TALONSOFT'S

BATTLE OF BRITAIN

GAME DESIGN BY

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I. INTRODUCTION

Shortly after the fall of France in 1940, Germany's mighty Luftwaffe, under the direction of Hermann Goering, began a bombing campaign against Britain that, when it ended, was one of the most dramatic air battles in history. In an attempt to gain air superiority and soften the island nation against an invasion (code-named Operation Sea Lion), the Luftwaffe pounded British airfields, industries, and urban centers for months. But to no avail. Britain and its Royal Air Force (RAF) rose to meet the challenge and fought back Hitler's mighty air force that streamed over the English Channel day in and day out. The Battle of Britain was the first major defeat Germany suffered in World War Two, and it would help to turn the tide of the war.

TalonSoft's Battle of Britain simulates this great clash. Through careful strategic planning, you can lead the German Luftwaffe to victory. Or, as commander of the Royal Air Force, you can savage Hitler's bomber formations with such famous aircraft as the Hawker Hurricane and the Supermarine Spitfire.

You can play either the official 1940 battle which lasts for three months, or you can play the added hypothetical "what-if" campaign of 1941, which prompts the question "If Hitler had to do it all over again, what would he have done differently?"

This Player's Guide explains in detail all the features and functions of the game. Read it carefully. Read Chapter II (Getting Started) first to set you along the path of plotting German raids. And don't forget to read the historical information near the end of the guide.

PLAYER'S GUIDE LANGUAGE AND FORMAT

For simplicity, the pronoun "he" is used where appropriate. The words "raid" and "mission" are interchangeable. The words "unit" and "air unit" are interchangeable. The words "primary airfields" and "primary sector airfields" are interchangeable. The word "squadron" is used to represent both RAF units and Luftwaffe gruppes. The term "British" is used to represent the RAF and its Commonwealth allies. And Finally, items underlined in the guide (e.g., "Select Bomber Missions") represent steps that the player should take to complete certain tasks. Other text accompanying the underlined steps is for informational purposes and should be read to ensure full understanding of all game functions.

II. GETTING STARTED

TalonSoft's Battle of Britain is a game that requires study to learn well. However, the actual mechanics of clicking buttons, plotting German raids, launching British interceptors, etc., is really quite simple. This section of the Player's Guide will help you get started quickly, by describing how to plot a few German raids and start the Reaction Phase. It is recommended that you begin your play of Battle of Britain as the Germans, as we believe it's easier to get into the game this way, because once you've plotted your raids, you can sit back and watch them fly.

Screen Flow Chart

Here's a quick diagram of how the screens in *Battle of Britain* relate to each other. Basically, beginning a new campaign begins by selecting either "New German Campaign" or "New British Campaign" from the Start-up Screen, then on to the Campaign Selection Screen, and then on to the Main Game Screen where the game is played. Other screens can be accessed from these three main screens, but you shouldn't concern yourself with those until you become more familiar with the game.

1. Select "New German Campaign" in the bottom right-hand corner of the Start-up Screen. This

Start-up Screen

Other screens that can be accessed from the Start-Up Screen are the Multiplayer, Game Options, and Saved Games. Selecting "New British Campaign" or "New German Campaign" takes you to the Campaign Selection Screen.

Campaign Selection Screen

On the Campaign Selection Screen, you will choose by year which campaign to play (one-day, one-week, one-month, or full-length). Click the game map in the bottom right-hand corner when a campaign is selected. This takes you to the Loading Screen, then the Main Game Screen.

Main Game Screen

Battle of Britain is played on the Main Game Screen. Other screens that can be accessed from here are the Game Options and Saved Game Screens.

Playing a One-Day 1940 Campaign

Follow the steps below to play a one-day 1940 Campaign as the Germans. In this tutorial, we will walk you through the steps in choosing a campaign and plotting a couple bombing raids against Kenley and Biggin Hill, two British airfields.

START-UP SCREEN

takes you to the Campaign Selection Screen where you will choose your campaign.

CAMPAIGN SELECTION SCREEN

2. On the Campaign Selection Screen, select "One-Day" under the 1940 heading. When you do this, the campaign's description appears and the map in the bottom right-hand corner highlights. Read the campaign description carefully. To win this simple one-day campaign, you must score more points than your British opponent. You do this by shooting down British aircraft and by bombing British airfields.

3. Once you've read the campaign description, select the map in the bottom right-hand corner of the Campaign Selection Screen. It should be highlighted with "START GAME." The Loading Screen appears briefly. When the campaign is finished loading, you are taken directly to the Main Game Screen.

MAIN GAME SCREEN

It's important to stop now and briefly describe the "phases" in the game. *TalonSoft's Battle of Britain* is played in phases. The German player has a Raid Planning Phase, a Reaction Phase, and an Intelligence Briefing Phase. The British player has a Movement Phase and a Reaction Phase.

game phases

raid planning phase

primary sector airfields

British air groups

As the German player, when you first enter the Main Game Screen, you begin in the Raid Planning Phase. It is in this phase that you will begin planning your upcoming day's raids against British targets. For this simple tutorial, we will walk you through the planning of two basic bombing raids against Kenley and Biggin Hill airfields, which are located just south of London. Kenley and Biggin Hill are classified as "primary sector airfields". That means that they are directly attached to one of the four main British air groups (groups 10, 11, 12, and 13). Primary sector airfields are very important, as they maintain most of the British air units which will be trying to intercept your incoming bomber formations, and, the German player receives points for bombing them. So, the

MAIN GAME SCREEN

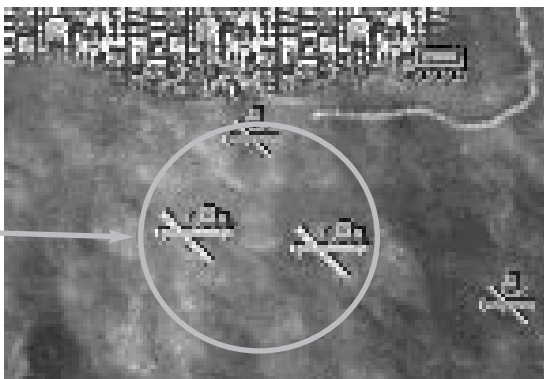zoom-in map

position screen over South London

more you damage these airfields, the better your chances for victory.

4. Along the right-hand side of the game map is the Preference Tool Bar. On this tool bar, click the "zoom-in" button twice. This will bring you in a little closer to the airfields. Once you've done this, scroll the map around a little (by moving the mouse arrow left/right, up/down along the edges of the screen) until you are just south of London (i.e., the big gray mass of urban area and targets in the bottom right-hand corner of Britain, as shown below).

Kenley and Biggin Hill

Kenley and Biggin Hill airfields are just south of London and her suburbs. These are the two airfields you will bomb. Move your mouse arrow over both airfields to see their names appear in a shaded black box. [**NOTE:** Upon entering the Main Game Screen, you may have cloud cover over Kenley and Biggin Hill. To remove it, simply click the "cloud" button on the Preference Tool Bar.]

shaded information boxes

5. Find the "highlight target damage" button on the Preference Tool Bar and click it. This highlights all targets on the map in green. As targets take damage, the highlights turn yellow, orange, and red to show the level of damage.

highlight target damage

Kenley and Biggin Hill airfields should now be highlighted in green, but your goal is to bomb them until they change color (red preferably). So, let's begin planning your bombing raids.
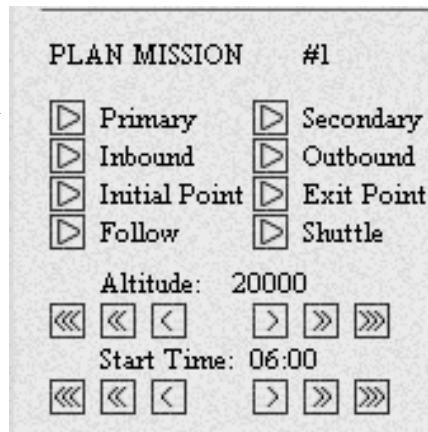
MAIN GAME SCREEN

bomb planning sub-tab

6. Along the far right-hand side of the Main Game Screen, is a tab system. In the Raid Planning Phase, this tab shows all the functions necessary to plan your raids. For this tutorial, we will only concern ourselves with plotting bombing missions. So, on this tab, <u>select "Bombing Mission"</u>. This immediately flips the tab to the planning sub-tab (as shown below).

"Primary Target" button

PLAN MISSION   #1

Primary   Secondary
Inbound   Outbound
Initial Point   Exit Point
Follow   Shuttle

Altitude: 20000

Start Time: 06:00

plan mission #1

At the top of the tab are the words "PLAN MISSION #1". That means the game is ready to take your first mission order. <u>To plan your first mission, select the "Primary" button</u>. This tells the computer that you will select the primary target for your raid. Once you've done this, you are ready to select Kenley airfield as the first target.

select Kenley airfield

inbound/outbound flight lines

"form-up" airfield
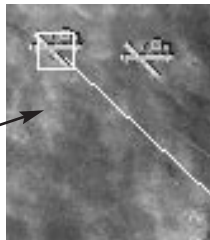
7. <u>On the game map, click on Kenley airfield.</u> Immediately, a white and red line appears directly across the English Channel connecting Kenley with a German airfield. The white line indicates the inbound flight path. The red line indicates the outbound flight path. The German airfield highlighted is where your air units "form up" to begin their flight to Kenley. While you can modify the inbound/outbound flight paths, and also set other flight orders using the other buttons on the planning sub-tab, we won't do any of that now. Your primary target is set and we will move on.

MAIN GAME SCREEN

▷ Pick Lead Unit **8.** As soon as you selected Kenley as the primary target, the "Pick Lead Unit" button appeared on the planning sub-tab. Click this button to open a list of air units on the bottom tab.

bottom tab: lead unit list

(F:0 B:0)	
▷ Stab/ErprGr 210	Bf 110C-4B
▷ 1/ErprGr 210	Bf 110C-4B
▷ 2/ErprGr 210	Bf 110C-4B
▷ 3/ErprGr 210	Bf 109E-4B

pick lead unit
(Stab/ErprGr 210)

9. Select the first unit in the list (Stab/ErprGr 210). This is a BF-110 fighter-bomber unit and will be the raid's "lead" unit. A lead bomber unit is the unit in a raid which takes the point in the formation. Once you've selected this unit, click "Done" in the bottom left-hand corner of the bottom tab.

add bomber units
(1,2,3 ErprGr 210)

▷ Add Bomber Units **10.** As soon as you closed the bottom tab, the "Add Bomber Units" *and* the "Add Fighter Escorts" buttons appeared on the planning sub-tab. Click "Add Bomber Units" to open a list of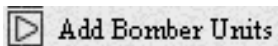 additional bomber units you can add to the raid. On this list, notice that your lead unit (Stab/ErprGr 210) appears with an "L" beside it. This is to remind you of what unit you picked as the lead. On this list, select all three additional units (1, 2, and 3 ErprGr 210). A "b" appears beside their names, showing that they have been selected. These will fly in formation with your lead unit. When finished, click "Done" in the bottom left-hand corner of the bottom tab. You are now ready to add fighter escort to your raid.

add fighter escorts
(Stab/JG 51 & I/JG 51)
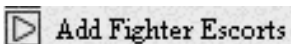
▷ Add Fighter Escorts **11.** After selecting additional bomber units, click "Add Fighter Escorts" to open a list of fighter units. On this list, select units Stab/JG 51 and I/JG 51. The letters "ce" appear beside their names, showing that they have been selected. These will fly with the bomber units as "close escort" fighters. You can set fighter units on "high escort," which can be advantageous under certain circumstances. But we won't bother with high escorts in this tutorial. Let's proceed. When finished, click "Done" in the bottom left-hand corner of the bottom tab. You have successfully completed the planning of your first mission.

MAIN GAME SCREEN

12. Select "New Mission" on the planning sub-tab, to refresh the tab and plan mission #2.

plot raid against Biggin Hill

13. Repeat steps 6 through 11 above to plot a bombing mission against Biggin Hill. Pick a lead unit, additional bomber units, and fighter escort in the same manner you did for Kenley airfield. But once you are finished with the second mission, click the "Done" button on the right tab to return to the main Raid Planning tab. You are now ready to enter the Reaction Phase.

begin reaction phase
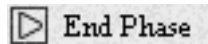
14. Click the "End Phase" button to exit the Raid Planning Phase and enter the Reaction Phase.

The Reaction Phase is where you, as the German player, will sit back and watch your raids in action. Once you click the "START" button in this phase, the clock begins and the phase continues until your raids have run their missions and a score is determined.
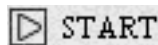
15. To begin the Reaction Phase, click the "START" button. The button immediately becomes "STOP" and you may click it on/off to start/stop the Reaction Phase as you wish. For this tutorial, however, just sit back, relax and watch your planes roll over the English Channel toward Kenley and Biggin Hill.

watch your missions!

Watching the Reaction Phase: The first thing you'll notice when you begin the Reaction Phase is the radio activity in the upper left-hand corner of the screen. It begins to increase. This represents your units forming up and taking off. Your raids will appear eventually (depending upon their launch time), and will fly over the Channel until they reach their targets. But it's not as easy as that. Your British opponent will scramble his air units to intercept your raids, and as the two air forces converge, attack messages appear giving you details about how many of your aircraft are being shot down, and vice-versa. The Reaction Phase may take awhile to complete, as the game is constantly updating and calculating data to generate a final score. Once all of your units land, the one-day campaign ends and you will either win or lose, depending upon the success of your raid.

Plot More Raids: Now that you have successfully completed the tutorial, you are ready to try again. Follow the steps above a few more times and plot more raids against Kenley and Biggin Hill. Try different things. Select different bomber units and escort fighters. Set your escorts to "high escort" to see how that changes your success. Change the formation's altitude settings and stagger your launch times to see if that affects the way the British respond to your incoming raids. Plot even more missions against other British primary airfields (such as Tangmere, Middle Wallop, and Pembrey). Plot some night bombing missions and fighter sweeps. Also, you can set the game speed up to x8 by clicking repeatedly on the clock face in the bottom right-hand corner. For the German player in the Reaction Phase, this is a good speed to set the game. When you are finished trying your hand at the Germans, turn the tables and play the RAF. Playing the British, however, is quite different than planning bombing missions.

To get a full understanding of how all functions in *Battle of Britain* work, refer to Chapter "IV-Playing the Game".

III. INTERFACE OVERVIEW

START-UP SCREEN

After the introduction movie, the Start-up Screen appears. On this screen, choose whether to start a new campaign or continue a saved campaign, adjust gaming options, or begin or continue a play-by-email game. To choose an option, move the cursor over your selection, then left-click to select.

New British Campaign   Game Options   Load Game

Play-by-Email & Hot Seat   Exit Game   New German Campaign

Campaign Selection Screen

To start a new campaign, select either "New British Campaign" or "New German Campaign" on the Start-up Screen. Once you've done so, the Campaign Selection Screen appears.

Command Campaign = Human Player
Artificial Intelligence = Computer Player   Select Campaign   Start Game

Campaign Description   Exit Door
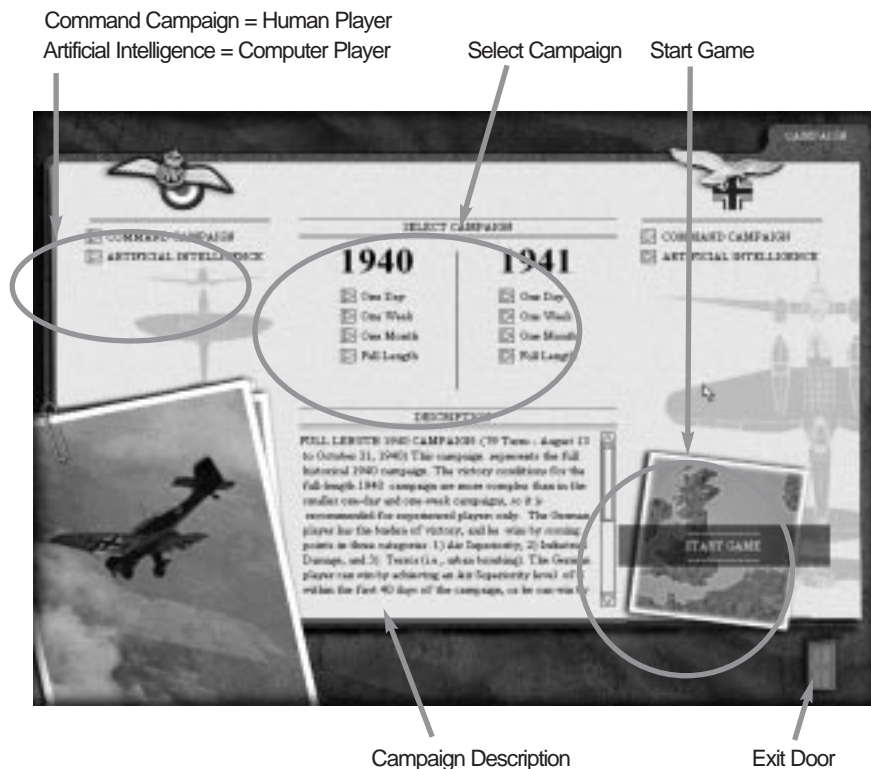
    Making your selection to begin either a new British or German campaign on the Start-up Screen automatically sets you up to play that side. In the top corners of the Campaign Selection Screen, there are two settings: Command Campaign and Artificial Intelligence. If you are playing as the Germans, "Command Campaign" is highlighted and means that you will command the Luftwaffe. The computer will automatically default to "Artificial Intelligence" and play the other side. These settings can be changed once you enter this screen.

    Once on this screen, decide whether to play a 1940 or a 1941 campaign. Each year has four different campaigns to choose from: one-day, one-week, one-month, or full-length. Select one by clicking on the arrow next to its name. Once you've made your selection, a brief description of the scenario appears below the campaign list. Once you are finished reading the description, click on the game map in the bottom right-hand corner (it should now be marked with "Start Game"). Clicking the game map takes you to the loading screen; the campaign loads and then begins. See p. 60 for more details about the different campaigns.

Main Game Screen

Once beyond the Campaign Selection and Loading Screens, you are ready to begin play. All play of *TalonSoft's Battle of Britain* is conducted on the Main Game Screen.

Game Map Information Bar Preference Buttons Raid Planning Phase Tab

Mini-Map

Score Turn Indicator Databases Minimize/Maximize Buttons Save Game Exit Door

Game Speed
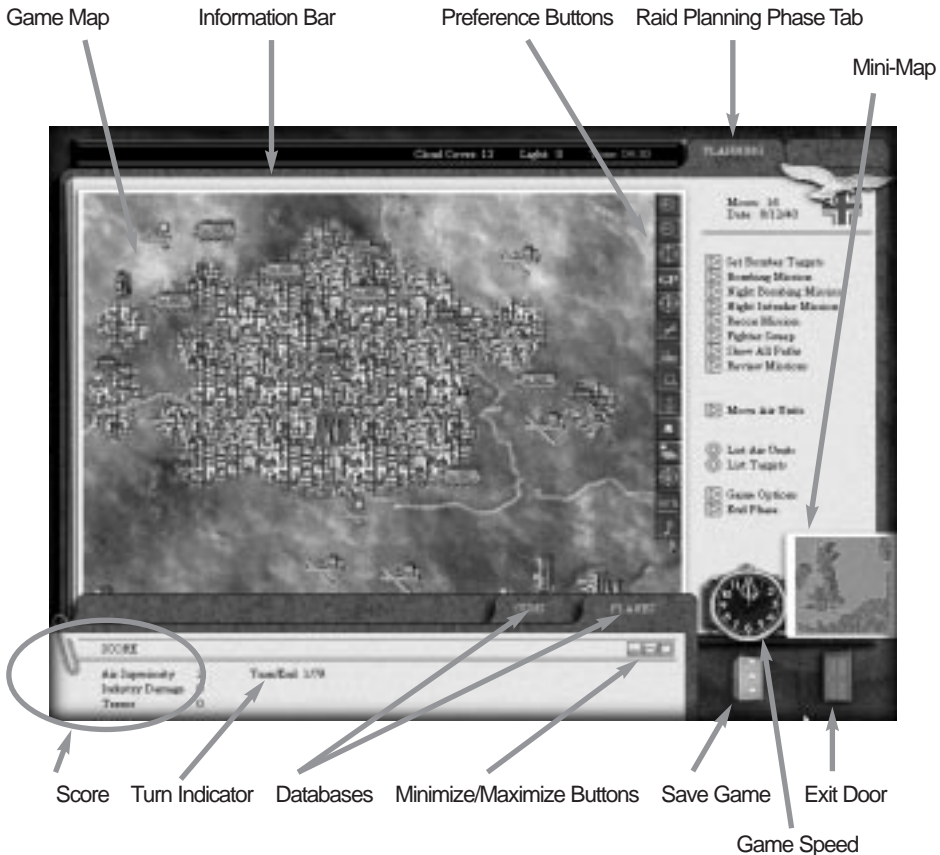
Game Map - The Game Map shows the area of operation (i.e., where the game is played). All German raids fly either out of France (bottom of map) or from airfields along the right edge. The British Isles, on the other hand, not only contain all the primary and secondary airfields where interceptors and patrols will be launched, but also shows all British targets which can be selected for bombing by the German player.

Information Bar - The information bar at the top of the screen lists German radio activity, the day's cloud cover and light, and the actual time of the current Reaction Phase. *See p. 34 for more details.*

Preference Tool Bar - This tool bar allows you to toggle on/off and highlight various visual preferences during game play. These preferences come in handy to keep "visual" tabs on all that's occurring on the map. Below is a detailed description of each preference button.

Zoom-out: Select this button to zoom out the map.

Zoom-in: Select this button to zoom in the map. You can zoom the map in 4 times.

Highlight Target Damage: Select this button to highlight all targets on the map with colored outlines. The colors represent the amount of damage the target has sustained. Light/Bright Green = Undamaged target; Yellow = 1-24% damage; Orange = 25-49% damage; Red = over 50+% damaged. This highlighting function works in the far zoom-out mode as well, but targets in the far zoom out are color-coded for easier identification. Use this highlighting function to clearly see target damage.

Highlight British Aircraft: Select this button to highlight all British aircraft with "status" colors. *This function only works when you are playing the game with 3D aircraft turned on.* The colors are: Black = interceptors; Green = patrols; Blue = units returning home.

Highlight German Aircraft: Select this button to highlight all German aircraft with "status" colors. *This function only works when you are playing the game with 3D aircraft turned on.* The colors are: Orange = incoming raids; Red = outgoing raids.

Toggle on/off Flight Lines: Select this button to toggle off 3D aircraft and play the game with "status" colored boxes and flight lines instead. This is a useful option for players experiencing *very* slow Reaction Phases. The colors for each side are as follows:

<p style="text-align:center">*British*</p>
<p style="text-align:center">Black/White Boxes and Black Lines = interceptors</p>
<p style="text-align:center">Green Boxes and Lines = patrols</p>
<p style="text-align:center">Blue Boxes = air units returning home</p>

<p style="text-align:center">*German*</p>
<p style="text-align:center">Orange Boxes and Lines = incoming fighter sweeps and bomber formations</p>
<p style="text-align:center">Orange Boxes only = recon and night intruder formations</p>
<p style="text-align:center">Red Boxes = outbound raids</p>
<p style="text-align:center">The size of the box also indicates the approximate size of the unit. The larger the box, the more aircraft in the raid.</p>

Toggle on/off Stragglers: Select this button to toggle on and off units classified as "stragglers". A "straggler" is a unit that breaks off from the main element of the raid due to shortage of fuel or damage. The purpose of this feature is to help reduce aircraft clutter on the map. Stragglers occur on both sides.

Highlight Locations with Anti-Aircraft (AA) Guns: Select this button to highlight all British locations which currently house anti-aircraft (AA) guns. *This feature appears only to the British player during his Movement Phase.*

Highlight Locations with Balloon Barrages: Select this button to highlight all British locations which currently house balloon barrages. *This feature appears only to the British player during his Movement Phase.*

Highlight Airfields with British Air Units: Select this button to highlight all British airfields which currently house air units. *This feature appears only to the British player during his Movement Phase.*

Toggle on/off Following Bomber Units: Select this button to toggle on and off all non-lead German aircraft, and instead show their shadows only. *This feature only works when you are playing the game with 3D aircraft turned on.* The purpose of this feature is to help reduce aircraft clutter on the map. See p. 50 for more information about German "lead" and "non-lead" units.

Highlight Locations with Current Recon Photos: Select this button to highlight all British locations that have a current German recon photo. A "current" photo is a photo that is either one or two days old. Any recon photo over two days old is not reliable. *This feature appears only to the German player during his Raid Planning Phase.* See p. 53 for more information about recon photos.

Highlight Airfields with German Air Units: Select this button to highlight all German airfields which currently house air units. *This feature appears only to the German player during his Raid Planning Phase.*

Toggle on/off Airfields: Select this button to toggle on and off all British airfields. *This feature appears only to the German player during his Raid Planning Phase.*

Toggle on/off Factories: Select this button to toggle on and off all British industry, including railyards and oil storage facilities. *This feature appears only to the German player during his Raid Planning Phase.*

Toggle on/off Ports: Select this button to toggle on and off all British ports. *This feature appears only to the German player during his Raid Planning Phase.*

Toggle on/off Radar Sites: Select this button to toggle on and off all British radar sites. *This feature appears only to the German player during his Raid Planning Phase.*

Show Urban Areas (and damage): Select this button to show *only* British urban areas. The red circles indicate the actual area of the urban site. Damage sustained to urban blocks outside the red circles have no effect. Damage to urban areas are represented by various hues of yellow: the brighter the yellow, the higher the damage level. Red dots in urban areas represent fires, and these fires mean that damage can spread to adjacent areas and fires can also increase the damage level of the area they are burning in. See p. 63 for more information.

Toggle on/off Targeted Locations: Select this button to toggle on and off all British targets which have already been selected for attack. *This feature appears only to the German player during his Raid Planning Phase.*

Toggle on/off Cloud Cover: Select this button to toggle on and off clouds. See p. 35 for more information about the effects of cloud cover.

Toggle on/off Sound Effects: Select this button to toggle on and off game sound effects.

Toggle on/off Music: Select this button to toggle on and off game music.

Watch Face - During the Reaction Phase, you may click on this watch face to increase game speed. There are four game speeds: x1, x2, x4, x8.
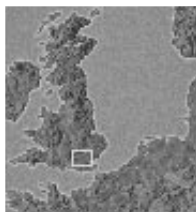
Mini-map - The mini-map displays a miniature of the entire area of play. You may click on this map to shift around to other areas of the map to view the action. The dots appearing here represent the air units as they move around the map. The colors correspond to the colors indicated under the "flight lines" function above, except for British interceptors. On the mini-map, they are white dots.

Filing Cabinet (save game) - Select the filing cabinet to save the game you are currently playing. *See p. 18 for more details.*

Exit Door - Click here to exit the game and return to the Campaign Selection Screen.

Right Tab System - During play, the right tab system changes to reveal information and features necessary for play. *See p. 20 for more details.*

Bottom Tab System - During play, the bottom tab system minimizes/maximizes to reveal information and features necessary for play. *See p. 17 for more details.* Two tabs, however, that appear as part of the bottom tab system are the "planes" and "guns" tabs. These tabs are

databases of aircraft and ground defense information. <u>At any time during play, if you wish to review real-world and game attributes on the various aircraft and ground defenses in the game, then click on the respective tab</u>.

Planes: Each aircraft has a list of statistics: its speed (combat speed), cruise (its normal speed when flying in formation), maximum altitude (how high it can fly), climb rate (number of feet per minute it can climb), maneuverability (ability to position itself affectively for combat), durability (how much punishment it can take before it goes down), armor value (its ability to reduce or defeat enemy shells from hitting it during combat), endurance (the number of minutes it can fly), load (maximum weapons payload), and gun value (a gun strength summation of the aircraft). <u>Click on the button beside an aircraft's gun value to view more details about the aircraft</u>.

											GUNS	PLANES
Aircraft	Speed	Cruise	Max Alt	Climb	Mvr	Durab	Armor	Endure	Load	Gun Value		
Hurricane I	328	240	33000	2300	30	29	1	115	0	◎ 16	fighter	
Spitfire I	362	250	34000	2400	33	28	1	100	0	◎ 16	fighter	
Spitfire IB	350	240	34000	2400	28	28	2	100	0	◎ 16	fighter	
Defiant I	305	250	30000	1900	26	28	1	120	0	◎ 8	fighter	
Gladiator	250	180	32000	2200	28	26	0	145	0	◎ 8	fighter	

The way to review this information is to look at an aircraft's attributes in context with other aircraft. For example, the Hurricane I and Spitfire I are very similar aircraft, but the Spitfire is slightly better in speed, cruise rate, maximum altitude, climb rate, and maneuverability, while the Hurricane is slightly more durable and has a better endurance. In contrast, notice how inferior the Gladiator is in many categories.

Aircraft	Speed	Cruise	Max Alt	Climb
Ju 88A-5	275	225	27000	925
7.9mm MG 81		x 1	F	gun
13mm MG 131		x 1	F	gun
7.9mm MG 81		x 2	TR	gun
13mm MG 131		x 1	BR	gun
1000kg GP Bomb		x 2	XT	GP bomb
250kg GP Bomb		x 2	XT	GP bomb
100kg GP Bomb		x 5	INT	GP bomb

Aircraft Details: Clicking on the button beside an aircraft's gun value opens that aircraft's details tab. Listed here are the selected aircraft's guns (the number of each and their facings), bomb load (if bombers), and any radar or electronic aviation components that the aircraft might have. The gun facings break down into F = front; TT = top turret; TR = top rear; R = rear; BR = bottom rear; BT = bottom turret; S = side. A gun can only fire toward its facing (unless it's a turret). So, depending upon what direction the attack is coming from, only a certain amount of an aircraft's guns will ever come into combat. For example, if a JU-88A-5 was being attacked from the front by Hurricane I's, then only its forward facing 7.9mm and 13mm machineguns would respond to the attack. So, even though the JU-88A-5 has a pretty sizable gun value, that doesn't mean that it will always bring to bear its full firepower. Bombers also have a listing for their bombs. XT = external bomb location and INT = internal bomb location. These are for information purposes only and have no bearing in the game whatsoever. **NOTE:** Fully loaded bombers will fly 30 MPH slower than their normal cruising speed.

Guns: This is a list of guns which appear (in various quantities) on the aircraft in the game. Like aircraft, guns have attributes that show their quality. For example, the .303 Browning machinegun's attributes, when compared to other guns, doesn't look very effective. But notice that it's accuracy is the second highest behind the 7.9mm MG 81, which makes it a pretty formidable

gun. Also appearing here are the effective ranges of light, medium, and heavy AA guns. Their ranges indicate how high in feet their shells reach into the sky. *Though not listed here, balloon barrages reach up to 5,000 feet.*

Aircraft Gun	Effect	Penetration	Range	Accuracy	Anti-Aircraft Gun	Effect	Range
.303 Browning MG	2	1	1500	34	Light AA Gun	1	4000
7.9mm MG 17	2	1	1500	33	Medium AA Gun	3	10000
7.9mm MG 15	2	1	1500	33	Heavy AA Gun	6	30000
7.9mm MG 81	2	1	1500	39			
13mm MG 131	3	2	2000	29			
15mm MG 151	3	2	2500	21			
20mm Cannon MG-FF	4	3	2500	16			
20mm Hispano Cannon	4	3	2500	25			

One useful point to make about reviewing these databases is that it will help you make better decisions (especially for the German player) on how to choose aircraft when plotting bombing raids, escort fighters, and interceptors. If you know a particular aircraft's limitations, then you will know how to use that aircraft to its best abilities.

Load/Save Game Screen

Select "Load Saved Game" on the Start-Up Screen to continue playing a previously saved game.

Saved Game Slots   Date Saved

Load/Save Game Buttons   Player Comments Box (type in comments here)   Exit Door

Along the left edge of the screen is a set of slots in which you can save games. The Save and Load buttons appear below the slots and are clicked to save/load a selected game accordingly. Along the right edge is the date area showing when the selected game was saved, and below that is the "player comments" box.

Loading a Saved Game: You can continue playing a saved game by first selecting "Load Saved Game" on the Start-up Screen. Once on the Load/Save Game Screen, select the saved game you wish to begin playing by clicking on the button to the left of its name, then click "Load" at the bottom of the list. Immediately, the game loads.

Saving a Game: During play, you may click on the filing cabinet in the bottom right-hand corner of the Main Game Screen. Once on the Load/Save Game Screen, type in any information you wish about the game in the "player comments" box by clicking on the arrow appearing beside the box. Then select a save location slot in the list along the left side of the screen, then click "Save".

Game Options Screen

Select "Game Options" on the Start-Up Screen to set various game options before beginning play. See the **README** file for details about game options.

Play-by-Email Screen

Select "Multiplayer" on the Start-Up Screen to begin either a Play-by-Email or Hot Seat game between two human players. See the **README** file for details about how to set up E-mail and Hot Seat games.

PLAYING THE GAME

Effective play of *TalonSoft's Battle of Britain* requires patience and study. For the German player to be successful, he must bomb British targets again and again, send recon aircraft over targets to get good damage assessment photos, and also consider spreading out his attacks to stretch the British defenses to their breaking point. On the other side, the British player must deal with a swarm of German raids that never seem to end. He must consider when and if to redeploy anti-aircraft (AA) guns, balloon barrages and fighter squadrons, and must also make the calculated (though terrible) decision to allow certain areas of his country to go undefended in order to conserve his resources and protect more strategically important areas. It is all of these considerations and challenges that face you in this game, and the mastering of these elements takes time. This chapter and the following sections describe how to play the game.

GAME PHASES

The play of *TalonSoft's Battle of Britain* is divided into a series of phases. For each day of a campaign, the British player has a **Movement Phase** and a **Reaction Phase**. The German player has a **Raid Planning Phase**, a **Reaction Phase**, and an **Intelligence Briefing Phase**. We'll begin by describing the British phases.

British Movement Phase

In the British Movement Phase, the British player has the opportunity to review the damage of the day's bombing missions against his country. He may also review the number of planes lost per side, the quality and condition of his pilots, and also move anti-aircraft guns, balloon barrages, and fighter squadrons (or "units") to other airfields/targets respectively in order to bolster defenses in

areas he considers weak. At the beginning of a new campaign, the information included in the Movement Phase is sparse, as the campaign hasn't started yet. As the campaign progresses, however, more and more information is added, so it is important for the British player to review the information carefully and note changes.

British Movement Phase Tab
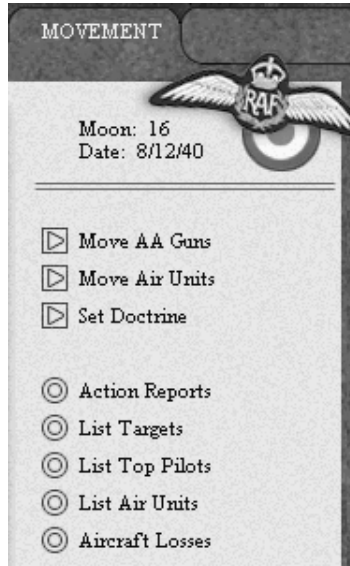
Move AA Guns (and balloon barrages): Selecting this option gives you the opportunity to review your AA gun and balloon barrage resources, and then move them to other locations if so desired. Unlike moving aircraft (see below), AA guns and balloon barrages are moved to and from a pool of available pieces, and then from this pool they can be transferred to other locations. To move AA guns and balloon barrages from place to place, follow these steps:

(1) Select "Move AA Guns" on the Movement Phase tab. This places you in the Move AA mode. All locations that currently contain ground defenses highlight.

(2) Once you've done this, you are prompted to "Move AA Guns-Select a Location" on the bottom tab. When this prompt appears, move the mouse arrow over the location on the map you wish to move AA guns and/or balloons to, and left-click. The location's details tab opens. Once you're on the details tab, you may move guns/balloons in and out of the location by clicking on the appropriate arrows. [**Note:** You may also select a location by clicking on the "List" tab which appears at the bottom. Doing so places you in a list of target types, which you then sort through to find the particular location you wish.]

(3) Click on the "+10" or "+1" arrows to move guns/balloons from the pool to the location. Click on the "-10" or "-1" arrows to move guns/balloons from the location to the "transit" pool. See below for more details about the pools.

(4) Once you are finished moving AA guns and/or balloons in this location, click the "Done" button in the bottom left-hand corner of the details tab. Repeat steps 2, 3, and 4 until you are finished moving all AA guns and/or balloons around the map.

(5) When you are completely finished moving all AA guns and/or balloons, click the "Exit" button on the bottom tab. This exits you out of the Move AA Guns function completely and back to the Movement Phase.

Operation Points: Operation points are spent by the British player each time a gun/balloon is moved. At the beginning of each new Movement Phase, the British player is given 100 Operation Points to spend moving guns, balloons, and air units (see below). The amount of Op Points spent moving these items is indicated in the "Move Cost" column. So, moving one balloon barrage costs 4 Op Points. Clicking the "Undo" button cancels all transfers you've conducted for the location you are currently working in. Once you've reached your limit in Op Point spending, you may not move any more guns, balloons, or units until your next Movement Phase.

The "pool" and "transit" columns: When moving guns/balloons out of a location, they always first go into the "transit" pool and then a day later (i.e., next Movement Phase), appear in the regular "pool" ready for redistribution. The "transit" pool basically serves to simulate (in an abstract manner) the time it takes to break down the guns/balloons at their location to get them ready for transfer. The regular "pool" represents all guns/balloons ready to be deployed. All new guns and balloons produced by the British economy during play appear immediately in the regular pool.

The Purpose of Transferring AA Guns and Balloons: As the British player it's important to distribute your ground defenses as effectively as possible in order to hinder German bombing. The more guns/balloons you have in a location, the better defended that location is. Each gun type has a fire range (i.e., the distance it can fire into the sky). Light AA guns can fire up to 4,000 feet; Medium AA guns 10,000 feet; Heavy AA guns 30,000 feet. the effectiveness of AA gunfire diminishes with altitude, so even though a heavy AA gun reaches up to 30,000 feet, formations flying along those altitudes are less likely to get hit than those under heavy AA gun fire at 15,000 feet. Balloon Barrages are extended on the end of cables that reach up to 5,000. German raiders, then, flying over targets with these ground defenses are more likely to be shot down, or run into the balloon cables. Thus, you'll want to keep an eye on which targets have (and do not have) ground defenses.

The area of Britain under Group 11's command (see page p. 86) will probably receive the brunt of any German attack (especially in the 1940 campaigns). So, pay particular attention to your ground defenses in that area. Review each campaign's victory and scoring conditions (p. 60) to see which targets are more likely to be targeted by German raids, then deploy your ground defenses accordingly. Take care, however, when placing balloon barrages around airfields, as any units you have attempting to land at those airfields could get caught in the cables.

Move Air Units: Select this option to move air units from one airfield to another. To move a unit, follow these steps:

(1) Select "Move Air Units" on the Movement Phase tab. This places you in the Move Units mode. All airfields with air units highlight.

(2) Once you've done this, you are asked to "Select Airfield" on the bottom tab. When this prompt appears, select the airfield on the map by left-clicking on it. [**Note:** You may also select an airfield by clicking the "List" tab which appears at the bottom. Doing so places you in a list of target types, which you then sort through to find the particular airfield you wish.] Once you've selected the airfield, the bottom tab opens to reveal the details of the airfield you've selected, and you are prompted to "Select a group to transfer."

Biggin Hill	primary airfield	attached to: 11 Group
▷ 32 Squadron	Hurricane I	Heavy AA Gun 4
▷ 610 Squadron	Spitfire I	Light AA Gun 20
		Medium AA Gun 6

(3) On the airfield's details tab, find the unit you wish to transfer and click on the button beside its name. Some locations have more than one air unit (you may only choose one unit at a time for transfer). You are then prompted to "*Select a new base*".

(4) Select the destination airfield (i.e., new base) you wish to transfer the unit to. The unit is then transferred to that new base.

(5) When you are completely finished transferring all units, click the "Exit" button on the minimized bottom tab. This places you back in the Movement Phase.

Transfer Time: The time it takes for the transferred air unit to arrive at its new base depends upon the distance between the two bases, so you may see a substantial delay before a transferred unit appears at its new base, although its name will appear at the location immediately. Transferred units automatically reattach themselves to the group command that they are being transferred to. For example, a unit transferred from Group 11 to Group 13 is now under control of Group 13. The doctrine settings for that unit (see p. 24) are automatically changed to the doctrine settings of the group it's transferred to. Operation points (see p. 000) used to transfer air units is one point per aircraft, but even if you only have one Op Point left, the entire unit will be transferred, but its transfer delay is increased dramatically to account for the lack of the needed op points.

The Purpose of Transferring Air Units: There are a number of reasons for moving air units around from base to base. One very good reason is to allow heavily engaged units (i.e., those that have flown a lot of missions) to rest. As a unit's pilots take fatigue (see p. 29), its combat effectiveness and morale go down. So, for example, swapping low morale Group 11 units with high morale Group 12 units is a good tactic to use to keep your readiness and attack quality high. Another good reason is to keep your opponent guessing as to where your units are. During a campaign, your opponent will be conducting recon missions to see where your ground defenses and aircraft are located. Redeploying your units, then, keeps your opponent off guard.

Another good reason to move air units is to respond to the various tactics your opponent may employ. For example, if during a campaign you find that the *Luftwaffe* is sending a lot of low level bombing groups with little or no fighter escort against Group 10 targets, you may wish to redeploy more Hurricane units to that sector (for Hurricanes are very effective against bombers). And you may also wish to move some of Group 10's Spitfire units to Group 11 to thwart aggressive German fighter sweeps.

One important caution when moving units, however, should be noted. Each airfield has a "capacity". This capacity number is the number of units that that airfield can maintain comfortably. *Primary airfields have a capacity of 4; secondary airfields have a capacity of 2*. If the number of units at an airfield exceed the airfield's capacity, then those units will take longer to refuel and get back into combat. You may exceed the capacity of an airfield if you wish (and there may be reasons for you to do so), but just be aware of the danger.

IMPORTANT

When moving AA guns, balloons and units, keep in mind the number of Operation Points you have. The cost to move these items comes out of the same Op Points pool, so if you've moved a lot of guns and balloons around, you may not have enough points to transfer squadrons and vice-versa. So, keep an eye on your Op points to ensure you have enough to conduct the transfers you wish.

Set Fighter Doctrine: Select this option to change your squadrons' attack doctrine.

There are four British fighter groups: Group 10, 11, 12, and 13 (see p. 86). For each of the four groups you may set the Alert Level Radius and the Interception Tactics.

Alert Level and Radius: British squadrons have four levels of alert: 1 hour, 15 minutes, 5 minutes, and 1 minute (the 'highest' level). The alert level is the time it takes a unit to get into the air after it receives orders to take off. The problem with keeping units on the highest alert level all the time is that their pilots gain fatigue (see p. 29) while they are waiting for orders to take off. The game allows units to start each day on 1 hour alert and then step up their alert level in reaction to German activity. When the German radio activity level exceeds 100, then all British units (except night fighters) go on 15 minute alert. Units go to higher levels of alert when detected German raids move within a radius that triggers a new level. The exception to this rule are night fighters. Blenheims, Beaufighters, Defiant IA's, and Havocs (during daytime hours) do not go on higher alert when German raids are detected. They stay at their default 1 hour level until nighttime hours arrive, and then they can go on higher alert status. The reason for this is to ensure that night fighters (who perform better at night and should be held in reserve and flown at night) do not gain unnecessary fatigue during the day. Alternatively, when nighttime arrives, day-

time fighters such as Spitfires and Hurricanes do not go on higher alert. They stay on the default 1 hour alert level.
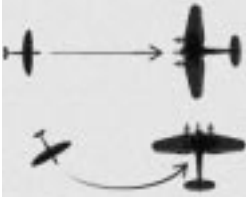
Interception Tactics: Interception tactics are set by group and aircraft type. There are four tactics: (1) direct-fighter, (2) bounce-fighter, (3) direct-bomber, and (4) bounce-bomber.

∏ Squadrons assigned **tactics 1 or 2** will have a preference for attacking enemy fighters while those with **tactics 3 or 4** will try to attack enemy bombers.

∏ Squadrons assigned **direct tactics 1 or 3** will go straight in to attack enemy formations without wasting any time.

∏ Squadrons assigned **bounce tactics 2 or 4** will maneuver into the best possible attack position. Bounce tactics usually require more time to maneuver into position and sometimes enemy escort fighters will attack them during this interval.

To set fighter doctrine, follow these steps:

(1) Select "Set Doctrine" on the Movement Phase tab. This places you in the Set Doctrine mode. The bottom tab opens and defaults to Group 11 fighters (as this is the group which will ultimately take the brunt of any German attack). The Movement Phase tab refreshes to show you all four fighter groups.

Set Doctrine for 11 Group			
Hurricane I	▷ direct-bomber	1 Minute Alert Radius:	50 miles
Spitfire I	▷ bounce-fighter	5 Minute Alert Radius:	100 miles
Spitfire IB	▷ bounce-bomber		
Defiant I	▷ direct-bomber	▷ Radius +10	
Gladiator	▷ bounce-bomber	▷ Radius -10	
Defiant IA	▷ direct-bomber		
Blenheim IF	▷ direct-bomber		
Beaufighter IF	▷ direct-bomber		

(2) Select your group from the Movement Phase tab, then set (by aircraft type) your fighter doctrines for that group. Once you've done so, each squadron of that aircraft type (in that group) will follow that doctrine.

(3) Repeat step 2 until you are finished setting the doctrine for each group, then click "Exit" on the Movement Phase tab to exit back to the Movement Phase.

The Purpose of Changing Fighter Doctrines: At the beginning of each new campaign, the game assigns a doctrine to each of your units based on historical performance. For example, your Spitfire units are set to intercept German fighters. If, however, you find that your German opponent is sending heavy bomber raids (with light fighter escort) against Group 11 targets, you may wish to reassign your Spitfire units in Group 11 to either bounce-bomber or direct-bomber.

It's important to note, however, that even though a fighter is assigned a particular attack doctrine, that doesn't mean it won't attack a different aircraft type if you order it to do so, or if it finds itself in a situation where no other target exists. For example, if you order Spitfires to attack a group of HE111 bombers, the units will do so, even though they may be set to direct-fighter tactics. Once these Spitfires get into the area of the bombers you've ordered them to attack, if there are Me109s in the vicinity, they will ignore the bombers and go after the fighters because of their doctrine setting. You must also keep in mind that there is a certain amount of randomness built in to how your fighters will react during interception. The skies can get very cluttered, and so your units will first choose targets based on their doctrine setting, and then choose targets based on what's in the area at the time of interception.

Action Reports (information-only tab): Select this option to review all the raids against you for the day and their results.

#	type	ftr	bmr	f/lost	b/lost	i/lost		target	damage (r:c:s)		
1	BOMB	66	67	0	0	0	AF	Biggin Hill	0	0	6
2	BOMB	71	62	1	1	1	AF	Kenley	0	0	19
3	BOMB	135	61	8	3	4	AF	Filton	0	8	100
4	BOMB	80	50	0	0	0	AF	Middle Wallop	0	0	49
5	BOMB	0	10	0	2	0	AF	North Weald	0	0	2

#: This is the raid ID number assigned to the raid by the German player. This number is not associated with the raid ID numbers which Fighter Command assigns to raids as they are detected. Basically, this is just a numerical list of the raids in the order the German player planned them.

Type: This is the raid type. There are four different German raid types: Bombing (Bomb), Fighter Sweep (FS), Reconnaissance (Recon), and Night Intruder (NI). *For more information about these raids, see p. 44.*

Ftr: This number represents the total number of fighter planes in the raid.

Bmr: This number represents the total number of bombers in the raid.

F/Lost: This is the number of estimated fighters destroyed in the raid.

B/Lost: This is the number of estimated bombers destroyed in the raid.

I/Lost: This is the number of British fighters (i.e., your aircraft) that were destroyed while attacking this raid. For the German player, the number here is an estimate of British aircraft destroyed.

Target: This is where the raid attacked. This information shows the location name and what kind of target it was. *For more information about targets, see p. 67.*

R,C,S: The "rcs" numbers represent the damage the target sustained from the raid. The letters mean different things for different target types.

For airfield targets: R=Runway damage, C=Communications damage, S=Service area damage. [**Note:** Damage to the runway (R) is easily repaired and so you shouldn't be too concerned with high R damage against airfields (although there is a risk of your aircraft crashing on a heavily damaged runway).] Damage against an airfield's communication and service areas is important, as the German player receives victory points by damaging these areas. *See p. 60 for more details about victory points and damage to your targets.*

For radar targets: R=Radar damage, C=Communications damage.

For area and railyard targets: R=Urban damage, S=Railyard damage.

For all others: R=Damage to Factory/Installation.

The Purpose of Reviewing The Action Report: The importance of reviewing the Action Report is obvious: As the British player, you need to know where the Germans are attacking. And, you need to know which targets are getting hit the most. Depending upon which campaign you are playing, the Germans will attack targets based on their needed victory requirements (see p. 60), and so you should review the Action Report carefully to see how much damage your targets are taking, and where the thrust of the attack is occurring. Once you take a full assessment of the damage, you can then make better decisions on where to move your AA guns and balloon barrages, move air units, and what attack doctrines to set.

⊙ List Targets   **List Targets (information-only tab):** Select this option to review details about your industries and airfields. Upon selecting this option, the tab refreshes to show you the full list of target types.

Pick Type of Target	Total	Damage
▷ area	248	0
▷ radar site	46	0
▷ primary airfield	348	0
▷ secondary airfield	136	0
▷ aluminum factory	510	0
▷ oil storage	440	0
▷ oil refinery	290	0
▷ chemical factory	280	0
▷ ball bearings factory	200	0
▷ electric power plant	1420	0
▷ steel factory	320	0
▷ rubber factory	230	0

The number under "total" represents the total effective value for that target type (i.e., the total undamaged capacity of that industry). It is adjusted downward for damage to other industries on which it is dependent (see p. 62). The number under "damage" is the percentage of the total capacity that has been damaged.

Once you've reviewed this information, if you wish to review specific target damage, click on a target type. The specific targets of that type appear.

Target List

primary airfield	damage (r:c:s)	air units	AA guns	balloons	attached to
St. Eval	0 :0 :93	1	16	0	10 Group
Filton	0 :8 :100	1	18	0	10 Group
Pembrey	0 :0 :0	2	11	0	10 Group
Middle Wallop	0 :0 :49	2	26	0	10 Group
Tangmere	0 :0 :62	2	43	0	11 Group

Name: This is the name of the target (i.e., St. Eval).

Damage: This is the percentage of damage to the target, broken down in three damage categories (if airfields), two damage categories (if radar sites), and only one category for any other target type. If the target has sustained damage, it will be listed here. The damage amounts listed here is always correct for the British player.

Air Units/Capacity/Size: This number represents the production capacity or size of the target. For factories and other industrial targets, this represents the production capacity; for railyards, this represents the size/importance of the yard; for airfields this represents the number of air units the base can comfortably maintain. *Primary airfields operate normally with 4 units; secondary airfields operate normally with 2 units.* You may over-stack an airfield if you wish

(i.e., have three squadrons at Croydon airfield), but the effectiveness of that airfield to get air-craft ready to fly is reduced.

AA Guns: This is the number of anti-aircraft guns currently located at the target.

Balloons: This is the number of balloon barrages currently located at the target.

Attached To: If you are reviewing a list of airfields, the Group (or primary airfield for sec-ondary fields) the airfield is attached to is listed here.

If you wish to view even *more* information about a target, select the target name, then click on the "details" tab and the information below appears.

Target Details

Kenley	primary airfield		attached to: 11 Group	
size	25		damage	0
capacity	4		com-damage	0
com-delay	3		serv-damage	19
Medium AA Gun	x 9	▷	253 Squadron	Hurricane I
Light AA Gun	x 27	▷	615 Squadron	Hurricane I
Heavy AA Gun	x 2			

The target "details" display gives you all the details of the target. It shows the target's name, which air group or primary airfield it is attached to (if an airfield), what kind of target it is, its size, capacity, and other important information. Also included are the following:

Com-delay: This number represents the additional delay in communications caused by the time required to transmit orders through the chain of command. This may be increased by damage to communications facilities at airfields or radar stations. The com-delay number of an airfield is directly connected to the amount of time it takes for a unit of that airfield to get off the ground. For example, if the alert level (see p. 24) of a unit is set to 60 minutes, if its air-field has com-delay damage of 15, it will take 75 minutes for that unit to get off the ground once it's ordered to launch.

Com-damage: This number represents the percentage of damage done to communications. Like the com-delay number, com-damage increases a unit's delay for launch.

Once you are in a target's details tab, you can select any squadrons which appear there (if an air-field) and open the "unit" and "pilots" tab (see p. 32).

The Purpose of Reviewing Target Information: It's absolutely necessary for the British player to conduct good damage assessment in order to decide how to prosecute his defense. You must know which airfields are being heavily attacked (so that you can decides whether to move their air units to other, less-damaged fields). You must know which industries are being pounded to dust in order to decide when and where to move AA guns and balloon bar-rages. Reviewing the target list, then, is one of the most important tasks you will perform in the Movement Phase. Your German opponent will conduct his attack based on what he needs to do to score points for victory. Review *Battle of Britain's* victory conditions (see p. 60) carefully to know which industries will be targeted most often. Although there are various visual preferences you can set to see how much damage a particular target has sustained (see p. 13), you still need to

review the Target List often to fully understand how much damage your poor (yet brave) country is taking.

List Top Pilots (information-only tab): Select this option to review a listing of your top pilots. As the campaign progresses, the game begins to promote pilots and adjust their attributes. Units with good pilots perform their duties better, so it's important to review your pilot information often and know which squadrons have the top guns.

Leading Pilots		exp	fat	mis	kills	fate	unit	type
Flt Lt	H. R. A. Beresfoed	58	13	4	2	---	257 Squadron	Hurricane
Flt Lt	F. R. Carey	61	11	1	2	---	43 Squadron	Hurricane
Pilot Off	G. H. Maffett	54	20	3	2	---	257 Squadron	Hurricane
Flying Off	W. Rhodes-Moorehouse	64	10	4	2	---	601 Squadron	Hurricane
Sgt	E. W. Wright	66	20	2	2	---	605 Squadron	Hurricane

Pilot Rank: This is the pilot's rank.

Pilot Name: This is the pilot's name. Nearly every pilot (both British and German) which flew in the Battle of Britain is in the game's extensive database.

Experience (exp): This number represents the pilot's experience. A pilot gains experience flying his aircraft, by killing enemy aircraft, and for successfully bombing targets.

Fatigue (fat): This number represents the pilot's fatigue level. A pilot gains fatigue "points" in the following categories:

Category	Points
1 hour alert	0
15 minute alert	1 (per minute)
5 minute alert	2 (per minute)
1 minute alert	3 (per minute)
Flying through flak	10 (per instance)
Dogfight	30 (per instance)
Fighter pilot attacking bomber	10 (per instance)
Bomber pilot attacked by fighter	10-30 (per instance)
Each minute flying	10 (per instance)
Landing	100 (per instance)

When a pilot's fatigue points exceed the number 10 plus his current fatigue level, then his fatigue level is increased by one. During overnight phases (the time between the ending of one Reaction Phase and the beginning of another), a pilot's fatigue level is divided by 4. A pilot's fatigue reduces his skill. For example, a pilot with 25 fatigue will have his performance reduced by 25%. A pilot's fatigue level will never exceed 99.

Missions (mis): This number represents the number of missions the pilot has flown.

Kills: This number represents the number of enemy aircraft the pilot is credited with shooting down. Only pilots with one kill or more are considered "top pilots".

Fate: This applies only to pilots who are currently or permanently unable to fly. There are

three fate types:

WIA = wounded in action (this pilot may return later)

MIA = missing in action (in game terms this is the same as KIA). MIA is more likely to happen to German pilots because they fly over enemy land.

KIA = killed in action

Unit: This is the unit the pilot is assigned to. You cannot reassign pilots to other units. They stay with the unit they are assigned for the entire game.

Type: This is the type of aircraft the pilot is (or was) flying.

The Purpose of Reviewing Top Pilots: Units with top pilots fly better interceptions missions. Thus, knowing which units have top pilots helps you decide which to "scramble" against incoming raids. Many of the pilots used in the game are actual pilots that flew in the Battle of Britain, so there's certainly interest here for those players who are familiar with the battle and recognize certain names.

List Air Units (information-only tab): Select this option to review your fighter squadrons. The information displayed here shows your units' morale levels, damage levels, etc.

The first tab that opens lists the aircraft types (Hurricane I, Spit-fire I, etc.). This is a list of all the aircraft that are (or potentially will be) flying in the campaign you are currently playing. If you wish to review a list of all units of that aircraft type, select a specific type. A list of all units using that aircraft appears (see below). It's important to note that you may see an aircraft type listed here, click on it, and get no response. This means that that particular aircraft type is not currently being used in the campaign and so no units have them. For example, at the beginning of the 1940 campaigns, no units are currently flying Beaufighter IF's. They will arrive later in the campaign. But Beaufighters are listed here at all times to remind you of air-craft to come.

Pick Type of Aircraft

▷ Hurricane I
▷ Spitfire I
▷ Spitfire IB
▷ Defiant I
▷ Gladiator
▷ Defiant IA
▷ Blenheim IF
▷ Beaufighter IF

Unit List

Unit List: Hurricane I		ready	unavail	exp	morale	base
238 Squadron	10 Group	16	6	60	48	St. Eval
87 Squadron	Filton	16	3	60	52	Exeter
213 Squadron	Filton	16	8	62	48	Exeter
504 Squadron	13 Group	16	4	56	36	Redhill
605 Squadron	Turnhouse	15	4	61	44	Warmwe

Unit Name: This is the name of the unit (example: 238 Squadron) *See p. 117 for a full list of all units.*

Headquarters: This is the headquarters to which the unit is attached. Most secondary airfields trace a chain of command through a primary "sector" airfield. A primary sector airfield is one attached to either Group 10, 11, 12, or 13. To view a list of all secondary airfields with primary airfields as commands, see p. 68.

Ready: This number represents the number of individual planes in the unit which are ready to take off.

Unavailable: This number represents the number of individual planes in the unit which are unable to fly. The four unavailable conditions are: (1) damaged (being repaired), (2) in maintenance, (3) moving from one base to another (in-transit), and (4) in reserve or without pilots.

Experience: This number represents the average experience of all pilots in the unit. The higher the unit's experience, the better it will perform.

Morale: This number represents the unit's willingness to press on in the face of enemy opposition and high losses. A unit's morale is reduced when its aircraft are destroyed and also due to high pilot fatigue (see p. 29). A unit's morale is increased due to inspiring leadership and by successfully bombing targets (for German pilots) or destroying enemy aircraft.

Base: This is the airfield to which the unit is based. This can change if the unit is transferred to another airfield during play.

Once you have reviewed a list of air units, you may select one individually to view even more details. Once you've selected the unit, click the "details" tab. The "unit" and "pilot" tabs appear.

```
238 Squadron

squadron
attached to:    10 Group

experience          60
morale              68

tactic          direct-bomber

COMMANDER:

Squadron Leader H. A. Fenton
leadership:          70
inspiration:         79




aircraft landing:          0
aircraft flying:           0
aircraft taking off:       0
aircraft ready:           16
aircraft fueling:          0
aircraft in maintenance:   0
aircraft being repaired:   3
aircraft in transit:       0
aircraft in reserve:       3
```

The Unit Tab. The Unit Tab lists full details about the squadron you have selected. The unit tab lists the unit's name, its experience (an average of its pilot skill) and morale (a compilation of the unit's success or failure in the past), its current attack doctrine, its commander and his leadership (which helps low-experienced pilots gain experience) and inspiration (affects the adjustment of the unit's morale between Reaction Phases), and the status of all its aircraft. There are nine status categories for aircraft: landing, flying, taking off, ready, fueling, in maintenance, being repaired, in transit, in reserve. A unit's aircraft status changes constantly during play.

The Pilot Tab. The Pilot Tab lists the details about each pilot currently in the squadron. It shows the pilot's rank, name, experience, fatigue, number of missions he has flown, his number of kills, and nationality.

238 Squadron		exp	fat	mis	kills
Sergeant	E. S. Bann	55	22	0	0
Sergeant	L. G. Batt	58	13	0	0
Pilot Officer	B. B. Considine	58	21	0	0
Flying Officer	C. T. Davis	69	11	0	0
Sergeant	M. Domagala	58	18	0	0

The Purpose of Reviewing Air Units: It's important to review the status of your air units to see which are taking heavy losses, which have low morale, and which have highly skilled or heavily fatigued pilots. Knowing this information will help you decide which units to rotate out of their current airfields to areas with less activity, or which units are getting the most enemy kills, etc.

Aircraft Losses (○) **(information-only tab):** Select this option to review all the aircraft that have been destroyed (on both sides) for the day's raids and for the entire campaign. Two numbers are displayed for each aircraft type. The first number (under the "total" column) is the total aircraft losses for the entire campaign. The second number (under the "today" column) is the total aircraft losses for the day. To the right is listed the total sorties both sides have flown for the day and for the entire campaign, and also total aircraft losses.

Aircraft	total	today	Aircraft	total	today	
Hurricane I	40	13	Bf 109E-3	5	1	Defender Sorties
Spitfire I	8	3	Bf 110C	15	7	today: 467
Gladiator	1	0	Bf 110C-4B	5	2	campaign: 2092
			Ju 87B	11	0	Defender Losses
			Ju 88A-5	17	7	today: 16
			He 111H-4	20	3	campaign: 49
			Do 17Z-2	8	7	Attacker Sorties
						today: 1378
						campaign: 5340
						Attacker Losses
						today: 27
						campaign: 81

The Purpose of Reviewing Aircraft Losses: For obvious reasons, knowing which aircraft are suffering the most losses will help you decide if current attack doctrine is effective. For example, if you're losing a lot of Spitfires and you have all Spitfires set on direct-bomber tactics, this probably means that enemy fighter aircraft are not being fully engaged and thus they have free reign to target and knock out your Spitfires. Thus, you may wish to change your Spitfire tactics to help reduce losses.

Very likely, you'll lose more Hurricanes during play than any other aircraft. This is not unusual for the British player, as there are more Hurricane units than any other. Don't be too concerned about Hurricane losses; unless, of course, they grossly exceed Hurricane replacements in the replacement pool (see below).

[O] Aircraft Replacements **Aircraft Replacements (information-only tab):** Select this option to review a listing of all British aircraft and their replacements. Two numbers are displayed for each aircraft type. The first number (under the "total" column) is the total number of replacement aircraft that have been produced during the campaign. The second number (under the "pool" column) is the number of aircraft that have not yet been distributed to the squadrons. These numbers change as the campaign progresses.

Aircraft	total	pool
Hurricane I	35	0
Spitfire I	13	5
Spitfire IB	3	3
Defiant I	0	0
Gladiator	0	0
Defiant IA	0	0
Blenheim IF	3	0
Beaufighter IF	1	1

The Purpose of Reviewing Aircraft Replacements: Keeping tabs on aircraft replacements is useful if you want to see how quickly aircraft are being replaced. As play progresses, your aircraft production centers add new planes to your replacement pool. These replacements are pulled out of the pool during play to fill holes in British units where necessary. If, for example, the replacement pool number (second number) for Hurricanes is zero (0), it means that the minute a new Hurricane rolls off the assembly line, it's being assigned as a replacement. Thus, knowing that a certain aircraft is not being manufactured quickly could give you incentive to not scramble units of that type for awhile in order to help replenish the pool.

Upgrades and the Replacement Pool: During a campaign, some units begin to upgrade their aircraft. For example, during the month of September in 1940, all Blenheim units begin receiving Beaufighters. The old Blenheims are not scrapped; they are simply rotated into the Blenheim replacement pool to be used by Blenheim units which have not fully upgraded.

Other Aircraft Replacement Sources: In addition to receiving replacement aircraft from your production facilities, you also receive aircraft from other sources. In 1940, you receive the following replacement aircraft on even-numbered turns:

From Canada: 4 Hurricane I's
From Bomber Conversion: 1 Blenheim IF

In 1941, you receive the following replacement aircraft on even-numbered turns:
From Canada: 4 Hurricane I's
From USA: 1 Havoc I

END PHASE BUTTON: When you are finished with your Movement Phase, press the "End Phase" button to enter the Reaction Phase.

British Reaction Phase

The Reaction Phase is where it all happens, where German raids are launched, and where the British player may "react" to incoming raids by setting up patrols and interceptors. While the German player simply sits back and watches his raids perform their missions (which he has plotted during his Raid Planning Phase, see p. 44), it is the British player who must rise to the occasion in the Reaction Phase.

THE "START/STOP" BUT-TON: The Reaction Phase begins in a "paused" state. This allows you to review the map (if desired) before the phase begins. To start the Reaction Phase, click the START button. When depressed, the start button becomes the STOP button. To stop the Reaction Phase, click the stop button.

Radio Activity: While they are forming up, German raids generate radio activity that grows until all raids are ready to launch. As radio activity increases, the number of green dots appearing beside the radio activity indicator increases to give you a visual representation of the amount of activity occurring across the English Channel. Every green dot (roughly 50 points of radio activity) equals *at least one* German raid forming, and maybe more. So, if the radio activity reaches three green dots (around 150 points) then that means at least three German raids are in the works.

Once the Germans form up and launch their raids, radio activity decreases and green dots are replaced by red dots. Again, this serves as a visual representation of radio activity going down.

Radio Activity and Patrols: One thing you'll want to do frequently as the British player is launch patrols once radio activity begins increasing dramatically. Launching patrols can help get your units in position to spot and intercept German raids. *For more information about how to set patrols, see p. 37.*

German Aircraft Flying Under Radar, Recon Aircraft, and Night Intruder Aircraft: German aircraft flying under radar (at 500 feet or lower) do generate radio activity; however, they are not detected on radar. Recon aircraft, on the other hand, do not generate radio activity, nor do night intruder aircraft. These types of raids will often just appear above their targets, take their recon photos or drop their bombs, and quickly fly home. There isn't a lot you can do about these particular raiders, save for anticipating their arrival and have enough ground defenses in place to hit them when they do arrive.

Cloud Cover (overcast): The overcast level represents the average density of cloud cover over the map. Cloud cover greater than 69 represents hostile weather that may damage aircraft during flight. Overcast may prevent bombers from visually locating their targets, or may hinder the ability of fighters to locate and attack bombers. Higher overcast levels may also increase the number of landing accidents. During the Reaction Phase, then, it's important to watch the overcast level carefully and launch (or not launch) interceptors accordingly. The actual cloud graphic appearing over land areas on the map is where cloud cover is currently in effect. If you fly units within these areas, they may receive the effects of cloud cover. This is particularly problematic for the German player, as dense cloud cover may prevent him from finding his targets. Also note that clouds will drift during the day, so areas not previously covered in clouds at the beginning of a Reaction Phase may be covered at the end. *You can toggle on/off cloud cover during the Reaction Phase (see p. 16).*

Light and Moon: The light number represents sun or moonlight. When the sun is up, light will be 100. After the sun sets, light is reduced to the moon level. During a full moon, light will never be less than 28. During a new moon, light will be reduced to zero. Night conditions exist whenever light is less than 50. Lower light levels reduce the range and the chance of visually detecting aircraft. Lower light levels reduce the ability of aircraft navigators. Lower light levels also reduce the effectiveness of bombing missions. And finally, lower light levels increase the likelihood of aircraft crashing during landings.

Date: The current day of the campaign. There are 8 different campaigns in *TalonSoft's Battle of Britain*, divided into 4 separate campaigns per year (1940 and '41). One-day campaigns last for 1 day. One-week campaigns last for 7 days. One-month campaigns last 31 days. The full-length 1940 campaign lasts for 79 days. The full-length 1941 campaign lasts for 184 days. One-day and one-day campaigns last for the full time limit. One-month and full-length campaigns, however, last for the full time limit *or* until the German player achieves victory, *or* until the game stops due to monthly score checks (see p. 60).

Time: 07:32   **Time:** The time represents military time. When you click the "Start" button to begin or resume a Reaction Phase, the clock starts and continues until either you have halted the Reaction Phase or the phase ends.

How Long Does a Reaction Phase Last? A Reaction Phase lasts until all raids and/or patrols are completed and no planes are left flying. This may stretch the Reaction Phase well into the next day. But once the Reaction Phase ends, a new British Movement Phase begins and the process starts all over again.

Time and Light: The time of day and the light number are interconnected. Notice that the timer is colored yellow. A yellow time means that it is daytime. As the day wears on, the light number decreases. Once the light number reaches 50, the time becomes blue which means that the sun has gone down and the Reaction Phase has moved into nighttime. This is important to watch carefully as your squadrons (and German units also) are affected by night conditions.

Message 2   **Message Level:** As action occurs during the Reaction Phase, message windows pop up giving you information about these situations. Adjusting the message level increases/decreases the amount of messages received.

At **message level zero (0)** no messages appear (a useful setting to help speed up the Reaction Phase).

At **message level one (1)** only high priority messages appear, such as combat results.

Stab/SKG 210 bombing Hawker - Langley

At **message level two (2)** a set of intermediate information is displayed.

1 x Bf 110C-4B damaged by Flak

At **message level three (3)** all messages are displayed.

Do 217E-2 takes target photos

Game Options   **Game Options:** Select this option to enter the Game Options screen to set various visual and play functions. *See the README file for more information.*

Cross of Iron Counter: Incoming raids, once they are picked up on British radar, appear first as a Cross of Iron counter. An orange counter represents an incoming raid; a red counter represents an outbound raid. Once a raid is "visually" sighted by ground spotters or from units in the air (such as patrols, see below), the counter turns into a 3D top-down graphic of the "lead" unit in the raid. *The Cross of Iron counter is only active when you are playing the game with 3D aircraft and only visible to the British player.*

British Reaction Phase Tab
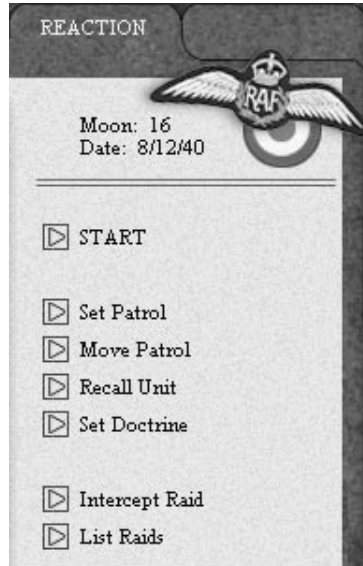
Set Patrol: At any time during the Reaction Phase, you may place units on patrol. To do so, follow these steps:

(1) Select "Set Patrol" on the Reaction Phase tab. This places you in the Set Patrol mode.

(2) On the bottom tab, you are prompted to "Set Patrol Location." Select any spot on the map you wish a unit to patrol. [**Note:** You cannot select a spot in the English Channel or on the German side, i.e. Norway, France, etc.] If you select an illegal patrol spot, the game warns you with a message.

(3) Once you've selected a location, the bottom tab opens to give you a list of units to choose from. From this list, choose your unit(s) to patrol the selected location. You may choose to launch a unit in full, or launch a small group of three aircraft from that unit. Select all the units or portions you wish. Use the scroll bar to advance down the list. [**IMPORTANT:** Before you choose units, you must set the altitude of the patrol. In the bottom right-hand corner of the tab is an altitude indicator. If you wish to set your patrols at lower or higher altitudes, then set the altitude here *first* before choosing units The default altitude for patrols is 15,000 feet (which means it may detect raids coming in between 10,000 and 20,000 feet). Setting patrols at 5,000 to 6,000 feet, will help detect German raids attempting to fly under radar. So basically, patrols can usually detect raids coming in within 5,000 feet above or below their current altitude setting.]

PLAYING THE GAME

			ready	exp	morale	range	delay	altitude	base
615 Squadron	launch 3	Hurricane I	16	59	56	20	8	0	Kenley
66 Squadron	launch 3	Spitfire I	16	60	50	36	8	0	Tangmere
601 Squadron	launch 3	Hurricane I	13	63	29	36	8	0	Tangmere
1 Squadron	launch 3	Hurricane I	16	58	44	44	8	0	Northolt
1 RCAF Squadron	launch 3	Hurricane I	16	58	31	44	8	0	Northolt

ASSIGN AIRCRAFT TO PATROL   SET PATROL

(4) When you are finished selecting units, <u>click "Done" on the bottom tab</u>. This places you back into the Set Patrol mode and you are prompted to select another patrol location. Notice that your selected locations are marked on the map. This helps you keep track of where you've sent patrols.

(5) <u>Repeat steps 2-4 to set as many patrols as you wish</u>. Once you are completely finished setting all patrols, <u>select "Continue" on the Reaction Phase tab to return to the Reaction Phase</u>.

Your patrols will launch according to their delay number (see graphic above), which is the number of minutes it will take the unit to launch. Once it reaches its patrol location, a unit will fly a square pattern over the area and remain there until it must return to base due to low fuel, or you choose to move it to another location (see "Move Patrol" below).

Assigning Patrols to Intercept Raids: You can assign patrolling units to intercept raids before or after they reach their patrol destination. See p. 39 for detail about how to reassign patrollers as interceptors.

The Purpose of Setting Patrols: The purpose of sending up patrols is to get units in the air quickly to intercept incoming raids, and to get a "visual" confirmation on a raid's aircraft complement. When raids come into the general vicinity of a patrol, the patrol may break off and intercept the raid, so if you can anticipate when and where raids will appear, you can already have fighters in the sky for interception. Also, when a raid is first identified by radar, it's simply a number of aircraft and not the complement of fighters versus bombers. Having patrols in the sky to meet raids as soon as they come over the English Channel gives you quicker unit identification and thus makes your task of assigning interceptors that much easier.

There's no hard-and-fast rule about when it's appropriate to launch patrols, but here are some suggestions:

- Watch your radio activity closely and when it begins to reach 400-500 points, consider launching patrols.

- Use your Blenheims, Beaufighters, Defiants, and Gladiators or groups of 3 Spitfires or Hurricanes to patrol the coastline. Patrolling along the coast helps you visually spot and identify raid aircraft complements quickly.

Move Patrol: Once you have patrols in the sky, you may move them to other locations. To do so, follow these steps:

(1) <u>Select "Move Patrol" on the Reaction Phase tab</u>. This places you in the Move Patrol mode. Immediately, all patrols on the map highlight.

(2) Select one highlighted patrol on the map.

(3) On the bottom tab, you are prompted to "Set New Patrol Location." Select any legal spot on the map (see "Set Patrol" above). Immediately, a line draws from the selected patrol to its new patrol location.

(4) After setting a new patrol location, the prompt on the bottom tab changes to "Select Patrol to Move" again. Repeat steps 2 and 3 until you have moved all patrols you wish.

(5) When you are finished setting new patrol locations, select "Continue" on the Reaction Phase tab to continue the Reaction Phase. Your patrols will begin moving to their new locations.

The Purpose of Moving Patrols: The purpose of moving patrols is to redirect your units into areas where German raids are moving. Oftentimes, you'll pick patrol locations that prove fruitless and so it's necessary to correct the problem. Moving patrols can also bring them into the direct path of incoming raids, thus turning patrols into interceptors.
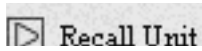
Recall Unit: Any unit in the sky can be ordered to return to its base (i.e., recalled). To recall a unit, follow these steps:

(1) Select "Recall Unit" on the Reaction Phase tab. This places you in the Recall Unit mode. Immediately, all of your units on the map highlight (if they weren't already highlighted).

(2) On the bottom tab, you are prompted to "Select Unit to Recall". Select the unit you wish to recall. The unit immediately un-highlights to show you which units you've already recalled, and you're prompted again to select another unit.

(3) Repeat step 2 until you are finished recalling units.

(4) Once you are completely finished, select "Continue" on the Reaction Phase tab to continue the Reaction Phase. Your recalled units should now begin returning to base.

The Purpose of Recalling Units: There are a number of reasons why you might wish to order a unit to return to base. If you've put up a lot of patrols and the Germans only threw a few raids at you, you are going to have a lot of units in the sky doing nothing but gaining fatigue and wasting fuel. You'll probably want to order these units back home quickly. Also, if you've ordered units to intercept a raid (see below) and you realize that the interceptors can't reach their target, you'll want to order them home to keep them from wasting time.

Set Doctrine: During the Reaction Phase, you may change the attack doctrine of your units. This function works the same as the Doctrine function found under British Movement Phase (see p. 00). Changing fighter doctrine during the Reaction Phase *does not effect* units which are currently in the air.
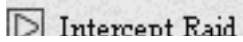
Intercept Raid: Intercepting German raids will certainly be your primary task during the Reaction Phase. Getting enough patrols in the air will help alleviate some of the pressure of having to launch so many interceptors, but inevitably you'll spend a lot of time spotting raids and then scrambling units to attack them. There are two ways to intercept a raid: by picking them individually on the map, or by using the "List Raids" function (see below). To intercept a raid by picking it on the map, follow these steps:

(1) Select "Intercept Raid" on the Reaction Phase tab. This places you in the Intercept Raid mode.

(2) On the bottom tab, you are prompted to "Select Raid to Intercept". Move the cursor around the map to find the German raid you wish to intercept and then click on that raid. Notice that as you hover the cursor over the raid(s), the message box appears giving you some information about the aircraft in the raid.

Raid 7 (50)
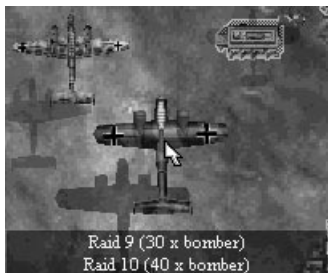
The message box gives you the raid ID number and the estimated number of aircraft in the raid (in parentheses), and if known, the complement of bombers and fighters. A Cross of Iron counter (either orange or red) is a raid that has been picked up on British radar, but has not been *visually* spotted.

Raid 9 (30 x bomber)
Raid 10 (40 x bomber)

A 3D aircraft model (which represents the "lead" unit in the raid) means that that raid has been visually spotted. This information should help you better determine which units to select for interception. [**NOTE:** If you move the cursor over a large group of raids and then click, you will first be prompted with an interim tab asking you to select one raid from the group. Select this raid, and then proceed to step 3 below.]

(3) Once you've selected a raid to intercept, the bottom tab opens and prompts you to "Select Interceptors". Select the unit(s) in this list you wish to intercept the raid.

Assign Intercepts		doc	aircraft	ready	exp	morale	range	delay	flying	base
▷ 615 Squadron	▷ launch 3	DB	Hurricane I	16	59	56	39	11	0	Kenley
▷ 600 Squadron	▷ launch 3	DB	Blenheim IF	14	58	34	41	63	0	Manston
▷ 79 Squadron	▷ launch 3	DB	Hurricane I	16	58	64	64	8	0	North Weald
▷ 616 Squadron	▷ launch 3	BF	Spitfire I	16	58	48	64	8	0	North Weald
▷ 66 Squadron	▷ launch 3	BF	Spitfire I	16	60	50	81	8	0	Tangmere
▷ 601 Squadron	▷ launch 3	DB	Hurricane I	13	63	29	81	8	0	Tangmere
▷ 25 Squadron	▷ launch 3	DB	Blenheim IF	16	56	39	88	63	0	Martlesham
▷ 65 Squadron	▷ launch 3	BF	Spitfire I	16	59	52	94	8	0	Westhampnett
▷ 602 Squadron	▷ launch 3	BF	Spitfire I	16	62	64	94	8	0	Westhampnett
▷ 1 Squadron	▷ launch 3	DB	Hurricane I	16	58	44	98	8	0	Northolt
▷ 1 RCAF Squadron	▷ launch 3	DB	Hurricane I	16	58	31	98	8	0	Northolt

Aircraft in Raid: 6   Fighters Assigned to Intercept: 2

You may select units in full, or you may select groups of 3. As you select, a series of double arrows appear next to the "ready" column. This means that this entire unit (or a portion of that unit) has been ordered to intercept the selected raid. You may choose any number of units to intercept. [**IMPORTANT:** Notice that not *all* of your units are listed here. A variable number of units appear for you to select. This list represents the units (in range order) which could possibly reach the selected raid in time to intercept it.]

As you select units, notice that at the bottom of the tab the total of all interceptors is displayed. This helps you keep track of how many planes you've assigned to attack the raid. You may also select the "base" name of a unit to draw a line from its base to the selected raid (this helps give you a visual idea of how far away from the raid the interceptor's base is).

Also note that some units listed are either already in the air on patrol or are en route to intercept other raids ("flying" column). You can still select these units and redirect them to intercept the current raid, but it may take time for them to respond to the order and frankly, it may not be worth your time. When choosing interceptors, you'll want to keep in mind the distance from the unit's base to the raid, and also the time (i.e., delay) it will take for the interceptors to get off the ground. You'll also want to choose units based on their attack doctrine ("doc" column). For example, if you're attempting to intercept a formation of 25 bombers with no fighter escort, you may wish to scramble Hurricane units set on Direct- or Bounce-bomber tactics (DB or BB).

(4) Click "Done" on the bottom tab once you are finished selecting your units.

(5) Repeat steps 2-4 to continue selecting and intercept raids.

(6) When you are finished selecting and intercepting raids, select "Continue" on the Reaction Phase tab to continue the Reaction Phase. Your interceptors will begin to launch according to their "delay" number.

The Purpose of Intercepting Raids: You should begin intercepting raids as soon as they start appearing on the map. Intercepting German raids is really the only way the British player can destroy and break up bomber formations. Though you have ground defenses which will destroy their share of raiders as they pass over targets, scrambling your units to intercept is essential to prevent the Germans from achieving victory. You scramble interceptors to engage and destroy enemy aircraft, and you also scramble interceptors to "break up" raid formations. Since the German player scores points by both destroying British aircraft and targets (see p. 60), intercepting a huge bomber formation and forcing it to break off and return home is just as significant as actually destroying aircraft in that raid.

As the Reaction Phase progresses, and as more and more raids start pouring in, your first inclination may be to try to intercept every single raid detected. This is not recommended. Not only is it virtually impossible to intercept every raid, attempting to do so will just put too many of your aircraft in jeopardy, and unnecessarily increase pilot fatigue (see p. 29). You'll want to review all German raids carefully, and pick those you think you can damage the most. To conduct a better, more thorough review of which raids to attack, you should use the "List Raids" function described below.

List Raids: Instead of intercepting raids by selecting them on the map, you can also review a full list of raids by selecting "List Raids" on the Reaction Phase tab. This allows you to review the details of the raids more thoroughly. To intercept raids using this function, follow these steps:

(1) Select "List Raids" from the Reaction Phase tab. This places you in the Intercept Raid mode. Immediately, the bottom tab opens to reveal a set of German raids currently underway.

Raid ID	A/C	Ftr	Bmr	Spd	Alt	Sector	Range	Intercepts
3	3	0	3	240	15000	Kenley	4	67
4	30	30	0	360	19000	Kenley	4	2
5	6	?	?	260	19000	Kenley	4	2
6	75	?	?	140	10000	Middle Wallop	50	64
7	50	?	?	160	19000	Tangmere	76	0
8	20	?	?	240	16000	Middle Wallop	71	0
9	30	0	30	180	15000	Biggin Hill	19	2
10	40	0	40	140	18000	Biggin Hill	19	2
11	30	30	0	240	17000	Biggin Hill	11	2

Raid ID: This is the ID number assigned to the raid by your controllers. Alongside the ID number, you may see a "-0". Raids with this symbol are outbound.

A/C: This is the estimated number of aircraft in the raid. For raids that have not been visually sighted, this number may be quite inaccurate.

Ftr: This is the estimated number of close escort fighters in the raid. If the raid has not been visually sighted, this will be a '?'. High escort fighters (see p. 52) are considered a separate raid and are listed as such.

Bmr: This is the estimated number of bombers in the raid. If the raid has not been visually sighted, this will be a '?'.

Spd: This is the estimated speed of the raid. Slow moving raids tend to be easier to intercept, and often (but not always) denote formations with bombers.

Alt: This is the estimated altitude of the raid. When you scramble interceptors, you don't have to worry about altitude. The game automatically takes your units up to the altitude necessary for interception and then attacks according to doctrine.

Sector: This indicates the nearest sector airfield to the raid.

Range: This is the distance to the nearest sector airfield.

Intercepts: This is the number of interceptors currently assigned to attack the raid.

(2) To choose a raid on this list, simply click on the button to the left of its ID number. The raid immediately highlights on the map. You may continue to select raids in this fashion until you find the raid you wish to intercept. You can only intercept one raid at a time.

(3) Once you've chosen a raid, select either the "Intercept" or "Recall" tab at the top of the bottom tab. If "Intercept", proceed to step 4. If "Recall", step 5.

(4) Selecting "Intercept" places you in the list of units you may choose from to intercept the raid. Select the units on this list (see p. 40 for full details on how to choose interceptors), then click "Done" on the bottom of the tab to return to the raid list. Proceed to Step 6 below.

(5) Selecting "Recall" places you in the list of units which are currently intercepting the raid. [**Note:** It's only necessary to select this option if you've already ordered units to intercept; otherwise, there will be no units to recall.] Once here, select the units you wish to send home (i.e., recall them), or set the units on patrol in their current location. When finished, click "Done" on the bottom of the tab to return to the raid list. Proceed to Step 6 below. On the Raid List is a "Recall All" button. You may select this button to recall *all interceptors from all raids.*

Select Units to Recall			doc	aircraft	flying	exp	morale	range	base	
▷ Recall	▷ Patrol	605 Squadron	DB	Hurricane I	14	61	44	31	Warmwell	
▷ Recall	▷ Patrol	65 Squadron	BF	Spitfire I	13	59	52	53	Westhampnett	
▷ Recall	▷ Patrol	19 Squadron	BF	Spitfire I	16	61	68	54	Boscombe Down	
▷ Recall	▷ Patrol	66 Squadron	BF	Spitfire I	13	60	50	66	Tangmere	
▷ Recall	▷ Patrol	601 Squadron	DB	Hurricane I	8	63	29	66	Tangmere	

Units selected for recall return to their home base as soon as the Reaction Phase continues; units set on patrol stop intercepting their raid(s) and begin patrolling in place as soon as the Reaction Phase continues.

(6) Repeat steps 2-5 until you are finished assigning or recalling interceptors, then click "Done" on the bottom of the Raid List tab to return to the Reaction Phase.

(7) If the Reaction Phase is "stopped", select the "START" button to begin again.

The Purpose of Intercepting Raids Using the "Raid List" Function:
Using the "Raid List" function allows you to review a larger list of raids and then assign interceptors to all or some of them. Too, the raid list gives you more information about the raid speed, altitude, etc.

The raid list changes quickly and often. One moment you may see a raid listed with 100 aircraft, and the next moment that raid may turn into a dozen smaller raids. One common tactic for the Germans is to have several smaller raids fly together in one large group, and then break apart once they reach a specific spot over England. They do this to mislead and confuse your radar facilities and spotters. So watch for this carefully. Also, it's important to know that the raid list is *not a full list of all raids currently in the air*. The raids listed here are those that Fighter Command considers the most valuable (or most dangerous). Raids that have already dropped their payloads and are returning home in smaller groups or have broken into smaller groups due to interception, are often not listed here because if they were, the list may very well be over 100+ raids. Such a number of raids would be difficult (at best) to keep track of in an all encompassing list, and hamper game speed. So, if you wish to intercept a raid that doesn't show up on the list, then use the interception function described on page p. 40 to select that specific raid.

German Raid Planning Phase

The Raid Planning Phase is the phase where the German player plans his missions (i.e., raids) for the upcoming day. Thus, the decisions you make here are of utmost importance. It is here--in this phase--that your victory or defeat is determined. Though you have little or no control over how the British player will assess and attack your raids as they begin arriving over his country, the decisions you make here may greatly deter his interception success, and also seal your fate as the *Luftwaffe* commander.

As the German player, the burden of achieving victory (in most of the campaigns, see p. 60) rests on your shoulders. The British player simply has to prevent you from winning, and as the defender, he has the advantage. However, it isn't impossible for you to win The Battle of Britain, contrary to historical precedence. You *can* win; you just have to plan your raids carefully.

German Planning Phase Tab
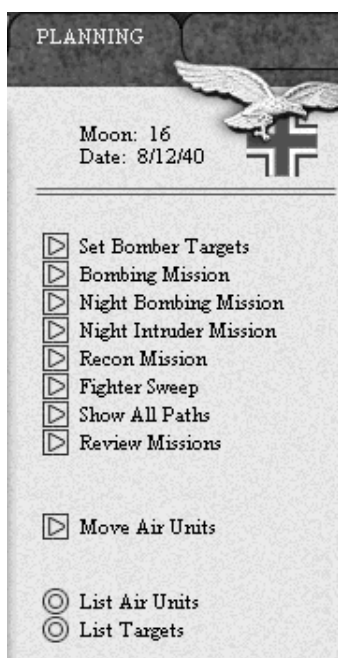
Set Bomber Targets: As *Luftwaffe* commander, one of your options is to allow your staff to plot some (or all) of your missions for the upcoming Reaction Phase. Your staff can plot all of the less important missions (such as small fighter sweeps and night intruders), giving you time to concentrate on those missions you wish to personally plan. Too, if your staff plots missions you don't like, you may cancel or modify them as you see fit. To have your staff plot missions, follow these steps:

(1) Select "Select Bomber Targets" on the Raid Planning Phase tab. This places you in the Staff mode. Immediately, the bottom tab maximizes to reveal a set of staff options.

(2) As soon as the bottom tab opens, you'll notice a listing of German air commands on the right tab: *Luftflotte* 2, 3, 5, and *Nachtkampfgruppe* (special night raiders).

By default, *Luftflotte* 2 is selected as the first command your staff will plot missions for. FL 2 is directly across the English Channel from British Group 11 (see p. 86), thus in any campaign, it will likely carry the brunt of the attack. But you may change the command group by simply selecting a new one on the right tab. Once you've selected a command group, you are ready to choose targets.

(3) Select the target type (on the bottom tab) you wish your staff to plot missions against.

Set Targets for Luftflotte 2

Primary Target Type: primary airfield

- area
- radar site
- primary airfield
- secondary airfield
- aluminum factory
- oil storage
- oil refinery
- chemical factory
- ball bearings factory
- electric power plant
- steel factory
- rubber factory
- aircraft factory
- engine factory
- avionics factory
- armaments factory
- railyard
- port

Max Cloud Cover Level: 70
Min Unit Morale Level: 35

- Plot a Single Raid
- Plot a Raid Group
- Plot All Recon
- Plot All Sweeps
- Plot All Raids
- Cancel All Raids

primary airfield (AF)

number locations   87

number damaged   0

total capacity 304

damage level   0%

Primary sector airfields are the main airfields from which most RAF units operate. Destroying these airfields are of utmost importance, as doing so curtails the performance of aircraft flying out of that field and also reduces the effectiveness of attached satellite airfields (i.e., secondary airfields). You must also attack primary airfields to score Air Superiority victory points.

By default, Primary Airfields are selected (as they are often the target most heavily attacked). Selecting another target changes the picture and data in the bottom right-hand corner. This information is valuable to review when choosing targets because it explains what the target is and its importance in the game.

primary airfield (AF)
number locations   87
number damaged   D

total capacity 304
damage level   0%

Primary sector airfields are the main airfields from which most RAF units operate. Destroying these airfields are of utmost importance, as doing so curtails the performance of aircraft flying out of that field and also reduces the effectiveness of attached satellite airfields (i.e., secondary airfields). You must also attack primary airfields to score Air Superiority victory points.

The target information in the bottom right-hand corner shows the target type name, the number of actual locations of that target type, the number of locations currently damaged, the capacity of the target, and the damage percentage. The textual description beneath the target picture gives you details about the target and its significance in the game. If the target is classified as a "critical industry" (see p. 62), then that information is also shown.

(4) Once you've selected a target type, <u>set the Maximum Cloud Level under which your staff will plot missions</u>.

Max Cloud Cover Level: 70

Setting a maximum cloud cover of 70, for example, tells your staff not to plot any raids for the upcoming Reaction Phase if the cloud cover will be 71 or higher.

(5) Once you've set the cloud cover, <u>set the Minimum Unit Morale Level by which your staff will select units for raids</u>.

Min Unit Morale Level: 35

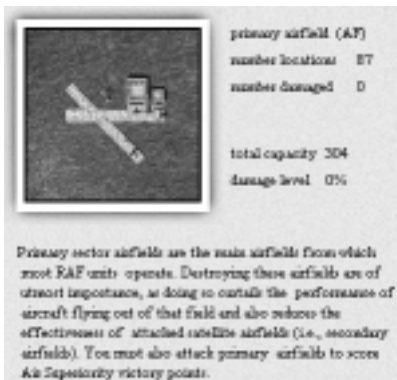Setting a minimum morale level of 35, for example, tells your staff not to select any units which have a morale of 34 or lower.

(6) After setting cloud cover and morale levels, <u>order your staff to plot a set of raids</u>. You may choose one of six orders.

Plot a Single Raid
Plot a Raid Group
Plot All Recon
Plot All Sweeps
Plot All Raids
Cancel All Raids
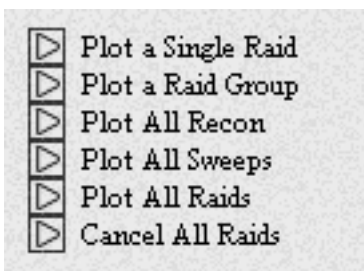
Plot a Single Raid: When you select this order, you are immediately prompted to choose a primary target on the map. See p. 48 to learn how to choose a primary target. After choosing a primary target and clicking "Done" on the right tab, your staff chooses the unit(s) which will fly that mission. They will also pick the type of mission to fly against that target.

Plot a Raid Group: When you select this order, you are immediately prompted to choose a primary target on the map. See p. 48 to learn how to choose a primary target. After choosing a primary target and clicking "Done" on the right tab, your staff will plot a single mission to that target, plus a series of other raids against targets in the surrounding area.

Plot all Recon: When you select this order, your staff automatically plots a series of recon missions against various targets in Britain (with an emphasis on picking locations of the target type you have designated). See p. 53 for more information on recons.

Plot all Sweeps: When you select this order, your staff automatically plots a series of fighter sweeps against various targets in Britain (with an emphasis on picking locations of the target type you have designated). See p. 54 for more information on sweeps.

Plot all Raids: When you select this order, your staff automatically plots a variety of raids against various targets in Britain (with an emphasis on picking locations of the target type you have designated).

Cancel all Raids: When you select this order, your staff will cancel all raids it has plotted for the selected Luftflotte *only*.

(7) Repeat the steps above to continue ordering your staff to plot raids until you are finished, or they tell you that you have "run out of resources."

Running out of Resources: It's important to note that your staff isn't perfect, and they will generally be very conservative when plotting raids. There's a lot of randomness built into the staff function, and they may often plot raids you consider foolish. But as the Luftwaffe commander, you have the right to reject anything your staff suggests, and you may personally modify the raids accordingly. During raid plotting, there will come a time when your staff will tell you that it has "insufficient resources" to carry out your request. Kindly smile at them, then escort them to a truck which will carry them far, far away to a prison for their insubordination. But all kidding aside, you need to know that your staff is doing the best it can and oftentimes, it will plot a lot of very good raids. For example, you'll notice that they almost always assign secondary targets (see p. 48) when planning bombing missions. This is a very good thing to do, as there are a lot of times when a raid simply cannot reach or find its primary target. If it doesn't have a secondary target to attack, it'll just turn around and go home. So, you can learn a lot from your staff. Just don't believe everything they tell you.

Modifying Raids: Your staff will show you the raids as it plots them, and you may modify them accordingly. To modify a raid, click on its name then select the "modify" tab to open the appropriate raid plotting sub-tab. See p. 54 for more information.

Cancelling Raids: In addition to ordering your staff to cancel all raids for a particular Luftflotte, you may select a raid in the list and then select the "cancel" tab. The raid is removed from the list and its line stays open for any additional raids you may wish to add later.
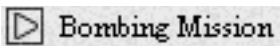
▷ Bombing Mission   **Bombing Mission:** Select this option to plan bombing missions. Follow these steps:

(1) Select "Bombing Mission" on the Raid Planning Tab. This opens the planning sub-tab.
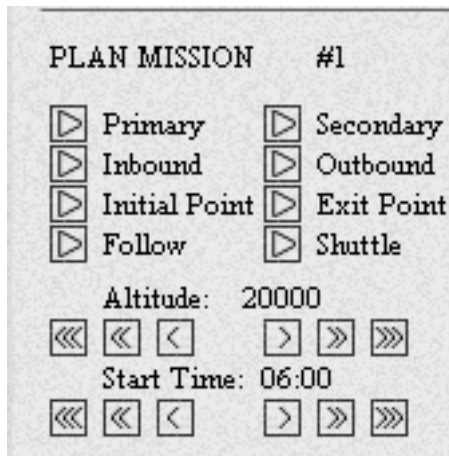
(2) On the planning sub-tab, select "Primary" to set your primary target. Once you've done so, find and select a target on the map you wish to designate as the primary target. This is the main target your raid will go after.

Primary Target Selection
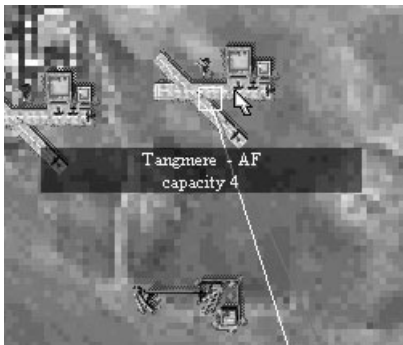
Once the primary target is selected, a white and red line is drawn from one of your airfields to the British target. The white line is the inbound path the raid will fly; the red line is its outbound path. The course and direction of these lines can be modified (see below). Your airfield which is highlighted with these lines is called the "form-up" airfield. This is the airfield at which all of your air units will gather to form the raid.

(3) If desired, select "Secondary" to set a secondary target. Once you've done so, select a target on the map (relatively close to the the primary target) you wish to designate as the secondary target. When selected, a yellow line and box highlights it from the primary target.

Secondary Target Selection
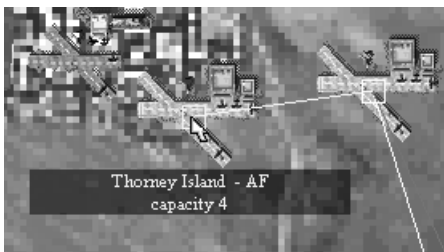
It's recommended that you set secondary targets often, because your raids may not always find (or reach) their primary targets. Once your raids are in the air, there's nothing you can do to help them, so help them now by giving them two targets to choose from.

(4) Set your flight paths.

Inbound: This is the first navigation point that a raid will fly to on its path to the target. To set the inbound point, first select this option then click on the map. The "white" line will adjust its shape to indicate where the inbound point is.

Initial Point: This is the second navigation point that a raid will fly to on its path to the target. To set the initial point, first select this option then click on the map. The "white" line (i.e., inbound line) will adjust its shape again to indicate where the initial point is.

Exit Point: This is the first navigation point that a raid will fly to on its path from the target back to its base. To set the exit point, first select this option then click on the map. The "red" line (i.e., inbound line) will adjust its shape again to indicate where the exit point is.

Outbound: This is the second navigation point that a raid will fly to on its path from the target back to its base. To set the outbound point, first select this option then click on the map. The "red" line (i.e., outbound line) will adjust its shape to indicate where the outbound point is.

The Purpose of Adjusting Your Flight Paths: The purpose of adjusting your raid flight paths is two-fold. First, you can navigate around heavy flak areas (which is highly desirable), and second, adjusting your flight path dramatically can mislead your British opponent into thinking that you are actually en route to another area of the map. But be careful. If you adjust the lines too dramatically, you may actually change the location of a raid's "form-up" airfield, which in turn could change the list of units available for the raid (see below).

Targets of Opportunity: When setting flight paths, you may wish to consider flying over targets along your outbound line, because if a raid cannot find its primary or secondary target, then during its flight, its target spotters may get a glimpse of "targets of opportunity." If it does, then very likely the raid will drop its bombs. Consider this tactic with extreme caution, however, for if a raid flies over targets fat with ground defenses, you could get cut to pieces.

(5) Select "Follow" to have this raid follow the same flight path as the previous raid. Of course, it isn't necessary to select this feature if this is your first raid. However, later in the Planning Phase, it might be worth your time to consider having some raids follow others. This tactic was used quite often by the Luftwaffe during the actual battle, and to great effect. Having several raids following each other can give the illusion of one large inbound formation, which in turn could mislead your British opponent into over-committing his forces.

(6) Select "Shuttle" to have the raid return to a different airfield than its home base. Once you've selected this feature, you are prompted on the bottom tab to choose a shuttle airfield. Choose one of your airfields on the map. This airfield is now considered the shuttle airfield for the raid. As soon as the raid reaches its shuttle airfield, it immediately reattaches itself to the new command under which that shuttle airfield is assigned and will be able to function normally in the future. One important note to make is that if you do assign a shuttle airfield to a raid, it's possible that units in the raid may become "disbanded". A unit is disbanded only as

a result of being reassigned to a shuttle airfield, and only if it runs out of operational aircraft at the time. The unit is removed from the game and its aircraft is rotated back into the German replacement pool. One reason you may wish to "shuttle" a raid to another airfield is to, again, confuse your British opponent as to where your units are located.

Altitude: 20000
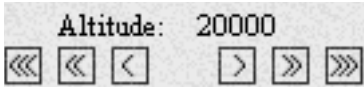
(7) Set the altitude for the raid. Each raid is assigned a default altitude. You may adjust this altitude by clicking on the left/right arrows on the planning sub-tab. You may wish to wait to set the altitude until after you've assigned units to the raid. Altitudes can be set up to 50,000 feet or as low as 100 feet. The altitude you set will dramatically affect the success of your raid (especially for bombing missions). If you set the altitude too high, the raid will probably do little damage to its target. If you set the altitude too low, you run the risk of getting torn apart by flak and balloon barrages. So, the best tactic to use when choosing an altitude is to first pick your units, then review their statistics under the "planes" database (see p. 17) to see aircraft ceiling limits, then set an altitude that works well within your aircrafts' limitations. [**NOTES:** Level bombers release their bombs from the assigned altitude and return to their home base before descending to land. Dive bombers dive down to 1000 feet to release their bombs and then climb back up to 6,000 feet to avoid barrage balloons and light flak on the way home. If you set an incoming altitude for dive bombers below 10,000 feet they conduct a "glide" bombing attack and are not as effective. Fighters on sweep missions (see below) will dive down to 1000 feet *only if* they strafe airfields and then climb back up to 6,000 feet to avoid balloons and light flak. Fighter sweeps and any other outbound fighter units which are flying directly over locations with balloon barrages will dive down to attack the balloons, but keep in mind that there is a slight chance that they will get tangled in the cables.

Flying Under Radar: Setting the altitude below 500 feet allows the raid to fly "under radar." Chain Home (CH) radar sites detect incoming raids at a minimum altitude of 3,000 feet, while Chain Home Low (CHL) radar sites detect incoming raids at a minimum altitude of 500 feet. See p. 86 to review the approximate distances that British radar can detect raids. Flying under radar has its advantages and disadvantages. Recons, night intruders, and small fighter sweeps have the best opportunity to fly under radar. They can reach their target, do their business, and be off before the British can do much about it. However, if you attempt to fly large formations under radar, you're likely to get cut to pieces by light AA guns and balloon barrages. So, take extreme caution when assigning raids to fly under radar.
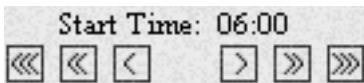
Start Time: 06:00

(8) Set the raid's launch time (start time). The time you set is the time the raid launches from its form-up airfield. You cannot start a raid any earlier than 6:00 in the morning and raids can be set to launch into the early hours of the next day. A raid's start time also directly affects its "time over target" (TOT) time which the game calculates for you based on the raid's start time and the units you choose. See below for more information about a raid's TOT.

▷ Pick Lead Unit

(9) Pick the lead unit for the raid by selecting "Pick Lead Unit" on the planning sub-tab. This is the air unit which will lead the raid. Immediately the bottom tab opens to show you a list of units from which to choose one unit as the raid's lead unit. On this list, select the unit you wish to lead the raid. Read the unit details on this list carefully, as you want to pick the best unit possible. Your lead unit doesn't

have to be very large, but it should have good attributes, as this will be the unit whose pilot's spot the target. So, the better quality the lead unit, the better chance the raid has of damaging the target. The list of units here is not a full list of every unit in your Luftwaffe. It is merely a selection of units that the game considers best suited for that particular raid from that particular form-up field. Once you are finished selecting the raid's lead unit, click "Done" on the bottom tab. You are now ready to assign additional bomber units to the raid.

(10) Add additional bomber units to the raid by selecting "Add Bomber Units" on the planning sub-tab. Immediately, the bottom tab refreshes to show you a list of bomber units you may add to the raid.

(F:0 B:0)		ready	exp	morale	range	bas
▷ Stab/ErprGr 210	Bf 110C-4B	3	68	99	18	Cal
▷ 1/ErprGr 210	Bf 110C-4B	5	88	95	18	Cal
▷ 2/ErprGr 210	Bf 110C-4B	5	91	96	18	Cal
▷ 3/ErprGr 210	Bf 109E-4B	2	82	99	18	Cal

Select any and all units on this list you wish to add to the raid. These units are immediately marked with a "b". Notice that the lead unit is present and is marked with an "L". The additional bomber units appearing here are a small selection of units the game considers best suited to accompany the lead unit on its mission. Once you are finished selecting units, click "Done" on the bottom tab. You are now ready to assign escort fighters to the raid.

Important Note: There are four primary attribute columns on the "pick lead" and "add bomber" tabs: ready, experience (exp), morale, and range. Ready is the number of aircraft ready to fly in the unit; experience represents the overall quality of the unit; morale is the quality of the unit to press on in the face of losses; and range is the distance of the unit from the "form-up" airfield. You should review these attributes carefully before picking bombers, as they will affect the overall performance of the raid during its mission. Pay particular attention to the ranges of your bomber units to their form-up airfields, because bomber units will trade off bombs for fuel; so if you have plotted a target a long way away from the form-up field, you should be able to reach the target but you'll be carrying fewer bombs.

(11) Add fighter escort to the raid by selecting "Add Fighter Escorts" on the planning sub-tab. Immediately, the bottom tab refreshes to show you a list of fighter units you may add to the raid.

(F:79 B:52)			ready	exp	morale	range	delay	alt
▷ II/ZG 76	Bf 110C	ce	0	64	75	84	0	20000
▷ II/ZG 26	Bf 110C	ce	0	73	83	91	0	20000
▷ Stab/JG 3	Bf 109E-3	he	0	74	89	95	0	22000
▷ I/JG 3	Bf 109E-3	he	0	66	71	95	0	22000
▷ II/JG 3	Bf 109E-3		30	71	87	95	0	20000

Select any and all fighter units on this list you wish to escort the bombers. When you first select them, they are set at "close escort" (ce).

Close Escort (ce): Close escort fighters protect the bombers by getting between them and the interceptors. This is a good tactic for preventing bombers from being attacked, but the escorts usually fight at a tactical disadvantage.
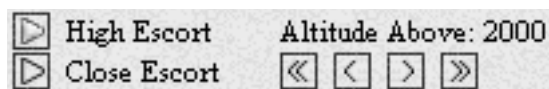
High Escort: High escort fighters fly above the raid and pounce enemy interceptors that fly nearby. High escort tactics will usually allow the escort fighters to engage the interceptors at a tactical advantage. High escort tactics are not very effective at preventing the bombers from being attacked, however. To change a fighter unit from close to "high escort", first select the high escort button appearing at the bottom of the tab, and then set the altitude you wish the fighters to fly above the bombers. Once you've made these settings, then choose fighter unit(s). The units you select will have "he" appear beside their ready aircraft, and their escort status and altitude marked accordingly.

Layering Your High Escorts: When setting escorts to higher altitudes, its important to know how British interceptors will come in to attack the raid. Interceptors set to Direct tactics will try to attack a raid at 1,000 to 2,000 feet above the raid's altitude. Interceptors set to Bounce tactics will try to attack the raid at 4,000 to 5,000 feet above the raid's altitude. So, you might want to set different altitudes for your high escort units in order to cover a larger area of sky above the bomber formation.

Fighter Ranges: A German fighter unit will only escort its bombers the distance of its fuel range. Once its fuel reaches the amount required to return home, it will break off and leave. Drop tanks increase a fighter's escort range, but drop tanks are released as soon as the unit enters combat. So, pay particular attention to your fighter ranges and assign escorts accordingly.
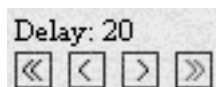
Setting a Delay: In addition to setting fighter units on high escort, you may also set a time delay. The time delay is the number of minutes the escort will be delayed after the main raid departs. This allows different fighter groups to escort the raid on different segments of its flight path. To set a delay, first set the delay time in the bottom right-hand corner of the escort tab, then select the fighter unit. The unit's delay time will change to reflect your settings.

(12) Once you are finished choosing fighter escorts, click "Done" on the bottom tab. You have finished plotting a raid!

New Mission

(13) <u>To begin plotting another bombing raid, select "New Mission" on the planning sub-tab</u>. This refreshes the tab and you are ready to repeat steps 2 through 11.

(14) Once you are finished plotting all bombing raids<u>, click "Done" at the bottom of the planning sub-tab to return to the main Planning Phase tab</u>.

Night Bombing Mission

Night Bombing Mission: Select this option to plan night bombing raids. The specific steps to plan night missions are exactly the same as regular bombing missions (see above). The only exception is that night bomber groups are not escorted by fighters, and therefore that step is skipped. However, night intruder missions may fly along the same path as a night bomber raid and occasionally shoot down an RAF night-fighter. So, night bombing missions can receive fighter escort if you plan it correctly.

Nachtkampfgruppe: Nachtkampfgruppe is the command specifically involved in the coordination of the night bombing offensive for the Luftwaffe. KGR 100 units are assigned to Nachtkampfgruppe, and in the 1941 campaign, the III/KG26 unit is also attached to Nachtkampf-gruppe. It is recommended that these units be *used only* as lead units when planning night bombing raids.

Night Intruder Mission

Night Intruder Mission: Select this option to plan night intruder raids. The specific steps to plan night intruder missions are exactly the same as regular bombing missions (see above). Night intruder missions are flown to disrupt the enemy's night air defense systems. They may fly along the path of friendly night bombers and attempt to engage enemy interceptors. They may patrol or bomb enemy airfields and attempt to shoot down enemy fighters that are trying to land. When planning night intruder missions, you'll notice that only one aircraft from the unit being selected is assigned the mission. One night intruder aircraft is assigned to the mission per unit you select.

Recon Mission

Recon Mission: Select this option to plan recon missions. The specific steps to plan recon missions are exactly the same as regular bombing missions (see above). Recon missions are usually conducted by one aircraft or a small group. The purpose of launching recon missions is to fly over targets to take aerial photos in order to gauge the amount of damage your raids have delivered to the target. Recon missions can also be planned first to fly over a target to get a better idea of where to attack. If there is no target photo for a target then it will be much more likely that bombers will fail to locate it. If photos are out of date (i.e., any recon photo over 2 days old) then the bomber planners will have less accurate information concerning air units stationed at the target (if an airfield) the ground defenses, or damage. Also, if you can coordinate it properly, you can run recon missions in the morning, have them return to home base, and then launch missions against the target they reconned to get the benefit of updated information. In other words, recon information on targets is immediately updated as soon as the recon unit arrives home. So, it's recommended that you run as many recon missions as you can to keep your intelligence up to date. Your staff is good at plotting recon missions.

Fighter Sweep: Select this option to plan fighter sweeps. The specific steps to plan fighter sweeps are exactly the same as regular bombing missions (see above). A fighter sweep is one or more fighter units assigned to fly over a target or to a specific spot in Britain in an attempt to hinder RAF activity. Fighter sweeps conducted over airfields will strafe the airfield and (hopefully) destroy/damage British aircraft before they leave the ground. So, a good use for fighter sweeps is to run them early in the morning about 30 minutes to an hour before launching bombers and their escort in order to catch the RAF off guard. And, if planned carefully, fighter sweeps can also play an escort roll, if you assign them to cover the area a bomber raid will fly into.

The Effects of Interceptions and Ground Defenses on Raids: There are various effects associated with your raids being intercepted by British units and ground defenses. When German fighters engage the enemy, they immediately begin to expend their fuel at four times the normal rate. And when they reach the fuel level that they need to return home, they break off the attack and fly home as "stragglers". Fighter bombers drop their bombs and then attack like "fighters". All other German aircraft do not expend extra fuel once intercepted, they defend themselves normally, and they do continue to their target (unless they are shot down or damaged). Once they reach their targets, if still engaged, their bombing accuracy is reduced depending upon the severity of the engagement (including ground defenses). Also, if a formation is attacked in such an aggressive manner that it must make a morale check (see p. 31), if it fails the check, the whole group will abort its mission, jettison its bombs, and head straight for home. This is where a unit's morale rating comes into play.

Show All Paths: Select this option to review all inbound/outbound flight paths of all raids currently plotted. This is a nice feature to use because it gives you a good visual idea of the flow of your attack, where your raids are coming from and where they will all converge and then separate as they reach Britain.

Review Missions: Select this option to review a list of all plotted raids. Once you are in this screen, you may select either "Modify" to adjust a raid (this takes you to the raid's planning sub-tab), or select "Cancel" to remove the raid completely. The line on which the cancelled raid appeared remains in the mission list and is filled in if you add a new raid later.

Mission List	type	ftr	bmr	depart	alt	TOT	target
1 Stab/KG 76	BOMB	79	52	06:00	20000	06:29	Tangmere
2 Stab/KG 2	BOMB	50	56	07:35	13000	08:02	Kenley
3 Stab/KG 4	BOMB	62	47	07:37	13000	08:03	Biggin Hill
4 Stab/KG 53	BOMB	65	20	07:39	13000	08:07	Croydon
5 II/KG 53	BOMB	83	41	07:41	13000	08:15	Hornchurch

Raid number and Lead Unit: The raid number and lead unit are listed first.

Type: This indicates the mission type. BOMB = bomber (night bomber also); FS = fighter sweep; NI = night intruder; REC = recon.

Ftr: The number of fighters assigned.

Bmr: The number of bombers or recon aircraft assigned. Also, fight-bombers are classified as bombers for game purposes.

Depart: The time the raid is due to complete forming up and launch.

Alt: The assigned altitude.

Time over Target (TOT): The time the raid is due to arrive over the target. Bomber units that suffer losses may turn back before reaching the target. Bomber units may fail to locate a target due to cloud cover (see p. 35) or poor intelligence of the target area (i.e., no recon photo). It's also important to note that a raid's TOT may change a few times as you are planning the raid. As you begin to plan the raid, the game tries to give you an estimated TOT. But once the raid is finalized, the TOT will change to reflect a more accurate time. However, if you "modify" the raid, the TOT may change again. So, do not interpret the TOT number as a perfect and exact time the raid will reach its destination. Interpret it as a good ballpark figure.

Target: The name and type of the primary target.

Move Air Units: The steps to take to review this information are the same as those listed under the British function. See p. 23 for details.

List Air Units (information-only tab): Select this option to review your air units. The steps to take to review this information are the same as those listed under the British function. See p. 30 for details.

List Targets (information-only tab): Select this option to review damage and other details about British targets. The steps to take to review this information are the same as those listed under the British function. See p. 27 for details. However, there are some things that are different for the German player if you select a specific target on the list to review its details See p. 57 for more information.
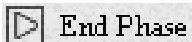
END PHASE BUTTON: When you are finished with your Movement Phase, press the "End Phase" button to enter the Reaction Phase.

German Reaction Phase

The German player starts the Reaction Phase by clicking the "START" button on the Reaction Phase tab. During the Reaction Phase, you watch the progress of your raids as planned in your Raid Planning Phase. You may pause the Reaction Phase for whatever reason by clicking the "STOP" button, but you cannot change or affect the outcome of the raids. The raids are launched as per your plans and their success (or failure) is determined by the computer. Once all raids are finished, the Reaction Phase ends and you are taken to your Intelligence Briefing Phase (see below).

During the Reaction Phase, however, you may review your missions by selecting "Review Missions" on the Reaction Phase tab, or you may adjust Game Option settings, adjust game speed, etc.

German Intelligence Briefing Phase

The German Intelligence Briefing Phase is where the results of the day's missions are reviewed by the German Player. The selections here are "information-only" features.

Intelligence Briefing Phase Tab
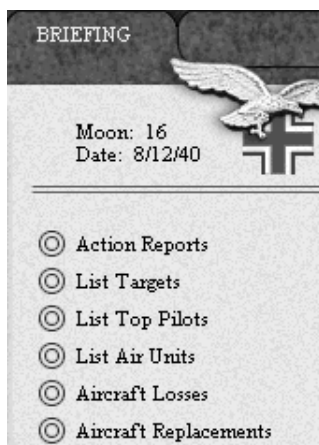
Action Reports (information-only tab): Select this option to review all the raids you've conducted for the day and their results. The steps to take to review this information are the same as those listed under the British function. See p. 26 for details. And, like the British action report tab, the information here may be inaccurate. The Action Report represents an immediate "results sheet" that your staff hands to you after a day's bombing, and so the number of reported British fighters shot down, the actual target damage amount, etc., might be a bit exaggerated. Review the other databases in the Intelligence Brief-

ing Phase to get a fuller and more accurate assessment on how your day's missions performed.

List Targets (information-only tab): Select this option to review details about British industries and airfields. The steps to take to review this information are the same as those listed under the British function. See p. 27 for details. The difference, however, is the kinds of information displayed. First, as the German player, you can never access a target location's details tab. You may select a target type on the first tab that appears and review a list of specific locations, but that's it. The information listed on this tab is discussed below:

primary airfield	damage	fighters	AA guns	balloons	last photo
St. Eval	0	0	0	0	1
Filton	0	0	0	0	1
Pembrey	0	0	0	0	1
Middle Wallop	0	0	0	0	1
Tangmere	0	0	0	0	1

Name: This is the name of the target (i.e., Filton).

Damage: This is the percentage of damage to the target. The number here is not necessarily accurate. Its accuracy is based on the age of the recon photo of the site (see below). If the target is an airfield, remember that airfield damage is divided between three categories: Runway, Service and Communication areas. You only receive victory points for damage to Service and Communication areas, but the damage listed *here* is an average of the runway and service area damage, and its accuracy is based on the age of the recon photo.

Size/Fighters/Capacity: This column will indicate the size of the target, the number of enemy fighters present, or the industrial capacity of the location. For factories and other industrial targets this represents the production capacity; for railyards this represents the size/importance of the yard; for airfields this represents the number of aircraft ("fighters") currently stationed there.

AA Guns: This is the number of AA guns at the location.

Balloons: This is the number of balloon barrages at the location.

Last Photo: Unlike your British counterpart, your Target List has a column for the age of the last recon photo taken of that location. If a "none" appears in the column, you have not taken a recon photo of that target. The number appearing here tells you how old (in days) the recon photo is. So, if the number "1" appears beside Filton airfield, the recon photo is one day old. A "current photo" is considered 1 or 2 days old. Any photo older than that means that your intelligence of that location is not reliable. It's important, then, to try to run recon missions (see p. 53) as often as possible to keep your photos current. Without current recon photos, you cannot tell how damaged the target is (targets do repair themselves over time, see p. 71), or how many air units or ground defenses are located there. Also, targets without any recon photo at all are difficult (if not impossible) to locate and destroy. Once you've run at least one recon mission against a target, then any missions against that target in the future have a higher chance of finding and targeting the location.

The Purpose of Reviewing Target Information: It's absolutely necessary for the German player to conduct good damage assessment in order to determine how to prosecute his attack. You must know how successful your attacks have been in order to determine if your strategy is working. What targets are you attacking? How are you attacking them? What intelligence (i.e., recon information) do you have on enemy targets? It's very likely that you'll coordinate your attacks according to your victory conditions. Review *Battle of Britain's* victory conditions (see p. 60) carefully to know which industries should be targeted most often. Although there are various visual preferences you can set to see how much damage a particular target has sustained (see p. 14), you still need to review the Target List often to fully understand how much damage your mighty Luftwaffe is dishing out.

List Top Pilots (information-only tab): Select this option to review a listing of your top pilots. The steps to take to review this information are the same as those listed under the British function. See p. 29 for details. As the campaign progresses, the game begins to promote pilots and adjust their attributes. Units with good pilots perform their duties better, so it's important to review your pilot information often and know which squadrons have the top guns.

List Air Units (information-only tab): Select this option to review your units. The steps to take to review this information are the same as those listed under the British function. See p. 30 for details. The information displayed here shows your units' morale levels, damage levels, etc.

Aircraft Losses (information-only tab): Select this option to review all the aircraft that have been destroyed (on both sides) for the day's raids and for the entire campaign. The steps to take to review this information are the same as those listed under the British function. See p. 32 for details.

Aircraft Replacements (information-only tab): Select this option to review a listing of all German aircraft and their replacements. The steps to take to review this information are the same as those listed under the British function. See p. 33 for details.

German Replacement Aircraft: Unlike the British player, your aircraft replacements come from a steady stream of off-map industrial sources. In 1940, you receive replacement aircraft on even-numbered turns. Refer to the list below to know your replacement rate.

Aircraft Type	# of Replacements
Bf 109E-7	1
Bf 109E-3	7
Bf 109E-4B	1
Bf 110C	3
Bf 110C-4B	1
Bf 110C-5	1
Bf 110D-1	1
JU 86P-2	0
Ju 87B	4
Ju 88A-5	8
Ju 88C-2	1
He 111H-4	4
Do 17Z-2	2
Do 215B-1	1
Do 215B-5	1

In 1941, you receive the following replacement aircraft on even-numbered turns.

Aircraft Type	# of Replacements
Bf 109E-7	6
Bf 109F-2	12
FW 190A-2	6
Bf 110C	3
Bf 110C-4B	2
Bf 110C-5	1
Bf 110D-1	1
Ju 86P-2	1
Ju 87B	2
Ju 88A-4	14
Ju 88C-2	1
Ju 88D-1	1
He 111H-4	7
Do 17Z-2	1
Do 215B-1	1
Do 215B-5	1
Do 217E-2	6
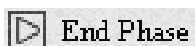
END PHASE BUTTON: When you are finished with your Intelligence Briefing Phase, press the "End Phase" button to enter the next Raid Planning Phase.

V. WINNING THE GAME

Now that you've read Section IV thoroughly and understand the mechanics of *Battle of Britain*, it's important to know how to win. In the one-month and full-length campaigns, the British win by preventing a German victory. In the one-day and one-week campaigns, the side with the highest point total wins. Also, depending upon your final score, you may achieve a draw.

There are two sets of campaigns which you can choose from to play: four 1940 campaigns and four 1941 campaigns. The 1940 campaigns are divided into one-day (August 12), one-week (the first week of the full campaign), one-month (the first 31 days of the full campaign), and full-length (the entire three month battle). The 1941 campaigns are also divided into one-day, one-week, one-month, and full-length (a six month battle). On the Campaign Selection Screen (see p. 12), you choose which one you wish to play. The one-day and one-week campaigns are considered "short" campaigns. The one-month and full-length campaigns are considered "long" campaigns. Each campaign has its own set of victory conditions and scoring system. So, you win a campaign by achieving its victory conditions, and you do that by scoring points. Read the information below carefully to see how to score points.

SHORT CAMPAIGNS

One-Day and One-Week 1940 Campaigns

Aircraft Destroyed: German player receives 1 point per enemy aircraft destroyed.

Aircraft Destroyed: British player receives 2 points per aircraft destroyed.

Airfield Damage: German player receives 1 point per every 4 percentage points of dam-

age to base "service" area of Fighter Command Primary Airfields (R:C:**S**). [These are primary airfields attached to British Groups 10, 11, and 12. Group 13 is not included in the damage.]

Airfield Damage: German player receives 1 point per 4 percentage points of damage to base "communications" area of Fighter Command Primary Airfields (R:**C**:S). [These are primary airfields attached to British Groups 10, 11, and 12. Group 13 is not included in the damage.] **NOTE:** Runway damage (the "R" number for damage) is not factored into points scored for hits against airfields, because runways are fixed quickly

One-Day and One-Week 1941 Campaigns

Aircraft Destroyed: German player receives 1 point per enemy aircraft destroyed.

Aircraft Destroyed: British player receives 2 points per aircraft destroyed.

Factory Damage: For every 25 points of damage to factories (including oil centers), railyards, and ports, German player gets 1 point times Capacity of target [Example: If factory sustains 25 points of damage and its capacity is 2, then German player gets 2 points.]

ACHIEVING VICTORY IN THE SHORT CAMPAIGNS: To win a short campaign, you must score more points than your opponent.

LONG CAMPAIGNS

The scoring and victory conditions for long campaigns are quite different from the short campaigns. To achieve victory in the one-month or full-length campaigns, the *German* player must score points in three separate categories: Air Superiority, Industrial Damage, and Terror (i.e., Urban bombing). If the German player scores enough points in these categories, then he wins. If not, the British player wins by default. Also, depending upon the German player's final score, he may achieve a "draw" (see below).

One-Month 1940 Campaigns

(1) Scoring Air Superiority Points

Serviceable Aircraft: Each player receives one point per serviceable aircraft on his side when the game starts, and this amount is adjusted as the campaign is played and as aircraft are deemed out-of-service. A serviceable aircraft is one defined as being "fueling," "ready," "taking off," "flying," and "landing" (see p. 32). An aircraft listed under any other category is not serviceable.

Airfield Damage: German players receives three points (3) per percentage point of Service and Communications area damage of Primary Sector airfields (R:**C**:**S**) [These are primary airfields attached to British Groups 10, 11, and 12. Group 13 is not included in the damage.] For example, if the German player does 20% damage to the Service area of an airfield, he gets 60 points; if he does 50% damage to the Communication area of the same airfield, he gets 150 points, for a total of 210 points.

Air Superiority   4 At the end of each Reaction Phase, the "Air Superiority" level shown on the bottom tab is obtained by dividing the German air superiority points by the British air superiority points (German points / British points = Air Superiority Level).

ACHIEVING AN AIR SUPERIORITY VICTORY: At the end of a one-month1940 campaign (or at any time during play), if the German player has achieved an 8 Air Superiority Level, he wins.

(2) Scoring Industrial Damage Points (German Player Only)

Industry Damage   0 Industrial Damage Points are obtained by the German player for reducing the British Industrial Output level by bombing factories (including oil centers), railyards, and ports. The industrial damage "level" number (located on the bottom tab) indicates the overall damage level of British industry, and is obtained by taking 8,500 minus the current British industry level and dividing by 500 (8,500 - British Output)/500 = Industrial Damage Level). As soon as the German player knocks the British Total Industrial Output down under 8,001, the Industrial Damage Level reaches 1; knock it below 7,501, number goes to 2, etc.

Damaging Critical Industries: There are certain industries in the game which are classified as "critical industries." Damage to these industries will begin to reduce the effectiveness of other industries and subsequently drive down their point values. Here's how the critical industries damage works.

When a Critical Industry's Output (CIO-indicated on the List Targets tab under the "total" column) is reduced below its 'critical level' (CIL), then "dependent" industry outputs (DIO) will be adjusted down using the following equation

$$[\text{Dependent Industry Output Adjustment -- DIOA} = \text{DIO} \times (\text{CIO}/\text{CIL})]$$

Critical Industry	Critical Level(CIL)	Dependent Industries
electric power	700	all other industries
chemical	100	oil refineries, and rubber factories
steel	100	armaments
ball bearings	120 (100)	aircraft assembly (armaments)
rubber	100	armaments
aluminum	120	aircraft assembly

Recon Missions: The German player will notice that the Critical Industry Output number (CIO) shown in the "total" column of the List Target tab is much lower than many of the totals indicated under 'critical level' above. This is to reflect partial or no recon information of that industry type. For example, as the German player, you may notice that the electric power CIO number is listed below 500; this means that you have only limited intelligence information about that industry and so you don't have a *good* idea about how effective your attacks are against electric powerplants. As you run more and more recon missions against an industry type, then the 'total' number (CIO) will change to reflect a more accurate reading. *For the British player, the totals on the List Target tab are accurate.*

(3) Scoring Terror Points (German Player Only)

Terror points are scored by knocking out each square mile of urban area (i.e., one pixel on the far zoom-out mode). The German player receives 1 point per each percentage point of damage to each square mile of urban area. The German player receives 100 points by completely knocking out one square mile.

The Terror number on the bottom tab represents the "level" of all damage to urban areas, and is obtained by dividing the terror points scored by 20,000. Once the terror points reach 20,000, the terror level increases to 1; once the terror points reach 40,000, the terror level increases to 2, etc.

During play, the only way you can see urban damage on the map is to click on the "Urban" button on the Preference tool bar. This will remove all other targets except the urban areas. If the urban area has any damage at all, small dots of yellow or red (fire) appear. The brighter the yellow, the more heavily damaged that urban area is. Red dots indicate fires burning in that area, and these fires can burn for a time, and also spread to other connecting urban areas.

ACHIEVING A NON-AIR SUPERIORITY VICTORY: Besides trying to win the one-month 1940 campaign through air superiority, the German player may try to win a non-air superiority victory by having damage "levels" which add up to 12 points. [Example: Air Superiority = 5; Industrial Damage = 4; Terror Level = 3 for a total of 12 points.]

One Month 1941 Campaigns

In a one-month 1941 campaign, the German player scores points as per the details described above under the one-month 1940 campaign. However, the German player cannot achieve an air superiority victory alone; he must win by having victory "levels" which equal or exceed 12 points.

Full-Length 1940 Campaigns

The points the German player must score for victory in the full-length 1940 campaign are the same as described above under the 1940 one-month campaign. The only difference is that the German player can *only* achieve an air superiority victory within the first 40 days of the campaign. If he does not achieve an air superiority level of 8 by day 40, then the victory conditions are changed so that he can only win by achieving a total "level" of victory which equals or exceeds 12 points.

Besides winning by air superiority as indicated above, a full-length 1940 campaign ends when certain scoring conditions are not met. To continue play after the first 31 days, the German player must have an air superiority level of at least 4. And, at the end of the second month, the German player must have a combined victory total of 8 or more or the game ends immediately.

Full-Length 1941 Campaigns

The points the German player must score for victory in the full-length 1941 campaign are the same as described above under the one-month 1941 campaign, but he can only achieve victory if his victory "levels" are equal to or exceed 16 points. And, as indicated under the 1940 full-length campaign, continuation of the full-length 1941 campaign is checked at the end of each month (every 31 days). **End of first 31 days = 8; end of second 31 days = 9; end of third 31 days = 10; etc.**

Playing to a Draw

In addition to winning or losing outright, you may also play at a level sufficient to reach a draw. In the short campaigns, if both scores are the same (i.e., you tie), then you have a draw. In the full-length campaigns, if the German player fails to suffer an early ending due to score checks at the end of each month (see above), then the worst he can do is a draw. In the one-month 1940 campaign, he must have at least an Air Superiority of 4 by game end, and in the one-month 1941 campaign he must have at least a combined score of 8. Any other results than those described in this paragraph will equate to either a win or a loss.

IMPORTANT!!

Please read the README file for any last minute changes to the
scoring system above.

Assessing Your Score

It's important that you keep track of your score during play. You can do this in two ways: 1) by watching the score numbers on the bottom tab, and 2) by accessing the "score summary" tab.

Air Superiority	4	Turn/End 4/31	Attacker Losses	: 25
Industry Damage	0		Defender Losses	: 17
Terror	0			

Game Score: For simplicity's sake, the game score is kept on the bottom tab at all times. If you are playing a short campaign, the score is a total for both sides. If you are playing a long campaign, the score is divided out among the three damage levels: Air Superiority, Industry Damage, and Terror. At the end of each turn, the numbers here will change if a score change has occurred. In short campaigns, the score will change often and usually between each turn. In the long campaigns, the three damage levels *may* change often, though it is expected that you'll notice little change between individual turns. This is due to the nature of strategic bombing. It takes a long time to deliver enough damage to the enemy before the score begins to move. As a result, we've added a "score summary" tab (see below) which gives you more information about how the course of the battle is going.

Turn/End: This section of the tab shows you the current turn and the total turns (or days) in the campaign. When you reach the last turn, the game ends.

Attacker and Defender Losses: This is an up-to-the-minute tally of destroyed aircraft for both sides.

SUMMARY

Score Summary Tab: You may review the score summary tab during play. It provides a more detailed overview of your score and how it was derived.

The top section of the tab shows the date, the campaign being played, the turn you're on, and the current cloud cover. The "Score Summary" section shows the score broken down by damage level (if necessary). The "Score Details" section divides both German and British scoring into separate categories, as described below:

Points for Ready Aircraft: This is the number of aircraft ready for service. The number in parentheses (_) is the number of aircraft currently out of service.

Points for Sector AF Damage: The German player scores points for damaging British Primary Sector Airfields. This is the current point total.

Points for Strategic Bombing: The German player scores points for damaging British industry. This is the current point total.

Points for Terror Bombing: The German player scores points for urban bombing. This is the current point total.

British Industrial Output: This is the current British industrial output strength. As Britain's industrial might is attacked, this number goes down.

NOTE: The information under "Score Details" will update itself during the Reaction Phase whenever you click on the Summary tab. And, it will fully update itself once the current Reaction Phase is complete.

The "Attrition Summary" section is a running total of various data which are important for you to review to see how quickly your air force is being whittled down. It shows totals for both the current turn and the campaign.. It shows the number of sorties (i.e., the total number of aircraft launches), the number of aircraft lost, and highest aircraft loss *type*, and KIA, MIA, and WIA pilot totals. This information *does* update during the current Reaction Phase, unlike the information under "Score Details." It's important to note that the "Highest Aircraft Loss" totals represent the highest losses for the indicated aircraft type, and also the total losses of that *type* for the campaign. For example, if you lost 13 He111-4s during the current turn, the number 13 appears for the day and the total number of He111-4s lost for the campaign will be listed under the campaign heading. Also, if a Reaction Phase comes and goes without any German sorties (and that's very likely

in long campaigns), the highest aircraft losses remain the same as the last turn in which German sorties ran.

NOTE: It's important to note that the score summary information tab is very useful but it *is* summary data. If you want more detailed information about the status of specific air units, location damage, top pilot lists, etc., refer to the specific database where that information can be found.

When is Victory Assessed? Victory is assessed at the very end of each Reaction Phase, right before the next British Movement or German Intelligence Briefing Phase. If victory is achieved, the game ends.

VI. TARGET DESCRIPTIONS

Area (AREA): Areas represent population centers (i.e., towns, suburbs, etc.). Bombing area targets (or "blitz" bombing) increases British terror, which goes toward achieving victory in many of the campaigns. See p. 15 to learn how to assess urban damage.

Civilian Factory: Civilian factories serve no purpose in the game, save that when a legitimate industrial location is destroyed, it may "relocate" itself to the closest civilian factory and begin production anew. As the German player, you are most welcome to bomb these targets if you wish, but spending a lot of time and resources doing so may not be in your best interest.
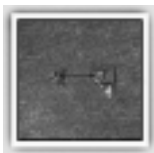
Radar Site (RADAR): Radar sites are Britain's first line of defense. There are two types of radar: CH (or Chain Home high radar), and CHL (or Chain Home Low radar). Knocking out radar sites reduces Britain's effectiveness to spot and attack your raids.

CH Sites	CHL Sites
Ventor	Poling
Dunkirk	Truleigh
Rye	Beachy Head
Pevensey	Foreness
Hawk's Tor	Dover
Canewdon	Fairlight
Bromley	Worth
Bawdsey	West Prawle
High Street	Rame Head
Norwich	Carnanton
West Beckham	Walton
Stenigot	Happisburgh
Saxton Wold	Ingoldmels
Danby Beacon	Easington
Ottercops Moss	Flamborough
Drone Hill	Shotton
St. Cyrus	Cresswell
School Hill	Bamburgh
Rosehearty	Cockburnspath
Nether Button	Anstruther
	Montrose
	Donnies Hill
	Hill Head
	Thurmster
	Kirkwall

See p. 86 to view a diagram of the approximate distances both CH and CHL radar can reach.

TARGET DESCRIPTIONS

Primary Airfields (AF): Primary "sector" airfields are the main airfields from which most RAF units operate. These airfields are attached to Groups 10, 11, 12, and 13. Destroying these airfields are of utmost importance, as doing so curtails the performance of aircraft flying out of that field and also reduces the effectiveness of attached satellite airfields (i.e., secondary airfields). Air units cannot launch from primary airfield with over 50% damage (see p. 72 for more information). You must also attack primary airfields to score Air Superiority victory points. Also note that there are a series of coastal and bomber command airfields on the map which are the exact same size as sector airfields. While these airfields do act as primary airfields, they are not classified as "sector" airfields and thus the German player does not receive Air Superiority points for bombing them.

Secondary Airfields (AF): Secondary airfields are small airfields which operate from converted grass fields or pastures. Many secondary airfields are attached to a neighboring primary airfield, which means that they receive orders to scramble through that primary airfield's communication system. Air units cannot launch from secondary airfields with over 50% damage (see p. 72 for more information). Though difficult to damage, the RAF do use secondary airfields, so it is in your interest to attack them whenever possible. A good tactic is to strike a secondary airfield in conjunction with an attack against its HQ (primary airfield), thus reducing the effectiveness of both at the same time. A list of HQs and their secondary airfields is below.

HQ (Primary Airfields) / Secondary Airfields

St. Eval / Roborough
Filton / Exeter
Filton / Bibury
Filton / Redhill
Middle Wallop / Warmwell
Middle Wallop / Boscombe Down
Tangmere / Westhampnett
Northholt / Heathrow
Kenley / Croydon
Biggin Hill / Gravesend
Biggin Hill / Manston
Biggin Hill / Hawkinge
Biggin Hill / Lympne
Hornchurch / Rochford
North Weald / Stapleford
Debden / Martlesham
Debden / Castle Camps
Duxford / Fowlmere
Wittering / Bircham Newton
Digby / Ternhill
Church Fenton / Leconfield
Church Fenton / Ringway
Turnhouse / Drem
Turnhouse / Grangemouth
Wick / Castletown

Aluminum Factory (ALUM): Aluminum factories are classified as "critical industries" (see p. 62). Aluminum factories help in the production of replacement aircraft, so serious damage to them reduces the effectiveness of aircraft factories.

Oil Storage (OILS): Oil storage facilities house most of the crude oil reserves of Britain. Britain's oil comes from foreign sources, so destroying oil storage facilities (along with attacks against oil refineries and chemical factories) begins to create a fuel shortage, which in turn reduces the amount of sorties the RAF can conduct.

Oil Refinery (OILR): Oil refineries convert crude oil into fuel for British aircraft. Destroying oil refineries (along with attacks against oil storage facilities and chemical factories) begins to create a fuel shortage, which in turn reduces the amount of sorties the RAF can conduct.

Chemical Factory (CHEM): Chemical factories are classified as "critical industries" (see p. 62). Destroying chemical factories (along with attacks against oil storage facilities and oil refineries) begins to create a fuel shortage, which in turn reduces the amount of sorties the RAF can conduct. Damage to chemical factories also reduces the effectiveness of rubber factories.

Ball Bearing Factory (BBFAC): Ball bearing factories are classified as "critical industries" (see p. 62). Damage to ball bearing factories reduces the effectiveness of aircraft and armaments factories, thus hindering the production of replacement aircraft.

Electric Power Plant (POWER): Electric power plants are classified as "critical industries" (see p. 62). All factories and facilities need electric, so heavy damage to electric power plants reduces the effectiveness of all other industries in the game.

Steel Factory (STEEL): Steel factories are classified as "critical industries" (see p. 62). Damage to steel factories reduces armaments factory production, which in turn hinders aircraft repairs and replacements.

Rubber Factory (RUBBER): Rubber factories are classified as "critical industries" (see p. 62). Damage to rubber factories reduces armaments factory production, which in turn hinders aircraft repairs and replacements.

Aircraft Factory (AFAC): Aircraft factories are the assembly facilities for replacement aircraft, thus destroying them hinders Britain's ability to replace aircraft.

Engine Factory (EFAC): Engine factories make aircraft engines, thus destroying them hinders Britain's ability to replace aircraft.

Avionics Factory (CFAC): Avionics factories manufacture parts for aircraft, thus destroying them hinders Britain's ability to repair and replace aircraft.
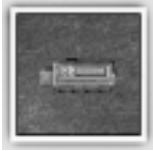
Armaments Factory (ARM): Armaments factories manufacture the weapons of war. Damage to armaments factories hinders Britain's aircraft and ground defense production.

Railyard (RAIL): Railyards are the hubs of the transportation system of Britain. They also act as the primary communications network, and thus damaging them can greatly reduce Britain's ability to transport its resources (i.e., fuel, aircraft parts, etc.) and ground defenses. Also, attacking railyards will reduce the effectiveness of any and all industries in its general area.

Ports (PORT): Ports are where foreign crude oil arrives. Thus, destroying ports (along with the systematic bombing of oil storage facilities, oil refineries, and chemical factories) can cripple Britain's fuel resources and greatly reduce her ability to fly aircraft.

Command Headquarters (HQ): British fighter and bomber commands appear on the map *for the British player only.* They appear so that the British player can know where his command centers are. They are not, however, viable targets which can be attacked by German raids. So, the German player should not bother in trying to target these during his Raid Planning Phase.

Target Damage Repair Rates

Target Damage: During the course of play, targets suffer damage due to German bomb-ing. Potential target damage occurs when a bomber formation reaches its target and drops its bombs. The severity of the damage depends upon the number of bombers involved, flight alti-tude, recon photos status, etc. All non-airfield targets can take up to 100% damage. Airfields, how-ever, because they have separate damage categories, could potentially receive 200% damage, because both the runway and the service area can suffer up to 100%. So, as you are watching your messages on the screen and the number "150" is flashed for damage to Biggin Hill, that could mean that the runway has suffered 75% damage, and the service center has suffered 75% damage.

Strategic Repair Rates: Target damage is repaired at various rates. There are two repair rate categories: strategic repair and tactical repair. All targets except airfields fall under strategic repair rates. Each target repairs an average number of points between Reaction Phases, as per the chart below.

Average Repair Points Per Day	Target
0.5	Urban
2.0	Civilian Factories (these factories serve very little purpose in the game, save that they may take the place of a factory (like an Aircraft Factory) if it is damaged severely)
5.0	Radar Site
1.0	Aluminum Factory
1.5	Oil Storage
1.0	Oil Refinery
1.0	Chemical Factory
1.5	Ball Bearings Factory
1.0	Electric Power Plant
1.0	Steel Factory
1.0	Rubber Factory
1.5	Aircraft Factory
1.5	Engine Factory
1.5	Avionics Factory
1.5	Armaments Factory
1.0	Railyard
1.0	Port

Tactical Repair Rates: Airfields repair very quickly and therefore fall under tactical repair rates. In addition to airfields, radar sites also have a communication section, and it too repairs quickly. Below is a list of tactical repair rates.

Target Section	Points
Communications	1 per 4 hours (airfields and radar sites)
Airfield Service	1 per 4 hours
Runway (over 50%)	1 per minute
Runway (50% less)	1 per 2 minutes

NOTE: An airfield with over 50% runway damage cannot launch aircraft. However, as you can see by the repair rates above, this will hardly be a problem in most cases. Runway damage to airfields usually translates into launch delays, which can change quickly during play.

Hostile Weather and Critical Industry Damage: Neither hostile weather nor damage suffered to targets due to critical industry adjustments affect repair rates in any way.

VII. HOT KEYS

Below is a list of hot keys in *Battle of Britain*. You may refer to this list as you play to refresh your memory, or you may hover the mouse arrow over a particular button, and if there is a hot key associated with that function, it will appear in the message box in parentheses (example: "go to the game options menu (CTRL-O)").

General
Q: Quit Game
CTRL-S: Save Game
Z: Zoom in the map
X: Zoom out the map

British Move Phase
G: Move AA Guns
A: Move Air Units
D: Set Doctrine
R: Action Report
T: List Targets
P: Top Pilots
U: List Air Units
L: Aircraft Losses
N: Aircraft Replacements
E, ESC: End Phase

British Reaction Phase
S: Start/Stop
P: Set Patrol
M: Move Patrol
R: Recall Unit
D: Set Doctrine
I: Intercept Raids
CTRL-R: List Raids
CTRL-M: Message Level
CTRL-O: Game Options
CTRL-T: Game Speed

German Raid Planning Phase
S: Set Bomber Targets
B: Bombing Missions
N: Night Bombing
R: Recon
I: Night Intruder
F: Fighter Sweep

CTRL-P: Show all Paths
CTRL-R: Review Missions
A: Move Air
U: List Units
T: List Targets
E. ESC: End Phase

German Reaction Phase

S: Start/Stop
CTRL-R: Review Missions
CTRL-M: Message Level
CTRL-O: Game Options
CTRL-T: Game Speed
E, ESC: End Phase

German Intelligence Briefing Phase

R: Action Reports
T: List Targets
P: Top Pilots
U: List Air Units
L: Aircraft Losses
N: Aircraft Replacements
E, ESC: End Phase

VIII. HISTORICAL

Hitler's First Defeat: The Battle of Britain
By Ben Knight
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"...the Battle of France is over. I expect that the Battle of Britain is about to begin. Upon this battle depends the survival of Christian civilization. Upon it depends our own British life, and the long continuity of our institutions and our Empire. The whole fury and might of the enemy must very soon be turned on us. Hitler knows that he will have to break us in this island or lose the war. If we can stand up to him, all Europe may be free. Let us therefore brace ourselves to our duties, and so bear ourselves that, if the British Empire and its Commonwealth last for a thousand years, men will still say, 'This was their finest hour.'"

-Prime Minister Winston Churchill (1874-1965) addressing the House of Commons, June 18, 1940

Historians usually argue that the Second World War was a direct result of, or a continuation of, the First World War. Certainly the 1940 Battle of Britain and the subsequent "Blitz" of English cities was a continuation of the air bombardment of Britain that had begun 25 years earlier during the Great War. The British eventually defeated the raiding German airships (zeppelins) and biplane bombers of Kaiser Wilhelm II in that first war, and they would likewise defeat the raiding German bombers and fighters of Hitler's air force (Luftwaffe) in the Second World War. Although the British won the Battle of Britain in 1940 by a slim margin, they nevertheless won it because they were better prepared for the battle than the Germans were. They were better prepared because of lessons they had learned in the First World War, and because during the interwar period they had made vital improvements to the air defense of their island nation.

The First Battle of Britain
The air bombardment of Great Britain began on January 19, 1915 with the first of 51 Zeppelin raids (which were made at night) that would continue through August 1918, several months before the end of the war. The first German zeppelins could carry less than a ton of bombs each and operate at an altitude of 10,000 feet. Later models could carry more than five tons each and reach a ceiling of over 20,000 feet, where it was difficult for British biplane fighters, taking off from nearby airdromes, to reach them before they had disappeared into the night.

The Germans stepped up their strategic bombing of England between the spring of 1917 and the spring of 1918 by using biplane heavy bombers with ranges of 500 miles. Twin-engine Gothas, which began the assault, could drop half a ton of bombs. Four-engine Giants, which were introduced later, could drop twice that load. These strategic bombers made 27 raids against England. Attacks usually occurred at night or at dusk, allowing the bombers to escape in the dark. However, the first midday, multi-craft bomber raid against London occurred on June 13, 1917. The fourteen Gotha bombers involved in the raid inflicted 600 casualties on the city without loss to themselves.

The extent of damage to English cities caused by air-dropped explosives and incendiaries was never great when compared to the desolation of the battlefront on the continent. After three years of raids, zeppelins had managed to inflict 2,000 civilian casualties. Admittedly, 2,000 was not an insignificant number, but the British Army was losing that same number of men on an average day at the front. However, the threat to the unarmed civilians and industries in England was immediate and perhaps more real to the people and their leaders.

To deal with this aerial threat, the British established an extensive network of airdromes manned by 16 fighter squadrons (many withdrawn from the front in France), Warning Control Centers (listening posts), balloon barrages, and emplacements for 480 anti-aircraft guns and 706 searchlights manned by 25,000 personnel. These defenses not only drove the Kaiser's airships and bombers to higher altitudes, diminishing the accuracy of their attacks, but they also inflicted substantial losses on the attackers. Altogether, the Germans lost 68 zeppelins and 24 Gothas in their first air war against Great Britain (no Giants were lost in combat). These losses were severe enough that the Germans abandoned their attacks by mid-1918.

Command of the Air

"*I think it is well for the man in the street to realize that there is no power on earth that can protect him from being bombed. Whatever people may tell him, the bomber will always get through. The only defense is offense, which means that you have to kill more women and children more quickly than the enemy if you want to save yourselves.*"

-Future Prime Minister Stanley Baldwin (1867-1947) in a speech
to the House of Commons, 1932

Even though both sides in the Great War switched from daylight to nighttime strategic bombing (or gave it up entirely) due to bomber losses inflicted by defending fighters and anti-aircraft batteries, the advocates of air power after the war maintained that strategic bombing would be the decisive element in any future war. One of the most influential and vocal advocates of air power was General Giulio Douhet (1869-1930) who had commanded the Italian Aeronautical Battalion during the First World War. In his 1921 work Il dominio dell'aria (The Command of the Air), Douhet was the first to publish the idea that land armies could no longer break through ground defenses to seize what mattered most in war-the enemy's production centers and resources. Therefore (the theory went), it was up to the air forces to fly over the land defenses, destroy the enemy's war industries by bombing and break the morale of the civilian factory workers. Civilians were deemed psychologically fragile and therefore more susceptible to terror than the soldiers in the trenches (particularly if chemical weapons such as poison gas were dropped on them).

Douhet believed that the strategic, or heavy, bomber was the perfect offensive weapon, that it was too difficult to locate and intercept in the vast halls of the sky, and that it would nearly always get through to complete its mission. He envisioned the next war being a contest between heavy bombers in which the first side to gain air superiority would be the first side that smashed the enemy's airfields and aircraft factories, thereby crippling the enemy's bomber power. With control

of the air thus established, a nation's heavy bombers could assault the enemy's cities unimpeded, forcing a swift capitulation. Such was the air doctrine theory proposed during the two decades of the interwar period, and many political and air force leaders-including those in Great Britain-believed in the forecast.

Fighter Command

"*If the aerial bombardment of our cities can be restricted or prevented, the chance that our morale could be broken by 'frightfulness' will vanish, and the decision will remain in the long run with the armies and navies. The more our air defenses are respected, the greater will be the deterrent upon a purely air war.*"

-Winston Churchill, 1935

Against the backdrop of big-bomber mania, Great Britain's Royal Air Force (RAF) was reorganized in 1936. It included an offensive arm of heavy bombers (called Bomber Command) whose aircraft carried large bombloads and machineguns for defense, and it included two defensive arms: Coastal Command, responsible for protecting Britain against seaborne enemies, and Fighter Command, equipped with interceptor fighters to thwart any air assault on the nation. Fighter Command was placed under the capable leadership of Air Chief Marshal Sir Hugh "Stuffy" Dowding (1882-1970). Dowding had commanded air squadrons in France during the First World War, and most recently he had been in charge of the Air Ministry's Supply and Research branch. Dowding knew he could not stop enemy bombers from reaching targets in Britain (at the time, the newly unveiled Luftwaffe was seen as the most likely enemy in the near future), but he hoped to make such raids prohibitively costly for the enemy.

It is not amiss to credit Dowding with winning the Battle of Britain. The decisions he made in the 1930s were crucial to British success. There were three important actions he took in the decade prior to the war: (1) he promoted radar research in its infancy; (2) he supported the development of metal-skinned, monoplane fighters such as the Supermarine Spitfire (which became a famous symbol of British courage in the Battle of Britain); and (3) he organized a complete air defense system based on fighter control through radio communications and up-to-the-minute radar and ground observer plots. All of these improvements provided the groundwork that Fighter Command needed to defeat the much-feared bomber.

In 1935, while at the head of research, Dowding had encouraged the development of a novel early-warning system-the Radio-Direction Finding device (RDF, later called radar). By 1940 over fifty Chain Home and Chain Home Low radar stations were deployed along the British coast facing seaward toward the European continent. The Chain Home stations could identify an aircraft out to 120 miles distance depending on the aircraft's altitude. Thus Fighter Command headquarters could "see" over the English Channel, much of Normandy and the Pas-de-Calais region in northern France and the western third of the North Sea. The 350-foot tall Chain Home radar towers were used to locate aircraft at high altitudes, while the 185-foot tall Chain Home Low masts were used to locate low-flying aircraft. British planes carried an early form of IFF (Identification Friend or Foe) gear so they could be detected by radar as friendly aircraft when aloft. Once an aircraft penetrated the Chain Home radar band, it was visually and acoustically tracked by Fighter Command's Observer Corps, which had hundreds of observation posts dotting the country, manned by thousands of trained observers.

Radar operators (working from exposed huts near the steel radar towers) and ground observers sent information by land line about the distance, direction, altitude and numbers of raiders directly to Fighter Command and Group headquarters. Fighter Command headquarters was based at Bentley Priory mansion, northwest of London. Under its command were four Fighter Groups responsible for defending Great Britain in the summer of 1940: No. 10 Group in southwest England, No. 11 in the southeast (including London), No. 12 in central England, and No. 13 in northern England and Scotland.

Each group headquarters would filter the radar and observer reports, plot them on giant map tables, and within minutes pass the key information to its sector stations (principle fighter bases). At the time of the battle, No. 10 Group had four sector stations, No. 11 Group had seven arranged in a defensive ring around London, No. 12 had six sector stations and No. 13 also had six. Each sector had command of one to four fighter squadrons, which comprised a wing. A squadron had a normal complement of twelve aircraft plus four to eight spares. More than half of the pilots were officers and the rest were sergeants. The fighter aircraft would be dispersed on the sector station airfields or at forward fields (also called satellite fields). In addition, there were nearby emergency airfields for use when necessary.

Group headquarters would study the raid plots and commit an appropriate number of fighter squadrons to intercept a given raid. As soon as a fighter squadron took off from its airfield ("scrambled"), a ground controller at that sector station would communicate with the squadron leader by high-frequency radio and order the squadron to a specific altitude along a certain compass bearing, or vector. Ideally, the ground controller would vector the squadron to a position of ambush where it not only had a height advantage over the enemy but was up sun, making it more difficult for enemy airmen to spot the interceptors. Oftentimes, however, a squadron simply had to climb straight into the oncoming enemy in order to intercept before the enemy bombers reached their expected target and dropped their loads. As soon as the squadron made visual contact with the enemy ("joy"), command would pass from the ground controller back to the squadron leader, who would issue attack orders to his squadron. After the air combat, the ground controller would radio the squadron where to land ("pancake").

Most leaders of the time believed "the bomber will always get through." Given the speed of modern bombers, they felt that fighters could not be alerted in time, take off and climb fast enough to intercept the enemy bombers before the latter had hit their targets. Before Dowding's ground controlled intercept system of air defense, the only solution had been constant patrolling by defending fighters, which was highly inefficient and draining on both men and machines. Dowding's system-at that time the most technically advanced in the world-changed all that. Thanks to his foresight and determination, Great Britain was well prepared to defend her cities from air bombardment by Hitler's Luftwaffe.

The Luftwaffe: "How Many?"

"We have no butter, my friends, but I ask you: Would you rather have butter or guns? Shall we import lard or metal ores? Let me tell you: Preparedness makes us powerful. Butter merely makes us fat!"

-Commander-in-Chief of the Luftwaffe, Hermann Goering
(1893-1946), in a speech at Hamburg, 1936

While Britain was prepared to defend against a German bomber offensive when war began, Germany was not adequately prepared to wage such a bomber offensive against Britain. German military leaders certainly knew of the interwar theories of air bombardment (in 1931 Hitler was quoting passages from Douhet's book in conversation), but they elected to build a force of tactical bombers instead of strategic ones. There were two main reasons for this.

First, since its unification in the 1860s, Germany had a tradition of being a land power with an excellent army-in many ways the best army on the continent. Even when restricted to a relatively small 100,000-man army as imposed by the victorious Allied nations in the Treaty of Versailles, German Army leaders still thought offensively. They did not subscribe to the theories of strategic bomber enthusiasts that entrenched defenders had too many advantages and ground warfare

would never again be decisive. Instead, with the help of specialists like Heinz Guderian, they developed a style of offensive warfare based on armored vehicles that emphasized sudden penetration and envelopment of enemy forces, both at the tactical and the strategic levels. This was the doctrine of blitzkrieg, or "lightning war," and the Luftwaffe was one element in their equation. Dive bombers would directly support the army in the field with pinpoint attacks on enemy positions, and medium level-bombers would interdict roads and railroads in the enemy's rear areas, preventing enemy reinforcements from sealing off the rupture in the frontline made by the attacking panzers and infantry.

It is not surprising that the Luftwaffe developed into a tactical air force to support the army. When Hitler ignored the Treaty of Versailles in 1935 and expanded Germany's armed forces, the fledgling Luftwaffe turned to the army for personnel to help fill its officer ranks. Thus at its formative stage, the Luftwaffe was already thinking along army lines. Although Hitler made sure it was a separate service, the Luftwaffe never developed a distinct strategic goal. Instead, it was an important tactical tool for use in blitzkrieg.

The second reason the Luftwaffe built tactical bombers rather than strategic ones was simple arithmetic. When expansion of the armed forces began, Hitler did not have the resources to build a large strategic air force. In terms of raw material, Germany could build two or three twin-engine medium bombers for every four-engine heavy bomber. According to the Luftwaffe's commander-in-chief, Hermann Goering, "The Fuehrer will never ask me how big our bombers are, but how many we have." Hitler and Goering opted for a numeric advantage over their anticipated enemies. When they initiated hostilities on September 1, 1939, they had achieved that goal-with over 4,300 operational aircraft, the Luftwaffe was the most powerful air force in the world, even though it did have a relatively short radius of action.

In the meantime, the Civil War in Spain from 1936 to 1939 gave the Germans an opportunity to test the Luftwaffe in combat conditions. They established the Condor Legion to support the fascist rebel army of General Francisco Franco. Against light Republican air defenses, German bombers and fighters flown by German volunteers proved their tactical value in ground support operations. Many German aviators gained valuable combat experience flying with the Condor Legion, which would give them an initial advantage in the coming world conflict. New aircraft such as the Messerschmitt Bf109 fighter, Junkers Ju87 Stuka dive bomber and the Dornier Do17 and Heinkel He111 medium bombers made their combat debut in Spain.

Although the Luftwaffe did not develop a strategic air force, it held firmly to the concept of air superiority. German bombers would support the army in the field, but their first step in any offensive would be to gain air superiority by bombing enemy airfields. Of course, in this they would be aided by the advances of the German Army and of the Goering's own airborne troops (parachutists and glider-borne infantry), who would seize control of key enemy airfields. The Luftwaffe would enjoy no such advantage in the Battle of Britain, however. It would have to gain air superiority over the British through bombing and fighter combat alone, without occupation. In fact, air superiority would need to be won before any attempt at successful occupation through naval invasion or airdrop could be made. This complete dependency on bombing and air combat to achieve results would, to some degree, be a new experience for Luftwaffe planners whose knowledge had been gained in victorious air campaigns over Poland, Norway, the Low Countries and France before the Battle of Britain.

In truth, the Luftwaffe had made no pre-war plans for an air offensive against Britain. The idea had been quickly shelved as unfeasible given the long air distances from Germany to England and the conviction that any bombers used in such an offensive could be better employed in the blitzkrieg role supporting the army. Only when Dunkirk fell to the German Army on June 4,

1940-less than a month after the start of their campaign in the West, but fully nine months after Germany and Britain were at war-did the Luftwaffe give any serious thought to an air war against Britain. Even then, it was not until July that an Intelligence study of the problem was made. Where the British had spent many years preparing a well-coordinated defense, the Germans spent a few weeks preparing a haphazard attack. The difference in planning would tell, as the British met each crisis in the battle with effective measures, while the Germans were figuratively blind-folded, trying to pin the tail on the lion (in this case)-and they missed.

Despite its weaknesses in planning, and despite its preference for medium over heavy bombers, the Luftwaffe did surpass all other nations at that time in one category that theoretically would benefit it in a strategic air war: It possessed significant numbers of a long-range fighter-the twin-engine Messerschmitt 110 "Destroyer." Though twin-engine fighters were necessarily less maneuverable than single-engine ones, they could escort bombers to targets deep in enemy territory that single-engine fighters of the day (such as the Messerschmitt 109) could not reach. When armed with light bombs, the Me110 was also used to bomb and strafe enemy airfields. The Me110 carried a heavier armament than opposing single-engine fighters. This, together with its relatively fast speed, would offset its poorer dogfighting capability-or so the Germans hoped. Unfortunately for them, the main British fighters in the summer of 1940-the Hawker Hurricane and the Supermarine Spitfire-were able to inflict such terrible casualties on the Me110 that the latter soon needed a fighter escort of its own.

The German escort fighter that could beat the Hurricane and could equal the Spitfire in air combat was the Me109. However, the Me109 was a short-range fighter (to be sure, so were the Hurricane and Spitfire). Its maximum range was 412 miles, but in combat situations it was far under this. Air combat required high speeds, which quickly consumed a fighter's fuel. As a result, Me109s could only spend about 30 minutes over England. As pilots headed home, they watched their fuel gauges and red warning lamps with dread. Geography favored the Germans in this, however. London itself (the industrial and political heart of Great Britain) and the RAF airfields protecting it were within range of Me109s based in northern France. Over southeast England, then, the coming air battle would be won or lost.

The Luftwaffe was not ignorant of radar, which was such a cornerstone in Dowding's defenses. The Germans had radar sets of their own and had detected the British radar signals beaming over France, but they did not use their own radar to pick up British aircraft over England. With high-powered lenses they could even see the British radar masts across the English Channel on the coast of Dover. However, they did not appreciate, or they dismissed, how much Fighter Command depended on its Chain Home radar system-at least, their Intelligence study done in July 1940 made no mention of it. Perhaps it was simply hubris on the Germans' part. After all, if British fighters rose up to attack German formations, this would provide German fighters with opportunities to shoot them down.

Blitzkrieg Unleashed

"The great drama is now approaching its climax. The men I got to know at Munich are not the kind to start a new world war. . . England may talk big [but] she is sure not to resort to armed intervention."

—Adolf Hitler (1889-1945), discussing the likelihood of Britain
going to war over Poland, August 14, 1939

When Hitler invaded Poland on September 1, 1939, the British began to evacuate children from London and other key British cities that very day-even before Britain was at war (the declaration would not occur until September 3). For the sake of its people, the British government had to prepare for disaster according to the predictions made by the interwar theories of bombing. Authorities expected cities to be destroyed in a matter of days once war was declared. Bomb shelters were constructed, strict blackouts were imposed to hide cities from night bombers, and gas masks were distributed in fear that Germany would once again open the Pandora's box of chemical warfare that she had in the First World War.

At the beginning of hostilities, President Roosevelt of the United States publicly asked the combatants to refrain from bombing civilians. To this they readily agreed. Not only was it to everyone's political advantage to do so, but neither side was militarily prepared to carry out such a campaign. Thus, the bombs did not fall on factory workers as feared-not yet.

However, German bombs did fall on the Poles in Warsaw. The German Army had reached the suburbs of the Polish capital after a week of fighting, yet the Polish Army resisted in Warsaw for another three weeks. On September 25, the Germans began heavy air attacks (dropping many incendiaries) aided by artillery bombardment to break the morale of Warsaw's defenders. Two days of bombing attacks (almost 1,800 sorties) left the city in flames. The fires coupled with the total suffering brought on by encirclement-typhoid fever, lack of supplies and impending ground attack-led to Warsaw's surrender on September 27.

By this time the Polish Air Force had ceased to exist. Surprised by the sudden German invasion, outnumbered by the Luftwaffe and flying aircraft of inferior quality, the Polish airmen had fought back bravely as best they could. To compensate for their relatively poor machines, Polish fighter pilots adopted the tactic of head-on attacks, which quickly brought them to point-blank range. As defenses collapsed, Polish leaders ordered their forces to escape to France by way of the Balkans, where they could continue the fight against Germany. Thousands of Polish airmen and ground crews made this difficult escape. More importantly, many would go on to participate in the Battle of Britain and compose some of the toughest units in Fighter Command.

Meanwhile, unescorted British daylight bombing attacks against Germany did not fare so well. Unequipped to pursue a Douhet-style war against German industries and workers (and not wishing to be the first to begin such a battle), the British used their twin-engine bombers to attack German warships. Within four months, German fighters and flak (anti-aircraft guns) had exacted a fearful toll on British bombers, thereby disproving the theory that the bomber will always get through. From the end of December 1939, Bomber Command admitted the futility of daylight attacks and relegated its force to nighttime operations.

After months of quiet, "phony" war on Germany's border with France, during which time France and Britain built up their forces but took little offensive action against Germany, Hitler's forces renewed active operations in April 1940 with invasions of Denmark and Norway. Denmark surrendered within hours. Fighting in Norway continued but was soon overshadowed by

greater events.

Attack in the West

"*I believe that, if an adequate fighter force is kept in this country, if the fleet remains in being, and if Home Forces are suitably organized to resist invasion, we should be able to carry on the war single-handed for some time, if not indefinitely. But, if the Home Defense Force is drained away in desperate attempts to remedy the situation in France, defeat in France will involve the final, complete and irremediable defeat of this country.*"

-Hugh Dowding to Chief of Air Staff, May 16, 1940

On May 10, Hitler unleashed his blitzkrieg once again as German troops and panzers poured across the borders of the Netherlands, Belgium and Luxembourg. German paratroops and air-landing infantry seized key bridges and airfields in Holland, allowing the 9th Panzer Division to quickly advance upon Rotterdam, one of the key cities in the urban "fortress" of the country. To terrify the Dutch into capitulation, Goering sent a hundred Heinkel 111s to bomb the city on May 14 (the same day that Churchill became Prime Minister of Great Britain). As German troops watched from across the river, Rotterdam was engulfed in flames. Nearly 1,000 civilians were killed and 78,000 made homeless. Holland surrendered that night.

Meanwhile, German panzers had breached the French defensive line near Sedan, France. Within a week they reached the Channel coast near Abbeville, cutting off a large portion of the Allied armies (including the British Expeditionary Force) from the rest of France. Allied air forces suffered severe losses to German fighters, anti-aircraft fire, bombs and the evacuation of their own airfields as Allied ground forces fell back before the German onslaught. During those terrible days in May, Dowding was called upon to send more and more of his Hurricane squadrons to France, stripping Fighter Command of the aircraft and pilots it would need for a complete defense of Britain. The defense of the island nation was his principle duty, so he opposed the War Cabinet's desires to send more drafts of Hurricanes from his command to the continent, even though such fighters were desperately needed to help protect the Allied armies.

After failing to break out of their encirclement, the Allied armies fell back on Dunkirk and began their escape by evacuation on May 27. Goering assured Hitler that his Luftwaffe could destroy the trapped enemy, but the task was too great even if conditions had been perfect-and conditions were far from perfect. The Luftwaffe's efforts over Dunkirk were weakened by poor visibility, lack of forward airfields, anti-aircraft fire and patrols by Fighter Command-the same problems it would face in the upcoming Battle of Britain. The Luftwaffe hurt the Allied evacuation but did not stop it. Fully 338,000 troops were transported to Britain (including 112,000 French), leaving less than 40,000 French troops to be captured when the Germans finally occupied Dunkirk on June 4.

Many of the British troops at Dunkirk, seeing the bombs fall around them, complained that the RAF was not protecting them, but the RAF flew over 2,700 fighter sorties and 650 bomber sorties in support of the operation. Had it not been for Fighter Command, the troops at Dunkirk would have fared far worse. Goering's boast that his Luftwaffe alone could defeat the enemy had proved hollow, but the rest of France still had to be conquered, so there was no time for Goering or the Luftwaffe to reflect on their inadequacies.

The day after Dunkirk fell, the Germans renewed their offensive against France. On June 14, German troops occupied Paris. A week later, the French delegation signed an armistice with Germany. Only Britain remained at war with Hitler.

Hitler Takes a Holiday

"Thank God we're now alone."

-Hugh Dowding commenting on the fall of France, June 1940

Hitler and Goering gloated over their stunning victories. The fall of France was especially satisfying to them-and unexpected in so short a time. Having reduced the number of his enemies to one, Hitler felt little sense of urgency. The British position looked hopeless to him, and he expected Britain's government to sue for peace. Meanwhile, there was a triumphal parade in Paris. Hitler waited until July before he issued directives to his armed forces about preparing for an invasion of England. Even then he possibly thought that the threat of invasion combined with bombing and a U-boat blockade (German U-boats could now base in captured Brittany ports, making it easier to reach the British convoy lanes) would bring Britain to the negotiation table without having to conduct the invasion. Either way, for an invasion to be successful, it needed to start before autumn weather arrived, and Goering needed to win air superiority over southern England and the English Channel in order to protect the invasion fleet from British air and sea attacks.

The Luftwaffe lacked plans and Intelligence information for such a strategic battle. It also lacked sufficient bases in northern France from which it could carry out the operation. Temporary airfields had to be constructed in the Pas-de-Calais and Normandy regions to accommodate the many German aircraft, and all the vital material for keeping the aircraft in action had to be brought forward.

While preparing for the major battle to come, the Luftwaffe waged a preliminary fight for the English Channel and Straits of Dover. Through July and into early August, the Germans launched frequent attacks against coastal convoys and ports. Fighter Command met the challenge. In the month from July 10 to August 12, the Germans lost close to 300 aircraft while Fighter Command lost 150. Although Luftwaffe operations sank 30,000 tons of shipping in this period, that number represented less than one percent of the total traffic that had traveled around the coasts. The Channel fight also allowed Dowding's forces to gain valuable experience with their ground controlled intercept system.

On August 1, Hitler issued Fuehrer Directive 17 for the battle. The Luftwaffe was tasked with destroying the RAF, both by air combat and by bombing attacks on airfields, aircraft factories and industries producing anti-aircraft weapons. Attacks against shipping and ports would be intensified later. The Fuehrer also reserved the right to order terror attacks on London and other cities, but until he granted permission such attacks were forbidden.

Goering gathered three Luftflotten (Air Fleets) for the battle. In Normandy and Brittany, Luftflotte 3 under the command of Feldmarschall Hugo Sperrle (who had commanded the Condor Legion during the Spanish Civil War) would use its strength against the major harbor of Portsmouth and its environs, at the proposed western flank of the German Army's channel crossing. From airfields in the Pas-de-Calais, Belgium and Holland, Feldmarschall "Smiling Albert" Kesselring's Luftflotte 2 would strike across the Strait of Dover. If and when invasion came, Kesselring's air fleet would guard the German Army's eastern flank against British naval attacks. General Hans-Juergen Stumpff's Luftflotte 5, a relatively small air fleet based in Norway and Denmark, would try to distract and disperse the British defenses by attacking targets in northern Britain.

The fifty squadrons of Fighter Command that faced Goering's air fleets were organized in four groups, each of which was commanded by an air vice-marshal subordinate to Dowding. Sir Quintin Brand commanded No. 10 Group opposite Luftflotte 3. Keith Park commanded No. 11 Group around London and would bear the brunt of the battle. Trafford Leigh-Mallory was in charge of No. 12 Group, north of Park's. He would become one of Dowding's main critics. Farther north yet was No. 13 Group, led by Richard Saul.

The commencement of the Luftwaffe assault, code-named Adler Tag (Eagle Day), was set for August 10. Poor weather delayed Eagle Day until August 13. Meanwhile, the German Navy collected an invasion fleet of barges and other craft for transfer to French ports, and the German Army conducted landing exercises. Hitler set the invasion date for September 21, with preliminary naval operations to start ten days beforehand on September 11. Goering therefore had four weeks to defeat Fighter Command. He expected to do it in less.
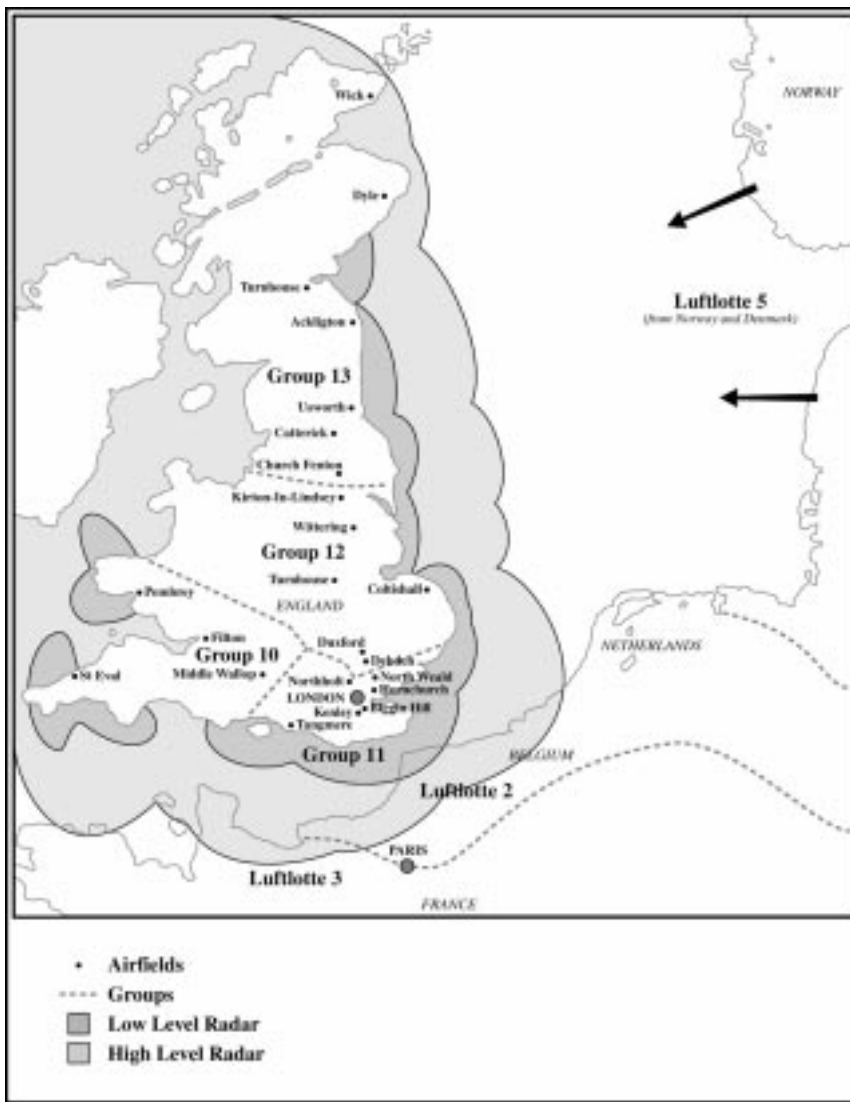
Operation Eagle

"*My Luftwaffe is invincible. Just look at its achievements in Poland and in France. Can one conceive of a war machine in history that has contributed so much toward such total victories as these? As a fighting force, surely the Luftwaffe is a living monument to National Socialism. And so now we turn to England. How long will this one last-two, three weeks? Our bomber fleets will make short work of the little islanders.*"

-Hermann Goering, summer 1940

Eagle Day started poorly for the Germans despite Goering's confident message to his forces: "From Reichsmarschall Goering to all units of Luftflotten 2, 3 and 5. Operation Eagle. Within a short period you will wipe the British Air Force from the sky. Heil Hitler." Bad weather forced Goering to postpone the morning raids, but a couple of bomber units did not receive the recall. Consequently, 74 Dornier 17s of Kampfgeschwader (Bomber Wing) 2, lacking their Me110 escort, flew to the Isle of Sheppey in the Thames Estuary, where they bombed Eastchurch airfield, putting it out of action for the day. Three squadrons of British fighters intercepted the bombers on the way out, knocking down four and damaging others, but the cloud cover helped the German bombers escape without further casualties.

The Luftwaffe flew almost 1,500 sorties on Eagle Day, including heavy attacks in the Southampton area by Sperrle's Luftflotte 3. Fighter Command responded to these incursions with 700 sorties of their own. On August 14, the action dwindled with less than 500 sorties on each side, but on August 15 the Luftwaffe reached what would be the peak of its activity in the battle with close to 1,800 sorties. However, instead of breaking the back of Fighter Command (which flew almost 1,000 sorties that day), the Luftwaffe suffered its heaviest casualties of the battle-75 aircraft destroyed, against 34 British fighters lost (plus many other aircraft destroyed on the ground). The surviving German airmen would ever after refer to August 15, 1940, as "Black Thursday."

Black Thursday was particularly grievous for the German right flank. Stumpff's Luftflotte 5 put in its first (and last) daylight appearance of the battle when it sent 123 bombers and 34 Me110s in two raids against northeast England that Thursday. Fortunately for the British, Dowding had covered this coast with radar and airfields, too. The attackers lost 23 aircraft-or 15 percent of their force. They shot down no British fighters, although they did destroy ten bombers on the ground. Luftflotte 5 could not absorb such heavy losses in one day and expect to continue the fight. Many of its units were redeployed south in early September to reinforce Kesselring's Luftflotte 2.

Luftflotte 2's efforts on Black Thursday included raids against Eastchurch (again) and Rochester airfield in Kent. Eastchurch and the nearby airfield of Detling were not part of Fighter Command-they housed Coastal Command aircraft. Similarly, Rochester was a Bomber Command airfield that included a factory for the new Stirling four-engine heavy bomber. Although Fighter Command aircraft used these sister airfields in emergencies, and Bomber Command and Coastal Command aircraft interfered with the German Navy as it accumulated an invasion fleet in French ports, the Luftwaffe needed to concentrate its first efforts against Fighter Command's sector stations and radar stations. Only in this way could it win air superiority. Instead, because of hasty preparations and inadequate Intelligence work, the Luftwaffe was dissipating its attacks.

In truth, Goering was aware that Luftwaffe attacks were being wasted on targets of little immediate importance. However, instead of demanding better reconnaissance work to locate Fighter Command's main bases, he would soon suspend attacks on radar sites. The Luftwaffe did not believe that its attacks on those installations had put any out of action because bombing had done no obvious damage to the towers. Furthermore, Goering was overconfident. If the RAF was losing aircraft at the rate that Luftwaffe Intelligence believed, Fighter Command would soon be down to a few fighters, and what good would radar do the British then?

The Germans put in another strong effort on August 16, flying over 1,700 sorties, during which time Luftflotte 3 pounded Tangmere airfield and Ventnor radar station. Weather on the next day was clear, but the Luftwaffe aircrews were given a day of rest, and only reconnaissance aircraft flew over England that day. Luftwaffe Intelligence now estimated that the RAF had only 300 serviceable fighters left, when in fact it had over 700. However, Dowding and the Air Ministry

realized that Fighter Command was losing pilots in combat faster than it could replace them, which boded ill for the defense.

What has been called the "hardest day" of the battle occurred on August 18. Even though both sides flew less than 800 sorties, the number of aircraft destroyed in the air and on the ground was nearly the highest of the entire battle. An immediate result of the day's operations was that Goering withdrew all of the Ju87 Stuka units from the battle because those belonging to Luftflotte 3 had once again suffered severe losses. Not only were the Stukas the slowest and smallest of the German bombers, their dive bombing tactics made it hard to provide them with effective fighter cover.

From August 19 to 23, a period of poor weather set in, allowing both sides to rest and repair. However, each day of respite in August made the Luftwaffe's task more difficult and decreased the likelihood of an invasion in September. It was during this spell that Churchill made his famous speech in appreciation of Fighter Command: "Never in the field of human conflict was so much owed by so many to so few." One waggish pilot supposedly responded, "I thought he was talking about our mess bill." That story may be apocryphal, but it doesn't take away from the fact that the British press and public looked upon Fighter Command's pilots as heroes because they were the first line of defense. Although many British soldiers at Dunkirk had wondered where the RAF fighters were during the evacuation, the presence of friendly fighters in the late summer skies of England was obvious to many civilians who watched the contrails of dogfights and heard the chattering of guns above. The public admiration bestowed on the pilots gave them a much-needed (and deserved) boost to their morale at a time when their casualties were oftentimes fearful.

One of the sadder chapters of British air defense was about to take place when the battle recommenced on August 24. As squadrons took losses, they would receive replacements and eventually be rotated to quiet sectors (such as to No. 13 Group in the north). Fresh squadrons would then move in to take their places in the battle zone. No. 11 Group received 264 Squadron as reinforcement at Hornchurch airfield outside London on August 22. The 264th was equipped with 16 Boulton Paul Defiants-a two-seat interceptor that carried a dorsal turret of four guns instead of the eight forward firing wing guns found on Hurricanes and Spitfires. The Defiant had been introduced into combat only three months earlier. Initially successful over France (in one case, Me109s had mistaken the Defiants of 264 Squadron for Hurricanes and dived on their tails, to be met by the concentrated fire of the turret guns), the Defiant had taken a beating during the Channel fights of July. The sister squadron to 264 was involved in that fight and had lost six of nine Defiants on a July 19 sortie. That squadron was still recovering in No. 13 Group when 264 Squadron moved forward to Manston airfield near the Strait of Dover on the morning of August 24.

A German raid at noon caught the 264 Squadron struggling into the air. Me109s pounced, knocking down three Defiants, including the one piloted by the squadron leader. Manston airfield was bombed (its close proximity to German airfields in France had made it a frequent target), and this time Fighter Command decided to close down the field. The squadron moved back to Hornchurch where that very afternoon another German raid caught the squadron still scrambling, and another Defiant fell in action.

The morning of August 28 was the undoing of 264 Squadron. The squadron intercepted a raid heading toward Eastchurch and engaged the bombers, but the squadron was immediately bounced by the bombers' high escort-Me109s of Jagdgeschwader (Fighter Wing) 26, which was led by Adolf Galland, one of Germany's highest scoring aces. Half a dozen Defiants were damaged or destroyed, making Galland wonder, "How can they put such planes into the sky?" A few hours after this, the remnants of 264 Squadron scrambled from Rochford airfield to avoid yet another bombing. The squadron had only two operational aircraft by evening, so it was withdrawn from the battle. The British had finally accepted the fact that the Defiant was no match for German daylight fighters. Its mission was therefore changed to one of night interceptor.

Meanwhile, a significant event occurred on the night of August 24. Several German bomber crews who were unable to find their target inadvertently released their bombs over London-a target that Hitler had forbidden the Luftwaffe to bomb except by his direct approval. Goering transferred the unfortunate aircrews to serve with the infantry, but the deed had been done, and Churchill ordered Bomber Command to retaliate. Over the next several nights, British bombers made their first attacks on Berlin. They caused little damage of military worth (certainly nothing to match pre-war expectations), but their presence over the capital was a gauntlet thrown down that Hitler and Goering would soon have to pick up (Goering had once boasted that his Luftwaffe would stop any air attack on Berlin).

Shifts in Strategy

"*The British drop their bombs indiscriminately and without plan on civilian residential quarters and on farms and villages. For three months I did not reply because I believed they would stop, but in this Mr. Churchill saw only a sign of our weakness. The British will know that we are now giving our answer night after night. Since they attack our cities, we shall eradicate theirs. The hour will come when one of us will go under, and it will not be National Socialist Germany.*"

-Adolf Hitler (1889-1945) to a crowd at the Berlin Sportpalast,
September 4, 1940

By the last week of August, the main thing that Operation Eagle had proven was that the Luftwaffe could only bomb successfully during daylight when its fighters provided a strong escort for the bombers (normally two fighters for every bomber). Unescorted or poorly escorted bombers had too often paid a bitter price. Given this fact, daylight bombing was necessarily restricted to the range of the Me109 fighter (the twin-engine Me110 Destroyer having shown itself unable to stand up to the Spitfire and Hurricane). Furthermore, without drop-tanks for extra range, the Me109

could only provide adequate escort over the southeast corner of England.

Therefore, starting on August 27 Sperrle's Luftflotte 3 abandoned daylight attacks and restricted itself to night bombing, which it began on August 28 with the first of four consecutive nightly raids against Liverpool. Night bombing was more inaccurate than daylight bombing, but without air superiority it was the only way to minimize bomber losses and still carry out attacks (as Bomber Command had also discovered). Sperrle's air fleet had begun the battle with a weaker fighter arm than Kesselring's air fleet, and Sperrle's was situated farther from England, which had handicapped his Me109 escorts. Now the fighter units of his air fleet were moved to airfields in the Pas-de-Calais to reinforce Kesselring's Luftflotte 2. On August 29, Kesselring began sending over large fighter sweeps (sorties by fighter units alone, designed to clear the sky of enemy fighters) and small but heavily escorted bomber formations (German fighter pilots referred to these bombers as "decoy ducks").

The shift in strategy paid off for the Germans as their daily losses fell and British casualties rose. In addition, Kesselring's bombers began to target Fighter Command airfields where they hadn't before. Many of the sector stations around London were repeatedly bombed-Biggin Hill worst of all--and the pressure on Fighter Command mounted as the weather remained fair.

The Luftwaffe was now applying mass of force along a narrow section of the front during daylight and sending over large incursions by night. Dowding maintained his conservative policy of defense along the entire front. The squadrons in Park's No. 11 Group were taking a beating, however. His pilots had to fly several sorties each day, which quickly left them fatigued. Under this strain, their life expectancy was measured in days, and the replacement pilots the squadrons received were short on fighter training due to the Air Ministry's emergency measures of reducing training time to generate more pilots and pulling volunteer pilots from other commands. In fact, Fighter Command was dwindling. It suffered casualties of 600 pilots (killed, wounded and missing) during August and September.

On the positive side, the RAF had been reinforced by a sizable contingent of Eastern European pilots (Polish and Czech). These were men who had fled to France when their countries were occupied by Hitler's forces. After the Battle of France, 5,500 Polish Air Force personnel had been evacuated to England, where 145 pilots plus ground crews participated in the Battle of Britain. Their names, however, were not reported to the press for fear of reprisals against their families in occupied Poland.

Fighter Command was cautiously reluctant to use these foreign pilots until they had learned English well enough to "understand the controller perfectly." Therefore, it was not until August 31 that 303 Squadron (Polish), flying Hurricanes, was allowed its first combat sortie. The Poles of 303 Squadron may have had a weak command of the English language, but they knew how to fight and were excellent marksmen. Swinging into battle, 303 Squadron achieved the highest "kill" rate (enemy planes shot down) of any squadron in Fighter Command during September. When the squadron was granted its first leave of station to rest, the men refused, expressing their desire to continue fighting. A Canadian flight leader with the squadron, John Kent (nicknamed "Kentski"), believed, "The Poles are playing the game for keeps far more than we are."

Although Fighter Command felt a want of good pilots in early September at the height of the battle, it was almost able to replace all of its destroyed aircraft thanks to the superb efforts of Lord Beaverbrook. When Churchill became Prime Minister in May, he put Beaverbrook in charge of Aircraft Production. Anticipating an immediate need for fighters, and plenty of them, Beaverbrook had doubled fighter production by July. He also made sure that aircraft too damaged for squadron use made their way back to repair units that rebuilt them. Because of Beaverbrook, Great Britain produced more fighters during the battle than Germany did (Hitler did not feel polit-

ically able to gear up Germany's war production yet).

If Fighter Command was weakening due to losses, it was not readily apparent to German fighter pilots and bomber crews who themselves were dwindling. Luftwaffe Intelligence, on the other hand, insisted that the RAF was down to its last fighters, overestimating the kills made by Luftwaffe airmen and underestimating Britain's fighter production and aircraft reserves. It would soon become a bitter joke with German air crews: "Here comes the last fifty Spitfires."

In truth, German airmen fared worse in many ways than their enemy counterparts. Not only were the Germans losing more aircraft in the battle than the British were, they were losing many more personnel. Two thirds of the German aircraft shot down were Me110s or bombers, which carried two to five crewmen each. Furthermore, to be shot down over England meant certain capture, whereas a British pilot who was shot down, assuming he was not hurt, could oftentimes return to his base by evening. German aircraft also had to fly over the English Channel (which the airmen called "The Sewer"). This was not so bad heading to target, but coming back with an aircraft that was damaged or low on fuel was very perilous. Many Me109 pilots who had used up too much fuel in combat over England had to ditch their fighters in the Channel. Fortunately for them, the Luftwaffe had implemented an air-sea rescue system far superior to anything the British had, so many downed German airmen were retrieved from the water.

German fighter pilots had one other thing going against them-Hermann Goering. He repeatedly berated them "in the harshest of terms" according to Adolf Galland. Goering accused them of failing to protect the bombers-which had suffered high losses-and of lacking fighting spirit. This had a negative effect on their morale. Goering insisted that they should provide closer escort to the bombers, which in fact limited their dogfighting ability when enemy fighters were encountered. During a visit by Goering to the base where Galland's Jagdgeschwader 26 was stationed, Galland tried arguing with Goering that the Me109 was less suited to close escort than the Spitfire, but Goering rejected his opinion. When Goering later asked Galland what he needed for his fighter group, Galland answered, "I should like an outfit of Spitfires for my unit," at which point Goering "stamped off, growling as he went."

On the British side, the ground-controlled intercept system continued to improve. Of course, it did not always work perfectly, and interceptions were never a sure thing. The enemy might be hidden by clouds or haze, critical time lapses might develop between ground observations and radioed commands to squadrons in the air, or mistakes in plotting or vectoring might occur. On August 26, Park issued a new order to No. 11 Group, designed to give headquarters and the ground controllers more information. As soon as enemy planes were sighted by a squadron leader, he was to radio the message "Tallyho" to the controller along with the estimated numbers, types, position and height of the enemy before giving attack orders to his squadron.

In air combat, having a height advantage over the enemy is preferred. Sometimes a squadron was scrambled too late to gain the desired height over the incoming raid. In cases like this, the British would often resort to head-on attacks. The windscreens and bulbous, laminated glass noses on German medium bombers left the bomber crews feeling exposed. When attacked head-on, German bomber pilots would slip their aircraft in the sky, trying to throw off the aim of the attackers, but also disrupting their own formation. British pilots attacking head-on were taking a bigger risk, too. A slight miscalculation and they would ram the enemy, or they might take bullets through their own windscreens. In a head-on attack, the relative speed of approach was in excess of 500 miles per hour. This allowed the pilots only a couple of seconds of firing opportunity before the aircraft had passed each other. A few seconds more on opposite courses, and the opposing aircraft would be a mile apart.

In sheer numbers of aircraft, the main British fighter in the Battle of Britain was the Hawker

Hurricane. For example, 12 of the 19 squadrons in No. 11 Group on Eagle Day were equipped with Hurricanes. Supermarine Spitfires made up most of the balance. In a dogfight between two pilots of equal skill, the German Me109 outperformed the Hurricane and was a match for the Spitfire. Therefore, in principle, Hurricanes would be assigned to attack German bombers while Spitfires engaged the German escort.

The preferred method of fighter attack was to dive from above, out of the direction of the sun. The attacker would then either pull up underneath the enemy aircraft, firing a few-seconds burst into its belly, and climb back "upstairs" to gain height for the next attack, or he would fire from above and then continue his dive or break to the right or left to escape. It was important to attack quickly and get out lest an enemy fighter come sneaking up behind. Aces most often held their fire until they approached to close range-say, 200 yards or less-thus guaranteeing hits. For the individual pilot, air combat lasted only a few minutes. Richard Hillary, a Spitfire pilot with 603 Squadron, expressed this common experience: "The next few minutes were typical. First the sky a bedlam of machines; then suddenly silence and not a plane to be seen."

The desire of the pilots for greater height began to jeopardize the success of Fighter Command. British pilots rightfully feared being "bounced" by German fighters from above. After hearing their complaints, ground controllers at sector stations started ordering their squadrons to patrol higher than group headquarters had ordered. The squadron leaders themselves also began to add more height, hoping to get above the German high escorts. As a result of all this additional height, the rate of interceptions started to decline and German bombers-whose destruction was the primary goal of RAF fighters-were able to sneak in underneath the defenders. On September 7, Park told the ground controllers of No. 11 Group to stop this practice and to conform to the height ordered by headquarters.

September 7 was important for another reason. On this day Luftwaffe strategy shifted once again. With Hitler's approval (he wanted reprisal for the British attacks on Berlin), Goering's forces set aside their attacks on Fighter Command stations and bombed London instead.

Tremendous Fat Cow

"*Yes, it has been a wonderful day, Emmy. I've sent my bombers to London; London is in flames.*"

-Hermann Goering on the phone to his wife, September 7, 1940

After a relatively peaceful morning, the late afternoon of September 7 roared with activity as the Luftwaffe launched 350 bombers and over 600 fighters in the most massive single raid of the war to date. Hermann Goering, with binoculars in hand, personally watched the dramatic opening from Cap Gris Nez on the French coast as his vast aerial armada rose in the air from its many bases and set its course for the capital of Britain.

Greater London had a population of 8.4 million when war began. Not only was it the political center of the British Empire, it was the largest manufacturing city in the nation, a commercial and industrial hub of railways and shipping. Its docks stretched for 67 miles along the Thames River. It was, as Winston Churchill described it before the war, "a tremendous fat cow tied up to attract the beasts of prey"-by which he meant enemy bombers-and now they were coming.

Albert Kesselring, whose Luftflotte 2 would carry out the daylight attack, was the main proponent of this change in bombing strategy. His fighter sweeps were not always successful in drawing the RAF fighters into battle. He believed London was the one target in England that the RAF fighters would have to come up and defend, allowing his own fighters many opportunities to shoot them down.

Ironically, Fighter Command was caught off-guard this day. Headquarters expected the giant raid-which it saw forming up over France and advancing-to split into several smaller groups that would once again go after the British sector stations with their vital operations rooms. The ground controllers positioned Fighter Command squadrons accordingly, leaving the approach to London open. As a result, many of the British squadrons did not engage the Germans until after the bombers had already dropped their incendiaries and high-explosives on London's docks and East End. The weight and concentration of the bombing soon caused the war's first firestorm to erupt. Another 250 bombers from Sperrle's Luftflotte 3 fed the inferno during the night. By next morning, the city had suffered over 1,700 casualties.

With the shift in Luftwaffe strategy, Fighter Command-feeling a relief from attacks on its airfields-was able to throw more and more of its weight against the Luftwaffe. Over the next few days, German daylight raids returned to London on a reduced scale, but night bombing continued unabated. Londoners were not immune to the assault. Production was interrupted as thousands of nervous workers stayed home or quit their work early to seek shelter for the night. However, as raids continued-and they would occur nightly for the next two months-the initial terror subsided, and more people developed a "London can take it" attitude toward the bombardment. They referred to it as "The Blitz."

By September 11, there was still no evidence that the RAF was beaten. This was Day-minus-10 on the German invasion schedule, when German naval operations were supposed to begin. Hitler postponed the schedule for three days. Unfortunately for the Germans, bad weather settled in during that time, so on September 14 Hitler had to postpone the start of naval operations for three more days.

When September 15 arrived with fair weather, Goering was ready to launch two large daylight strikes against London in yet another attempt to break Fighter Command and the will of the British people to resist. The raids were foiled as up to two dozen squadrons intercepted the Germans all along their path, including a "big wing" attack by five squadrons (60 fighters) of No. 12 Group led by Douglas Bader, who had lost both of his legs in a flying accident in 1931. Many of the German bombers jettisoned their loads or dropped them haphazardly when faced with such tough opposition. Buckingham Palace was struck for the third time in a week. The Luftwaffe lost 60 aircraft that day (not the 175 claimed in bold headlines on the front pages of newspapers like the Daily Mirror, Daily Telegraph and Daily Herald), and Fighter Command lost 26. Since then, the British have celebrated September 15 as "Battle of Britain Day."

Given this setback to the Luftwaffe, Hitler postponed the invasion of Britain indefinitely when his new deadline arrived on September 17. Goering still hoped for a Luftwaffe victory, however. Through the end of the month, as weather permitted, Kesselring's Luftflotte 2 renewed the daylight attacks on London. Several attacks were also made against aircraft factories. Combats on September 27 and 30 were nearly as fierce as those of September 15 in terms of number of aircraft lost-and the outcomes were the same: Fighter Command was able to prevent accurate and concentrated bombing by the Germans.

When October came, the Luftwaffe changed its daytime tactics. Some of the Messerschmitt fighters were outfitted with single 250-kilogram (550-pound) bombs and sent over on nuisance raids at altitudes of 25,000 feet or greater (the British called these raiders "snappers"). Other fighters flew escort or conducted sweeps. These high-altitude attackers were so hard to reach by scrambling fighters that Park had to issue orders for a standing patrol of one or two squadrons during daylight hours. Both sides' pilots were exhausted by the many sorties they flew in October, but the snappers achieved nothing of strategic value.

The Luftwaffe kept only a few medium bombers on daylight operations in October; most were reassigned to night attacks. Over 7,000 tons of high-explosive bombs and nearly 5,000 incendiary containers rained down on Greater London during the month. Liverpool, Birmingham and Coventry were also targeted but on a smaller scale. The heaviest raid came on October 15 when over 400 German bombers targeted London.

Just as in World War One, there were three defensive measures against night bombers: night interceptors, anti-aircraft guns and barrage balloons. [Search lights, too, were used defensively to detect night raids, but their use was restricted as part of the general black-out.] The main British night interceptor in 1940 was the twin-engine Bristol Blenheim. Fighter Command had six Blenheim squadrons during the battle. The Blenheims carried airborne intercept radar but the sets were unreliable at this stage of the war. In addition, the Blenheims were not much faster than the bombers they were trying to inter-cept, so they did not achieve many kills compared to the number of sorties they flew. British anti-aircraft guns were also generally ineffective in knocking down German bombers, but their fire did drive the enemy to higher altitudes. Fear of barrage balloons also kept the enemy from making low-level attacks. The Germans lost more bombers from accidents during October than they did from enemy action (of course, taking off and landing at night or in poor weather increased the likelihood of accidents).

Although the night Blitz would continue through May 1941, the Battle of Britain was over by the end of October 1940. The outcome was clear.

Victory for Fighter Command

"After Stuffy was made to retire, the war blew up into a global thing. Great names arose-*Eisenhower, Montgomery, Alexander, Bradley. Great battles were won-Alamein, D-Day, the crossing of the Rhine. But they were all courtesy of Stuffy Dowding. None of those people would even have been heard of if Stuffy hadn't been there, if he hadn't won the Battle of Britain. His stat-ue ought to be standing atop a plinth in Trafalgar Square.*"

-Sandy Johnstone, Squadron Leader of 602 Squadron (Spitfires), awarded the
Distinguished Flying Cross during the battle

Dowding's air defense system triumphed over the Luftwaffe even though his fighters had been outnumbered (on August 10, he had 750 serviceable fighters against the enemy's 1,030 fighters and 1,260 bombers). Of the nearly 3,000 RAF pilots who fought in the battle, 1,000 were killed, wounded or missing, but they had destroyed 1,700 German aircraft since July. The two air forces were not the only ones to suffer, however. During September and October (the heaviest period of the Blitz), over 32,000 British civilians were also killed or injured, and thousands upon thousands were made homeless. This number was far less than the carnage envisioned by pre-war theorists, but it was bad enough.

Although Fighter Command won the Battle of Britain, its commander, "Stuffy" Dowding, was forced to resign in November. In truth, the Air Ministry had wanted his resignation in July,

but Churchill had intervened then, saying, "I think he is one of the very best men you have got." Complaints were leveled against Dowding by No. 12 Group leader Trafford Leigh-Mallory and others shortly after the battle that he should have committed his fighters in larger groups, or "big wings," instead of sending in one or two squadrons at a time. Indeed, Dowding husbanded his forces. He no doubt felt he had to because the Germans decided when and where the blows would fall. Fighter Command thus had to be prepared all along the front and at all times. Against any given raid, Dowding committed a force that was deemed adequate and which still left him with reserves to counter other threats that might develop in the next few minutes.

A big wing took longer to form up than a squadron, and time was critical when scrambling to intercept. Big wings were also more difficult to maneuver than single squadrons. The basic dilemma was this: Attack with smaller units while the raiders were still approaching the target, or attack with a larger unit after the raiders had dropped their bombs and were heading home. Several small attacks at one or two-squadron strength could result in higher RAF pilot casualties than one large attack by a big wing (there being more chance that the smaller units would be outnumbered by the enemy escort), but early interceptions translated into fewer bombs on target. All in all, the criticisms leveled against Dowding might have had more validity if his system had failed at some point. It didn't. Therefore, history recognizes it as a poor way to treat the victorious commander.

The Luftwaffe had spent three months trying to defeat its one remaining enemy, Great Britain, before autumn weather arrived. In the end, the Luftwaffe was not strong enough to get the job done. Failure did not rest with the fighter pilots, who Goering thought were lacking in fighting spirit. In fact, the top Luftwaffe aces scored twice as many kills in the battle as the top British aces. Failure rested with German leadership and German Intelligence. They tried to match an improvised plan and a shifting strategy against the world's most advanced air defense system that was backed by a nation that outputted more fighter aircraft than Germany did. Hitler-who exercised little command during the battle-had just suffered his first strategic defeat of World War Two. It did not bother him much, however. His attention was already focused on invading the Soviet Union in the following year.

Britain Unbroken: Hitler's Dilemma, 1941

"*If that is so, then why are we in this shelter and whose are those bombs that are falling?*"
-Soviet Foreign Minister Vyacheslav Molotov during an air raid in Berlin to German Foreign Minister Joachim von Ribbentrop who commented that Britain was finished, November 12, 1940

Although war between Germany and the Soviet Union was inevitable from Hitler's national-socialist and anti-communist point of view, the invasion of Russia did not have to begin in the summer of 1941. The Non-Aggression Pact signed by Germany with Russia in 1939 gave Hitler some economic breathing room if he had desired to continue his effort to bring Great Britain to the bargaining table. Instead, Hitler turned his forces east in an attempt to obtain living room (Lebensraum) for Germanic peoples, capture the vast grain fields of the Ukraine and valuable oil fields of the Caucasus, and destroy the "Bolshevik" regime of the Soviet Union, which he invariably linked with the Jewish population.

A two-front war had long been the night-mare of German military strategists. However, Hitler and the majority of his generals expected another lightning victory-a blitzkrieg campaign that would last a few months only, shatter Russian resistance and take the German panzers beyond the spires of Moscow to the distant cities of Archangel and Astrakhan. Such a victory would secure Germany's eastern front, deny Britain a potential ally and allow the Germans to return in greater force to face the ever-defiant Churchill. Poland, Denmark, Norway, Holland, Belgium, France-all had been conquered in short periods of time by German blitzkrieg. Therefore, it seemed reasonable for German leaders to expect Russia to quickly collapse when invaded (just as it had seemed reasonable for German leaders to expect Britain to break under the Luftwaffe assault in the summer of 1940). In fact, the German Army of 1941 would be even stronger than the one that had invaded France a year before. In hindsight, it is easy to see that the Germans ignored certain difficulties in defeating Britain and in defeating Russia. For instance, the Germans would have to cover three times the distance to reach Moscow in 1941 as they had to reach Paris in 1940, and the roads in Russia were among the worst in Europe.

Members of Hitler's staff were already working on plans for the invasion of Russia (eventually called Operation Barbarossa) while the Battle of Britain was being fought. Alternative strategies existed, however. In October and November 1940, Hitler explored the possibility of expanding the war with Britain. He spoke to Spain's Franco about assisting a German invasion of Gibraltar (code-named Operation Felix), which was a vital British naval base commanding the western approach to the Mediterranean Sea. He spoke to Marshal Petain about Vichy French cooperation against British interests in Africa and the Middle East. He spoke with Soviet Foreign Minister Molotov about possible Russian expansion into British-dominated India and the Persian Gulf area. However, all of these meetings failed to achieve Hitler's desired goal of increasing the number of Britain's enemies. (In reference to his encounter with Franco, Hitler said he would "rather have three or four teeth extracted than go through that again.")

Meanwhile, the war did expand, but not in the direction Hitler expected or desired. Italy, who was already at war with Great Britain, suddenly invaded Greece on October 28. Instead of winning a quick conquest over a minor country, Mussolini suffered embarrassment as his ill-equipped and poorly-led troops were halted within five days and then pushed back by the determined Greek defenders. Mussolini also suffered embarrassment when 21 British Swordfish torpedo bombers successfully attacked Taranto harbor on the night of November 11, crippling five Italian capital ships. Then in early December, the British began their counter-attack in North Africa that would almost completely destroy the Italian army facing them by February 1941.

That was the month when Hitler sent General Erwin Rommel and the first German troops to

Libya. These men would eventually constitute the famous Afrika Korps that would drive the British forces back into Egypt. Preparations were also made for a blitzkrieg campaign into the Balkans. On April 6, the Axis invasion of Yugoslavia and Greece commenced. Against meager air defenses, Luftwaffe bombers made repeated terror attacks on Belgrade, dropping high-explosives and incendiary bombs and killing 3,000 civilians. Axis troops poured across Yugoslavia's wide borders, and she surrendered on April 17. By the end of the month, the Germans had also captured all of mainland Greece.

Even though the British were temporarily on the run in the Mediterranean theatre, Hitler sent only enough forces to prop up Mussolini's armies and to stall British counter-attacks. He never committed enough German troops and aircraft to gain a decisive edge over the British in North Africa. His focus was now on Operation Barbarossa, which was launched on June 22. Of course, even if Hitler had done more to throw the British out of the Mediterranean, this would not have defeated Great Britain. Arguably, only an invasion of England would accomplish that, and the next best thing to invasion would be a siege to starve the island nation into submission. There were two ways for Germany to siege Great Britain in 1941: by air and by sea.

The Battle of the Atlantic

"*It is absolutely necessary to recognize that the greatest task of the hour is concentration of all our power against Britain. In other words, the means necessary for the defeat of Britain must be produced with energy and speed. All demands not absolutely essential for warfare against Britain must deliberately be set aside. There are serious doubts as to the advisability of Operation Barbarossa before the overthrow of Britain. The fight against Britain is carried on primarily by the Luftwaffe and the Kriegsmarine. There is therefore the greatest need to produce the weapons used by these two services and to concentrate these weapons on the British supply lines, which are taking on increased significance in view of the fact that the entire armaments industry, particularly aircraft and ship construction, is being shifted to America. Britain's ability to maintain her supply lines is definitely the decisive factor for the outcome of the war.*"

-Admiral Erich Raeder (1876-1960), Commander-in-Chief of German Navy, to Hitler, December 27, 1940

Great Britain was an industrial nation, but she was not self-sufficient. At the start of the war, she was importing 55 million tons of goods per year to support her economy. This included all of her oil, half of her food and much of her metals. The war brought rationing, an increase in home-gardening, and thrift by substitution and recycling, but the nation still depended on a steady flow of material to her ports. The convoy system, instituted when war began, itself caused a decline in imports because convoying delayed or reduced the number of trips individual merchantmen could make. However, the convoy system was a necessary defense against the German U-boat threat.

The German siege of Great Britain by sea had been ongoing since September 1939, but not until June 1940 did it start to heat up. Beginning then, U-boats operating against the British convoy lanes could return to German-occupied ports in Brittany rather than make the long journey back to Germany. This was the start of the "Happy Time" for the U-boat crews. Over the next few months, until winter weather came, it was not unusual for a U-boat to sink half a dozen merchant ships on each patrol. In the meantime, more and more U-boats were finishing their training and becoming operational. Worse for Great Britain, Hitler had other weapons besides U-boats to use against her shipping.

The Luftwaffe established Kampfgeschwader 40 in France to attack British merchantmen from the air. Solitary patrols by Focke-Wulf Fw200 Condors ranged far into the North Atlantic to

sink many vessels, and Luftwaffe aircraft also laid mines in British waters. German fast attack boats (E-boats) attacked the coastal traffic around England, while a handful of commerce raiders (converted merchantmen) attacked British shipping all over the world. Large surface raiders also made sorties into the Atlantic. In March 1941, four German warships returned from such sorties: the battlecruisers Gneisenau and Scharnhorst entered Brest harbor, and the heavy cruiser Admiral Hipper returned to Germany, as did the pocket-battleship Admiral Scheer after a 161-day cruise. Together these raiders had sunk or captured nearly 50 ships. In addition, their presence on the sea lanes had caused delay and disruption to the convoy traffic. More was to come. In late May 1941, two other warships were ready to sortie against the convoy lanes-the battleship Bismarck accompanied by the heavy cruiser Prinz Eugen.

Fortunately for Great Britain, she had an undeclared ally in the Battle of the Atlantic. This was the United States. President Franklin Roosevelt did everything short of war to help Churchill and the British people in 1941. In March of that year, the important Lend-Lease Bill was signed into U.S. law, and U.S. airbases were then established in Greenland and Bermuda for anti-submarine duty. In April, the U.S. Navy's Security Zone (the area where it would provide convoy protection) was extended eastward to just short of Iceland, and by July a U.S. base was built in Iceland. Meanwhile, because British shipyards were already busy constructing new ships, many damaged British ships were being repaired in U.S. yards.

New construction was making up for many merchant ship losses. Despite German efforts, British-controlled shipping was only reduced by 4 percent between September 30, 1940, and September 30, 1941. The German "blockade" of Britain had reduced and impeded imports, but not to a critical level that would defeat her. Of course, Hitler had other military priorities. He was raising new divisions for the German Army in preparation for an invasion of Russia. If he had wished to defeat Britain by siege in 1941, he should have given priority to building more U-boats and aircraft instead of tanks and artillery. In fact, the German economy was not yet on a wartime schedule. Many industries still operated on single shifts. If Hitler wished to strangle Great Britain, he needed to demobilize some of the manpower already in his army, returning skilled workers to U-boat yards and aircraft-related industries, for U-boats and aircraft were the principle keys to winning the war against Britain.

The Opposing Air Forces in 1941

"We thought, in view of our experiences, that to attack England again was a hard decision. But, after all, we knew our opponent and his potential power. It was no easy task but we knew how to hit him, and we could do it if we concentrated all our forces on this one aim. It went against the grain, it was contrary to the German concept of purpose and duty, to be satisfied with a half-measure of success when a task had to be accomplished, and worse to turn to a new aim while the first had not yet been achieved."

-Adolf Galland, commander of Jagdgeschwader 26, contemplating a renewed assault on Britain versus an invasion of Russia in 1941

Although the Luftwaffe failed to win air superiority over England in September 1940, it was not a defeated force. However, it still suffered from slack aircraft production. In May 1940, the Luftwaffe had an available strength of 4,782 aircraft (excluding transports). In June 1941 (over a year later), this figure had only risen to 4,882 aircraft, which was a net increase of only 100 aircraft. By comparison, the German Army and SS field forces had grown considerably in size, from 3.4 million men in May 1940 to 4 million men in June 1941, and the number of panzer divisions had doubled. The German Army and Navy were growing, but the Air Force had apparently stagnated.

If the number of German aircraft had not risen by the spring of 1941, their quality had at least improved. The obsolete Dornier Do17 medium bombers were gradually being replaced by modern Do217s and Junkers Ju88s, which carried heavier payloads over greater ranges. More Heinkel He111 bomber crews were being trained as pathfinder units (their aircraft were fitted with the X-Gerat radio-beam guidance system that allowed them to better locate their targets at night). Newer variants of the Messerschmitt Bf109 single-engine fighter were brought into service, and fuel drop tanks could be used to increase its relatively short range. The Focke-Wulf Fw190 was also introduced. On a one-for-one basis, it was superior to any aircraft in Fighter Command. With a range of over 600 miles, the Fw190 could potentially escort German bombers to England's industrial Midlands and back, though at the time the Luftwaffe was only conducting night bombing raids.

One disadvantage the Luftwaffe could not overcome was the quality of its aviation fuel. Lacking substantial fuel sources, the Germans only produced 87-octane gasoline for their aircraft. The Royal Air Force, on the other hand, had started using 100-octane gasoline shortly before the Battle of Britain in 1940. The higher-octane fuel improved the engine performance of British aircraft, allowing a better climb rate and boosts in speed. This was the same aviation fuel that the U.S. Army Air Corps was using, and as long as Britain could import fuel from America, British aircraft would benefit from the 100-octane gas.

The Royal Air Force was also producing more aircraft than the Luftwaffe in the spring of 1941. A dozen new squadrons had been added to the ranks of Fighter Command since the Battle of Britain. Improved variants of the Hurricane and Spitfire fighters were quickly replacing battle-worn planes in the frontline. More nightfighters were now available to combat the Blitz, including the twin-engine Beaufighter IF to replace the obsolete Blenheim IF. Armaments production was also increasing, which meant more anti-aircraft weapons for vital industries, airfields and cities, and more heavy weapons and vehicles for the British Army (it had left so much equipment behind on the beaches of Dunkirk in May 1940). The British still feared a German invasion in 1941, but the British Army was in much better shape now than it had been in September 1940 to defend against such an attempt.

Fighter Command was not the only arm of the Royal Air Force to grow during the winter. Coastal Command had 210 long-range anti-submarine aircraft based in the British Isles by June 1941. Aircraft were a prime deterrent to U-boat activity. Coastal Command also employed Beau-fighters to seek out German maritime bombers, and anti-shipping bombers to use against any German invasion fleet or warships. In fact, a lone Coastal Command Beaufort torpedo bomber made a daring surprise attack against the Gneisenau in Brest harbor on April 6. The pilot was posthumously awarded the Victoria Cross, but his torpedo struck home, crippling the battlecruiser.

Bomber Command was the other arm of the Royal Air Force. Its most significant accomplishment in 1940 had been the accurate bombing of invasion barges that the Germans had collected in Channel ports. In retaliation for the Blitz, Bomber Command tried more area bombing of its own on the night of December 16-17 when it sent 134 bombers to hit Mannheim. Lacking any kind of radar guidance system, the bombers achieved negligible results. However, by February 1941, the new four-engine heavy bombers (Short Stirlings and Handley Page Halifaxes) were joining the Royal Air Force, giving Bomber Command greater strength.

In March, Churchill directed Bomber Command to concentrate on naval targets to help with the Battle of the Atlantic. More than 1,100 sorties were flown against the German battlecruisers docked at Brest. On April 10, four bombs struck the already damaged Gneisenau. These hits helped keep her out of commission for months. Night area raids were also carried out against German shipyards. From late March until the end of May, Bomber Command flew 900 sorties against the naval yards at Kiel. Other ports, such as Hamburg, also came under attack during this time. In truth, as each month passed, Great Britain was more and more able to defend herself and to fight back.

Bombs on England

"*We shall bomb Germany by day as well as by night in ever-increasing measure, casting upon them month by month a heavier discharge of bombs, and making the German people taste and gulp each month a sharper dose of the miseries they have showered upon mankind.*"

-Winston Churchill, June 22, 1941

If Hitler had postponed his invasion of Russia and elected instead to intensify his war with Britain in 1941, and if he had given priority to aircraft and U-boat production to better carry out that war, what might the Luftwaffe have contributed to the effort? In truth, the Luftwaffe was already doing something against Great Britain in early 1941. It was continuing its terror Blitz. During the four months of winter, from November 1940 through February 1941, Britain had suffered another 25,000 civilian casualties.

There would be awful repercussions to this Luftwaffe strategy. Far from denting British

morale, the terror bombing of British cities only provoked Churchill and Bomber Command (whose leaders already embraced the doctrine of area bombing) to reply in kind. Ineffective though Bomber Command's raids were at first, they would mount in intensity and accuracy as the war progressed. Just as German leaders thought the morale of the British people could be broken through bombing, so the British leaders thought the morale of the German people could be broken by the same means. Ironically, neither side's civilian population came close to breaking during the war from bombing alone. Many people were killed or injured, and many others were forced to live in miserable conditions, but there was no mass panic. People suffered from the raids, but they continued their day-to-day business as best they could. Factories and dock facilities were damaged, but for the most part area bombing at night lacked the accuracy and concentrated destructive force necessary to cripple production for the long term.

March and April brought no respite for Britain as Goering launched several heavy attacks each month against London and other major cities. In the first week of May, Luftwaffe attacks were directed against Liverpool, and 18 vessels were sunk in the port while another 25 were badly damaged. The port's handling capacity was reduced by a quarter from these air bombardments. On the night of May 10-the first anniversary of the German invasion of the West-500 bombers participated in one of the heaviest raids yet against London, but it was also one of the last major attacks before the units were sent east to participate in Operation Barbarossa.

If Hitler had wanted to renew his campaign against Britain in 1941, terror bombing could only be one small ingredient. The Luftwaffe needed to renew its daylight attacks because daylight attacks would mean more accurate bombing of key targets. The air battle against Britain in 1940 had begun late in the campaigning season (early August), and autumn weather had shut it down by the end of October. By comparison, Goering would have had six months in 1941 to defeat the Royal Air Force-from May (when the German offensive against France had begun the year before) until October (when poor weather could be expected again to limit operations). Instead of 80 days, Goering might have had 180 days to finish his task.

His task in 1941 would have been little different from his task in 1940. Goering needed to defeat Fighter Command, thus allowing his bombers free reign over Britain during daylight hours. In 1940, due to the limited range of the Messerschmitt Bf109 fighter, the battle had been waged over Fighter Command's ring of airbases protecting southeast England. Many bombs had been dropped to crater airfields and damage hangars. Now with longer-ranged fighters, the Luftwaffe had greater opportunities to defeat Fighter Command by striking at specific industries that supported the Royal Air Force. The Luftwaffe had devoted little attention to attacks on vital industries in 1940. In 1941 it had the ability to strike at Britain's aircraft industry or possibly at the fuel that powered that industry.

This was the way the British Air Staff was approaching the war with Germany. The Air Staff had already identified oil as a vulnerable point in the German economy. Indeed, Hitler's forces were eventually crippled in 1944 when Allied bombing reduced German aviation gasoline production by 95 percent and total synthetic fuel production by 85 percent. The Germans might have tried a similar approach against Britain in 1941. With U-boats and surface raiders strangling the convoy traffic, the Luftwaffe could have continued its attacks against British ports (such as London and Merseyside), helping to reduce the inflow of oil and aviation fuel. During the Battle of Britain, German bombers had targeted oil storage tanks at Thameshaven near the mouth of the Thames River. Other storage facilities around the country (many located in the south) could have been similarly attacked in 1941 in an attempt to create a fuel shortage for Fighter Command and the British economy. The Luftwaffe could have expanded its attack to include the eight principle chemical factories that supplied Britain's oil refineries with the necessary chemical agents for

turning crude oil into fuel and lubricants.

Another way the Luftwaffe could have struck at the very foundation of British industry would have been to attack the nearly two dozen electric power plants scattered around the island. In May 1943, the Royal Air Force attempted this tactic against Hitler when it destroyed the Mohne and Eder Dams, which were providing hydroelectric power to the Ruhr industrial area of Germany. The British power plants had no anti-aircraft defenses in 1941 to protect against bomber strikes. However, nearly half of the power plants were located in Scotland and northern England, too far north for German fighters based in France to reach, so British fighters of No. 13 Group would have been able to thwart such raids.

It would also have been difficult, though certainly possible, for the Germans to attack Britain's armaments industry directly. There were more than fifty major factories producing guns, munitions and other weapons of war for the British army, navy and air force. It would have been an immense task to knock out all of these factories, but the Germans could have found ways around this problem-shortcuts as it were. They could have targeted the steel industry, most of whose factories were located in the coal-producing region of the Midlands. More vulnerable than the steel industry was the rubber industry, which produced tires and other components used in modern weapons and vehicles. There were seven rubber manufacturers in Britain, all within reach of German bombers and their escorts. Fortunately for the British at this time, they still had access to the crude rubber sources of Malaya and Dutch East Indies, which accounted for 89 percent of the world's supply (the Allies would lose this vital source to the Japanese by February 1942).

Alternatively, the Luftwaffe could have struck directly at British aircraft production to help win air superiority. The future of the Royal Air Force depended on its ten major assembly plants and six engine factories. Fighter Command would be sure to defend them in strength. Not surprisingly, these factories were also some of the most heavily defended points in Great Britain in terms of anti-aircraft defenses. Aircraft production also depended on avionics equipment and aluminum. The avionics factories were grouped in the south of England, within easy reach of German raiders, and the eight aluminum plants (located mostly in the Midlands) were relatively defenseless-as were Britain's ball bearing plants, perhaps the most critical industry of all.

In 1943, when America was at war with Germany, the United States Strategic Bombing Survey identified anti-friction ball bearing production as the weakest link in German military production. Ball bearings were used in everything from aircraft to U-boats, anti-aircraft guns to tanks and trucks, and even in plant machinery itself. Schweinfurt, deep inside Germany, was producing 45 percent of all the bearings manufactured in Germany. The U.S. Eighth Air Force suffered terrible losses trying to knock out this target, but to Reichsminister for Armaments and War Production Albert Speer, the American attacks were critical indeed. He believed that if all of Germany's ball bearing plants had been repeatedly attacked, "Armaments production would have been materially weakened over a period of two months and would have been brought to a complete standstill at

the end of four months."

Thankfully for the world, Britain did not have to face this kind of problem in 1941. She was able to produce all the weapons and aircraft her population could man. The continued safety of her ocean lifeline to America insured a victory for the Allied nations in World War Two. Even if Britain had lost some factories to German air bombardment, or even if she had lost production time by dispersing or relocating her vital plants (as the Soviet Union had to do), American factories-untouched by the enemy-could make good the material losses.

Selected Bibliography

Bickers, Richard Townshend. *The Battle of Britain*. 1990.

Buell, Thomas, et al. *The Second World War: Europe and the Mediterranean*. 1989 (West Point Military History Series).

Collier, Basil. *The Defence of the United Kingdom*. 1957 (official British history).

Deighton, Len. *Battle of Britain*. 1980.

Ethell, Jeffrey, et al. *The Great Book of World War II Airplanes*. 1984.

Gunston, Bill. *The Illustrated Directory of Fighting Aircraft of World War II*. 1988.

Hough, Richard, and Denis Richards. *The Battle of Britain: The Greatest Air Battle of World War II*. 1989.

Keegan, John. *The Second World War*. 1989.

Leverington, Karen, editor. *The Vital Guide to Fighting Aircraft of World War II*. 1995.

Mason, Francis K. *Battle over Britain*. 1990.

Murray, Williamson. *Luftwaffe*. 1985.

Price, Alfred. *Luftwaffe Data Book*. 1997.

Wood, Derek, and Derek Dempster. *The Narrow Margin: The Battle of Britain and the Rise of Air Power*, 1930-1940. 1990.

Young, Peter, editor. *The World Almanac Book of World War II*. 1981.

Accounts by Participants

Galland, Adolf. *The First and the Last*. 1954 translation.

Gelb, Norman. *Scramble: A Narrative History of the Battle of Britain*. 1985.

Hillary, Richard. *The Last Enemy*. 1969 (originally published in 1942 as Falling through Space).

Townsend, Peter. *Duel of Eagles*. 1970.

BRITISH AIRCRAFT

"*I saw a blob coming up from the south, and investigated. Boy! Oh, boy! Twenty fat Dorniers, flying wing tip to wing tip, ack-ack all round. I was well ahead and above them, so shoved the old throttle open, and dived at them head on. I picked the chappie who appeared to be leading the bunch, settled him in my sights, and let him have it. There isn't much time to muck about in a head-on attack. I gave a short burst, then slid underneath his big black belly with only feet to spare, and flashed through the rest of the formation. I hadn't meant to cut it so close, and instinctively ducked as I saw wings, engines, cockpits, and black crosses go streaking past my hood.*"

-RAF Pilot Officer Boggle Bodie, recalling September 15, 1940

Boulton Paul Defiant I, IA

In December 1939, the RAF received its first deliveries of the Defiant I, a turret-armed defensive fighter. Stable and pleasant to fly, the single-engine Defiant lacked any forward-firing guns-the turret was behind the pilot and it could not be trained directly forward. Instead, the designers of the Defiant intended the aircraft to fly alongside, underneath or across the path of an enemy bomber so the turret-gunner could pour a steady stream of fire into the bomber's flank, belly or glazed nose. This type of aircraft may have fit into the pre-war ideas of standing fighter patrols and enemy raids that consisted of bombers alone, but the Defiant was butchered by the German Bf109 single-seat fighter in the Battle of Britain.

In theory, the extra pair of eyes and modern power turret on the Defiant should have overcome any deficiencies it might have had in fighter-to-fighter combat. Unfortunately, the weight of the turret (600 lbs.) as well as the extra crewman, plus the aerodynamic drag produced by the turret and protruding guns, all served to erode the aircraft's performance. Under-powered for its weight, the Defiant had a poor climb rate and slow speed when compared to the other day fighters in the battle. Furthermore, the gunner's aim could be thrown off in a dogfight because a different hand (the pilot's) controlled the movement of the aircraft (the gunner had his own control stick to operate the turret, with a firing button on top of the stick).

When it was time to scramble against the oncoming enemy, seconds were precious. Unfortunately, the Defiant required more time to reach interception altitude than the Hurricane or Spitfire because it was under-powered, but it also took a little longer for two crewmen to get strapped in and start rolling down the runway than it did for a lone Hurricane or Spitfire pilot.

The RAF's single-seat fighters carried batteries of eight machineguns, but the Defiant had only four. However, each gun had 600 rounds (enough for 30 seconds of firing), which was twice as long as gunfire from a Hurricane or Spitfire. On the other hand, the sergeant gunner in a Defiant needed more courage than most to go aloft. His turret was structured such that it was difficult for him to bail out of his position, particularly if electrical power to the turret was lost.

After its losses in day combat, the Defiant was switched to the night fighter role (Defiant IA). Here is where the extra pair of eyes really helped-along with the installation of AI (Airborne Intercept) Mark IV radar. During the winter of 1940-41, the Defiant IA shot down more enemy raiders per interception than any other night fighter. Production of the Defiant ended in February 1943.

Bristol Beaufighter IF

The twin-engine Beaufighter reached service one year after its first flight in July 1939. Designed as a long-range night fighter with a heavy, fixed forward-firing armament (four 20mm cannon and six .303 caliber machineguns), the Beaufighter IF was a powerful and durable aircraft quite capable of shooting down anything that crossed its path. However, it was prone to a take-off swing, making it somewhat dangerous to fly, and this defect was never fully corrected.

Equipped with the AI Mark IV radar and a dorsal observation position, the Beaufighter appeared in small numbers with Fighter Command just as the German Blitz began to heat up and Dowding needed more and capable night fighters. The Beaufighter also operated as a day fighter with Coastal Command (Mark IC) in the Battle of the Atlantic where its relatively long range allowed it to hunt down German maritime bombers. The aircraft was produced throughout the war, serving in different roles in many theatres.

Bristol Blenheim IF

The Blenheim is known principally for its role as an RAF light bomber. It first entered service in 1937, and was approaching obsolescence by 1940. The twin-engine Blenheim was easily produced and served in large numbers during the early war years. Lacking a long-range fighter, the RAF filled the gap with the Blenheim IF, a short-nosed version of the light bomber. A battery of four .303 caliber machineguns was attached under the fuselage, another machinegun was installed in the port wing, and a reflector sight was added for the pilot. The dorsal turret (with a single machinegun) could be retracted partway. Even so, the turret put an extra drag on the aircraft's speed. Because of its slow speed, the Blenheim could hardly catch an enemy bomber, let alone dogfight with a German fighter effectively, so the six squadrons of Blenheim IFs were placed in the night fighter role. The world's first operational fighter radar-the AI Mark III-was installed in the aircraft, and a Blenheim gained the world's first night AI victory on July 22, 1940. Production of the Blenheim was terminated in mid-1943.

Douglas Havoc I

Produced as a twin-engine bomber by the Douglas Aircraft Company in the United States, the Havoc I was exported to France in 1940 where it first saw combat. It was considered fast and modern. After the Battle of France, Great Britain began to import Havocs and convert them to night fighters, adding flame dampers to hide the engine exhausts and painting the aircraft in dark schemes. The Havoc I had a glazed nose; later versions (called Bostons) would have a solid nose filled with half a dozen guns and carry a 4,000-pound bombload. The aircraft also served with distinction with the U.S. Army Air Corps (it was known as the A-20 in the U.S.). Of the 7,385 produced by Douglas, more than 40 percent were exported to the Soviet Union during the war. Production ceased by the end of summer 1944.

Gloster Gladiator

Entering service in early 1937, the Gladiator was the RAF's final development of the biplane, fabric-covered, fixed-undercarriage, single-seat fighter. At a time when the German Bf109 monoplane was winning air superiority in Spain, the Gladiator boasted four .303 caliber machineguns and a sliding canopy for the pilot. Short on modern aircraft, Great Britain kept the Gladiator in the frontline at the start of the war until she could replace them with the new Hurricane. Two squadrons of Gladiators suffered severe losses in the Battle of France. No. 10 Group had one flight (half of 247 Squadron) stationed at Roborough during the Battle of Britain. The relatively slow speed of the Gladiator meant it could barely catch German bombers and could rarely escape a dogfight with German fighters. However, it served well on Malta and in the Western Desert against the Italian Air Force whose aircraft in the first years of the war were also obsolete and included biplane fighters. Production of the Gladiator ceased in 1940 after 480 had been made for the RAF and another 60 carrier-based Sea Gladiators had been delivered to the Fleet Air Arm.

Hawker Hurricane I, IIC

The Hurricane I was Great Britain's first monoplane fighter, joining the service in late 1937. With a fixed forward-firing battery of eight .303 caliber machineguns, retractable landing gear, and a top speed far exceeding that of contemporary bombers, it was the type of modern fighter Britain desperately needed to make her new air defense system complete. The Hurricane also had a unique airframe construction of fabric and tubular metal that allowed it to absorb punishment in its fuselage that would have been fatal to an all-metal stress-skinned fighter like the Spitfire or Bf109 (the Hurricane did have a metal-skinned front fuselage and, by 1940, metal-skinned wings).

A squadron of Hurricanes could scramble to 20,000 feet in 16 minutes, which was slightly slower than a squadron of Spitfires. The Hurricane was easy to fly and also a steady gun platform. For these reasons, the Hurricane was often assigned to go after German bombers while its younger and abler sister, the Spitfire, tackled the German fighters. Though the Spitfire would receive much recognition during and after the battle, the Hurricane was Britain's workhorse fight-

er at the time, making up two-thirds of Fighter Command's strength in 1940. It destroyed more enemy aircraft in the Battle of Britain than all the other defenses combined-in fact, some sources credit the Hurricane with 80 percent of the kills.

The Hurricane's Merlin engine had a carburetor system instead of the direct fuel injection that the German Bf109 enjoyed. As a consequence, centrifugal force would starve the engine for a beat as the Hurricane went into a dive. Because of this, and because of the Bf109's superior speed and better climb rate, the Hurricane often had to accept air combat on terms set by the Bf109, as the latter could escape more easily in any direction. However, the Hurricane's turning radius was inside that of the twin-engine Bf110, which gave the British aircraft an advantage over the German heavy fighter.

The Mark IIC became available in late 1940. It had a more powerful Merlin engine, and for armament it carried four 20mm cannons instead of machineguns. As the Spitfire replaced the Hurricane in the fighter role, the latter was used effectively as a fighter-bomber and tank buster. The Hurricane served in the European theatre until 1943 and in the Far East until the end of the war. By the time of its final delivery in September 1944, over 14,200 Hurricanes had been produced.

Supermarine Spitfire I, IB, IIA, VB

Few combat aircraft have attained the glamour associated with the Spitfire, which it earned not only for its defensive victory in the Battle of Britain but for its fine looks and excellent performance. Entering RAF service in 1938, the Spitfire I was light and agile. Its eight .303 caliber Browning machineguns could spray a total of 160 bullets per second, so even inexperienced pilots had a chance of hitting their target. Most pilots aligned the eight guns to converge their fire at about 250 yards (the fire would then diverge at distances beyond that). However, like the Hurricane, the Spitfire carried only enough ammunition for 15 seconds of firing. Short bursts of two or three seconds duration were the norm, though novice pilots (and there were many in the Battle of Britain) fired longer bursts and at ranges of 500 yards or more.

The Spitfire was very much a short-range fighter like its principle opponent the Bf109. The two combatants were nearly equal in air combat-any disadvantage being offset by some advantage. For instance, the Bf109 had a direct fuel injection system (the Spitfire's Rolls-Royce Merlin engine had a carburetor), but the Spitfire had a bubble cockpit canopy which gave the British pilot a better field of vision. A squadron of Spitfires could scramble to 20,000 feet in 13 minutes, faster than any other RAF fighter, which made the Spitfire a vital asset to the British air defenses.

Spitfires composed one-third of Fighter Command aircraft during the battle, filling out 19 squadrons in July 1940. Of these, one squadron (the 611 at Digby) was equipped with the modified Spitfire IB. Only 30 of the Mark IB were produced. They carried two 20mm cannons and four .303 caliber machineguns. The long barrels of the cannons, and the blisters on the wings over the 20mm ammunition drums, adversely affected the aircraft's performance. There were also some operational problems with the first series of 20mm cannons, as they had been copied from foreign design.

Meanwhile the Spitfire IIA was also entering service, retaining the eight machinegun battery but with an improved Merlin engine. By Spring 1941, the Mark VB had been introduced. It car-

ried the mixed armament that the Mark IB had carried but with all the bugs worked out. The Spitfire VB could beat the Messerschmitt Bf109F-2, but it was often outclassed by the Focke-Wulf Fw190A-2. The Spitfire VB became the mainstay of Fighter Command up until mid-1942. Improved variants of the Spitfire were continuously designed and produced throughout the war.

Westland Whirlwind

The twin-engine Whirlwind was the result of the RAF's need for a long-range escort fighter. Whirlwind pilots liked the aircraft's fast speed and nose armament of four 20mm Hispano cannon. Though each cannon carried only 60 rounds, the shells had a longer effective range than that of .303 caliber machinegun bullets and produced more damage on impact.

Only 112 Whirlwinds were built (in fact, 200 had been ordered but the last 88 were cancelled)-enough to equip 263 Squadron and later 137 Squadron. Unfortunately for the British, the Whirlwind suffered from an unreliable Rolls-Royce Peregrine engine. Had the Merlin engine been used instead, the aircraft would have been a great machine. As it was, the Merlins were needed for Spitfires and Hurricanes, and two or three of these single-engine fighters could be produced for every Whirlwind twin-engine fighter. Eventually, the Whirlwind became a fighter-bomber before it was replaced in that role by the superior single-engine Hawker Typhoon.

GERMAN AIRCRAFT

"We had to escort the Ju87 Stuka dive bombers-a slow flying aircraft, heavily loaded. And you know, there's a mentality among bomber pilots-they would always want the fighters very close to them. So we had to stick with them under orders from high command. In some cases, I had to lower my flaps to stay with the Ju87s-and that made us an extremely beautiful target for the Spitfires on top of us. We lost a lot of pilots that way."

-Gunther Rall, Bf109 ace, Jagdgeschwader 52

Dornier Do17P-1, Z-2, Z-10

The twin-engine Do17 earned the nickname "Flying Pencil" early in its career because of its thin fuselage when viewed from the side. Derived from a civil aircraft prototype, the Do17 joined the Luftwaffe in 1936 and participated in the Spanish Civil War from 1937. It was stable, reliable, and had twin tail-fins and rudders. Its bombload was light when compared to the German medium bombers that followed it in service, but it was trusted by its crews. Approximately three Kampfgeschwader of Do17s fought in the Battle of Britain, concentrated in Luftflotte 2.

The Do17P-1 was an older, three-seat reconnaissance version with BMW engines and cameras in the bomb-bay. It was removed from frontline service not long after the battle. The Do17Z-2, which entered service in 1939, had improved Bramo engines and an expanded crew compartment with plenty of glazed area to give the crew a wide field of vision. The four-man crew was grouped together forward to benefit morale. The rear-facing gunner had to man three 7.9mm

machineguns-one ventral and one in each side window. The Do17Z-10 Kauz (Screech Owl) variant was introduced in 1940 as an intruder with two 20mm cannon and four 7.9mm machineguns, but the Do17 was already obsolescent by this time, so production of all versions ceased by mid-1940.

Dornier Do215B-1, B-5

The Do215 was simply an export model of the Do17Z taken over by the Luftwaffe. However, its performance relative to the Do17Z was greatly enhanced by the use of more powerful Daimler-Benz engines. The Do215B-1 served in a reconnaissance role with cameras. A dozen of these aircraft were converted to Do215B-5 night intruders and given solid noses with two cannons and four 7.9mm machineguns. The intruders served against England until October 1941, when they were transferred to Sicily in the Mediterranean theatre.

Dornier Do217E-2

Recognizing its success but wishing to replace the aging Do17Z, Dornier manufacturers designed a larger, more powerful version of their medium bomber. This was the Do217, of which the E-2 was an early variant. With twin BMW radial engines, the Do217E-2 could carry up to four times the bombload of the Do17Z-2 and travel more than twice the distance at much greater speed. It was an exceptionally efficient bomber, armed with six machineguns including a 15mm in the nose, and it gave the RAF quite a surprise. Initial deliveries were used in an anti-shipping role with Kampfgeschwader 40, but Kampfgeschwader 2 was also equipped with Do217s by the end of 1941. Production ceased in late 1943 after 1,730 had been built.

Focke-Wulf Fw190A-2
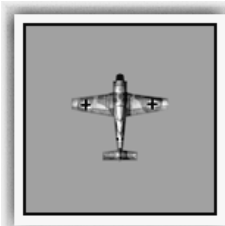
Designed to replace the Messerschmitt Bf109, the Fw190 Wurger (Butcher Bird) became the most feared German fighter of World War II. It began to appear in service in 1941 and quickly demonstrated its superiority over the Spitfire VB, the best RAF fighter of the day. With a BMW radial engine, the Fw190 was faster than its enemies and faster than its stablemate, the Bf109. The Fw190A-2 also had a better armament than the Bf109. The canopy on the Fw190 provided a better view for the pilot, and its larger, sturdier build meant it could withstand more damage. Fw190 pilots preferred fast slashing attacks, using their aircraft's superlative speed to break away before returning to the attack again. The Germans also employed the Fw190 as a fighter-bomber. Over 20,000 of the aircraft were produced before the end of the war.

Heinkel He111P, H-4

The earliest versions of the twin-engine He111 bomber fought with the Condor Legion during the Spanish Civil War. The final versions were still fighting when the war in Europe came to an end in 1945, by which time more than 7,000 He111s had been produced. Thus, the He111 was the longest-serving medium bomber in the Luftwaffe's arsenal of aircraft. It was easily distinguished by its elliptical wings, large glazed nose and cigar-shaped fuselage.

The He111 could carry twice the bombload of the Do17 at almost twice the distance. However, it was slower and less maneuverable than the Do17, which meant it was less likely to escape from an enemy fighter attack. Its bomb bay consisted of eight vertical compartments, each capable of holding a 250-kg (550-lb) bomb nose up. In this way the bombs fell out of the aircraft tail first and tumbled before pointing nose downward. He111s were responsible for bombing Rotterdam on May 14, 1940, gutting the center of the city.

The He111P was an early-war version of the bomber powered by Daimler-Benz engines (the same type used in Messerschmitt fighters). Some reconnaissance units flew the He111P in the Battle of Britain. The He111H-4 version, which followed the P, was built around Jumo engines and carried extra armor and five instead of three machineguns. There was also an extra gunner in the crew, but as with most Luftwaffe bombers the guns were positioned such that rarely could more than one gun be brought to bear at a time against an attacking fighter.

For the Battle of Britain, Goering gathered five Kampfgeschwader of He111s, making it the most numerous bomber in the battle. He also employed a pathfinder unit equipped with He111s-Kampfgruppe 100, attached to Luftflotte 3. This was a night bombing group with specially trained crews who used the X-Gerat radio-beam guidance system to find their target with up to a 120-yard accuracy. The pathfinders would drop incendiaries to mark the target with fire for following bombers. Fortunately for Great Britain, her scientists learned how to jam the German beams to decrease the accuracy of the attacks.

Junkers Ju86P-2
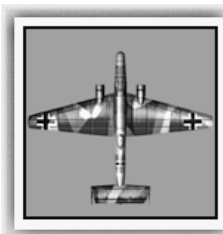
The Ju86P-2 twin-engine aircraft was a redesign of a slow medium bomber that had fought in Spain with the Condor Legion and that had seen its final frontline use in the blitzkrieg of Poland in September 1939. After that, the Junkers firm converted some of the old bombers (of which almost 1,000 had been built) to extreme-altitude reconnaissance aircraft by removing the armament, fitting new turbo-charged Jumo engines, and adding cameras and a pressure cabin for the crew. This allowed the Ju86P-2 to operate at altitudes over 40,000 feet above sea level-or an unprecedented eight miles high. At this height, the Ju86P-2 went nearly unnoticed from the ground, and interception by enemy fighters was next to impossible, though the British finally managed to accomplish it in 1942 with stripped-down Spitfire Vs.

Junkers Ju87B
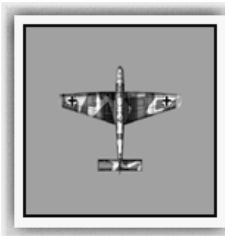
The twin-seat Ju87B dive bomber first appeared in action in 1938 with the Condor Legion in Spain. Making dives at 60 to 80 degrees, and releasing its 1,100-pound bombload at a height of 3,000 feet or so, the Ju87 Stuka (dive bomber) could hit its target with an accuracy of 30 yards. This capability for precision bombing made it a valuable asset to blitzkrieg operations in support of the German Army. The Stuka was powered with a single Jumo engine that had direct fuel injection. It was easily identifiable by its cranked wings and fixed undercarriage. The bomber's steep dive was slowed by air brakes, allowing the pilot to take steadier aim. Later, a whistle siren was added to the undercarriage (the "Jericho trumpet") as an effective psychological weapon.

During the campaigns in Poland, the Low Countries and France, the screaming pinpoint attacks by Ju87s created fear bordering on panic among civilians and Allied soldiers. This made it a darling of German propagandists, and the Luftwaffe did not have difficulty finding recruits for the Stuka units early in the war. The aircraft had two major flaws, though: slow speed and relatively short range. Without air superiority, the obsolescent Stuka was easy prey for enemy fighters. Over England, British fighter pilots enjoyed what they called a "Stuka party"-pouncing on the vulnerable Ju87s as the latter entered their dives or before they could regroup after making their dives.

The Luftwaffe assembled approximately three Stukageschwader for the Battle of Britain. However, after the first six days of Operation Eagle, the Stuka units had lost 41 aircraft plus more than 20 others damaged. Goering accepted the obvious fact and withdrew them from combat after August 18. Their participation was quite limited for the remainder of the battle. The Ju87 units remained in France, though, waiting for the day that never came-when Luftwaffe fighters would finally gain air superiority, allowing the Ju87s to renew their attacks without serious loss to themselves.

Ju87s were employed effectively in other theatres after 1940, and late-war versions were principally used as tank busters. Production of the aircraft ceased in September 1944 after more than 5,700 had been built for the Luftwaffe.

Junkers Ju88A-5, A-4, C-2, D-1

The twin-engine Ju88A-5 represented the best of the Luftwaffe medium bombers in the Battle of Britain. It was faster than the others, had a better range and bombload, and it could out-dive British fighters to escape. The Ju88 possessed good maneuverability, and Luftwaffe leaders also expected it to be a dive bomber (air brakes were fitted to some versions). However, dive bombing placed too much stress on the airframe, and the Ju88 was normally used as a level bomber. The Ju88A-4 was very similar to the A-5, but it had a more powerful Jumo-F engine.

As with the Do17Z, the four-man Ju88A aircrew was grouped in a forward compartment. Their survival rate was higher than that of the other bomber crews, and the British considered it the toughest bomber to shoot down during the battle. The Luftwaffe had about four Ju88A Kampfgeschwader available for use against Britain in August 1940, and another was brought for-

ward as reinforcement later.

The Ju88 would prove to be the most versatile aircraft in the Luftwaffe, serving in many different roles on all fronts. At the time of the battle, there were small numbers of Ju88D-1 reconnaissance aircraft and Ju88C-2 night intruders. When the Allied bombing campaign against Germany intensified later in the war, the Ju88 would demonstrate its worth as an excellent night fighter in home defense. The Ju88 was in service throughout the war, with 15,000 produced.

Messerschmitt Bf109E-3, E-4B, E-7, F-2

Early versions of the Bf109 (Bayerische Flugzeugwerke, renamed Messerschmitt in 1938) fought with the Condor Legion in Spain. The Bf109 combined the smallest practicable airframe with the best engine then available to Germany. The E (Emil) version used a Daimler-Benz engine with direct fuel injection that allowed the fighter to go straight into a dive without starving the engine. The aircraft was delicate to handle but could maneuver well in combat, had a high acceleration, and could out-dive and out-climb every RAF fighter in the Battle of Britain.

The Bf109 was the only single-seat fighter in service with the Luftwaffe until 1941 (when the Fw190 appeared). The Bf109E-3 version was armed with two 7.9mm machineguns in the nose and one 20mm cannon in each wing. The cannons had a longer range than the .303 caliber machineguns mounted on British fighters, and its shells could do grievous damage, but each cannon was only supplied with 60 rounds. The aircraft was a dangerous foe to the RAF. Fortunately for the British, it was a short-range fighter (which limited how far it could fly over southern England), and there were not enough of them to beat Fighter Command (Great Britain was producing nearly two single-engine fighters for every one that Germany produced in the critical summer of 1940).

Between them, the two Luftflottes in France had eight Bf109 Jagdgeschwader arranged against Fighter Command on August 10, 1940. This amounted to 805 operationally ready Bf109s against an estimated 650 operationally ready Hurricanes and Spitfires-hardly a sufficient margin if Goering wanted to quickly win air superiority. Furthermore, not until the E-7 variant appeared did the Luftwaffe make a determined effort to fit the Bf109 with a fuel drop-tank to increase the range of the aircraft. The E-4B variant, which equipped one fighter-bomber staffel, could carry a single 250-kg (550-lb) bomb.

In 1941, the F (Friedrich) version was introduced with improvements to the airframe and power plant. However, this variant only had a three-gun armament: one 15mm and two 7.9mm machineguns in the nose (wing-mounted guns in the earlier E version had reduced the aircraft's handling in air combat). As with all the Bf109s, the F-2 had a narrow undercarriage that prevented stress to the wings when landing but that made the aircraft unstable on the field and resulted in many accidents.

Desperate for more and more fighters on all fronts-including the home front when long-range U.S. daylight bombing strikes began-Germany kept building Bf109s throughout the war. In fact, the Bf109 was Germany's most widely produced fighter, with more than 33,000 built.

Messerschmitt Bf110C, C-4B, C-5, D-1/R2

The twin-seat Messerschmitt Bf110C had joined the Luftwaffe at the start of the war. Designed as a Zerstorer (Destroyer, or heavy fighter), the Bf110 was intended to provide escort for far-ranging bombers and to clear enemy airspace that the short-range Bf109 could not reach. Goering transferred many skilled Bf109 pilots to the Destroyer units, hoping to create an elite force.

The Bf110 had a pair of Daimler-Benz, direct fuel-injection engines. It packed a hard punch with two 20mm cannons and four 7.9mm machineguns in its nose (the radioman/rear gunner manned another 7.9mm machinegun in the dorsal position). It was a stable machine, with a top speed exceeding that of the RAF's Hurricane, but it had a wide turning circle and poor acceleration. For these reasons, the Bf110 did not get many firing opportunities against British fighters, and its kill ratio was quite low.

There were roughly three Bf110C Zerstorergeschwader involved in the Battle of Britain. Also present was the fighter-bomber variant (Bf110C-4B), which could carry a 1,100-pound bombload. This variant constituted most of the aircraft in the Erprobungsgruppe 210 ground-attack unit attached to Luftflotte 2. In addition, some Bf110C-5s were available for reconnaissance, having a camera in place of the nose cannon. Two gruppen of the long-range Bf110D-1 were also available, stationed in Norway where their underwing fuel tanks gave them the necessary range to escort Luftflotte 5 bombers. However, on "Black Thursday" (August 15), this unit lost 7 of 34 fighters in one daylight mission and inflicted no losses on the British interceptors.

In truth, the Bf110 was almost a liability to the Germans in the battle. On occasion, Bf109s were called upon to protect Bf110s from enemy fighters. In many cases, Bf110 losses were too great for the meager protection they were providing German bombers. However, given the overall shortage of German fighters, Goering needed the Bf110 in the frontline. Otherwise, the Luftwaffe would have been sending even fewer bombers by daylight against targets in England.

The Bf110 found its best use in protecting German airspace against Allied bombers later in the war. Both day and night interceptor versions were built for this purpose, and Bf110 production did not cease until early 1945.

British Ground Defenses

"*To try to bring down the attacking German bombers, we had 3-inch anti-aircraft guns down at Dover, within sight of France. Those guns were of First World War vintage. They were so old it was said they had to be drawn from the Imperial War Museum in London. Along came August and the first waves of German bombers came over. At that time, nobody in the country had seen aircraft in such numbers. It was phenomenal to us and, at Dover, we were the first to see them. You'd hear their distant drone and then there they were, all in perfect formation. It was an amazing sight, and even more amazing when the formations grew bigger and bigger. The joke was they were flying at-I can't remember exactly-maybe 23,000 feet. The range of our guns was 16,000 feet! It was hopeless. We could do nothing but watch them going over.*"

-Robert Angell, anti-aircraft gunner

Anti-Aircraft Guns

Just as they had done in the First World War, the British once again used batteries of anti-aircraft (AA) guns as part of their air defenses to combat the German raiders. By the time of the Battle of Britain, the British Army had deployed close to 2,000 AA guns around the country. Many of the heavy guns were in fixed sites but some were on mobile mountings. They ranged in caliber from 40mm to 4.5-inch and were usually grouped in four-gun batteries. Although army personnel manned the guns, AA Command was under the operational control of Fighter Command.

The 4.5-inch heavy AA gun was used in static positions. It could fire a 54-pound shell to high altitude, though the higher the target the less chance of hitting it. The 3.7-inch gun entered service in 1938. It was the most prevalent heavy gun in AA Command, and it could fire 28-pound shells at a rate of ten per minute, engaging bombers up to their practicable ceiling. The 3-inch gun fired a 16-pound shell but its useful ceiling was 10,000 feet under that of the 3.7-inch gun.

None of these heavier AA pieces could traverse fast enough to track aircraft at low altitudes. Such targets had to be engaged by light AA guns. Because low-flying aircraft moved through a gun's field of fire at a faster rate than high-flying aircraft did, light AA guns had to swivel fast and fire as many projectiles in the shortest possible time to score hits. The best light AA gun in the British defenses was the Swedish 40mm Bofors, adopted into service in 1938. It could fire 120 rounds of 2-pound shells a minute, engaging aircraft up to 5,000 feet effectively. The British also had many smaller-caliber AA weapons deployed at fighter airfields and other "vulnerable points" (as officially defined).

Unfortunately for the British, many of their AA guns lacked predictors for aiming and proximity fuses for the shells. The situation was far worse at night when enemy bombers were rarely seen and perhaps only briefly caught in the glare of searchlights. After the air bombardment of London began in early September, AA Command reinforced the city with over 100 heavy guns. Beginning on September 10, AA Command also instituted a policy of maximum fire against night raiders, even if the guns were firing blindly. This benefited the morale of the defenders and expended much ammunition, but as the commander-in-chief of AA Command said, it was a "policy of despair." During September 1940, nearly 260,000 rounds were fired by the guns to knock down 144 aircraft (that was the equivalent expenditure of 1,800 rounds per aircraft destroyed). On the night of October 15-16, the guns fired over 8,300 shells to destroy two aircraft and damage two others.

Inefficient though it may have been, the fire of AA guns achieved other positive effects besides shooting down the occasional enemy. It forced the enemy aircraft to fly at higher altitudes for their own safety. At these greater heights their bomb aiming was less accurate. Furthermore, enemy pilots would take evasive action when under fire, and this would tend to break up their formations and make the task of the bombadiers more difficult. For these reasons, AA Command deserved a share of the victory in the Battle of Britain.

Barrage Balloons

The British also used squadrons of barrage balloons as part of their defense against low-flying raiders. By August 31, 1940, Fighter Command had 2,200 kite balloons deployed in barrage patterns around key British cities, harbors and installations (about 500 balloons protected Greater London alone).

Each hydrogen-filled balloon was tethered to the ground with strong steel cables and hoisted aloft when enemy raiders were reported in the area-hence the expression, "when the balloon goes up," meant the enemy was coming. The balloons floated at an approximate height of one mile, and their mooring cables created deadly obstacles that aircraft had to weave through in order to miss. It was infinitely safer for pilots to simply fly above the balloon barrage. Either way, the balloons achieved the desired effect by hindering enemy bombers. German fighter pilots were awarded partial kills when they shot down barrage balloons because of the danger from increased exposure to British anti-aircraft.

About the Author

Ben Knight has researched, designed and developed paper and computer strategy games for over 15 years. His knowledge of the Battle of Britain stems from his work on the PC versions of *Achtung Spitfire*! and *Over the Reich* and his solitaire boardgame, *London's Burning*. Other air combat games he has designed or developed include *Victory at Midway*, *Air Superiority* and *Air Strike*.

The Aircraft of the Battle of Britain, 1940-1941

Name	Type	Year	Crew	Weight (lbs.)	W.Span (ft.-in.)	Length (ft.-in.)	Speed (mph)	Ceiling (feet)	Climb (fpm)	Range (miles)	Armament
ROYAL AIR FORCE											
Gladiator	BF-SE	1937	1	3,450	32-3	27-5	250	32,000	2,200	336	4 mg
Hurricane I	F-SE	1937	1	4,670	40-0	31-5	328	33,000	2,300	371	8 mg
Spitfire I	F-SE	1938	1	5,067	36-10	29-11	362	34,000	2,400	336	8 mg
Spitfire IB	F-SE	1940	1	5,067	36-10	29-11	350	34,000	2,400	322	2 c, 4 mg
Defiant I	F-SE	1940	2	6,282	39-4	35-4	305	30,000	1,900	403	4 mg
Hurricane IIC	F-SE	1940	1	5,640	40-0	32-0	320	33,000	2,300	345	4 c
Spitfire IIA	F-SE	1940	1	5,142	36-10	29-11	357	37,200	2,850	407	8 mg
Spitfire VB	F-SE	1941	1	5,100	36-10	29-11	374	35,500	2,666	392	2 c, 4 mg
Whirlwind	F-TE	1940	1	7,840	45-0	32-9	360	30,000	2,300	672	4 c
Defiant IA	NF-SE	1940	2	6,282	39-4	35-4	300	29,361	1,900	403	4 mg
Blenheim IF	NF-TE	1937	3	8,700	56-4	39-9	240	27,000	1,400	899	6 mg
Beaufighter IF	NF-TE	1940	2	13,800	57-10	42-9	310	28,900	1,800	1,271	4 c, 6 mg
Havoc I	NF-TE	1940	2	11,400	61-4	45-11	311	25,170	2,000	447	6 mg
LUFTWAFFE											
Bf 109E-3	F-SE	1939	1	4,421	32-4	26-8	357	34,000	2,800	373	2 c, 2 mg
Bf 109E-7	F-SE	1940	1	4,421	32-4	26-8	357	34,000	2,700	481	2 c, 2 mg
Bf109F-2	F-SE	1941	1	4,330	32-6	29-0	373	34,000	3,154	583	3 mg
Fw190A-2	F-SE	1941	1	7,055	34-5	29-1	382	34,775	2,666	695	2 c, 4 mg
Bf 110C	F-TE	1939	2	9,920	53-5	40-4	349	33,000	2,100	620	2 c, 5 mg
Bf 110D-1/R2	F-TE	1940	2	9,920	53-5	40-4	350	34,000	2,100	1,190	2 c, 5 mg
Bf 109E-4B	FB-SE	1940	1	4,421	32-4	26-8	320	34,000	2,200	342	2 c, 2 mg, 550#

The Aircraft of the Battle of Britain, 1940-1941

Name	Type	Year	Crew	Weight (lbs.)	W.Span (ft.-in.)	Length (ft.-in.)	Speed (mph)	Ceiling (feet)	Climb (fpm)	Range (miles)	Armament
Do 17Z-10	NI-TE	1940	4	11,484	59-0	53-5	260	27,861	1,000	994	2 c, 4 mg, 1,102#
Do 215B-5	NI-TE	1940	4	11,685	59-0	53-5	302	29,961	1,600	1,239	2 c, 4 mg, 1,102#
Ju 88C-2	NI-TE	1940	4	17,637	65-10	47-2	303	32,451	1,500	1,197	1 c, 5 mg, 1,102#
Ju 87B	DB-SE	1938	2	6,085	45-4	36-5	240	26,000	800	351	3 mg, 1,100#
Do 17Z-2	MB-TE	1939	4	11,484	59-0	53-5	265	27,000	900	916	6 mg, 2,200#
He 111H-4	MB-TE	1940	5	17,000	74-3	54-6	258	25,500	900	1,680	5 mg, 4,400#
Ju 88A-5	MB-TE	1940	4	17,637	65-10	47-2	275	27,000	925	1,869	5 mg, 6,614#
Ju 88A-4	MB-TE	1941	4	17,637	65-10	47-2	286	27,000	985	1,869	5 mg, 6,614#
Do217E-2	MB-TE	1941	4	19,522	62-4	60-10	320	29,530	900	2,393	6 mg, 8,818#
Do 17P-1	R-TE	1938	3	11,484	59-0	53-5	246	20,340	900	650	3 mg
Do 215B-1	R-TE	1939	4	11,685	59-0	53-5	292	31,170	1,640	1,239	6 mg
He 111P	R-TE	1939	4	17,640	74-3	54-6	250	25,000	500	686	3 mg
Bf 110C-5	R-TE	1940	2	9,920	53-5	40-4	350	33,000	2,100	636	5 mg
Ju 86P-2	R-TE	1940	2	14,771	84-0	54-0	260	47,000	1,300	838	none
Ju 88D-1	R-TE	1940	4	17,637	65-10	47-2	300	26,000	1,060	1,141	3 mg

KEY

Year: Entered service
Weight: when empty
Range: at 15,000' altitude
c: 20mm cannon
mg: machinegun
#: bombload in pounds

BF-SE: Biplane Fighter, Single-Engine
F-SE: Fighter, Single-Engine
F-TE: Fighter, Twin-Engine
NF-SE: Night Fighter, Single-Engine
NF-TE: Night Fighter, Twin-Engine
FB-SE: Fighter Bomber, Single-Engine
NI-TE: Night Intruder, Twin-Engine

DB-SE: Dive Bomber, Single-Engine
MB-TE: Medium Bomber, Twin-Engine
R-TE: Reconnaissance, Twin-Engine

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
1 Squadron	Hurricane I	D. A. Pemberton	Northolt	British	
3 Squadron	Hurricane I	S. F. Godden	Wick	British	
17 Squadron	Hurricane I	C. W. Williams	Martlesham	British	
19 Squadron	Spitfire I	P. C. Pinkham	Duxford	British	
23 Squadron	Blenheim IF	G. F. W. Heycock	Wittering	British	night fighters
25 Squadron	Blenheim IF	W. W. Loxton	Martlesham	British	night fighters
29 Squadron	Blenheim IF	S. C. Widdows	Digby	British	night fighters
32 Squadron	Hurricane I	J. Worrall	Biggin Hill	British	
41 Squadron	Spitfire I	H. R. L. Hood	Hornchurch	British	
43 Squadron	Hurricane I	J. V. Badger	Tangmere	British	
46 Squadron	Hurricane I	J. R. MacLachlan	Digby	British	
54 Squadron	Spitfire I	J. A. Leathart	Hornchurch	British	
56 Squadron	Hurricane I	G. A. L. Manton	North Weald	British	
64 Squadron	Spitfire I	A. R. D. MacDonnell	Kenley	British	
65 Squadron	Spitfire I	A. L. Holland	Rochford	British	
66 Squadron	Spitfire I	R. H. A. Leigh	Coltishall	British	
72 Squadron	Spitfire I	A. R. Collins	Acklington	British	
73 Squadron	Hurricane I	M. W. S. Robinson	Church Fenton	British	
74 Squadron	Spitfire I	F. L. White	Hornchurch	British	
79 Squadron	Hurricane I	J. H. Hayworth	Acklington	British	
85 Squadron	Hurricane I	P. W. Townsend	Debden	British	
87 Squadron	Hurricane I	T. G. Lovell-Gregg	Exeter	British	
92 Squadron	Spitfire I	P. J. Sanders	Pembrey	British	
111 Squadron	Hurricane I	J. M. Thompson	Croydon	British	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
141 Squadron	Defiant I	W. A. Richardson	Kirton in Lindsey	British	
145 Squadron	Hurricane I	J. R. A. Peel	Westhampnett	British	
151 Squadron	Hurricane I	J. A. G. Gordon	Stapleford	British	
152 Squadron	Spitfire I	P. K. Devitt	Warmwell	British	
213 Squadron	Hurricane I	H. D. McGregor	Exeter	British	
219 Squadron	Blenheim IF	J. H. Little	Catterick	British	night fighters
222 Squadron	Spitfire I	J. H. Hill	Kirton in Lindsey	British	
229 Squadron	Hurricane I	H. J. Maguire	Wittering	British	
232 Squadron	Hurricane I	M. M. Stephens	Wick	British	
234 Squadron	Spitfire I	J. S. O'Brien	Middle Wallop	British	
238 Squadron	Hurricane I	H. A. Fenton	St. Eval	British	
242 Squadron	Hurricane I	D. R. S. Bader	Coltishall	British	
245 Squadron	Hurricane I	E. W. Whitley	Aldergrove	British	
247 Squadron	Gladiator	G. F. Chater	Roborough	British	
249 Squadron	Hurricane I	R. L. Wilkinson	Boscombe Down	British	
253 Squadron	Hurricane I	H. M. Starr	Turnhouse	British	
257 Squadron	Hurricane I	H. Harkness	Debden	British	
263 Squadron	Hurricane I	H. Ecles	Grangemouth	British	
264 Squadron	Defiant I	P. A. Hunter	Kirton in Lindsey	British	
266 Squadron	Spitfire I	R. L. Wilkinson	Wittering	British	
302 Squadron	Hurricane I	W. A. J. Satchell	Leconfield	Polish	
303 Squadron	Hurricane I	R. G. Kellett	Northolt	Polish	
306 Squadron	Hurricane I	D. R. Scott	Church Fenton	Polish	
307 Squadron	Defiant IA	G. C. Tomlinson	Kirton in Lindsey	Polish	night fighters

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
310 Squadron	Hurricane I	G. D. M. Blackwood	Duxford	Czech	
312 Squadron	Hurricane I	F. H. Tyson	Duxford	Czech	
501 Squadron	Hurricane I	H. A. V. Hogan	Gravesend	British	
504 Squadron	Hurricane I	J. Sample	Wick	British	
600 Squadron	Blenheim IF	D. de B. Clarke	Manston	British	night fighters
601 Squadron	Hurricane I	E. F. Ward	Tangmere	British	
602 Squadron	Spitfire I	A. V. R. Johnstone	Westhampnett	British	
603 Squadron	Spitfire I	E. H. Stevens	Turnhouse	British	
604 Squadron	Blenheim IF	M. F. Anderson	Middle Wallop	British	
605 Squadron	Hurricane I	W. M. Churchill	Drem	British	
607 Squadron	Hurricane I	J. A. Vick	Usworth	British	
609 Squadron	Spitfire I	H. S. Darley	Middle Wallop	British	
610 Squadron	Spitfire I	J. Ellis	Biggin Hill	British	
611 Squadron	Spitfire IB	J. E. McComb	Digby	British	
615 Squadron	Hurricane I	J. R. Kayll	Kenley	British	
616 Squadron	Spitfire I	M. Robinson	Leconfield	British	
1 RCAF Squadron	Hurricane I	E. A. McNab	Northolt	Canadian	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
Stab/KG 1	He 111H-4	Karl Angerstein	Rosieres-en-Santerre	German	
I/KG 1	He 111H-4	Maier	Montdidier	German	
II/KG 1	He 111H-4	Benno Kosch	Montdidier	German	
III/KG 1	Do 17Z-2	Willibald Fanelsa	Rosieres-en-Santerre	German	
Stab/KG 76	Do 17Z-2	Stefan Froelich	Cormeilles-en-Vexin	German	
I/KG 76	Do 17Z-2	August Lindeiner	Beauvais-Tille	German	
II/KG 76	Ju 88A-5	Paul Moericke	Creil	German	
III/KG 76	Do 17Z-2	Egon Thiem	Cormeilles-en-Vexin	German	
Stab/KG 2	Do 17Z-2	Johannes Fink	Arras	German	
I/KG 2	Do 17Z-2	Kurt Gutzmann	Epinoy	German	
II/KG 2	Do 17Z-2	Paul Weitkus	Arras	German	
III/KG 2	Do 17Z-2	Werner Kreipe	Cambrai	German	
Stab/KG 3	Do 17Z-2	Chamier-Glisezinski	St. Trond	German	
I/KG 3	Do 17Z-2	Walther Gabelmann	St. Trond	German	
II/KG 3	Do 17Z-2	Gunther Pilger	Antwerp	German	
III/KG 3	Do 17Z-2	O. Rathman	St. Trond	German	
Stab/KG 53	He 111H-4	Lothar Stahl	Lille-Nord	German	
I/KG 53	He 111H-4	Heinz Kauffmann	Lille-Nord	German	
II/KG 53	He 111H-4	Gunther Winkler	Lille-Nord	German	
III/KG 53	He 111H-4	Max Gruber	Lille-Nord	German	
II/StG 1	Ju 87B	von Klitzing	Tramecourt	German	
IV/LG 1	Ju 87B	Kurt von Brauchitsch	Tramecourt	German	
Stab/ErprGr 210	Bf 110C-4B	Walter Rubensdorffer	Calais-Marck	German	
1/ErprGr 210	Bf 110C-4B	M. Lutz	Calais-Marck	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
2/ErprGr 210	Bf 110C-4B	U. von Boltenstern	Calais-Marck	German	
3/ErprGr 210	Bf 109E-4B	O. Hintze	Calais-Marck	German	
II/LG 2	Bf 110C	Otto Weiss	St. Omer	German	
Stab/KG 4	He 111H-4	Hans-Joachim Rath	Soesterberg	German	
I/KG 4	He 111H-4	Heinrich Meissner	Soesterberg	German	
II/KG 4	He 111H-4	Dr. Gottlieb Wolff	Soesterberg	German	
III/KG 4	Ju 88A-5	Erich Bloedorn	Amsterdam	German	
1/KGr 100	He 111H-4	Fritz Aschenbrenner	Vannes	German	night unit; Nachtkampfgruppe
Stab/JG 3	Bf 109E-3	Gunther Lutzow	Samer	German	
I/JG 3	Bf 109E-3	Hans von Hahn	Samer	German	
II/JG 3	Bf 109E-3	Erich von Selle	Samer	German	
III/JG 3	Bf 109E-3	Adolf Galland	Samer	German	
Stab/JG 26	Bf 109E-3	Gotthardt Handrick	Audembert	German	
I/JG 26	Bf 109E-3	Rolf Pingel	Audembert	German	
II/JG 26	Bf 109E-3	Karl Ebbighausen	Marquise	German	
III/JG 26	Bf 109E-3	Gerhard Schopfel	Caffiers	German	
Stab/JG 51	Bf 109E-3	Werner Molders	Wissant	German	
I/JG 51	Bf 109E-3	F. Beckh	Wissant	German	
II/JG 51	Bf 109E-3	G. Matthes	Wissant	German	
III/JG 51	Bf 109E-3	H. Trautloft	Wissant	German	
Stab/JG 52	Bf 109E-3	M. von Bernegg	Coquelles	German	
I/JG 52	Bf 109E-3	Wolfgang Ewald	Coquelles	German	
II/JG 52	Bf 109E-3	H. von Kornatzki	Peuplingne	German	
Stab/JG 54	Bf 109E-3	Helmut Hoehne	Campagne	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
I/JG 54	Bf 109E-3	H. von Bonin	Guines	German	
II/JG 54	Bf 109E-3	A. Kraut	Hermalingen	German	
III/JG 54	Bf 109E-3	G. Scholz	Guines	German	
I/LG 2	Bf 109E-3	Hanns Truebenbach	Calais-Marck	German	
Stab/ZG 26	Bf 110C	Joachim F. Huth	Lille	German	
I/ZG 26	Bf 110C	Wilhelm Macrocki	Lille	German	
II/ZG 26	Bf 110C	R. von Rettburg	Crecy-en-Ponthieu	German	
III/ZG 26	Bf 110C	Johann Schalk	Barley	German	
Stab/ZG 76	Bf 110C	Walter Grabmann	Laval	German	
II/ZG 76	Bf 110C	Erich Groth	Abbeville	German	
III/ZG 76	Bf 110C	C. Dickore	Laval	German	
Stab/LG 1	Ju 88A-5	Alfred Bulowius	Orleans/Bricy	German	
II/LG 1	Ju 88A-5	Manfred Debratz	Orleans/Bricy	German	
I/LG 1	Ju 88A-5	Wilhelm Kern	Orleans/Bricy	German	
III/LG 1	Ju 88A-5	Dr. Ernst Bormann	Chateaudun	German	
Stab/KG 27	He 111H-4	Gunter Behrendt	Tours	German	
I/KG 27	He 111H-4	Albert Ulrich	Tours	German	
II/KG 27	He 111H-4	Joachim Schlichting	Dinard	German	
III/KG 27	He 111H-4	Speck von Sternberg	Rennes	German	
Stab/KG 51	Ju 88A-5	Dr. Carl Fisser	Orly	German	
I/KG 51	Ju 88A-5	Wilhelm Schulz-Hein	Melun	German	
II/KG 51	Ju 88A-5	Otto Winkler	Orly	German	
III/KG 51	Ju 88A-5	Walter Marienfeld	Etampes	German	
Stab/KG 54	Ju 88A-5	Helmut Hoehne	Evreux	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
I/KG 54	Ju 88A-5	Andre Heydebrock	Evreux	German	
II/KG 54	Ju 88A-5	Friedrich Koester	St. Andre-de-l'Eure	German	
Stab/KG 55	He 111H-4	Alois Stoeckl	Villacoublay	German	
I/KG 55	He 111H-4	Siegfried Korte	Dreux	German	
II/KG 55	He 111H-4	Erich von Lachemaier	Chartres	German	
III/KG 55	He 111H-4	Franz Schlemell	Villacoublay	German	
Stab/StG 1	Ju 87B	Walter Hagen	Angers	German	
I/StG 1	Ju 87B	Paul-Werner Hozzel	Angers	German	
III/StG 1	Ju 87B	Helmut Mahlke	Angers	German	
Stab/StG 2	Ju 87B	Oskar Dinort	St. Malo	German	
I/StG 2	Ju 87B	Hubertus Hitschold	St. Malo	German	
II/StG 2	Ju 87B	Walter Enneccerus	Lannion	German	
Stab/StG 77	Ju 87B	Graf von Schoenborn	Caen	German	
I/StG 77	Ju 87B	Nikolas von Dalwigk	Caen	German	
II/StG 77	Ju 87B	Waldemar Pleweg	Caen	German	
III/StG 77	Ju 87B	Helmut Bode	Caen	German	
V/LG 1	Bf 110C	Walther Liensberger	Guyancourt	German	
Stab/JG 2	Bf 109E-3	Helmut Wick	Beaumont-le-Roger	German	
I/JG 2	Bf 109E-3	G. Seegert	Beaumont-le-Roger	German	
II/JG 2	Bf 109E-3	W. Schnellmann	Beaumont-le-Roger	German	
III/JG 2	Bf 109E-3	E. Mix	Le Havre	German	
Stab/JG 27	Bf 109E-3	Max Ibel	Carquebut	German	
I/JG 27	Bf 109E-3	E. Neumann	Crepon	German	
II/JG 27	Bf 109E-3	W. Andres	Crepon	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
III/JG 27	Bf 109E-3	Joachim Schlichting	Carquebut	German	
Stab/JG 53	Bf 109E-3	Gunther von Maltzahn	Cherbourg-Ouest	German	
I/JG 53	Bf 109E-3	G. Blumensaat	Cherbourg-Ouest	German	
II/JG 53	Bf 109E-3	H. Bretnuetz	Dinan	German	
III/JG 53	Bf 109E-3	Hans-Joachim Harder	Lesneven	German	
Stab/ZG 2	Bf 110C	Friedrich Vollbracht	Toussee-le-Noble	German	
I/ZG 2	Bf 110C	Joachim Heinlein	Neufchatel	German	
II/ZG 2	Bf 110C	Karl-Heinz Lessmann	Guyancourt	German	
Stab/KG 26	He 111H-4	R. Fuchs	Stavanger	German	
I/KG 26	He 111H-4	H. Busch	Stavanger	German	
III/KG 26	He 111H-4	G. Wolfien	Stavanger	German	
Stab/KG 30	Ju 88A-5	W. Loebel	Aalborg	German	
I/KG 30	Ju 88A-5	K. Doench	Aalborg	German	
III/KG 30	Ju 88A-5	J. Kollewe	Aalborg	German	
I/ZG 76	Bf 110D-1/R2	Werner Restemeyer	Stavanger	German	
II/JG 77	Bf 110D-1/R2	K. Hentschel	Stavanger	German	
s1/5/AufklGr 122	He 111P	F. Bohm	Soesterberg	German	
s1/4/AufklGr 123	He 111P	K. von Barsewisch	St. Trond	German	
Stab/KG 40	Ju 88D-1	Konrad Geisse	Brest	German	
KGr 126	He 111H-4	Alfons Orthofer	Brest	German	
Stab/StG 3	Ju 87B	G. Edert	Nantes	German	
s1/3/AufklGr 122	Ju 88D-1	G. Heinze	Vannes	German	
I/StG 3	Ju 87B	W. Siegel	Nantes	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
KGr 806	Ju 88A-5	S. Jacob	Nantes	German	
s1/3/AufklGr 31	Bf 110C-5	W. Burmeister	Nantes	German	
7/LG 2	Bf 110C-5	S. Werdin	Calais-Marck	German	
s1/2/AufklGr 11	Do 17P-1	H. Thiel	Le Bourget	German	
2/AufklGr 123	Do 17P-1	K. von Barsewisch	Le Bourget	German	
s1/AufklGr Obd Luft	Ju 86P-2	Hans-Jurgen Stumpff	Stavanger	German	
s1/1/AufklGr 120	He 111P	B. Bank	Aalborg	German	
s1/1/AufklGr 121	He 111P	R. Franz	Aalborg	German	
s6/AufklGr Obd Luft	Ju 86P-2	Albert Kesselring	Amsterdam	German	
3/AufklGr 22	Do 17P-1	H. K. Eichstedt	Stavanger	German	
2/AufklGr 22	Do 17P-1	K. Barth	Stavanger	German	
s2/5/AufklGr 122	Ju 88D-1	F. Bohm	Soesterberg	German	
s2/4/AufklGr 123	Ju 88D-1	K. von Barsewisch	St. Trond	German	
s3/4/AufklGr 123	Bf 110C-5	K. von Barsewisch	St. Trond	German	
s2/3/AufklGr 122	He 111P	F. Koehler	Vannes	German	
s2/3/AufklGr 31	Do 17P-1	H. J. von Klaeden	Nantes	German	
s2/2/AufklGr 11	Bf 110C-5	J. Wunderlich	Le Bourget	German	
s2/1/AufklGr 120	Ju 88D-1	W. K. Heuer	Aalborg	German	
s2/1/AufklGr 121	Ju 88D-1	R. Franz	Aalborg	German	
s2/AufklGr Obd Luft	Ju 88D-1	Hans-Jurgen Stumpff	Aalborg	German	
s1/1/I/NJG 2	Ju 88C-2	A. Huelshoff	Gilze-Rijen	German	
s2/1/I/NJG 2	Do 17Z-10	A. Boehme	Gilze-Rijen	German	
s1/2/I/NJG 2	Ju 88C-2	K. H. Heyse	Gilze-Rijen	German	

British and German Air Units (1940)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
s2/2/I/NJG 2	Do 17Z-10	K. W. Jung	Gilze-Rijen	German	
s1/3/I/NJG 2	Ju 88C-2	U. Mayer	Gilze-Rijen	German	
s2/3/I/NJG 2	Do 17Z-10	K. Boensch	Gilze-Rijen	German	
I/KG 77	Ju 88A-5	C. Balcke	Laon	German	
II/KG 77	Ju 88A-5	E. Behrendt	Laon	German	
III/KG 77	Ju 88A-5	Maxim Kless	Laon	German	
2/KGr 100	He 111H-4	H. Kuster	Vannes	German	night unit; Nachtkampfgruppe
3/KGr 100	He 111H-4	H. von Holleben	Vannes	German	night unit; Nachtkampfgruppe
s3/AufklGr Obd Luft	He 111P	Albert Kesselring	Amsterdam	German	
s4/AufklGr Obd Luft	Do 215B-1	Hans-Jurgen Stumpff	Stavanger	German	
s5/AufklGr Obd Luft	Bf 110C-5	Albert Kesselring	Amsterdam	German	
III/JG 52	Bf 109E-3	A. von Winterfeldt	n/a	German	arrives as reinforcement in 21 days
Stab/JG 77	Bf 109E-3	E. R. von Manteuffel	n/a	German	arrives as reinforcement in 28 days
I/JG 77	Bf 109E-3	J. Janke	n/a	German	arrives as reinforcement in 12 days
III/JG 77	Bf 109E-3	H. Seeliger	n/a	German	arrives as reinforcement in 35 days
II/KG 26	He 111H-4	E. Christian	n/a	German	arrives as reinforcement in 7 days
II/KG 30	Ju 88A-5	W. Kinkelbein	Amsterdam	German	
KGr 606	Do 17Z-2	J. Hahn	n/a	German	arrives as reinforcement in 3 days

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
1 Squadron	Hurricane IIc	D. A. Pemberton	Redhill	British	
3 Squadron	Hurricane IIc	R. F. Aitken	Martlesham	British	
17 Squadron	Hurricane IIc	C. W. Williams	Castletown	British	
19 Squadron	Spitfire IIA	B. J. Lane	Fowlmere	British	
23 Squadron	Havoc I	R. H. A. Leigh	Manston	British	night fighters
25 Squadron	Beaufighter IF	H. P. Pleasance	Wittering	British	night fighters
29 Squadron	Beaufighter IF	S. C. Widdows	Coltishall	British	night fighters
32 Squadron	Hurricane I	R. A. B. Russell	Pembrey	British	
41 Squadron	Spitfire IIA	D. O. Findlay	Catterick	British	
43 Squadron	Hurricane I	T. F. D. Morgan	Drem	British	
54 Squadron	Spitfire IIA	R. F. Boyd	Hornchurch	British	
56 Squadron	Hurricane IIc	E. N. Ryder	North Weald	British	
64 Squadron	Spitfire IIA	A. R. D. MacDonnell	Hornchurch	British	
65 Squadron	Spitfire IIA	J. R. A. Peel	Kirton in Lindsey	British	
66 Squadron	Spitfire IIA	A. S. Forbes	Warmwell	British	
72 Squadron	Spitfire Vb	A. R. Collins	Acklington	British	
74 Squadron	Spitfire IIA	F. L. White	Gravesend	British	
79 Squadron	Hurricane I	J. H. Hayworth	Pembrey	British	
85 Squadron	Havoc I	P. W. Townsend	Debden	British	night fighters
87 Squadron	Hurricane I	J. Sample	Colerne	British	
92 Squadron	Spitfire Vb	P. J. Sanders	Biggin Hill	British	
111 Squadron	Spitfire IIA	J. S. McLean	Dyce	British	

BRITISH AND GERMAN AIR UNITS

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
141 Squadron	Defiant IA	T. G. Lovell-Gregg	Acklington	British	night fighters
145 Squadron	Spitfire IIA	P. S. Turner	Tangmere	British	
151 Squadron	Defiant I	W. A. J. Satchell	Wittering	British	
152 Squadron	Spitfire IIA	D. P. A. Boitel-Gill	Warmwell	British	
219 Squadron	Beaufighter IF	J. A. G. Gordon	Tangmere	British	night fighters
222 Squadron	Spitfire IIA	R. C. Love	Coltishall	British	
234 Squadron	Spitfire IIA	J. S. O'Brien	Warmwell	British	
242 Squadron	Hurricane IIc	D. R. Scott	North Weald	British	
245 Squadron	Hurricane I	D. R. S. Bader	Aldergrove	British	
247 Squadron	Hurricane I	P. G. St. G. O'Brian	Roborough	British	
253 Squadron	Hurricane I	R. G. Kellett	Leconfield	British	
257 Squadron	Hurricane IIc	R. R. S. Tuck	Coltishall	British	
263 Squadron	Whirlwind	A. E. Donaldson	Filton	British	
308 Squadron	Spitfire IIA	J. Orzechowski	Northolt	Polish	
302 Squadron	Hurricane IIc	H. Laguna	Kenley	Polish	
303 Squadron	Spitfire IIA	W. Lapkowski	Northolt	Polish	
306 Squadron	Hurricane IIc	T. H. Rolski	Northolt	Polish	
307 Squadron	Defiant IA	Grodzicki	Exeter	Polish	night fighters
310 Squadron	Hurricane IIc	J. Latimer	Duxford	Czech	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
312 Squadron	Hurricane I	E. Gizak	Kenley	Czech	
401 Squadron	Hurricane IIc	A. D. Nesbit	Digby	British	
402 Squadron	Hurricane I	P. A. Hunter	Digby	British	
501 Squadron	Spitfire IIA	E. Holden	Colerne	British	
504 Squadron	Hurricane I	M. Rook	Exeter	British	
600 Squadron	Blenheim IF	G. Stainforth	Colerne	British	night fighters
601 Squadron	Hurricane IIc	E. J. Gracie	Manston	British	
602 Squadron	Spitfire IIA	E. H. Stevens	Prestwick	British	
603 Squadron	Spitfire Vb	F. M. Smith	Drem	British	
604 Squadron	Beaufighter IF	G.C. Tomlinson	Middle Wallop	British	night fighters
607 Squadron	Hurricane IIc	F. H. Tyson	Drem	British	
609 Squadron	Spitfire Vb	M. Lister-Robinson	Biggin Hill	British	
610 Squadron	Spitfire IIA	H. C. A. Woodhouse	Westhampnett	British	
611 Squadron	Spitfire IIA	H. Ecles	Hornchurch	British	
615 Squadron	Hurricane I	G. S. Powell-Shedden	Kenley	British	
616 Squadron	Spitfire IIA	H. F. Burton	Tangmere	British	
331 Squadron	Hurricane I	A.N. Cole	n/a	Norway	arrives as reinforcement in 90 days
71 Squadron	Hurricane I	W. E. G. Taylor	Martlesham	American	
403 Squadron	Spitfire IIA	H. S. Darley	Ternhill	Canadian	
452 Squadron	Spitfire IIA	R. G. Dutton	Kirton in Lindsey	Australian	
485 Squadron	Spitfire IIA	H.M. Starr	Leconfield	New Zealand	
68 Squadron	Beaufighter IF	M. Aitken	n/a	British	night fighters; reinforcement-2 days
81 Squadron	Hurricane IIc	A. H. Rook	n/a	British	arrives as reinforcement in 60 days
91 Squadron	Spitfire IIA	C. P. Green	Lympne	British	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
93 Squadron	Havoc I	M. B. Hamilton	Middle Wallop	British	night fighters
118 Squadron	Spitfire IIA	F. J. Howell	Warmwell	British	
121 Squadron	Hurricane I	R. P. R. Powell	Kirton in Lindsey	American	
122 Squadron	Spitfire IIA	W. A. Richardson	n/a	British	arrives as reinforcement in 120 days
123 Squadron	Spitfire IIA	J. E. McComb	n/a	British	arrives as reinforcement in 125 days
125 Squadron	Defiant IA	H. M. Mitchell	n/a	British	night fighters; reinforcement-45 days
129 Squadron	Spitfire IIA	H. Harkness	n/a	British	arrives as reinforcement in 90 days
130 Squadron	Spitfire IIA	E. P. P. Gibbs	n/a	British	arrives as reinforcement in 150 days
133 Squadron	Hurricane IIc	G. A. Brown	n/a	American	arrives as reinforcement in 90 days
255 Squadron	Defiant I	G. F. Chater	Kirton in Lindsey	British	
256 Squadron	Defiant I	G. H. Gatheral	Middle Wallop	British	
258 Squadron	Hurricane IIc	E.F. Ward	Kenley	British	
264 Squadron	Defiant IA	A. T. D. Sanders	West Malling	British	night fighters
266 Squadron	Spitfire IIA	P.G. Jameson	Wittering	British	
313 Squadron	Spitfire IIA	G.L. Sinclair	n/a	Czech	arrives as reinforcement in 90 days
315 Squadron	Spitfire IIA	Pietraszkiewicz	Northolt	Polish	
316 Squadron	Hurricane I	C. J. Donovan	Pembrey	Polish	
317 Squadron	Hurricane I	A. Brzezina	Colerne	Polish	
605 Squadron	Hurricane IIc	C.R. Edge	Ternhill	British	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
Stab/KG 1	He 111H-4	Karl Angerstein	Rosieres-en-Santerre	German	
II/KG 1	Do 217E-2	E. Enderle	Montdidier	German	
III/KG 1	Ju 88A-4	Lehwess-Litzmann	Rosieres-en-Santerre	German	
Stab/KG 76	Ju 88A-4	Egon Thiem	Cormeilles-en-Vexin	German	
I/KG 76	Ju 88A-4	R. von Sichart	Beauvais-Tille	German	
II/KG 76	Ju 88A-4	Riedesel zuEisenbach	Creil	German	
III/KG 76	Ju 88A-4	von Benda	Cormeilles-en-Vexin	German	
Stab/KG 2	Do 17Z-2	H. Reickhoff	Arras	German	
I/KG 2	Do 17Z-2	W. Lerche	Epinoy	German	
II/KG 2	Do 217E-2	K. Rohde	Arras	German	
III/KG 2	Do 17Z-2	H. Eichhorn	Cambrai	German	
Stab/KG 3	Ju 88A-4	Walther Gabelmann	St. Trond	German	
I/KG 3	Ju 88A-4	F. Pasquay	St. Trond	German	
II/KG 3	Ju 88A-4	K. Peters	Antwerp	German	
III/KG 3	Do 17Z-2	O. Rathmann	St. Trond	German	
Stab/KG 53	He 111H-4	Max Gruber	Lille-Nord	German	
I/KG 53	He 111H-4	Heinz Kauffmann	Lille-Nord	German	
II/KG 53	He 111H-4	H. Steinweg	Lille-Nord	German	
III/KG 53	He 111H-4	R. Fabian	Lille-Nord	German	
II/StG 1	Ju 87B	Anton Keil	Tramecourt	German	
IV/LG 1	Ju 87B	H-K Strepp	Tramecourt	German	
Stab/SKG 210	Bf 110C-4B	Werner Restemeyer	Calais-Marck	German	
I/SKG 210	Bf 110C-4B	K-H Sticker	Calais-Marck	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
II/SKG 210	Bf 110C-4B	W.R. Roessinger	Calais-Marck	German	
II/LG 2	Bf 109E-7	Otto Weiss	St. Omer	German	
Stab/KG 4	He 111H-4	Heinrich Meissner	Soesterberg	German	
I/KG 4	He 111H-4	K. Noske	Soesterberg	German	
II/KG 4	He 111H-4	Dr. Gottlieb Wolff	Soesterberg	German	
III/KG 4	He 111H-4	W. Buhring	Amsterdam	German	
1/KGr 100	He 111H-4	Kurt Aschenbrenner	Vannes	German	
Stab/JG 3	Bf 109E-7	Gunther Lutzow	Samer	German	
I/JG 3	Bf 109E-7	Hans von Hahn	Samer	German	
II/JG 3	Bf 109E-7	Erich von Selle	Samer	German	
III/JG 3	Bf 109E-7	W. Oesau	Samer	German	
Stab/JG 26	FW 190A-2	A. Galland	Audembert	German	
I/JG 26	FW 190A-2	Rolf Pingel	Audembert	German	
II/JG 26	FW 190A-2	Gotthardt Handrick	Marquise	German	
III/JG 26	FW 190A-2	Gerhard Schopfel	Caffiers	German	
Stab/JG 51	Bf 109F-2	Werner Molders	Wissant	German	
I/JG 51	Bf 109F-2	H.F. Joppien	Wissant	German	
II/JG 51	Bf 109F-2	J. Fozo	Wissant	German	
III/JG 51	Bf 109F-2	R. Leppla	St. Omer	German	
Stab/JG 52	Bf 109E-7	H. Trubenbach	Coquelles	German	
I/JG 52	Bf 109E-7	Wolfgang Ewald	Coquelles	German	
II/JG 52	Bf 109E-7	E. Woitke	Peuplingne	German	
Stab/JG 54	Bf 109F-2	H. Trautloft	Campagne	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
I/JG 54	Bf 109F-2	H. von Bonin	Guines	German	
II/JG 54	Bf 109F-2	D. Hrabak	Hermalingen	German	
III/JG 54	Bf 109F-2	A. Lignitz	Guines	German	
I/LG 2	Bf 109F-2	H. Ihlefeld	Calais-Marck	German	
Stab/ZG 26	Bf 110C	J. Schalk	Lille	German	
I/ZG 26	Bf 110C	H. Kaminski	Lille	German	
II/ZG 26	Bf 110C	R. von Rettberg	Crecy-en-Ponthieu	German	
III/ZG 26	Bf 110C	K. Kaschka	Barley	German	
Stab/ZG 76	Bf 110C	Walter Grabmann	Laval	German	
II/ZG 76	Bf 110C	Erich Groth	Abbeville	German	
Stab/LG 1	Ju 88A-4	Knust	Orleans/Bricy	German	
II/LG 1	Ju 88A-4	G. Kollewe	Orleans/Bricy	German	
I/LG 1	Ju 88A-4	Wilhelm Kern	Orleans/Bricy	German	
III/LG 1	Ju 88A-4	K. von Brauchitsch	Chateaudun	German	
Stab/KG 27	He 111H-4	G. Ulbricht	Tours	German	
I/KG 27	He 111H-4	F. Reinhard	Tours	German	
II/KG 27	He 111H-4	Gunzel	Dinard	German	
III/KG 27	He 111H-4	von Beust	Rennes	German	
Stab/KG 51	Ju 88A-4	Schulz-Heyn	Orly	German	
I/KG 51	Ju 88A-4	H. Hahn	Melun	German	
II/KG 51	Ju 88A-4	M. Stadelmeier	Orly	German	
III/KG 51	Ju 88A-4	Walter Marienfeld	Etampes	German	
Stab/KG 54	Ju 88A-4	Andre Heydebrock	Evreux	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
I/KG 54	Ju 88A-4	R. Linke	Evreux	German	
II/KG 54	Ju 88A-4	E. von Dellmensinger	St. Andre-de-l'Eure	German	
Stab/KG 55	He 111H-4	Franz Schlemell	Villacoublay	German	
I/KG 55	He 111H-4	R. Keil	Dreux	German	
II/KG 55	He 111H-4	Dr. E. Kuhl	Chartres	German	
III/KG 55	He 111H-4	H. Wittmer	Villacoublay	German	
Stab/StG 1	Ju 87B	Walter Hagen	Angers	German	
I/StG 1	Ju 87B	Paul-Werner Hozzel	Angers	German	
III/StG 1	Ju 87B	Helmut Mahlke	Angers	German	
Stab/StG 2	Ju 87B	Oskar Dinort	St. Malo	German	
I/StG 2	Ju 87B	Hubertus Hitschold	St. Malo	German	
II/StG 2	Ju 87B	Walter Enneccerus	Lannion	German	
Stab/StG 77	Ju 87B	Graf von Schoenborn	Caen	German	
I/StG 77	Ju 87B	H. Bruck	Caen	German	
II/StG 77	Ju 87B	Waldemar Pleweg	Caen	German	
III/StG 77	Ju 87B	Helmut Bode	Caen	German	
Stab/JG 2	FW 190A-2	W. Balthasar	Beaumont-le-Roger	German	
I/JG 2	FW 190A-2	K.H. Krahl	Beaumont-le-Roger	German	
II/JG 2	FW 190A-2	Helmut Wick	Beaumont-le-Roger	German	
III/JG 2	FW 190A-2	H. Hahn	Le Havre	German	
Stab/JG 27	Bf 109E-7	W. Schellmann	Carquebut	German	
I/JG 27	Bf 109E-7	E. Neumann	Crepon	German	
II/JG 27	Bf 109E-7	W. Lippert	Crepon	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
III/JG 27	Bf 109E-7	M. Dobislav	Carquebut	German	
Stab/JG 53	Bf 109F-2	Gunther von Maltzahn	Cherbourg-Ouest	German	
I/JG 53	Bf 109F-2	Brustellin	Cherbourg-Ouest	German	
II/JG 53	Bf 109F-2	H. Bretnutz	Dinan	German	
III/JG 53	Bf 109F-2	W.D. Wilcke	Lesneven	German	
Stab/KG 26	He 111H-4	A. Holle	Stavanger	German	
I/KG 26	He 111H-4	H. Busch	Stavanger	German	
III/KG 26	He 111H-4	V. von Lossberg	Stavanger	German	night unit; Nachtkampfgruppe
Stab/KG 30	Ju 88A-4	E. Bloedorn	Aalborg	German	
I/KG 30	Ju 88A-4	Lau	Aalborg	German	
III/KG 30	Ju 88A-4	Schumann	Aalborg	German	
II/JG 77	Bf 109E-7	H. Hans	Couvron	German	
s1/1/AufklGr 123	Bf 110C-5	L. Hoffmann	Soesterberg	German	
s2/1/AufklGr 123	Ju 88D-1	D. Liebe-Piederit	St. Trond	German	
Stab/KG 40	Do 217E-2	E. Peterson	Brest	German	
II/KG 40	Do 217E-2	W. von Schlippenbach	Brest	German	
III/KG 40	He 111H-4	Kowalewski	Brest	German	
s1/3/AufklGr 122	Ju 88D-1	J. Hurck	Vannes	German	
KGr 806	Ju 88A-4	H. Emig	Alencon	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
KGr 606	Ju 88A-4	J. Hahn	Nantes	German	
s1/1/AufklGr 124	Ju 88D-1	Andreas Nielsen	Aalborg	German	
7/LG 2	Bf 110C-5	H. Eckert	Calais-Marck	German	
4/AufklGr 11	Ju 88D-1	H. Thiel	Le Bourget	German	
2/AufklGr 123	Ju 88D-1	K.R. Franken	Le Bourget	German	
1/AufklGr 33	Ju 88D-1	Gunther Korten	St. Trond	German	
1/AufklGr 120	Ju 88D-1	W.K. Hever	Aalborg	German	
1/AufklGr 121	Ju 88D-1	L. Viefhues	Aalborg	German	
s1/AufklGr Obd Luft	Ju 86P-2	J. Sonnleitner	Stavanger	German	
3/AufklGr 22	Ju 88D-1	H.K. Eichstedt	Aalborg	German	
2/AufklGr 22	Ju 88D-1	K. Barth	Aalborg	German	
s2/3/AufklGr 122	Bf 110C-5	K. Ludke	Soesterberg	German	
s1/3/AufklGr 123	Ju 88D-1	J.K. Franzreb	St. Trond	German	
s2/3/AufklGr 123	Bf 110C-5	Dr. W. Reinhardt	St. Trond	German	
s2/1/AufklGr 124	Do 215B-1	Andreas Nielson	Stavanger	German	
3/AufklGr 31	Bf 110C-5	A. von Brixen	Nantes	German	
4/AufklGr 14	Ju 88D-1	Hans Seidemann	Le Bourget	German	
s3/1/AufklGr 120	Do 215B-1	A. Knebel	Stavanger	German	
s7/AufklGr Obd Luft	Ju 86P-2	O. Rothenberg	Brest	German	
s8/AufklGr Obd Luft	Ju 86P-2	A. Rading	Amsterdam	German	
Stab/NJG 2	Ju 88C-2	K. Hulshoff	Gilze-Rijen	German	
s1/1/I/NJG 2	Ju 88C-2	K. Boensch	Gilze-Rijen	German	
s2/1/I/NJG 2	Ju 88C-2	K. H. Heyse	Gilze-Rijen	German	
s1/2/I/NJG 2	Ju 88C-2	K. Herrmann	Gilze-Rijen	German	

British and German Air Units (1941)

Name	Aircraft Type	Leader (at start)	Home Base	Nationality	Notes
s2/2/I/NJG 2	Do 17Z-10	H. Voelker	Gilze-Rijen	German	
s1/3/I/NJG 2	Ju 88C-2	U. Mayer	Gilze-Rijen	German	
s2/3/I/NJG 2	Do 215B-5	K.W. Jung	Gilze-Rijen	German	
I/KG 77	Ju 88A-4	J. Potter	Clermont	German	
II/KG 77	Ju 88A-4	D. Peltz	Montreuil	German	
III/KG 77	Ju 88A-4	von Frankenberg	Montreuil	German	
2/KGr 100	He 111H-4	H. Begemann	Vannes	German	
3/KGr 100	He 111H-4	G. Jurgens	Vannes	German	
s2/AufklGr Obd Luft	Ju 88D-1	P. Rack	Amsterdam	German	
s3/AufklGr Obd Luft	He 111P	H. Poser	Amsterdam	German	
s4/AufklGr Obd Luft	Do 215B-1	W. Krauss	Stavanger	German	
s5/AufklGr Obd Luft	Bf 110C-5	H. Koesters	Stavanger	German	
s6/AufklGr Obd Luft	Bf 110C-5	H. Kikat	Le Bourget	German	
4/JG 77	Bf 110D-1/R2	K. Erick	Stavanger	German	
Stab/KG77	Ju88 A-4	J. Raithel	Montreuil	German	

CREDITS

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SEARCH OF GAME HINTS. They are neither permitted nor qualified to supply
such information. Hints on some of our more difficult games are available in the
members section of our web site or by calling the hintline number printed in the
manual for your game (not applicable to all products).

TALONSOFT'S

BATTLE OF BRITAIN

GAME DESIGN BY
GARY GRIGSBY
AND
KEITH BRORS

Contents

Your Battle of Britain historical strategy game should contain a Players Guide, a CD-ROM, Quick Start installation instructions and a TalonSoft product catalog with a separate price list.

Installing for Windows 95/98

1. Launch Microsoft Windows 95/98®.

2. Place the Battle of Britain CD in the CD-ROM drive. The Auto-Run selection box should launch immediately if you have Auto-Run enabled on your computer. On this box, select "Install Game." Then proceed to Step 5 below.

3. If Auto-Run is disabled on your computer you will need to run the Install program manually. From the Desktop, click on the "Start" button on the Taskbar and select "Run".

4. When the "Run" window appears, type E:\SETUP and click "OK".

NOTE: If your CD-ROM drive letter is not E: (as shown above), then substitute the appropriate letter (e.g., D:\SETUP).

5. When you reach the "Welcome" screen, click on the Next button to continue.

6. When the "Choose Destination Location" screen appears, either choose the default folder by clicking the Next button, or see the note below.

NOTE: The default folder for installation is C:\Program Files\TalonSoft\Battle of Britain. If you wish it to be something other than that, click the Browse button and enter a new destination in the Path box. If the folder you specify does not exist, the program will prompt you to create it.

7. When installation is complete, click on the Start button on the Taskbar. Then select Programs, then TalonSoft. Select Battle of Britain. Finally, select "Battle of Britain" to begin.

Troubleshooting

The performance of Battle of Britain on your system will depend on how "fast" your video card is, how "fast" your system is, and how much total system memory is available. Be sure to add the latest available drivers for your system hardware to ensure optimal performance. Battle of Britain requires Direct X6 for play. If you do not already have DX6 installed on your system, you may install it using the version which accompanies the game on the CD. Be sure to have DX6 installed on your system before trying to play Battle of Britain.

Be sure to visit the TalonSoft website for the latest game updates and information, at http://www.talonsoft.com

SYMPTOM: The install program hangs up, crashes, or stops while installing the game.

REMEDY: There could be an incompatibility issue with the Install program and your hardware acceleration on your video card.Try lowering the Hardware Acceleration on your video card in your System Properties to basic.

REMEDY: Make sure that you have the latest available drivers for all of your systems hardware. (Sound Card, Video Card, CD Rom drive.)

SYMPTOM: The Reaction Phase in Battle of Britain is terribly slow on my system.

REMEDY: There are a lot of data calculations going on during the Reaction Phase. That, coupled with a lot of graphical features toggled on in the game, can slow the Reaction Phase down considerably on low-end machines (i.e., Pentium 133 to Pentium 200). To help increase the speed of the Reaction Phase, we recommend that you play the game with 3D aircraft turned off by toggling on the "Flight Lines" function (see p. 14 of the Player's Guide for details). This replaces the 3D aircraft with color-coded lines and boxes. We also recommend that you go to the Game Options Screen (see the README file for details) and toggle on/off features such as ground explosions, aircraft shadowing, clouds, etc., until you are satisfied with Reaction Phase performance. Ultimately, the Reaction Phase may still run a little slow regardless of what you do, but Battle of Britain allows you to toggle on/off graphical features to help increase game performance.

SYMPTOM: I try to launch Battle of Britain and keep getting a message such as "Can't load bmap02.bmp" error.

REMEDY: This message is related to the amount of virtual memory you have on your system. The map in Battle of Britain is divided into large sections, and those sections require a sizeable amount of virtual memory in order to load properly. Make sure that you have at least 100 to 150 MB of free hard drive space on your system before trying to play the game.

SYMPTOM: The sound effects and/or in-game video clips don't work.

REMEDY: The Battle of Britain uses Direct X6. Make sure that you have the latest drivers available for your sound card and that your sound card is Direct X compatible.

> **Please read the README file for any last minute changes and additions to the game.**

NOTES