

Finnish Air War 1.28e

**An add-on package for
Microprose's European Air War**



Finnish Air War

1939-1940, 1941-1944 and 1944

Three new campaigns for Microprose's European Air War.

"This war is nothing but the continuation and the last act of the liberation war. We fight for our homes, our faith and our fatherland."

Marshal Mannerheim

1. Introduction

Finnish Air War (FAW) contains a comprehensive set of files which enable you to simulate, with a fair degree of realism, the air war over Finland in 1939-1940 and 1941-1944, using Microprose's classic flight-simulator, European Air War.

FAW can be played either in single missions, or by using a specially written campaign.

FAW is a Community project, put together by the following people:

"vonOben"	Per Rasmusson	Campaign files, terrain, world and target files, ground objects, skin and 3dz editing, put together and tested the package, project leader.
"Illu"	Jouni Ollila	Historic research, some ground and aircraft models.
"Knug"	Tomas Andersson	Graphical User Interface.
"Karel II"	Karel Chvojka	Aircraft models and textures.
"Freddy B"	Frédéric Botto	Aircraft models and textures.
"Edward"	Edward Eisler	Aircraft textures.
"Knegel"	Ralf Kraeft	Flight models, damage models, loadout files.
"Mr Jelly"	Tony West	FAW Manager program and misc editors.
"Neira"	David Vidal	Movies.
"Pobs"	Brian Egan	Some ground models.

A lot of other people have contributed and they are mentioned later in this document.

If you have any problems, queries or feedback about FAW the best way is to post a question at the SimHQ EAW Forum <http://www.simhq.com/>

If you find any bugs please make note of as many circumstances as possible (date, what type of plane was flown, what types of additional planes appeared and so on...). Thanks in advance.

Finnish Air War has been worked at for six years and we have done the best we can to create a new world that works and can be built on subsequently. Geg started this project in the autumn of 2002, but had little time and vonOben took over in late 2002.

Because of the long development time many of the original team members has left and the last years it has been mostly a one mans job by vonOben.

2. Features

Our goal was to make FAW as historically accurate as possible and we have tried to get all dates, plane appearances and bases right. Nevertheless this is not always possible in detail and it has been hard to find information, especially about the Soviet squadrons.

Main feautres:

- FAW Manager Program (FAWMan.exe) which automatically changes the frontlines and other files according to the date.
- 41 different aircraft types and variants with individual engine sounds are included.
- Realistic flight- and damage models for EAW1.28e.
- 3 different campaigns: Winter War 1939-1940 Continuation War 1941-1944 The Summer 1944 Soviet offensive: May 14, 1944 - September 4, 1944.
- 44 careers are available: 25 Finnish, 3 German and 39 for The Soviet Union.
- Careers with 56 historical missions.
- 32 different frontlines cover the three campaigns.
- A new world with airbases and targets accurately placed.
- 4 terrain sets are included: summer, autumn, winter and hard winter.
- Ground forces with trenches, artillery and bunkers that follow the frontline movements.
- War damage will show after the heavy battles at the Karelian Isthmus.
- Simple and easy set-up procedure.

Improvements in the 1.28d version:

- FAW updated to fully work with 1.28d.
- New flyable planes in Finnish single missions: Blenheim IV, Ju 88A, Hurricane I,
- New flyable planes in Soviet single missions: Douglas A-20
- New Ju 87 HR cockpit by Sera.
- New Hard winter terrain with frozen sea.
- New ground objects that were needed for 1.28d: Finnish fuel truck and Finnish open truck.
- Ju 87 error in planes.dat corrected: The ammo count was zero, so the guns wouldn't fire.
- Many minor skin and 3dz improvements for the planes.
- Individually engine sounds for all planes.
- Improved FAW Manager that use the new folder system in EAW. Autumn terrain is now automatically loaded.
- All needed files for German Career/Single missions are now included in FAW.
- War damage will show up automatically at historically accurate places and will increase over time.
- Battle area targets that will show up around the frontline to give more realism.
- Improved campaign files to give better campaign play.
- More Winter hangar screens included.
- Some files were accidentally left out of FAW 1.02 and they are now included: Knug's cardpack and a winter skin for the Castle.

Improvements in the 1.28e version:

- FAW updated to fully work with 1.28e.
- FM/DM updated to 1.28e standard by Knegel.
- Some minor skin and 3dz improvements for some of the planes.
- New action codes implemented for planes with moving flaps: Gladiator, Curtis 75 and P40.
- Some skins were accidentally left out of earlier FAW versions and they are now included: Fokker CX winter version with ski for 1941, Blenheim IV skin for 1944, Bf 109 G2 skin for 1944.
- Some screens updated to better image quality.
- 47 single missions based on historical events included.
- Terrain fix: Purple spots in some of the winter coast terrain tiles on ATI video cards. Fixed with additional bmp's.
- Some minor bugs corrected.

Improvements in the 1.28e update version:

- Target files updated for Online flying, so the rearm feature can be used.
- Problem with wrong skin/3dz for I-153 (slot 1) in the Winter War corrected.
- Problem with Finnish skin/3dz showing up for moving grounds objects on Soviet side corrected.
- Aircraft mini pics updated to better quality.
- I-153 winter hangar added.
- Improved 3dz/skin for TB-3.
- Improved and corrected the tile map (EAW.tm).
- A specific Tarnames.str added for online play.

3. Installation and game play

The game is available as a self-extracting archive and requires a basic 1.28e patched installation of European Air War to extract into. The 1.28e patch can be downloaded here:

http://www.users.on.net/~pam_biddell/1.28E_Install/128eInstallPR.htm

When FAW has been extracted a new folder called "FAWScenario" and a file called "FAWMan.exe" should now be in your EAW 1.28e folder.

Important Notes:

- Single Mission during the Winter War: Don't use random plane select! All available planes are not used during the Winter War so you have to select the plane types yourself!
- The smk files for the intro (Globe.smk and intro.smk) are not read from subfolders. They must be in EAW 1.28e folder. If you want to watch the FAW intro, you must copy those files from the K-FAW Screens Base folder manually. This will hopefully be fixed in the next EAW version.

The FAW Manager:



Every time you want to play a FAW single mission, a campaign mission or fly online you should start the FAW Manager (FAWMan.exe)!

When your mission is over, click on OK and go to the room/office. At that step, do not click on "Next Mission". Instead QUIT, leave the room and quit EAW.

This is essential since the FAW Manager must create the appropriate Cdf.set and Dir.set files before you fly next mission! The Cdf.set and Dir.set system was introduced in EAW 1.28c and those files point EAW to read the correct files.

To start your next mission, run the FAW Manager again and repeat the procedure for each mission as described below to the end of the campaign.

If you want to start a new campaign:

First select if you want to have Finnish or Russian music loaded.

Then select the appropriate date in the list "Select a frontline date".

All dates are written like this year-month-date for example: 391130

When you click the date all files are loaded and when you see "Ready" you can click on the "Launch FAW" icon and EAW starts!

If you want to start a single mission or fly online:

First select if you want to have Finnish or Russian music loaded.

Then select the appropriate date in the list "Select a frontline date".

All dates are written like this year-month-date for example: 391130

When you click the date all files are loaded and when you see "Ready" you can hit the "Launch FAW" icon and EAW starts!

If you want to continue flying a campaign:

First select if you want to have Finnish or Russian music loaded.

Then select the appropriate Career*.sve file in the list.

When you click on the Career*.sve file the FAW Manager automatically reads the date in the career file and all files are loaded and when you see "Ready" you can hit the "Launch FAW" icon and the EAW starts!

Clean up:

When you are done flying FAW and want to switch to default EAW or some other scenario, open the FAW Manager and click on the Clean up button. That will bring you back to a clean EAW.

Extra procedures:

Hard Winter terrain

Automatically changes of seasons are limited to winter, summer and autumn. If you want to fly with hard winter terrain you have to load it manually.

If you want to fly a single mission or a campaign with hard winter, follow the procedure described above and then click on “Winter Hard.txt” in the “Additional scripts” selection box before you click on the “Launch FAW” icon.

This will load the hard winter terrain textures.

Note: This has to be done after every time files have been loaded with the FAW Manager if the season or year has changed!

Terrain Winter Fix

If you have an ATI video card and there are purple spots in some of the winter coast terrain you can fix it by loading additional bmp's.

If you want to fly a single mission or a campaign with the winter fix, follow the procedure described above and then click on “Winter Fix.txt” in the “Additional scripts” selection box before you click on the “Launch FAW” icon.

This will load the winter fix terrain textures.

Note: This has to be done after every time files have been loaded with the FAW Manager if the season or year has changed!

Continuation War in the summer of 1944

If you want to fly a campaign or single mission in the summer of 1944: follow the procedures described above, but you should always select dates that end with “CW”, for example “440430 CW”. If you want to continue your Continuation War campaign after April 30, 1944 then you must hold the mouse pointer over your Career file in the list to see the date for the next mission.

Don't click on the career file!

Instead select the appropriate date followed by CW, for instance “440430 CW”.

Then click on the “Launch FAW” icon. This will load the appropriate files for the Continuation War in the summer of 1944.

The reason is that the FAW Manager automatically loads the files in “44s.txt”, which are for “The Summer 1944 Soviet offensive” campaign (May 14, 1944 - September 4, 1944).

3.5. German Career/Single missions:

If you want to fly a German campaign or single mission in the summer of 1944: follow the procedures described above, but you should always select dates that end with “GR”, for example “440616 GR”. If you want to continue your German campaign, then you must hold the mouse pointer over your Career file in the list to see the date for the next mission.

Don't click on the career file!

Instead select the appropriate date followed by GR, for instance “440616 GR”.

Then click on the “Launch FAW” icon. This will load the appropriate files for a German mission in the summer of 1944.

The reason is that the FAW Manager automatically loads the files in “44s.txt”, which are for “The Summer 1944 Soviet offensive” campaign (May 14, 1944 - September 4, 1944).

3.6. Online flying:

If you want to fly online follow the procedure described above and then click on “Online.txt” in the “Additional scripts” selection box before you click on the “Launch FAW” icon.

This will load the online version of Tarnames.str which have unique names on all targets.

Note: This has to be done after every time files have been loaded with the FAW Manager if the season or year has changed!

3.7. Extra files

There are a “_Extra folder” present in the Scenario folder where you can find some extra files you can use if you like. There are two Main screens by Neira.

You can copy the Main screens (Main2.pic) and place them in any of the K-Screens 1939 K-Screens 1941 K-Screens 1944 folders.

Please note that there are already a Main2.pic in the K-Screens 1939 folder. If you want to keep it please rename it first!

How the FAW Manager works:

If you look in the folder where you installed FAW you will find a "FAWScenario" folder. In that folder you'll find a number of folders. One is the Scripts folder, where there are three txt files for each year: A winter, a summer and an autumn script and some additional scripts for the Continuation War in the summer of 1944 and German missions. The script tells the FAW Manager which folders to write into the Dir.set file.

When the FAW Manager reads a script it first cleans out all add on files present in the EAW folder before the new Dir.set file is created.

In the FAWCdfs folder there are a number of CDF.set files, three for each year: A winter, a summer and an autumn script and some additional CDF.set files for the Continuation War in the summer of 1944 and German missions. The CDF.set files are renamed to CDF.set by the FAW Manager and placed in the EAW folder.

So if you click on a date in the list "Select a frontline date" for example 391130, which is a winter date. Then the FAW Manager first cleans out add on files and then reads the script "39w" and creates a Dir.set file and a CDF.set file. The files in the folder 391130, which is a sub folder in the "DateRelated" folder, are copied to the FAWTransfer folder. The date folders always contain at least an Eaw.tm and a Frntline.dat file.

4. Limitations and problems

Sound files

There are no sound files included in this package except for the engine sounds.

You can copy your favourite sounds to the appropriate folders inside the Scenario folder: N-FAW Sounds Base (files usable for all years), N-Sounds 1939, N-Sounds 1941 and N-Sounds 1944.

Then the FAW Manager will load the sound files for you automatically.

Russian briefing

There are unfortunately no Russian mission briefing included, only empty cdf files to disable the briefing speech. It would be most welcome if anyone would like to contribute with a Russian briefing speech.

Special Missions and Events in Campaigns:

The dates of historically missions and events in campaigns are not always right because it's not possible to control the EAW campaigns that exact.

Hard winter terrain with frozen sea:

The frozen sea shouldn't be considered as ground and you shouldn't try to land on the ice!

FAW Manager

The FAW Manager needs to have the VB6 Runtime Library installed which it normally is on most computers. If it's not installed you get messages like this when trying to start the FAW Manager:

Component "MSFLXGDR.OCX" or one of its dependencies not correctly registered: a file is missing or invalid.

Then you go here: <http://www.sandbagger.uk.com/jellyadd.html>

to download: 'JelsVB6Runtimes', which installs the runtime files needed.

The 7217 Error Message or Screen tearing

The 7217 error is caused by video cards/drivers that no longer handle 8 bit. That and the screen tearing problems should now be fixed for most video cards. If you still have problems try to run EAW through the D3DWindower program which can be downloaded here:

<http://www.filefront.com/13838785/D3DWindower-English/>

5. Hints for game-play

EAW was designed as a fighter-based WWII combat simulation where the player(s) employ relatively fast fighters against relatively slow bombers. The strategic air war over Britain and Germany mostly forms a backdrop to the immediate fighter-based action.

5.1. Close-support and ground-attack:

Many of the campaign aircraft and missions are in the areas of close-support and ground-attack, using slow and relatively vulnerable aircraft as the Fokker CX. However, EAW doesn't handle this situation well. Because the EAW.exe expects the player to be flying a fighter, your formation of attack aircraft will rarely be provided adequate fighter support. Your escorts may never appear, or they may simply fly away early in the mission. In order to overcome this, it is important to approach your ground target at medium height, in tight formation. Given the predictability of the EAW mission format, you will generally encounter enemy fighters some short while before reaching the target. At that point, use radio to request additional help: there is a small but distinct chance of this happening. Then go into a fairly steep dive, throttled-back. Make sure your squadron follows. Keep in the dive until the target if possible, slowly flattening out the dive. Attack from as low a height as practicable. If the target is well defended by flak, get in and out as fast as possible: don't linger to strafe, or you may take very heavy losses. Then cross your fingers for the trip home: travel at treetop height, trying to keep the formation together if possible.

5.2. Attacking fast bombers with slow biplane fighters.

A typical example would be a Gloster Gladiator attacking an IL-4 or an I-153 attacking a Ju 88A.

Get as high as you can before reaching the enemy. In a campaign mission, don't use the ALT+N function but instead use time acceleration. Then slow to normal time as you approach where the enemy is supposed to be, and climb until you are 500-1000m above the enemy bombers. Then trade-off height for speed to get yourself into a good attacking position with a reasonable speed advantage (no less than 100 km/h, preferably more).

There are two alternatives at this point. Either go through the bomber formation head-on, opening fire as a squadron-unit trying to hit engines and wings, and then come around as fast as you can to pick off the stragglers. Or manoeuvre for a beam attack (again aiming for engine hits to create stragglers) and try to stay with the bombers as long as possible.

Attacks from astern will often leave you with a very slow closing speed, and make you an easy target for bomber return-fire. Of course, all the while the escort fighters will be after you. And so the whole operation requires a fine sense of timing.

5.3. Unescorted medium bombers.

If you recognise your squad is not escorted you have two choices: Abort the mission and head home or try your luck. If you want to have a go be prepared for an tough mission. Keep your flight close together if you are the leader, fly low and at high speed, or gain much altitude right on the beginning of your mission and proceed to your target area in a shallow dive. You might be able to outrun your interceptors this way. You can also lookout for another flight nearby and join it. If you don't lead your flight try evasive maneuvers and keep your wingmen with you to combine the defensive guns if you are attacked. You can also try to protect the other flights of your squad. This can be done in a defensive and in an offensive way. Keep in mind, you also have offensive guns. Make use of them if you are in a good position. One more hint: In most cases the interceptors turn home after the mission target was destroyed...

5.4 The Junkers 87D-5

There is a short campaign where you can fly the Junkers 87D-5. But it will not be easy. It is slow and it is quite big and an easy target. Don't count much on your tail gunner. Just fly like a hero.

Dive-bombing, that's your designation and you will love it with Kneigel's flight model:

Align with the target but you will need at least 1000 to 2000 meters altitude, arm your bombs. Fly somewhere over the target and reduce power to slow down to 300 km/h, drop your landing gear, it will work as dive brake, reduce the engine power completely and begin your dive. You can and have to use attack angles of about 70 to 80 degrees to bomb accurately. Fly straight into the target, drop your bombs at about 600 meters and pull out giving full power, retract the landing gear/dive brake. With little training you will achieve a deadly bombing accuracy. Although the real Stuka didn't have a retractable landing gear you have to retract it after takeoff and extend it before landing. Unfortunately this takes a bit from the immersion.

6. The Campaigns

Winter War 1939-1940

The Winter War campaign 1939-1940 replaces the 1940 Battle of Britain campaign in EAW.

When you play this campaign DO NOT select Limited Supply or you may not have bombs to carry.

Units available for the Winter War 1939-1940 campaign

Finland	Aircraft	Replacements	Campaign start date
LLv 10	Fokker CX		November 30, 1939
LLv 24	Fokker DXXI		November 30, 1939
LLv 26	Gladiator		February 01, 1940
LLv 26	Fiat G.50		February 11, 1940
LLv 28	MS 406		February 04, 1940
LLv 42	Blenheim I		January 26, 1940
LLv 44	Blenheim I		November 30, 1939
LLv 46	Blenheim I		November 30, 1939
F 19	Gladiator		January 10, 1940

Soviet Union	Aircraft	Replacements	Campaign start date
7 IAP	I-16		November 30, 1939
25 IAP	I-16	I-153	November 30, 1939
49 IAP	I-16		November 30, 1939
64 IAP	I-16		November 30, 1939
68 IAP	I-153		November 30, 1939
145 IAP	I-16	I-153	January 10, 1940
152 IAP	I-153	I-16	January 01, 1940
3 OIAE KBF	I-16		February 10, 1940
13 OIAE KBF	I-16	I-153	November 30, 1939

Slot no and plane types in WW campaign:

00 I-16	15 SB-2
01 I-153	16 Gladiator
02 Not used	17 Not used
03 Not used	18 Not used
04 Not used	19 MS 406
05 Not used	20 Blenheim I
06 TB-3	21 Blenheim IV
07 Not used	22 Fiat G.50
08 DB-3	23 Gladiator
09 I-16	24 Fokker DXXI
10 Not used	25 Not used
11 Not used	26 Not used
12 I-153	27 Fokker CX
13 Not used	28 Not used
14 Not used	29 Not used

Continuation War 1941-1944

The Continuation War 1941-1944 replaces the 1943 campaign in EAW.

When you play this campaign DO NOT select Limited Supply or you may not have bombs to carry.

Units available for the Continuation War 1941-1944 campaign

Finland	Aircraft	Replacements	Campaign start date		
1/LeLv 16	Gladiator		June 25, 1941		
3/LeLv 16	Fokker CX		June 25, 1941		
LeLv 24	B-239		June 25, 1941		
LeLv 26	Fiat G.50		June 25, 1941		
LeLv 28	MS 406		June 25, 1941		
LeLv 30	Fokker DXXI	Bf 109G2	June 25, 1941		
LeLv 32	Fokker DXXI	Curtis 75	June 25, 1941		
LeLv 34	Bf 109G2		March 22, 1943		
LeLv 42	Blenheim I		June 25, 1941		
Soviet Union	Aircraft	Replacements	Campaign start date		
7 IAP	I-153	Mig-3	Lagg-3	Yak-9T	June 25, 1941
152 IAP	I-153	Hurricane II	P-40E		June 25, 1941
154 IAP	I-16	I-153	P-40E	Yak-7	June 25, 1941
195 IAP	I-153	Hurricane II	P-40E	Yak-9T	June 25, 1941
197 IAP	I-153	Hurricane II	Yak-9T		July 05, 1941
415 IAP	Mig-3	Lagg-3	La-5		October 20, 1941
524 IAP	Mig-3	I-16	Lagg-3		February 18, 1942
609 IAP	Mig-3	Hurricane II	Lagg-3	La-5	June 25, 1941
65 ShAP	I-16	I-153	Hurricane II	IL-2	June 25, 1941
5 IAP KBF	I-16	Hurricane II	Yak-1	La-5	June 25, 1941
13 IAP KBF	I-153	I-16	Lagg-3	La-5	June 25, 1941
71 IAP KBF	I-16	I-153	La-5		June 25, 1941
13 KIAP KBF	Yak-1	Yak-7	Yak-9T		November 05, 1942
57 ShAP KBF	IL-2				June 18, 1942
Slot no and plane types in CW campaign:			15 SB-2		
00 Hurricane II			16 B-239		
01 Mig-3			17 Bf 109G-2		
02 Yak-7			18 Curtis 75		
03 IL-2 3M			19 MS 406		
04 Yak-1			20 Blenheim I		
05 P39-N			21 Blenheim IV		
06 A-20B			22 Fiat G.50		
07 Pe-2			23 Gladiator		
08 IL-4			24 Fokker DXXI		
09 I-16			25 Ju 88A-4		
10 Lagg-3			26 Do 17-Z2		
11 Yak-9T			27 Fokker CX		
12 I-153			28 SB-2		
13 La-5			29 Hurricane I		
14 P-40E					

The Summer 1944 Soviet offensive: May 14, 1944 - September 4, 1944

The Continuation War 1941-1944 replaces the 1944 campaign in EAW.

When you play this campaign DO NOT select Limited Supply or you may not have bombs to carry.

Units available for the Summer 1944 Soviet offensive 1944 campaign

Finland	Aircraft	Replacements	Campaign start date
HleLv 24	Bf 109G2	Bf 109G6	May 14, 1944
HleLv 26	B-239		May 14, 1944
HleLv 28	MS 406	Bf 109G2	May 14, 1944
HleLv 30	Bf 109G6		May 14, 1944
HleLv 32	Curtis 75		May 14, 1944
HleLv 34	Bf 109G6		May 14, 1944
PleLv 42	Blenheim I		May 14, 1944
II/JG54	FW 190A6		June 16, 1944
I/SG3	Ju87 D5		June 16, 1944
I/SG5	FW 180F8		June 16, 1944

Soviet Union	Aircraft	Replacements	Campaign start date
14 GIAP	Yak-9		May 14, 1944
29 GIAP	Yak-7	Yak-9	May 14, 1944
103 GIAP	P-39		May 14, 1944
17 GshAP	IL-2		May 14, 1944
152 IAP	P-40		May 14, 1944
159 IAP	La-5		May 14, 1944
191 IAP	P-40		May 14, 1944
195 IAP	Yak-9		May 14, 1944
196 IAP	P-39		May 14, 1944
197 IAP	Yak-9		May 14, 1944
435 IAP	Lagg-3	La-5	May 14, 1944
773 IAP	P-39		May 14, 1944
214 ShAP	IL-2		June 06, 1944
566 ShAP	IL-2		May 26, 1944
943 ShAP	IL-2		May 14, 1944
3 GIAP KBF	La-5		May 14, 1944

Slot no and plane types in WW campaign:

00 Hurricane II	15 SB-2
01 Mig-3	16 B-239
02 Yak-7	17 Bf 109G-2
03 IL-2 3M	18 Curtis 75
04 Yak-1b	19 MS 406
05 P39-Q	20 Blenheim I
06 A-20B	21 Blenheim IV
07 Pe-2	22 FW 190A-6
08 IL-4	23 Fw 190F-8
09 I-16	24 Bf 109G-6
10 Lagg-3	25 Ju 88A-4
11 Yak-9UT	26 Do 17-Z2
12 I-153	27 Ju 87D-5
13 La-5FN	28 IL-4
14 P-40N	29 Hurricane I

7. The aircraft

Finland and Germany:

Bf 109G was a single-seat all-metal cantilever low-wing monoplane fighter with retractable undercarriage. Finland bought on 1 Feb, 1943 from Germany 16 new and 14 overhauled used planes of the model G-2. Add to that every aircraft destroyed in the action was to be replaced by new. The first 16 a/cs arrived on 13 March, 1943 and the rest (minus one that was damaged) on 16 May, 1943. The replacements were received as follows, 3 on 9 Aug, 1943, 1 on 2 Sep, 2 on 11 Nov, 3 on 5 Jan, 1944, 1 on 21 Feb, 5 on 6 March, 2 on 21 March, 1 on 27 Apr and 1 on 1 June. On 15 March, 1944 Finland bought 30 G-6s, 15 of those arrived between 16 and 18 March, 1944, 10 on 8 Apr and 5 on 1 May. After the signing of the "Ribbentrop Agreement" Finland received 14 G-6s on 19 June, 1944, and another 26 G-6s and 1 G-8 by the end of June. In July Finland received 16 G-6s and 1 G-8 and in August 23 G-6s.

Brewster Model 239 was an all-metal single-seat shipboard fighter monoplane with a retractable undercarriage. 54 examples of the model was ordered from Brewster Aeronautical Corporation by the US Navy, but only 11 F2A-1s entered service starting from June 1939 and the remaining 43 were declared surplus to requirements and released for export to Finland. Finland bought 44 (the prototype included!) Brewsters on 16 Dec 1939. They were shipped in boxes to Trollhättan, Sweden via Stavanger, Norway, and were assembled and coded BW-351 - 394 at the SAAB factory. After test flights they were flown to Finland. The first four arrived on 1 March, 1940 and the last by May.

Bristol Blenheim was a twin-engined three-seat all-metal structured bomber and long range reconnaissance aircraft. On 6 Oct, 1936 Finland bought 18 Mk. Is from England. The first two aircraft took off from Filton piloted by Finnish pilots on 26 July, 1937. The route was Filton - Croydon - Amsterdam - Hamburg - Malmö - Stockholm - Helsinki, where they arrived on 29 July, 1937 at 2.45 p.m. The last aircraft of this so called Series I arrived on 27 July, 1938. Manufacturing license was acquired from Bristol Aeroplane Company on 12 Apr, 1938 and consequently 15 Mk. Is (Series II) were ordered from the State Aircraft factory on 6 Apr, 1939. Before the manufacturing got started the WWII and the Winter War broke out and Finland had to bought two series of Blenheims from England. So called Series III consisted of 12 Mk. IVs that were flown to Finland by Finnish pilots. The aircraft were handed over to the Finnish crews on 17 Jan, 1940 and 10 aircraft arrived on 21 Jan. One had disappeared on the transfer flight and another damaged in Sweden. The latter arrived on 5 June, 1940. The Series IV had 12 Mk. Is that arrived on 26 Feb, 1940 piloted by English crews. During the Interim Peace the manufacturing of the Series II began. The first aircraft was ready on 14 June, 1941 and the last on 9 Jan, 1942. On 7 Jan, 1942 Series V of 30 Mk. Is and Series VI of 10 Mk. IVs have been ordered. The first of the Series V was ready on 19 July, 1943 and the last 26 Nov. The first of the Series VI was ready on 26 Feb, 1944 and the last on 15 Apr. Series of 5 Mk. IVs was ordered on 27 July, 1943, but the order was cancelled on 19 Sep, 1944 after the Armistice.

Curtiss Hawk 75A was a stressed-skin all-metal structured cantilever low-wing fighter monoplane, fitted with hydraulically operated split flaps and main landing gears which retracted directly to the rear, the wheels turning 90 degrees to lie flat in the wing. Since the Spring of 1941 the German Luftwaffe agreed to sell some of their war booty. Finland bought 44 Curtiss Hawk 75A of 5 different subtypes in three deliveries from 23 June, 1941 to 5 Jan, 1944.

Dornier Do 17 Z was a four-seat twin-engine monoplane mid-weight bomber and reconnaissance aircraft of metal structure and retractable undercarriage. German Marshal Herman Göring donated 15 ex-Luftwaffe Do 17 Zs to Finnish Air Force on 11 Nov, 1941. First 3 aircraft arrived on 5 Jan, 1942 and 14 by the end of the month. The last arrived on 11 Feb, 1942.

Fiat G.50 was the first all-metal single-seat fighter monoplane with a retractable undercarriage produced in Italy. Finland bought 25 CMASA manufactured G.50s from Italy on 23 Oct, 1939 and 10 more on 31 Jan, 1940. The aircraft were assembled in Malmö, Torslanda and Trollhättan, Sweden. Then they were flown to Finland via Västerås, Sweden. The first arrived on 18 Dec, 1939 and the last by 19 June, 1940.

Focke Wulf FW 190 was considered Germany's best fighter of the war. When the first version entered service in 1941, it showed marked superiority to its opponents in almost every aspect. It was faster than any other Allied fighter in service at that time, had far heavier armament, was immensely strong, had excellent power of manoeuvre and good pilot view. The A series included many fighter and fighter bomber versions, some having not only the increasingly heavy internal armament but also two or four 20 mm cannon or two 30 mm cannon in under wing fairings. The F series were close-support attack aircraft, some having the Panzerblitz array of R4M rockets for tank-busting.

Fokker C.X was a two-seat mixed structured semi-biplane dive bomber and communications aircraft with fixed landing gear. Finland bought 4 C.Xs and acquired the manufacturing license on 18 May, 1936. The aircraft were shipped to Finland in Nov, 1936. Air Depot received the aircraft on 16 Jan, 1937. Series II consisting of 13 C.Xs were ordered from State Aircraft Factory and Series III of 17 aircraft on 12 Feb, 1937. Series II was ready in Jan-June, 1938 and series III in June-Dec, 1938. Series IV of 5 C.Xs was ordered on 24 Apr, 1942 and was ready by the end of the year.

Fokker D.XXI was a single-seat fighter monoplane with a mixed structure and a fixed landing gear manufactured by N. V. Nederlandsche Vliegtuigenfabriek Fokker. Finland bought 7 D.XXIs from Netherlands on 18 Nov, 1936 and acquired a license to build 14 more. The first D.XXIs were transported to Finland between 4 Nov and 13 Nov, 1937. The first license manufactured D.XXIs, the so-called 2nd Series, were completed by the State Aircraft Factory between 11 Nov, 1938 and 18 March, 1939. On 15 June, 1937 a limitless license was acquired. 21 D.XXIs of the 3rd Series were assembled between 16 March and 27 July, 1939. FAF had 42 Mercury powered D.XXIs. In addition a total of 55 Wasp engined D.XXIs were manufactured (4th and 5th Series) after the Winter War. They were completed between 29 Oct, 1940 and 2 March, 1942 (4th Series) and between June and 28 Nov, 1944 (5th Series).

Gloster Gladiator Mk.II was a mixed structured bi-plane fighter with a fixed landing gear. Finland acquired 30 Gladiators from England on 12 Dec, 1939. 10 of those were donated and 20 were bought. The planes were shipped to Sweden and they were assembled at Centrala Flygverkstaden Malmslätt. Then the planes were delivered to Barkarby and flown to Finland. The first 4 arrived on 18 Jan, 1940 and the last planes on 16 Feb. Swedish volunteer unit Flygflottilj 19 brought 12 Gladiators with them in Finland on 10 Jan, 1940.

Hawker Hurricane Mk. I was a metal structured single-seat cantilever low-wing fighter with retractable main landing gear. Finland bought 12 Hurricanes from England after the outbreak of the Winter War. The planes were delivered from R.A.F. on 2 Feb, 1940 and flown to Finland. The first 6 were received on 21 Feb and the rest on 26 Feb. The first 6 left St. Athans, England on 25 Feb, and flew via Edinburgh - Wick - Stavanger - Oslo - Västerås, Sweden, where they arrived on 29 Feb. The second group flew the same route and lost two aircraft as damaged, 1 in Wick and the other near Stavanger. 4 planes arrived Västerås on 6 March. In Finland the Hurricanes arrived on 7 March (6 planes), 3 on 8 March and the last on 10 March. The Finns captured 1 Hurricane IIA in February 1942. Two more were captured in the Continuation War, but they were not repaired into flying order.

Ilyushin Il-4 was a three- or four-seat (depending on the mission type) twin-engine metal-structured cantilever low-wing monoplane mid-weight bomber aircraft with retractable undercarriage. On 2 Oct, 1942 Finland bought 4 Il-4s from German war booty depots. The aircraft were delivered to the Finnish crews in Brjansk on 13 Oct. 3 of the Il-4s arrived on 21 Oct as one was destroyed during the transfer flight on 14 Oct at Sjeschtschinskaya, near Riga, Latvia.

Junkers Ju 87D-5 was heavily used as a ground-attack and close support aircraft, and the well trained crews knew how to hit their target. After the war had started it became clear that the Stuka was obsolescent and proved too vulnerable to more advanced fighters. It's speed was hopeless, compared to that of the enemy fighters, so to make the Ju 87 more maneuverable, it's wingload had to be reduced and the Ju 87D-5 had extended outer wings.

Junkers Ju 88 A-4 was a four-seat twin-engine monoplane mid-weight bomber of metal structure and retractable undercarriage. Finland bought 24 new Ju 88 bombers in Spring 1943. The first 12 aircraft were handed over to the Finns in Tutow, Germany 10-11 Apr, 1943 and the rest on 20 Apr. On 15 Apr the first group arrived in Malmi airfield, Helsinki, and transferred to Pori on the following day. On 23 Apr the 11 Ju 88s arrived to Pori straight from Germany. One was destroyed on the way, North of Riga, Latvia.

Morane-Saulnier M.S. 406 was a single-seat cantilever low-wing fighter of mixed structure and retractable undercarriage manufactured by Aeroplanes Morane-Saulnier Puteaux, S.N.C.A.O. Bouguenais, S.N.C.A.M. Toulouse and S.N.C.A.C. Billancourt. France donated 50 M.S. 406s to Finland during the Winter War. After all only 30 were sent and assembled by French mechanics at AB Aerotransport's facilities at Bulltofta airfield at Malmö, Sweden. The aircraft were flown to Finland between 4 and 29 Feb, 1940. After Germany invaded France in 1940 Finland bought 8 of the Type 406 and 2 that were converted to the Type 410 from the German war booty depots that arrived in boxes between 18 Dec 1940 and 4 Jan, 1941. The converted 410s differed from the true 410s in the details, f.ex. none received the ejector exhausts and some even retained the semi-retractable radiator. 15 more aircraft were bought in 1941 including 8 converted 410s. 16 July, 1942 Finland bought from Germany 30 of the Type 406. In the Fall 1942 the last two were bought, again from Germany.

Tupolev SB-2, was three-seat twin-engine cantilever mid-wing monoplane mid-weight bomber aircraft of metal structure and with retractable undercarriage. 8 SB-2 and SB-2bis aircraft were captured as force-landed during the Winter War. After the beginning of the Continuation War 16 SB-3s were bought from the war booty depots of Germany. Those were delivered to Finland as disassembled in three lots. The first 6 arrived on 5 Nov, 1941; the following 5 on 11 Apr, 1942 and the last 5 on 27 Aug, 1942.

Soviet Union:

Bell P-39, the first aircraft arrived from Great Britain in December 1941, with American deliveries beginning in early 1942. Soviet pilots preferred the AirCobra, to any other aircraft received from the Allies. The aircraft had good maneuverability, was easy to handle, well armed and afforded the pilot excellent all round vision. The aircraft suffered considerable difficulties during the winter.

Curtiss P-40, the first P40's first arrived in Russia September 1941 and following training and familiarization the first combat sorties were flown in October 1941.

The P40 was considered an "average" aircraft by Russian pilots. The aircraft suffered considerable difficulties during the winter. The aircraft did however have a very durable airframe, which could absorb considerable damage, good radio communications and an excellent flight range of 1100km. The P-40 remained in production until December 1944.

Douglas A-20B Based on a Northrop model (while Northrop was still working with Douglas), it became one of the major attack bombers of the Allies. A large number of versions was produced, and most versions operated satisfactory. The Lend Lease shipments to The Soviet Union started in October 1941.

Hurricane II, almost 3000 Hurricanes were sent to Russia as part of the lend lease agreement. The first aircraft arrived in July 1941 and first flew in September. The aircraft was popular with Russian pilots because it was simple to control, easy to maintain and repair under field conditions and stable in flight. Another advantage was that all Hurricanes were fitted with radios, unlike their Russian counterparts. However it suffered from poor visibility from the cockpit and initially from engine unreliability caused by the poor quality of Russian fuel. Due to its undercarriage configuration, the aircraft was also prone to crashing on poorly surfaced runways. The Hurricanes were eliminated from VVS service in mid 1943

Ilyushin DB-3M was a three-seat twin-engine metal-structured cantilever low-wing monoplane mid-weight bomber aircraft with retractable undercarriage.

Ilyushin IL-2 was a ground-attack aircraft and one of the most important Soviet combat aircraft of World War II. The IL-2 was well designed and highly effective at its task.

Ilyushin Il-4 was an improved version of the DB-3M long range medium bomber and had a modernised airframe with light alloy structures, and a redesigned nose that improved aerodynamics. IL-4 was a three- or four-seat (depending on the mission type) twin-engine metal-structured cantilever low-wing monoplane mid-weight bomber aircraft with retractable undercarriage.

Lavochkin La-5 was a development and refinement of the LaGG-3 and was one of the Soviet Air Force's most capable fighter. The La-5 had good speed and good climb rate and later models (La-5FN) were almost equal to the Messerschmitt Bf 109G versions.

Lavochkin Lagg-3 was a durable fighter despite being generally rated as underpowered and not highly maneuverable. The aircraft was easy to master however, and pilots found it more tractable than the MiG-3, which had a more difficult handling. The most notable feature of the LaGG-3 is the fact that it could be produced in large numbers, and that it was the starting point for the Lavochkin La-5.

Mikoyan-Gurevich Mig-3 was a cantilever low-wing monoplane design, with fully retractable tailwheel landing gear and an enclosed cockpit. The MiG-3 was one of the main fighters of the VVS when the Continuation War started. Although it had an excellent performance at high altitude, but most air battles were fought at a low to medium altitude, in which the MiG-3 lacked maneuverability and performance.

Petlyakov Pe-2 was a three-seat twin-engine metal-structured cantilever mid-wing light bomber, ground attack, fighter-bomber and reconnaissance aircraft. One of the most successful Soviet aircraft of the war, Pe-2 provided the backbone of the USSR's tactical bombing.

Polikarpov I-153 was a single-seat bi-plane fighter with mixed structure, the upper wing "gulled" into the fuselage and manually retractable main undercarriage. The I-153 was one of the most outstanding biplanes ever used in combat and it remained in service until 1943.

Polikarpov I-16 was the world's first service single-seat cantilever low-wing monoplane fighter with mixed structure and retractable undercarriage. The I-16 was fast, highly maneuverable, with excellent climbing speed and roll rate, yet soon outclassed by newer aircraft.

Tupolev SB-2 was a three-seat twin-engine cantilever mid-wing monoplane mid-weight bomber aircraft of metal structure and with retractable undercarriage. When the War broke out the SB-2 was already obsolete and was relatively short ranged or capable of a light load only.

Tupolev TB-3 was heavy bomber and could carry 1000 kg of bombs 2200 km at a cruising speed of 180-200 km/h. It was terrible outdated both in design and performance and an easy prey for modern fighters. The TB-3s were also used in the transport role and carried personnel, arms and equipment to the fronts.

Yakovlev Yak-1 was one of the first modern fighter types that the Soviet Union possessed at the outbreak of the Continuation war. The Yak-1 was fast and agile, but suffered from a light armament and poor performance at high altitude.

Yakovlev Yak-7 was an improvement on the Yak-1 series and entered service in the latter half of 1942. It proved more of a match for the fighters of the FAF than had its predecessor, but in itself it was an important forerunner of the formidable Yak-9.

Yakovlev Yak-9 was a durable fighter, capable of absorbing a lot of battle damage and still making it home. It was also a successful ground attack fighter

8. Historical background: The Winter War 1939-1940

After the Germans occupied most of Poland late in 1939, the Soviets, although under a non-aggression pact with the Germans, became concerned regarding the possibility of an invasion by their unlikely bed-fellows. Of special concern was the existence of a less-than-friendly Finland on their northern border, which might be persuaded to allow such an invasion through their territory. There was also the threat of an amphibious invasion up the Gulf of Finland to Leningrad. Finland had become independent from Russia late in the First World War, with a southern border only about 25 mi from Leningrad (St. Petersburg). The Soviets demanded the Finns concede territory, primarily in the Karelian isthmus adjacent to Leningrad, as well as some strategic islands in the Gulf of Finland and a naval base on the southern Finnish coast, to provide a defensible buffer for the Motherland. These demands amounted to less than 1% of Finland, and in return the Russians offered to exchange about twice this territorial area elsewhere along the border. Largely out of principle and a deep mistrust of the Soviets, the Finns refused. When negotiations broke down, the Soviets invaded on 30 November 1939.

The Soviets committed over 900 aircraft and almost a million troops, outnumbering the Finns by some 3-to-1 on the ground and nearly 9-to-1 in the air, and expected an easy victory. The Finnish Air Force (FAF), or Ilmavoimat, possessed fewer than fifty operational fighters, about 18 British Blenheim bombers, and an assortment of some sixty mostly obsolete close-support, reconnaissance and liaison aircraft. Primary among these were Fokker CX and Blackburn Ripon 2-seater biplanes. A stiff Finnish resistance and brutal winter weather, however, quickly halted the advance, with great Soviet losses.

Probably because of their over-confidence, the Red Air Force did not initially commit their best aircraft to the Finnish invasion, which was to be known as the Winter War. Their fighter forces were equipped primarily with I-15bis biplanes and I-16 Type 5, 6, and 10 monoplanes, and the bombers were mostly SB-2 and DB-3 types. As these fighter types have been covered in detail earlier, we will concentrate more closely on the Finnish fighters, of which there were just two squadrons. One of these was equipped with about ten serviceable, but quite obsolete British Bulldog IVA biplanes.

The second squadron comprised 36 more capable Fokker D.XXI low-wing monoplanes with fixed, streamlined gear and enclosed cockpits. The Finns had bought seven of these fighters from the Dutch in 1937, about a year prior to their operation by the Dutch Air Force, and completed about 35 more under license prior to the Winter War. Of mixed construction, the fuselage had a steel-tube structure covered by metal forward and on top of aft fuselage, the rest being fabric covered. The wing structure was of wood covered by bakelite and plywood, and fitted with hydraulic flaps. The first Finnish Fokkers were powered by Polish-built supercharged Bristol Mercury VII radial engines equipped with a 3-blade metal ground-adjustable props. The Finnish-built Fokkers were fitted with essentially identical locally built Mercury VIII motors. Armament included two synchronized FN Browning 7.9mm machine guns in the cowl, and two more in the wings, aimed with the aid of telescopic sights. The Fokker also offered a much more stable gun platform than their Russian opponents.

One of these aircraft was fitted experimentally with a 20mm cannon under each wing in place of the machine guns, but the poor reliability and performance of these weapons prevented their being installed on additional Fokkers. Their heavy recoil also shook the aircraft badly, and the reduced rate of fire and lower accuracy did not suit the Finns' almost radical passion for pin-point gunnery.

The FAF had purchased 17 Bulldog IVAs early in 1935, upgraded with the Mercury VI.S2 engine which provided much improved speed and climb performance over the standard RAF Bulldogs. Other modifications included a NACA cowl and enhancements intended to improve arctic operations, like heated guns. The Finnish Bulldogs were quite competitive with the Russian biplane fighters early in the war, but were hopelessly outclassed in every respect except maneuverability by the enemy monoplanes. Unable to catch the fast Soviet bombers, they were not really a factor in the air conflict, although Bulldog pilots did claim some victories.

The Fokkers, however, were quite competitive with the Russian monoplanes in both speed and climb performance, and in armament. These figures might be slightly optimistic, however, because the Fokkers were fitted with skis throughout the Winter War, as were many of the Soviet aircraft. I-16 Types 5/6 were often fitted with non-retractable skis, while the Type 10 and later variants could be equipped with semi-retractable skis. The slightly lower wing loading of the I-16s conferred marginally better turn performance on the Soviet monoplanes, which were also better armored. The Fokker was considerably heavier than the Russian fighters, and therefore had better initial acceleration in a dive. So, even with a top dive speed of only about 320 mph, somewhat below that of the I-16, the Fokkers could usually escape from the Soviet monoplane if necessary. Compared with the Soviet biplane fighter, the Fokker was considerably faster and climbed better, but the I-15bis was much more manoeuvrable.

Of more importance than the rough parity in equipment quality, however, was the relative quality of pilot training and combat leadership. Although the Red Air Force had considerable recent combat experience in both Spain and the Far East, and their top commanders were Spanish War veterans, the Soviets did not initially commit their most experienced units to the Winter War.

The Red Air Force command structure was also disastrous. In mid-1937 a so-called "dual-command," or "collegiate control" arrangement was instituted in which political commissars were assigned to each unit with status equal to that of the tactical commanders. Field commanders were obligated to submit their plans and decisions to political councils comprised of these commissars, which had veto powers. The political councils could also recommend demotions, reprimands, etc., which, during this period of Stalin's purges, were tantamount to death sentences. As can be imagined, such a system severely undermined command confidence, innovation, and effectiveness.

In 1938 the Red Air Force had been reorganized. The mixed Air Brigades had been abolished and homogeneous Air Regiments of about sixty aircraft each had been established. For bombers this included fast bombers, dive bombers, light bombers, and close-support bombers, normally arranged in five squadrons of 12 aircraft each. Fighter and ground-attack regiments typically comprised four squadrons of 15 aircraft. Seldom were regiments up to full strength, however, with fighter regiments typically having some 48 aircraft and bombers about 36. Four to six Air Regiments were normally combined into Air Divisions. Each military district was assigned fighter and bomber divisions composed of homogeneous units, but the "Army Air Forces" were also retained, with each army provided a composite division. This system inevitably led to fragmentation of control.

In spite of recommendations of Spanish veterans to adopt the German 4-aircraft, two-pair tactical unit, the Red Air Force had retained the old 3-plane Zven'ya doctrine. In contrast, the Finns had no combat experience, but were tactically quite innovative and benefited from sending pilots on exchange tours with other air forces, such as Germany and France. As early as 1935, they had adopted the flight of four fighters, operated in two pairs. This is essentially the Fighting Wing, Finger-Four fighter doctrine, the development of which is normally credited to Moelders and the German Condor Legion in Spain several years later, as discussed in a previous chapter. FAF doctrine was quite advanced, and included a "first see, first shoot" policy, by which a wingman was authorized to attack an enemy before his leader if he was in the best position to do so. The Finns were also quite aggressive, with an "attack regardless of numbers" policy, which normally provided them with the initiative in air combat.

Such a doctrine, although quite efficient, requires a high degree of training throughout the pilot corps, a fact realized and taken seriously by the Finns. Their training included a heavy emphasis on air-to-air gunnery and strafing; acceptance into a fighter squadron required a pilot to demonstrate an incredible 75% hits in strafe. In addition to the usual air-to-air gunnery training firing against towed targets, the Finns also employed a more unusual technique. They would release a small paper parachute from the cockpit, then maneuver to keep it in sight and make multiple firing runs against it.

To aid gunnery accuracy the Finns as policy harmonized their guns to converge at about 150 yds range. With guns widely separated in both the cowl and wings, bullets tend to achieve a very sparse pattern at target range if all are pointed straight ahead, much like a shotgun. By harmonizing all the guns so that their rounds converged to a point, the effect was greatly increased "bullet density" at the chosen range. Inside a distance slightly greater than this convergence range, the concentration of projectiles is much more dense, more akin to rifle fire. Harmonization rewards excellent marksmanship and close-range fire. Because the rounds tend to diverge outside convergence range, however, long-range fire is actually penalized. Those with poor marksmanship skills who expect to take random long-range "Hail-Mary" gun shots, are substantially better off without harmonization. The Soviets, not incidentally, did not harmonize their guns at this time.

Another interesting practice of the Finns was to load the right-hand synchronized cowl machine gun totally with tracers to assist in correcting the bullet stream. The other three guns were typically loaded with incendiary and armor-piercing ammo.

Not only were the Soviets still employing an outdated 3-plane fighter tactical doctrine, normally without the benefit of radios, but their overall level of pilot training was quite low, even though there were some experienced pilots available. As an illustration, it was not uncommon for wingmen to follow their leader around during an engagement and fire their guns whenever he did, whether they were pointed in the general vicinity of an enemy aircraft or not.

During the Winter War, the Finnish fighters normally dispersed in small numbers to auxiliary camouflaged airfields to avoid detection and attack on the ground. Standing alert for reports of Russian bombers, they often flew 6-8 sorties each day. When not flying, their aircraft were covered and kept warm by the use of electric radiators and heated oil dipsticks, and could be airborne in a matter of minutes.

On the first day of the war, the Soviets bombed Helsinki and many other cities, expecting the Finns to surrender. When this did not occur immediately, the Russian bombers switched to transportation facilities, such as railway junctions and harbors. Early in the war the Soviet bombers typically flew at medium altitudes in formations of 3-9, usually without fighter escort, and suffered heavy losses. Russian bomber crews reportedly showed a high degree of air discipline, staying together for mutual protection at all costs. For instance, if one bomber was crippled, the entire flight would slow down so it could remain in formation.

The primary Soviet bombers of the Winter War, the Tupolev SB-2, discussed earlier in conjunction with their service in Spain and the Far East, and the larger and slightly slower Ilyushin DB-3, were both relatively fast aircraft with twin radial engines. Speed was their primary defense; they were impervious to the Finnish Bulldog biplanes and even the Fokkers had only a 30-40 mph speed margin. Without an initial altitude advantage, the Fokkers often had a long chase to close with a bomber formation.

Once engaged, however, the Russian bombers seriously under-armed, with only two light machine gun covering the rear hemisphere; one of these guns was mounted on top, the other on the belly. Unfortunately, there was only one gunner, so he had to scramble from one gun to the other as the attacking fighters changed position, so it was effectively one puny rifle-caliber gun against the entire firepower of the attacker. The Finns were methodical and relentless in their attacks, often closing well within 100 ft and concentrating on the gunner first, then the engines and fuel tanks. Still, the Soviet bombers were well armored against light machine gun fire, and each attack often consumed considerable time and ammunition.

The Finnish fighters initially concentrated on protecting their troops enroute to the front, then shifted to air defense. After the first two days of the conflict, terrible winter weather closed in, effectively ending flight operations for about two weeks. During December the Finns frantically appealed to the world for help; fighter aircraft were purchased from every available source. The first to begin arriving even before the end of the year were Italian Fiat G.50 monoplanes from an order of 25 placed late in October, although these did not begin to be available in useful numbers until mid-February. An order of thirty Gloster Gladiator Mk II biplanes began arriving in mid-January and were immediately pressed into service to replace the old Bulldogs, which were finally withdrawn in early February; the entire order of Gladiators was on hand by mid-February. The delivery of thirty Morane-Saulnier M.S.406 monoplanes donated by France also occurred during February. In addition, beginning in early March, the Finns began to take delivery of the first of 44 Brewster F2A-1 (actually the B-239 export variant) Buffaloes purchased from the U.S. Navy and assembled in Sweden by Norwegian mechanics. Only a handful of these fighters, however, were available before the end of the conflict. Likewise, delivery of ten Hawker Hurricanes during early March came too late. Other assistance was provided beginning in early January by a Swedish detachment of a dozen Gladiators and four Hawker Hart light biplane bombers that operated in the Lapland region to the north. There were also a half dozen Danish volunteer fighter pilots who flew along side the Finns, as well as a few other foreign volunteers.

Of this mixed bag of fighter types, the Fokkers, primarily due to their larger numbers during the Winter War, were most successful, claiming a 16-to-1 kill ratio. Finnish claims were predominantly against Soviet bombers and, although all air-combat claims should be taken with much seasoning, theirs are probably more reliable than most, since a high percentage occurred over friendly territory where wreckage could be confirmed.

Next in effectiveness, again primarily because of higher numbers available earlier in the conflict, were the Gladiators. Their claims were also predominantly against bombers, but the biplanes were more effective against the Russian fighters. Although relatively under-powered and slower than the Soviet monoplanes, the Gladiators could out-turn any of their opponents, which made them dangerous in a dogfight, especially against inexperienced pilots. Because of their better maneuverability, the Gladiators typically took off first and landed last in order to cover the takeoff and landing of the monoplanes. The shortcomings of the Gladiator were quickly evident, as their loss rate was alarming. Their light armament was only marginally effective against the armored Soviet aircraft and their lack of a firewall made them susceptible to flaming in the air.

Neither were the Soviets standing still during this period. After initial heavy bomber losses, they introduced some 500 additional aircraft in January, and began to escort their bombers on a regular basis. Newer fighters were committed, including the I-153 biplanes and I-16 Type 18 monoplanes. At this time, the Red Air Force was concentrating on supporting their ground forces which had bogged down on the Karelian front.

The I-153, just recently introduced and blooded in Mongolia, was described earlier in conjunction with its service against the Japanese. By the time of its introduction in Finland, however, most Chaikas were fitted with their intended powerplants comprising the 1000-hp Shvetsov M-62 radial engine with 2-speed supercharger, based on the Wright Cyclone R-1820G-5, and the AV-1 2-position hydraulic variable-pitch propeller. Among Finnish fighters at this point in the war, only the Gladiator was slightly more maneuverable; but the Chaika's big engine, more powerful than any available to the Finns, conferred superior performance in every other respect to the Finnish biplane. In fact, the Chaika was nearly as fast as the Finnish monoplanes. When employed properly, the I-153 was very effective during the Winter War.

The I-16 Type 18, like most of the Chaikas, was powered by the M-62 engine. In addition, the Type 18 was the first Soviet fighter to be equipped with the new AV-1 propeller as standard equipment, although some earlier I-16 versions were retrofitted with this device.

The Type 18, except for the new powerplant and the resulting higher weight, was otherwise very similar to the I-16 Type 10, still armed with four machine guns. Its speed was comparable to that of the best of the fighters available to the Finns, and it possessed the best climb performance in the theater. In addition, the Type 18's turn performance was as good as any of the Finnish monoplanes, but, of course, markedly inferior to the Gladiator. This combination of traits made the I-16 Type 18 probably the best Russian fighter of the Winter War.

By mid-February, the newly arrived Finnish monoplane fighters began to play significant roles in the air war. The best of these was probably the Fiat G.50, which could claim title to the fastest fighter in the theater during this period, but only by a very slim, insignificant margin. Both the Fiat and the Morane M.S.406 had comparable top speeds and superior dive performance relative to even the best Russian fighters, but, they were significantly under-powered by comparison, which resulted in inferior climb performance. Also having slightly higher wing loadings than the I-16s, these imports suffered from inferior turn performance, particularly in sustained engagements during which they would tend to lose speed and altitude (i.e., energy) faster. To make matters worse, both fighters were not well designed for such cold weather, and had significant maintenance and operational problems. Alone among the more modern Finnish fighters, the Fiat's open cockpit also placed its pilot in the same uncomfortable accommodations as his Soviet counterparts, and like most other fighters available to the Finns, it had no armor protection. The Morane did have light pilot seat armor, but it was found to be only marginally effective against Soviet ammunition.

The somewhat improved top speeds of these new retractable-gear fighters was an advantage, however, in comparison with the Fokkers in running down Russian bombers; the greatest object of the Finns' attentions. Unlike the French version of the M.S.406, which sported an engine-mounted 20mm Hispano cannon firing through the prop hub, in the imported Moranes the cannon was replaced by a light 7.5mm Chatellerault machine gun to match the pair installed in the wings. With only three rifle-caliber guns, the Finnish Morane was well under-armed. The Fiats, on the other hand, were better equipped for dueling with bombers; the Italian fighters were fitted with a pair of synchronized 12.7mm Breda-SAFAT heavy machine guns in the cowl. These heavier weapons were much more effective against the armor protection of both the Soviet bombers and fighters.

Along with committing increased numbers of aircraft, the Soviets modified their tactics somewhat after the first days of the conflict. Along with supporting their stalemated ground forces and bombing transportation facilities, they shifted much of their bombers' attentions to the Finnish fighter airfields...when they could be found. The Finns, in response, shifted operating locations often. The size of the Russian bomber formations also increased significantly, and they were escorted regularly. Later in the war it was not uncommon for raids of a hundred bombers to be mounted, with a like number of fighter escorts. In good weather, the Russians could operate as many as 1,000 sorties per day.

The Finnish tactics called for the first interceptors on scene to engage the Soviet escort fighters, so those arriving later could have a clear go at the bombers. The Soviet bombers also began to fly at higher altitudes, which made interception more difficult, but also reduced bombing accuracy. There were, in addition, regular night bombing raids. The Fokkers attempted only one interception mission on a bright moonlit night. Without the aid of any sort of air direction system, however, this effort failed.

Because of their low numbers, the Fokkers flew mostly in pairs. Occasionally during large bomber raids or to protect ground operations, they mounted formations of 15-20, sometimes mixed with Gladiators. The fighter pairs normally patrolled in a fairly wide, nearly line-abreast formation, and typically attacked in trail. In addition to bomber interception the Finnish fighters flew protective patrols over their troops and engaged in ground strafing attacks. Their obsolete close-support aircraft could only operate effectively under conditions of air superiority. Even the fast Blenheim bombers were poorly protected and generally required fighter escort. As in most air conflicts over friendly territory, Finnish fighters were at considerable peril to ground fire from their own troops when operating at low altitudes.

The Soviets, with the advantage of numbers, normally flew in much larger formations, typically 6-30 fighters. As they were usually on the offensive, the Russians often also enjoyed the initial altitude advantage. One of their favorite tactics was known as the "Spanish Circle," from its origins in the Spanish Civil War. A number of I-16s would form a circle over Finnish fighters, with each taking turns performing dive-and-zoom attacks. The Finns were forced to make continual hard defensive turns to defeat successive attacks from different directions, eventually running them out of airspeed, altitude, and ideas. The best defense was usually an early diving escape attempt. The Finnish fighters also adopted this tactic from the Soviets.

Late in February, the Soviets committed about 500 additional aircraft to the Finnish campaign in preparation for a massive ground offensive, bringing their total to over 2,000 aircraft, including nearly a thousand bombers and about 500 fighters. This force represented nearly half the strength of the entire Red Air Force. Meanwhile, the FAF had grown to nearly 200 planes, with the average of better quality than at the start of the war, but the number serviceable remained fairly constant at nearer a hundred.

At the end of February the Finns suffered their worst losses of any single engagement of the air war when the Soviets mounted a well-coordinated fighter attack on one of their major bases. Just as the mixed squadron of fifteen Fokkers and Gladiators was taking off to intercept a reported bomber raid, some 40 I-16s and I-153s converged on their field almost simultaneously from three directions for a strafing attack. In the wild, low-altitude melee that followed, the Finns lost five Gladiators and a Fokker, while confirming eight Russian fighters, including an I-153 by ground fire. Following this engagement the Finnish Gladiators were relegated to reconnaissance missions only.

The following day the Russians began their final ground assault, and for the next two weeks the Finnish fighters were engaged primarily in strafing attacks for the first time, throwing in everything they had in an attempt to stem the Red tide surging across the ice of the Bay of Viipuri. Early in the offensive the element of surprise and poor weather prevented the Soviets from providing effective anti-aircraft fire or air cover for their troops, and these strafing attacks wreaked havoc. Later, however, Russian anti-aircraft increased greatly and the weather improved somewhat, allowing better fighter cover. These defenses, along with the ever-present "friendly fire" of Finnish ground troops, increased FAF loss rates.

By mid-March it was obvious that the Soviet offensive could not be stopped, and the Finns were forced into an armistice, accepting the Russian terms. As a result, Finland lost substantially more territory than the Soviets had at first demanded, including Viipuri (Vyborg), their second largest city. During this short, but vicious conflict, the FAF reportedly lost 60-70 aircraft, about equally distributed between air and ground losses, plus about the same number severely damaged. In addition, the Swedes lost six planes. Soviet aircraft losses have been estimated at 700-900; the Finns actually claimed only about 240 in air combat, with some 80 more "probables," while the ground forces claimed 330 downed. FAF claims were overwhelmingly against Russian bombers. Of the original Finnish Fokkers, only eleven were lost; nine to enemy action, one to "friendly" ground fire, another in an operational accident. Most of the rest went on to serve again a little over a year later in the Continuation War.

The Winter War, although it lasted less than four months, illustrates some important points regarding air combat. One of the most important is that the numbers of aircraft on each side do not tell the whole story. In this conflict, the Soviets enjoyed an approximate 10-1 advantage in aircraft, but LOST aircraft in combat at roughly the same ratio. Still, they ultimately won the war. As we have seen in previous air wars, particularly in WW-I, quantity is typically much better correlated with the final outcome of a conflict than with aircraft exchange ratios. If the side with superior numbers is willing and able to make good on its losses, it can accomplish its goals in support of the overall effort and eventually achieve victory. The price, however, may be great.

In this conflict, the Soviets had the overwhelming advantage of numbers, and at least parity, if not a slight edge in quality with respect to fighter designs for most of the war. In addition, they had the advantage of holding both the strategic and tactical initiative in most cases.

This usually allowed them to benefit from the element of surprise, concentration of numbers during a given engagement, and an initial altitude advantage. Another plus was the combat experience, at least at higher command levels, of the Russians in Spain and the Far East. This latter advantage was more than offset, however, by an inefficient command structure, low morale, and a general lack of experience among aircrews during much of the conflict.

The Finns, on the other hand, could also claim rough parity in fighter quality, a much higher overall level of aircrew training, high morale, and a more efficient and effective fighter employment doctrine. Also, as they typically were based much closer to the air action, the FAF could generate more combat sorties per aircraft than the Soviets, who were forced to waste much more time just transiting back and forth to the combat arena.

This factor has a powerful force-multiplying effect on the "density" of aircraft that can be engaged in combat at any time with a given total number of aircraft. Operating mostly over friendly territory, the Finns were also less likely to lose downed aircrew; and those that survived returned to combat much wiser, with the effect of increasing the overall level of aircrew experience over time.

The general availability of radios to the FAF was another important factor. Finnish Fokkers were normally equipped with indigenous P-12-17/1 radios. Flight leaders usually had very low-power transmitters with a range of only about 3 mi for coordinating within their flights, while the wingmen generally had only receivers. A system of trained air observers had been established before the Winter War, using telephones to call the squadron headquarters, which were equipped with radios for notifying airborne fighters. The telephone system was not well developed, however, which often resulted in significant sighting delays. Even though the Finns did not have a very effective air-direction system during the Winter War, they were often able to receive engagement and sighting reports that were valuable in allowing them to concentrate their limited forces where they were most needed.

Although it is often dangerous to draw sweeping conclusions from limited air conflicts, the Winter War illustrates many critical principles that will be reinforced throughout the history of air combat.

By Robert Shaw <http://www.sci.fi/~fta/history.htm>

9. Historical background: The Continuation War 1941-1944

When the Continuation War started the Finnish fighter force was in a remarkably better shape than in the beginning of the Winter War. Four fighter squadrons had rather good fighter aircraft in their disposal; Brewsters (BW), Fiats (FA), Moranes (MS) and Curtisses (CU).

However, all the other types except the Brewsters were already gradually becoming obsolete in their performance and weaponry. The basic personnel in the squadrons consisted of the war hardened veterans and also the reserve pilots had got a short but intensive rehearsal training. The new fighters had been test flown and the special type oriented tactics had been developed for them.

The basics of the Winter War fighter tactics remained the same in the Continuation War. The shortage of the fighters in the Winter War had, however, often limited the tactical freedom to the use of the sections. Now it was possible to use bigger formations to increase the strike power and mutual support (11):

" In the combat spread formation the lead division flew lower, and on the side of it and higher flew the top cover division. Both of those divisions were made of two independent sections. When the combat started the lead division hit first, and only if the help was needed, the top division joined the battle. Even in that case the other section of the top division stayed up, if possible, to give cover. In the big air combats the fight spread out after the first attack over a large area and there was no way to maintain formation integrity. Individual sections of two fighters each tried to stay together to lend mutual support within the section or division."

In the offensive phase of the Continuation War the fighter units got experiences which modified somewhat the tactical principles. Both the own and the enemy fighters had changed, the force ratio was not so unfavorable and the offensive gave new missions for the fighters.

The main mission for the fighters still was the air superiority battle, but additional missions were ground attacks, reconnaissance flights and even artillery fire control flights.

One of the most important phases of the air combat was the search. It had to be done so that the own formation was hiding itself as well as possible and at the same time all own pilots could keep an effective look out. The principles of the search were as follows:

The Fokkers (FR) were operating mainly over the sea where the enemy used rather small formations. FRs used usually divisions or a division plus section with one section as the top cover. The enemy flew normally at low altitudes, so, FRs also used altitudes of 600 - 1 500 feet. Fokkers were rather slow and therefore used shorter distances between the section's planes than the other types, normally about 75 yards.

The Fiats (FA) flew usually in a division formation so that the section separation was 100 - 150 yards and the distance between the sections was 300 - 400 yards. If two divisions were flying together the distance between them was 1000 - 2000 yards. FAs used normally the altitudes of 6 000 - 10 000 feet to be able to convert potential energy for speed; the enemy flew usually at 1 500 - 4 500 feet. It was a standard practice to make small turns during the search and the wingmen changed often wing to improve the look out.

The Curtisses (CU) used the normal combat spread formation and the top cover section changed the side freely. The Brewsters (BW) flew the search phases using a flight formation. Both of the divisions could check the six of another and the top division flew clearly higher. BWs had a good radio system and the fighter power could be quickly concentrated from a large area.

The Moranes (MS) used usually a division formation and had almost always to fight against bigger numbers. The speed of the fighter had its effect on the spread of the formation; the faster the speed, the broader the formation. The best way for the look out was that every pilot performed his look out as if he had been alone in the sky.

The use of the top cover proved to be important to avoid the surprises. The flying in division formations demanded a good skill level in the search and individual combat because the two sections had to be able to fight against even the big superiority in numbers until additional forces arrived. The benefit of the small formations was that they were harder to see.

The enemy radio intelligence was well arranged and therefore there was a radio silence until the enemy was seen.

In the ground attacks the strikes on the marching troops, truck and horse columns and trains were found effective. The enemy anti aircraft fire was quite fierce and that's why the surprise was essential.

The Fokkers attacked successfully on the sea targets using armour penetrating ignition bullets. Torpedo boats and even bigger ships could be set on fire with those. The attacks were done simultaneously from different directions and the boat evasive manoeuvres could be anticipated and followed.

The reconnaissance flights by the fighters proved to be effective. However, the pilot had to be able to keep in his mind the reconnaissance results without notes. The best way was to give the reconnaissance information in the real time by radio to the responsible staff. This was especially important during the offensive during which the situations changed quickly. When the fighters carried out a reconnaissance mission, one pilot concentrated on the reconnaissance task and the others kept the look out for the enemy fighters.

The fighter bases were located at 30 - 60 miles from the front line, but temporary air bases were also positioned rather near the front line. Especially the Fiats, due to their short range, had to use a forward basing system. The forward bases had to have a good anti aircraft system and the flight units had to be kept in the high readiness.

The temporary transfers of the fighter units had to be made to concentrate the fighter power to the critical battle areas. Those transfers, however, always demanded rather extensive advance preparations.

The enemy tried to avoid the air combats, which almost without exception were victorious for the Finns. So, the FAF had the air superiority during the offensive phase of the Continuation War.

The Soviet pilots opened the fire at too long ranges. They used as the combat manoeuvres slow rolls, loops, immelmans and some uncontrolled movements which they did well but which didn't have much practical use in the air combat.

The most frequent enemy fighter of that time was the I-153, which was as fast as CU but slower than BW, MS and FA. It was extremely agile and could benefit the reverse firing opportunities, however, usually losing these "wild west sheriff duels".

The I-16 bis had become more general than the I-16 and it was a very good fighter; from the Finnish fighters only BW was better than it.

The new enemy fighter types, MiG-1 and MiG-3, were fast but obviously they were sensitive to stall and spin; they always tried to get a surprise and avoided dog fight.

The cooperation in the Soviet formations was improving but still sometimes was inadequate; the top cover could escape from the battle and sometimes even the other section of a division disappeared when the another section was under an attack.

In the Eastern Karelia the enemy used in the same formation several different aircraft types and it was a kind of indication that even a superpower could suffer the shortage of the aircraft.

The Soviet fighters flew usually below 7 500 feet and they often used clouds not only to escape but also to hit back.

In the end of 1941 the enemy started to use new flying units with British and American fighters. These were transported to Archangel and assembled in Vologda. The Hawker Hurricane squadrons operated in Sorokka area and the Curtiss Tomahawk squadrons in Leningrad area. The type transfer training obviously had been short because in the first combats against Hurricanes these were found as easy targets.

The Soviet MiG-3 fighters avoided dog fights against MS and FR fighters and they had started to apply the energy tactics. They also opened fire nearer than before.

When the trench war period started in the spring of 1942, the enemy began to intensify its flight operations over the Gulf of Finland. The targets of the operations were the sea traffic, the harbour city Kotka and Suursaari Island. The enemy also flew continuous reconnaissance flights to check the sea traffic, the railway and road transportations in the Southern Finland and the front line. More and more MiG-3 and Tomahawk fighters were in use and a new ground attack aircraft, the Il-2, made its first appearance. In the summer and autumn of 1942 appeared LaGG-3 and Spitfire fighters. BW fighters could still fight successfully against these new models. In fighter combats the BWs used broad and loose flight formations with a big altitude separation.

In the spring of 1943 again new types, La-5, Yak-1, Yak-7b and Boston III appeared over the Gulf of Finland. The new Soviet fighters had better performance than the Brewsters (BW), but at that time the FAF got new Messerschmitt 109 G 2 (MT) fighters which were good enough in performance and very successful in their energy tactics. The BWs had to use bigger formations with a very wide altitude separation and often the MT fighters flew top cover for them. In addition to that the ground control station network on the coast proved to be very effective for the fighter operations.

Also north of Lake Ladoga, in the Aunus area, the enemy flight operations intensified in the summer of 1942. The Curtiss (CU) squadron which operated there, had a rather small amount of fighters and flew both the intercept sorties and escort missions by sections and divisions. The advantage of the small formations was that the CUs often were able to make the surprise attacks. They proved to be successful against even the much bigger numbers of the enemy fighters. The CUs, Curtiss Hawk 75 As, were slower than any enemy type in that area, and therefore they always tried to start the fight from the height advantage. This was the only way to catch, for example, the new and fast enemy bomber Pe-2.

In the dogfights the CU pilots proved to be superior compared to the opponents and therefore they always tried to tie the enemy in those. The principle was always to attack regardless of the numbers. During summer 1942 the CU squadron didn't lose a single pilot although in one air combat, for example, one CU pilot had to fight alone against 5 LaGG-3s until these retreated to their own side, while the CU pilot chased them and shot one of them down.

In the Maaselkä area north of Aunus the enemy air activity was very low after the trench war started. The BWs were transferred to the Gulf of Finland front and the MS fighters remained in Maaselkä. MSs proved to be inferior compared to the enemy fighters, but the skill of the pilots kept the win ratio victorious. The MS fighters got more and more reconnaissance missions over the vast forest area of the Eastern Karelia.

The enemy still avoided air combats. Spitfire and Hurricane pilots were more aggressive knowing the good performance of their fighters. The other pilots usually tried to escape using extremely low altitude to eliminate the shooting position from behind and below. The I-16 fighters also used rockets as air-to-air weapons. During escort missions the enemy fighters sometimes disappeared letting their protégés on the mercy of the Finnish fighters.

In the Aunus area the most common enemy fighters were the MiG-3s. Those were ready to challenge the Finnish CU fighters only if they had a big numerical superiority and they were on their own side of the front line. They used mostly the energy tactics and often flew in the line astern formation patrolling over their own troop positions.

In the Maaselkä area the enemy used more and more Tomahawk and Hurricane fighters. The skill level of the enemy pilots had increased, but they still lacked accuracy in the air gunnery.

In the beginning of 1943 one prisoner of war pilot told that the Soviets tried actively to learn the opponent's fighter tactics and develop their methods and training according to that.

The emphasis of the enemy air operations concentrated more and more on the Gulf of Finland where quite big formations were used.

The enemy used over the Gulf of Finland new aircraft types like LaGG-3s, La-5s, Yak-1s, Il-2s and Pe-2s. The Soviets improved their attack planning and co-operation in the formations. The bombers and ground attack aircraft flew at the lowest altitude escorted by the fast fighters LaGG-3s and La-5s. The top cover fighters flew high ahead and behind the attack formation. During the return flight the old I-153 and I-16 fighters could take off from Lavansaari island base to protect the Il-2 attack planes. These I-fighters acted as kind of baits for the Finnish fighters; they were agile and if the Finnish fighters started the fight with them they lost time and the attack planes could slip away. In the air combats the enemy pilots tried to draw the battle into the circle of their island base and ship anti aircraft artillery.

During the late summer of 1943 the old enemy fighters disappeared from the Gulf of Finland and they were replaced by the LaGG-3s and La-5s. The combat experiences showed that BW was more agile than the LaGG-3. The La-5 had superior performance compared to BW.

The LaGG-3 was about as agile as MT. The La-5 was more agile than MT being in the same category with MT in the other performance.

Over the Gulf of Finland and Karelian Isthmus the enemy often used a formation of four Il-2s escorted by four fighters. From two to three of these kind of formations flew in line astern with 5 minutes time intervals. The biggest enemy formations included about 45 aircraft. In the big formations the bombers and ground attack planes flew at low level and the escort fighters were stacked above them up to 15 000 feet. The enemy ground control system seemed to work well. The enemy fighters often were positioned so that the Finnish fighters attacked them and the Soviet bombers could slip to their island bases at Seiskari and Lavansaari.

In the beginning of 1944 the enemy increased the combat air patrol type of operations over the Gulf of Finland. The skill of the enemy pilots proved to be mixed due to their pilot losses during the battle of the Gulf of Finland. The accuracy in the air gunnery still was not very good and obviously the best pilots had been transferred to La-5 and Yak-9 fighters. The LaGG-3 pilots looked newcomers; for example one LaGG-3 formation had started a dog fight with the Finnish MS fighters and all the LaGGs had been shot down.

In the beginning of the summer 1944 the Finnish fighter control and base system was reorganised in the Karelian Isthmus and on the coast of the Gulf of Finland due to the increased air operations of the enemy. The Finnish fighter leaders expected the Soviet strategic attack to begin in the early summer 1944 and arranged the fighter system ready for that. In the end of May 1944 a new wing control centre began to control the entire fighter force flexibly in the area of the expected main defence sector.

When the Soviet attack started on 9th June 1944 the enemy concentrated on the Karelian Isthmus about 1500 aircraft. Their mission was to bomb the Finnish front line troops and transportations, to reconnoiter the defence positions and to maintain the air superiority. The main idea was to break the defensive line with a heavy bombardment. The Soviet air task lacked the strategic elements and being more tactical directed the Soviet air resources to a very small operation area. This made the Finnish fighter units' task much easier because now the limited fighter force could be concentrated effectively on that same small area. Only the MT fighters had good enough performance to fight successfully against the manifold superior numbers of the attacker. Other fighter types were transferred to secure the rear and side sectors.

The intercept sorties were flown with as many fighters as was available at any certain moment, usually 8 - 20 fighters. The basic idea was that the top section or division attacked on the Soviet escort fighters while the lower division or flight attacked on the bombers. However, often, due to the great numbers of the Soviet escort fighters, all of the Finnish fighters had to commit themselves to the fighter combats. Anyhow, the Finnish principle was always to attack even as a section regardless of the numbers of the enemy. The limited fighter force was not able to repulse the bomb raids, but it caused continuous losses which were eating the enemy pilot cadre. The attacks scattered the Soviet formations and spread the combat over a larger area where the enemy could not get the direct benefit from the big numbers. The duels were solved by the combat skill and shooting accuracy of the individual pilots and the Finns proved to be the winners almost always. There were several occasions in which the Soviet formation turned back after seeing the Finnish fighters in the interception position.

When the Soviet offensive was stopped in the middle of July 1944 the enemy activity also in the air operations began to go down. The Soviet fighters started to avoid air combats while the Finnish fighter force was continuously becoming stronger due to the small losses and the deliveries of the additional MT fighters.

One very important mission for the Finnish fighters was to escort own bomber formations. These played a decisive role in the defence because the bombings could be concentrated on attacking massed troops just before preplanned attack times. Warnings of impending troop movements were continually being captured by radio intelligence. The bomber formations included usually 30 - 40 aircraft and they were escorted by 12 - 18 fighters divided in three groups. The first group escorted the lower bombers, mainly Blenheims, the second group escorted the higher bombers, mainly Junkers Ju 88s and the third group flew as a top cover. The fighters escorted the bombers also during the return flight to 30 - 60 miles over own side, and then returned over the front line to patrol. The MT fighters were extremely effective in their escort missions; the escorted Finnish formations didn't lose a single bomber for the enemy fighters.

In August 1944 the enemy air operations came practically to a halt; the Finnish fighter units continued to patrol and make reconnaissance sorties to secure the situation.

By Heikki Nikunen <http://www.sci.fi/~fta/history.htm>

10. Acknowledgements and credits

First of all, our thanks to Microprose\Atari and the pioneers of EAW-editing, without whom none of this would have been possible, especially to:

Charles Gunst, Dominique "Dom" Legrand, "Moggy", Paulo Morais, and Dirk "Emil" Schoorens

The Editors we used to make FAW:

3dz Analyzer by Will Baldwin
3DZ Converter by Alessandro Borges
3DZ!Studio by Alessandro Borges
3DZ!Studio by Gurney
3DZ!Studio by Gurney updated by Sydbod
3DZ!Studio by Gurney updated by Will Baldwin
Airgrid by MrJelly
AXE 2.0 by Benjamin Peterson
Campaign editor by Gurney
CDF file extractor by Paulo Morais
CDF re-packer by MrJelly
Convoy Editor by MrJelly
Flight Editor by MrJelly
Formation Editor by MrJelly
Hill Generator by Woolfman and Alatrisme
Loadout Editor by MrJelly
Map Generator by Woolfman and Alatrisme
Object Editor by Gurney
PicPac by Microprose
Plane Hanger by MrJelly
Str Editor by MrJelly
Target Editor by Gurney
Target Editor by MrJelly
Terrain Editor by Woolfman
Tmod Table Editor by MrJelly
Tpc2Pcx converter by George

Skins provided in this package were made by the following people:

The planes in the "Winter War 1939-1940" campaign:

Finnish planes:

Blenheim I (Bf 110G slot). LLv 44.	Skin by FreddyB, 3dz by Captain Kurt.
Blenheim IV (Me 410A slot). LLv 46.	Skin by FreddyB, 3dz by Captain Kurt.
Fiat G50 (FW 190A slot). LLv 26.	Skin: Patrick Grand-Chavin and Illu, 3dz: Captain Kurt and Illu.
Fokker CX (Ju 87 B slot). LLv10.	Skin by Edward, 3dz by Karel Chvojka.
Fokker DXXI (Me 262A slot). LLv12.	Skin by Edward, 3dz by Karel.
Gloster Gladiator (FW 190 D slot). LLv 26.	HR skin by Flying Tiger, 3dz by Jan Tuma.
Morane Saulnier 406 (Bf 110 C slot). LLv28.	HR Skin by DeanH and Flying Tiger, 3dz by Col. Gibbon.

Soviet Union planes:

Ilyushin DB-3 (B 26 slot). Unknown unit.	Skin and 3dz by Karel Chvojka.
Polikarpov I-16 (Hurricane slot). Unknown unit.	Skin by Steve Day, 3dz by Captain Kurt.
Polikarpov I-153 (Spitfire XIV slot). 71 IAP.	Skin and 3dz by Captain Kurt.
Tupolev SB-2 (Mosquito slot). Unknown unit.	Skin by Karel Chvojka, 3dz by Captain Kurt mod. by Karel C.
Tupolev TB-3 (B17 slot). Generic Paint scheme.	Skin and 3dz by Karel Chvojka.

Finnish planes in the "Continuation War 1941-1944" campaign:

Brewster Buffalo 239 (Bf 109E slot). 4LeLv 24.	Skin by Flying Tiger, 3dz by Captain Kurt.
BF 109G-2 (BF 109G slot). LeLv 34.	HR skin and updated 3dz by Illu.
Blenheim I (Bf 110G slot). PLeLv 48.	Skin by FreddyB, 3dz by Captain Kurt.
Blenheim IV (Me 410A slot). LeLv 48.	Skin by FreddyB, 3dz by Captain Kurt.
Curtis Hawk (Bf 109K slot). LeLv32.	HR skin by Flying Tiger, 3dz by Rotton50.
Dornier 17Z-2 (Ju 88C slot). LeLv48.	Skin: Flying Tiger, 3dz by Karel Chvojka.
Fiat G50 (FW 190A slot). HLeLv 26.	Skin by Patrick Grand-Chavin, 3dz by Captain Kurt.
Fokker CX (Ju 87 B slot).	Skin and 3dz by Karel Chvojka.
Fokker DXXI (Me 262A slot).	Skin and 3dz by Karel.
Gloster Gladiator (FW 190 D slot). LeLv 16.	HR skin by Flying Tiger, 3dz by Jan Tuma.
Hurricane I (V1 slot). LeLv 26	HR skin by Flying Tiger, 3dz by Col. Gibbon.
Junkers 88A (Ju 88A slot). PLeLv 44.	HR Skin by DeanH, 3dz by Col. Gibbon.
Morane Saulnier 406 (Bf 110 C slot).	HR Skin by DeanH, 3dz by Col. Gibbon.
Tupolev SB-2 (He 111H slot).	Skin by Karel Chvojka, 3dz by Captain Kurt mod. by Karel C.

Finnish and German planes in the "Summer 1944 Soviet offensive" campaign:

Brewster Buffalo 239 (Bf 109E slot). 4LeLv 24.	Skin by Flying Tiger, 3dz by Captain Kurt.
BF 109G-2 (BF 109G slot). LeLv 24.	HR skin and new 3dz by Illu.
BF 109G-6 (Me 262A slot). 3/HLeLv 24.	HR Skin by Flying Tiger, 3dz by Mr. Johnson.
Blenheim I (Bf 110G slot). PLeLv 48.	Skin by FreddyB, 3dz by Captain Kurt.
Blenheim IV (Me 410A slot). PLeLv 48.	Skin by FreddyB, 3dz by Captain Kurt.
Curtis Hawk (Bf 109K slot). LeLv32.	HR skin by Flying Tiger, 3dz by Rotton50.
Dornier 17Z-2 (Ju 88C slot). PLeLv48.	Skin: Flying Tiger, 3dz by Karel Chvojka.
Focke Wulf 190A-6 (FW 190A slot).II./JG 54.	HR Skin by Flying Tiger, 3dz by Mr. Johnson.
Focke Wulf 190F-8 (FW 190D slot). I/SG5.	HR Skin by Flying Tiger, 3dz by Mr. Johnson.
Hurricane I (V1 slot). LeLv 26	HR skin by Flying Tiger, 3dz by Col. Gibbon.
Ilyushin DB 3F/ IL-4 (He 111H slot) LeLv 48.	Skin and 3dz by Karel Chvojka.
Junkers 87D-5 (Ju 87 slot). I/SG3.	HR Skin by Flying Tiger, 3dz by Col. Gibbon.
Junkers 88A (Ju 88A slot).PLeLv 44.	HR Skin by DeanH, 3dz by Col. Gibbon.
MS 406 (Bf 110C slot).1/HLeLv 28	HR Skin by Flying Tiger, 3dz by Col. Gibbon.

Soviet Union planes in the "Continuation War 1941-1944" campaign and the "Summer 1944 Soviet offensive" campaign:

Curtiss P-40E (Tempest slot). 154 IAP.	HR skin by Flying Tiger. 3dz by Captain Kurt. Douglas
A-20 (B-17 slot). Unknown unit.	HR skin by FreddyB. 3dz by Captain Kurt.
Hurricane II (P-38H slot). 152 IAP.	HR skin by Illu, 3dz by Col. Gibbon edited by Illu.
Ilyushin IL-2 (P-47D slot). Unknown unit.	Skin by Steve Day, 3dz by Charles Gunst.
Ilyushin IL-4 (B 26 slot) Unknown unit.	Skin and 3dz by Karel Chvojka.
La-5 (Typhoon slot). Unknown unit.	Skin by Steve Day, 3dz by Captain Kurt.
LaGG-3 (Spitfire II slot). 9 IAP.	Skin by Flying Sheep, 3dz by Tailspin, Flying Sheep and Col. Gibbon. Cockpit gauges placed by Crashin' Jack.
Mig-3 (P-38J slot). 7 IAP.	Skin by Flying Sheep, 3dz by Tailspin and Captain Kurt.
P-39 (P-51D slot). 103 GIAP.	HR skin by Illu, 3dz by Col. Gibbon. Cockpit gauges placed by Crashin' Jack.
Petlyakov Pe-2 (B-24 slot). Unknown unit.	Skin by Flying Tiger, 3dz by Karel Chvojka.
Polikarpov I-16 (Hurricane slot). 4 GIAP.	Skin by Steve Day, 3dz by Captain Kurt. Cockpit gauges placed by Crashin' Jack.
Polikarpov I-153 (Spitfire XIV slot). 7 IAP.	Skin and 3dz by Captain Kurt. Cockpit by SteveT and Captain Kurt
Tupolev SB-2 (Mosquito slot). Unknown unit.	Skin by Karel Chvojka, 3dz by Captain Kurt mod. by Karel C.
Yak-1 (P-51B slot). 3 GIAP.	Skin: Patrick Grand-Chavin, 3dz: Tailspin, Captain Kurt, Patrick Grand-Chavin. Cockpit by Claudio Wilches.
Yak-7 (P-47C slot). 156 IAP.	Skin by Flying Sheep, 3dz by Tailspin, Captain Kurt and Col. Gibbon. Cockpit by Claudio Wilches.
Yak-9 (Spitfire IX slot). 113 GIAP.	Skin by FreddyB, 3dz by Tailspin and Col. Gibbon. Cockpit by Claudio Wilches.

Misc skin updates:

P****s.3dz edits with code 1 lines added by Col.Gibbon: Blenheim I, Blenheim IV, Fiat G50, Gloster Gladiator, P****s.3dz edits with code 1 lines added by vonOben and misc fixes: Brewster 239, Curtis Hawk, Fokker CX, Fokker DXXI, Ilyushin DB 3F, I-16, I-153, P-40, IL-2, IL-4, La-5, Lagg-3, Mig-3, P-39, Yak-1, Yak-9, Other small improvements: fixed palette issues (pink pixels), improved F1 running prop and static prop colours and transparency, added transparent aircraft shadows where they were missing, modified aircraft shadow 3dz to better match aircraft shape etc by vonOben.

The other files provided in this package were made by the following people:

3D.CDF

Airfield 3DZ by Moggy and vonOben.

Airfield tpc by Major Lee and vonOben.

Plane 3dz and Plane tpc listed above.

Tmod 3dz and Grnd tpc by Col. Gibbon, GhostBoy, FreddyB, Illu, Pobs, sagginb, Shreck, vonOben.

Data.cdf 1939-1941-1944:

Loadot.dat Planes.dat and Weapons.dat from rp2.6v10 by Knegel.

World, targets and campaign dat files by vonOben.

Vcg_*.dat files by Captain Kurt, Crashin' Jack, and others.

Flt.cdf 1939-1941-1944:

Flight and damage model rp2.6v10 by Knegel.

German speech

Speech files by Cord and Microprose, compiled by Muas.

Grbrief.cdf:

Finnish briefing speech by Vesa.

Converted to snd format by von Beerhofen.

Music.cdf

Aradio2m and Gradio1m converted by RAF_Dumoulin.

The others converted by vonOben.

Music folders

Rescued.bgm supplied by RAF_Dumoulin converted by vonOben

Captured.bgm supplied by RAF_Dumoulin converted by vonOben

YouDead.bgm supplied by RAF_Dumoulin converted by vonOben

HalloFame.bgm supplied by RAF_Dumoulin converted by vonOben

The others downloaded and converted by vonOben.

Screens

Aircraft selection screens by Knug.

Aircraft selection screens for Eaw 1.28 by vonOben.

Barrack screens by Knug, Marco Bonafede and vonOben.

Briefing screens by Knug and vonOben.

Hangar screens by Knug, FreddyN and FlyRight.

Main screens by vonOben.

Map screen by vonOben.

Sounds

Engine sounds by Wudpecker.

Speech1.cdf:

Russian speech by Mishanya.

Speech2.cdf:

Russian speech by Mishanya.

Speech3.cdf:

Finnish Speech by Pete.

Recordings by Baron Von Martin.

Conversion to snd format and fine tuning by Neira.

Sprites.cdf

Misc effects by VonBeerhofen slightly edited by vonOben. Hwgs smoke by max188.

Gunsight by ?

People by Pobs.

Terrain.cdf Summer:

FAW Terrain by vonOben.
Railway Tracks by sagginb.
Sky by Julio.
Clouds by +mia.

Terrain.cdf Autumn:

FAW Terrain by vonOben.
Railway Tracks by sagginb.
Sky by Julio.
Clouds by +mia.

Terrain.cdf Winter:

FAW Terrain by vonOben.
Railway Tracks by vonOben.
Sky by Max188.
Clouds by +mia.

Terrain Winter Hard

FAW Terrain by vonOben.
Frozen ice wake by FlyRight, edited by vonOben.

Text_eng.cdf

Str files by Stanley99, vonOben, VonRon, Knegel.

Ukbrief.cdf

Empty cdf file (copy of Menu_eng.cdf).

Usbrief.cdf

Empty cdf file (copy of Menu_eng.cdf).

Extra folder

Main screens by Neira.

If I forgot somebody please let me know and I'll add his name.

Also a Big thanks to people in the EAW Code group that made the 1.28e FAW update possible, especially to:
Knegel and MrJelly.

Per "vonOben" Rasmusson
Helsingborg, Sweden
per.eslov@spray.se

<http://vonoben.free.fr/>

January 30, 2009

Updated for 1.28d version:
March 20, 2010

Updated for 1.28e version:
November 28, 2010

Updated for 1.28e update version:
March 13, 2011