those created in hard campaign, the easy campaign pilots have higher values.

Medals

Pedro Alvim found the byte for the medals in the CAREERxx.SVE file: 235c5. The values give a sequence of combinations of medals in the board (for now he has worked only German medals):

IC2= Iron Cross 2nd Class
IC1= Iron Cross 1st Class
GC= German Cross
KC=Knights Cross
KCO= KC + Oak Leaves
KCS= KCO + Swords
KCD= KCS + Diamonds
- = empty medalboard
* = not known

D HEX Luftwaffe Medals

0 00 -
1 01 IC2
2 02 IC1
3 03 -
4 04 GC
5 05 IC2+GC
6 06 IC1+GC
7 07 GC
8 08 KC
9 09 IC2+KC
10 0a IC1+KC
11 0b KC
12 0c KC+GC
13 0d IC2+KC+GC
14 0e IC1+KC+GC
15 0f KC+GC
16 10 -

17 11 IC2
18 12 IC1
19 13 -
20 14 GC
21 15 IC2+GC
22 16 IC1+GC
23 17 GC
24 18 KCO

25 19 *
26 1a *
27 1b *
28 1c GC+KCO
29 1d *
30 1e IC1+GC+KCO
31 1f *
32 20 *

33 21 IC2+KCS
34 22 *
35 23 *
36 24 *
37 25 *
38 26 IC1+GC+KCS
39 27 *
40 28 *
41 29 *
42 2a *
43 2b *
44 2c *
45 2d *
46 2e IC1+GC+KCD

The sequence EAW uses is:
01 = IC2 5 kills
02 = IC1 11 kills
06 = IC1+GC 15 kills
0e = IC1+GC+KC ...
1e = IC1+GC+KCO ...
26 = IC1+GC+KCS ...
2e = IC1+GC+KCD ...

If we modify the byte, the medals get stored in the Hall of Fame (HOF). When we are in the MB or HOF and if we click on the medal to see info, the game shuts down: I don't know why (probably because the medal info board is stored in another unknown byte, and must correspond).

EAW SAVED MISSION (*.MSN) FILES

All *.MSN files are 400 bytes long. The options on the selection screen are:

Year	(1940, 1943, 1944 or 1945)
Time	(Dawn, Day,Dusk)
Weather	(Random, Clear, Partly Cloudy, Heavy Cloud, Overcast)
Instant Action	(Yes or No)
Mission	(Ftr Sweep, Bomb, Intercept, Interdict, Escort Flight)
Target	
No. of Aircraft	
Cruise Altitude	(Random, Low, Medium, High)
Home Base	
Friendly Secondary Aircraft	
Formation Size	(Random, Small, Medium, Large)
Pilot Skill	(Random, Green, Seasoned, Expert)
Enemy Activity Level	(Random, Light, Moderate, Heavy)
Enemy Primary Aircraft	
Enemy Secondary Aircraft	
Enemy Pilot Skill	(Random, Green, Seasoned, Expert)
Enemy AAA Level	(Random, Light, Moderate, Heavy)

The format of the *.MSN file is:

Bytes				
00-0b	xxxx xxxx 6502 00aa Not known			
09	Instant Action (80) or not (00)			
0c-23	File Name e.g. "Spitfire Ia vs Bf-109 E-4"			
24-10f	All zeros 0000 0000.....			
110	Year	00=1940	01=1943	
		02=1944	03=1945	
114	Time of Day	00=Random	01=Dawn	02=Day
		03=Dusk	04=Night (?)	
118	Weather	00=Random	01=Clear	02=Partly Cloudy
		03=Heavy Cloud	04=Overcast	
11c	Mission Type	00=Escort	01=Ftr Sweep	02=Bomb
		03=Intercept	04=Interdiction	
120	Target e.g.	17=Tangmere	36=Hornchurch	
		3e=Le Havre	4f=Beaumont le Roger	
124	No. of Aircraft in Player's flight			
128	Cruise Altitude	00=Random	01=Low	
		02=Medium	03=High	
12c	Home Base			
130	Friendly Secondary Aircraft : Use Aircraft code or feff ffff= None			
134	No. of Friendly Aircraft			
138	Pilot Skill			
13c	Enemy Activity	00=Random	01=Light	
		02=Moderate	03=Heavy	
140	Enemy Primary Aircraft	(see above)		
144	Enemy Secondary Aircraft	(see above)		
148	Enemy Skill Level	00=Random	01=Green	
		02=Seasoned	03=Expert	
14c	Enemy AAA Level	00=Random	01=Light	
		02=Moderate	03=Heavy	
164	Player Aircraft Type	(see above)		
168	Friendly Secondary Aircraft	(see above)		
17c	Enemy Primary Aircraft	(see above)		
180	Enemy Secondary Aircraft	(see above)		

The problem with MSN files editing is the first 4 bytes. Most probably are some sort of encoded checksum. If you take a look into EAW.EXE you will find references to a public key that could related with this

problem or with the CD validity check.

EAW SOUNDS
Meatwater's Soundpacks (http://www.meatwater.de) have new sound files.
The sound files format is: snd00xx.snd
Paulo Morais has utilities for converting RAW format sound files to EAW format and vice-versa.

In Meatwater's Version 1.3 the files are:

snd0009.snd	35.1k	Bomb whistle
snd0025.snd	906 bytes	.30 cal MG
snd0026.snd	805 bytes	.50 cal MG
snd0027.snd	1.03 k	20 mm cannon
snd0028.snd	1.49 k	30 mm cannon
snd0029.snd	34.8 k	Rocket launch
snd0050.snd	183 k	Gear up/down
snd0051.snd	74.5 k	Parachute
snd0052.snd	32.9 k	Touchdown

In Meatwater's Version 2.0 the files are:

snd0003.snd	67.8k	Flak explosion
snd0004.snd	133k	Bomb explosion
snd0009.snd	46k	Bomb whistle
snd0019.snd	45.2k	Flak shot
snd0020.snd	37.6k	Flak hit
snd0022.snd	128k	Plane explosion
snd0023.snd	115k	" "
snd0025.snd	3.34k	.30 cal MG
snd0026.snd	4.36k	.50 cal MG
snd0027.snd	5.19k	20 mm cannon
snd0028.snd	6.05k	30 mm cannon
snd0029.snd	77.4 k	Rocket launch
snd0030.snd	233k	Radial startup
snd0031.snd	319k	Radial running
snd0034.snd	234k	In-line startup
snd0035.snd	114k	" running
snd0038.snd	80.2k	Me-262 startup
snd0039.snd	247k	" running
snd0042.snd	118k	Other engines
snd0043.snd	69k	Bomber engines
snd0044.snd	184k	V-1 engine
snd0047.snd	292k	Engine failure
snd0050.snd	183k	Gear up/down
snd0052.snd	32.9 k	Touchdown

grb_031.snd and gbrf.cdf	8963k	German briefing
aradio1m.adp and aradio2m.adp	}	American Radio music
bradio1m.adp and bradio2m.adp	}5691k	British Radio music
gradio1m.adp and gradio2m.adp	}	German Radio music (incl Lilli Marlene)

I prefer the Version 1.3 .30 and .50 cal MG sounds, but otherwise the Version 2.0 sounds.

The SND file structure is made of a header part of 7 DWORD (28 bytes total length) followed by waveform data (RAW format in the sense of the program Wave Studio bundled with old SB cards. From the seven header parameters only 4 matter:

#3 - data size in bytes
#4 - sample rate (Hz)
#5 - resolution 8 or 16 for bits
#6 - 1 stereo, 0 mono
By using Paulo Morais' SND2RAW.EXE the header is striped and dumped to screen, and a RAW wave file generated to be edited by some compatible program. After that, using RAW2SND.EXE it is possible to obtain a file usable by EAW. These two DOS programs give some help if executed without parameters.

EAW.EXE LOCATIONS
The EAW.EXE file has not undergone much investigation, but the following are some notes about it. Be VERY CAREFUL if you decide to try editing the EXE file, and MAKE A BACK-UP COPY FIRST.

The location of "the Wall" as found by DOM (in eaw12b.exe)
"The "wall" on the EAW map prevents you from flying to the map extremities. It is coded at bytes 1245FC to 12460B as follows :
00 00 C0 FD / 00 00 40 07 / 00 00 C0 E4 / 00 00 40 E9 (the / are added for clarity only)
00 00 C0 FD is the coordinate for the left side of the wall
00 00 40 07 is the coordinate for the right side
00 00 C0 E4 is the coordinate for the upper side
00 00 40 E9 is the coordinate for the lower side

If you want the wall to fit to the ends of the 640x320 tiles matrix, set these bytes to :
00 00 80 FD / 00 00 80 07 / 00 00 80 E4 / 00 00 80 E9

Setting the bytes to "00 00 C0 FA 00 00 40 0A 00 00 C0 E1 00 00 40 EC", for example, will give you access to the other side of the map. As far as I tried, all values are possible (to be checked ??). Setting all bytes to zero gives nothing good (don't try, it isn't worth it !.)

The tiles matrix format is coded at bytes 118C20 to 118C25 as:
"80 02 / 00 00 / 40 01" where 80 02 codes for 640 (2x256 + 128) and 40 01 codes for 320.

When you change bytes 118C20-118C21 for something else (larger or smaller value), the result is ugly because the EAW.TM and EAW16.HM structure arrangements do not fit to this new format (the rows of tiles are not aligned). In other words, if you want to change the width of the map, you'll have to set the rows of tiles (EAW.TM) and corresponding elevations (EAW16.HM) accordingly. If you change bytes 118C20-118C25 for "80 02 00 00 80 02", the new matrix will be in the 640x640 tiles format (as I said on the forum, I tried this).

Hence, the result is cleaner than in the previous case : the northern moiety of the map looks normal with the default EAW.TM and EAW16.HM files but the southern part is blank since no corresponding tiles and elevations exist in the default files. To easily create them, just duplicate the whole bytes of EAW.TM at the end of the file to get a "double-sized EAW.TM". The same operation has to be done with EAW16.HM. To see the difference, I filled the new section of the EAW.TM with "C2" sea tiles and the new section of EAW16.HM with 00. Then, set bytes 12460A-12460B to "40 EE" to move the "wall" to the south.

Bytes 118C3C to 118C43 ("00 00 80 FD 00 00 80 E4) contain the coordinates which correspond to the upper left corner of the first tile of the matrix. It looks like a reference.

==========
THE END