Flying Corps Contents

CHAPTER ONE GAME OVERVIEW

1.1 INTRODUCTION

Flying Corps is a simulation of World War 1 aerial combat over France. You can choose to take part in single "scramble" missions or to immerse yourself in one of four major campaigns. Extensive configurable options allow you to customise Flying Corps to give you the style and type of game you require. The aircraft in Flying Corps have been exhaustively researched and are characterised by flight models which incorporate individual characteristics and idiosyncrasies. The game's artificial intelligence is geared towards First World War tactics, and each computer-controlled pilot is treated as a separate individual with differing priorities and abilities. The dogfights in Flying Corps take place over some of the most detailed terrain seen in a flight simulation, using data taken from period trench maps and actual wartime aerial photography. Flying Corps will take you closer to the front than you've ever been before.

This manual is organised into five main chapters and an appendix. This chapter deals with the overall layout of Flying Corps, and all of the options within the game. Chapter Two provides the information to enable you to fly the actual aircraft available in Flying Corps. Chapter Three covers the wide range of tactics you will need to employ as a First World War pilot. Chapter Four details all of the aircraft to be found in the skies while playing Flying Corps. Chapter Five is a detailed historical account of the major air campaigns which are featured in the game. This is followed by a detailed bibliography and game credits. The appendix lists the keyboard and joystick controls for the game.

1.2 THE GAME

To install and load Flying Corps refer to the installation and loading instructions in the separate TECHNICAL SUPPLEMENT. The game begins with an animated title sequence. Should you not wish to view this, press the space bar to leave the title sequence and progress to the options screen.

The Options Screen

The options available at the start of the game are displayed on the options screen:

Preferences

Preferences allows you to set up all of the detailed game characteristics ranging from your joystick and sound settings to precise characteristics of the aircraft you will be flying. This feature is also available in-flight.

Scramble

The Scramble option gives you the choice of a number of single missions ranging from a simple 'first flight' to more complex stalking manoeuvres. This is the ideal entry into the game, and it will teach you how to survive more complex missions.

Campaign

Campaign is the option which leads you to one of four major campaigns, which will provide the most severe test of your strategic skill and mettle. This is the heart of Flying Corps.

Load Game

Load game allows you to retrieve a previously saved game, which may be stored on your hard disc.

Quit

Quit will end your session of Flying Corps, after you have verified that you wish to exit, and return you to DOS or Windows.

Multi Player

Multi player allows you to play with Flying Corps with someone else, but is an option only available to players who are running Flying Corps under Windows 95. The separate TECHNICAL SUPPLEMENT details how this feature operates.

Credits

Credits takes you to the game credit screen.

Selections can be made by highlighting an option with the mouse pointer and clicking with the left mouse button, or moving the highlight with the up or down cursor key and pressing the Enter key. All selections in Flying Corps can be made using either mouse or keyboard.

The preferences, scramble and campaign options are now discussed in more detail. In order to allow you to make a quick start the next section, part three, deals with the scramble option. The full range of available preferences are detailed in part four, and details of the campaign elements of the game are supplied in part five. Part six provides a schematic description of the aircraft cockpit.

1.3 SCRAMBLE

If you wish to get straight into the action select Scramble. Here you will find and fly small individual missions.

First of all, you are presented with a list of the flyable aircraft in Flying Corps. Each aircraft has its own unique set of characteristics, and are described more fully in Chapter Five of this manual. Select the aircraft you wish to fly using the mouse or keyboard. The screen then displays the full choice of available scramble missions.

First Flight

This is the simplest scramble mission. The aim is to take off from your airfield, climb to 2000 feet and fly a complete circuit around the airfield. Land and come to a halt in the centre of the field. Chapter Two has a section which deals with how you should approach this first flight.

Follow Leader

Starting in the air, follow your leader as he performs a series of manoeuvres designed to throw you off his tail. You need to stay with him for about 3 minutes.

Turkey Shoot

Dive on to the tail of a novice pilot who is flying a straight and regular course. He presents a perfect target but he might turn if he spots you.

One on One

Your opponent will pass on your right, heading in the opposite direction. The aim is to get on his tail as rapidly as possible.

Ground Attack

Fly low and disable tanks on the ground with your bombs. A truck convoy and an observation balloon present further ground targets.

Squadron Encounter

Lead your squadron of three flights against a large enemy formation that is rushing towards you.

Stalking Prey

Your flight is above and to the rear of an enemy flight that is unaware of your presence. Stalk your prey and draw close enough to make a surprise attack.

First Patrol

Lead two flights of three aircraft on a patrol of the front lines. You must be able to identify and respond to possible threats.

Quit

Takes control back to the main options screen.

1.4 PREFERENCES

You may alter your game preferences on the main options screen, or while you are flying - in which case you must press the F12 key. The preferences screen displays a number of icons which you can select:

Joystick icon: Joystick setup

This allows you to configure Flying Corps to suit your analogue control system.

The coolie hat and throttle controls are provided on a number of advanced joysticks and the following options apply to the CH and Thrustmaster products.

If you are using a stick that is plugged into a separate programmable throttle then the coolie hat should be programmed using the software provided by the throttle adaptor manufacturer. In these circumstances the Flying Corps Coolie Hat option should be disabled.

If you are using a stick fitted with a coolie hat and if the stick is plugged directly into the games port, then you should enable the Flying Corps Coolie Hat option.

After you have chosen your desired setup the in-built calibration system will start. Follow on-screen instructions to set up the control system.

Aircraft on grid icon: Aircraft setup

This sets the flight preferences and therefore allows you to adjust the realism and difficulty levels of the flight model. Flight Preference Options are:

Torque effects

When enabled, the rotating propeller will affect the flight model.

Wind

When enabled, wind will affect all aircraft.

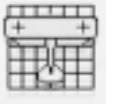
Gyroscopic effects

When enabled, this will allow the gyroscopic effects of rotary engined aircraft to affect the flight model. In all of the rotary engined aircraft featured, the gyroscopic effect is clockwise from the pilots seat perspective. See Chapter Two, which describes the gyroscopic effects in more detail.

Slipstream effects

When enabled, the slipstream from the propellor will affect the airflow over the aircraft's lifting surfaces.

Joystick



Aircraft on grid

Torque Effects

Wind

Gyroscopic effects

Slipstream effects

Chapter 1 - Game Overview

Co-ordinated rudder

Spinning

Power boost

Ground collisions

Two aircraft

Limited Arms

Vulnerability

Spinning Compass

Decelerate Trigger

Padlock

Bomb Weight

Blackouts

Co-ordinated rudder

When enabled, the rudder will be controlled in harmony with the stick, making flight easier. Disable if you have rudder pedals or you want a more realistic response.

Spinning

Disabling the option will reduce the chance of your aircraft spinning if mishandled.

Power boost

When enabled, the engine of your aircraft will be more responsive and powerful, making flight easier.

Ground collisions

When enabled, collision with the ground will damage or destroy your aircraft.

Two aircraft icon: Difficulty options

The following options set the level of game difficulty when playing Flying Corps.

Limited Arms

When enabled you will be able to carry approximately 500 rounds. Otherwise your ammunition is unlimited.

Vulnerability

When enabled you will be vulnerable to enemy fire.

Spinning Compass

When enabled, the flight compass will behave more accurately when the aircraft is turned violently - the compass will spin, and will only return to equilibrium in level flight.

Decelerate Trigger

This setting is relevant after using the time acceleration TAB key during the game.

When the trigger is set to combat, your aircraft will drop back into real time when you are directly threatened and enemy aircraft can fire at you. Enemy aircraft will also be more aggressive and will not try to escape. Use this setting when you want fast and furious action.

If the trigger is set to tactical, then real time is reset much earlier in the encounter. This will give you time to engage the enemy at a tactical level and allow you to gain height or manoeuvre, so that you may be able to achieve tactical dominance. Enemy aircraft will be more cautious and act more realistically. For instance, they may turn tail and run! Use this setting for additional realism.

Padlock

Padlock refers to the locking of head movements from within the cockpit, or locking the viewing angle if you are using an outside view. Two types of padlock are supported:

Only when visible: The enemy aircraft must be in view before the padlock can be initiated. This is the more realistic option.

In visible range: You will be able to initiate a lock when an enemy is within visible range. It is not necessary to have the enemy in view to initiate the lock.

Bomb Weight

When enabled bomb weight and drag affects the performance of the aircraft.

Blackouts

When enabled the pilot will temporarily blackout after pulling a high 'g' turn.

Whiteouts

When enabled there will be a whiteout when you look into the sun.

Auto Pilot skill

This refers to the AI settings of your computer opponents and therefore affects the skill level of opposing pilots. Possible setting are novice, regular, ace. In the game, each enemy pilot can have a different skill level. By selecting novice, you will force the range of skills encountered to be low. Alternatively, selecting ace will mean that the range of skills you encounter will be relatively high.

Target size

Altering this setting affects the accuracy of your guns. Possible settings are small, regular and large. The smaller the target size the more realistic the setting.

Treble clef icon: Audio Volumes

These options enable you to customise your audio output:

SFX

Allows you to adjust the volume of in-game sounds such as gun noise and explosions.

Engine

Allows you to alter the level of engine noise. The engine level is also affected by the SFX level.

Film

This controls the sound channel for the animation sequences.

Musical note

This controls the volume of music in the game.

Rectangular icon: Graphics Options

Adjusting the graphics parameters alters the way your hardware will perform during the course of a game.

The most significant performance factor is resolution. Only attempt to run Flying Corps at the highest resolutions if you have fast and up-to-date hardware. Experiment with the settings that provide the best compromise between frame rate and detail level.

In Flying Corps it is possible to set the preferences and difficulty options in a great variety of different ways. Player are encouraged to experiment with the settings to produce a customised version of Flying Corps which best suits their style of play.

PREFERENCES AND DIFFICULTY SUMMARY

The Beginner	Ultimate realism
Torque effects disabled	Torque effects enabled
Wind disabled	Wind enabled
Gyroscope effects disabled	Gyroscope effects enabled
Slipstream effects disabled	Slipstream effects enabled
Co-ordinated rudder enabled	Co-ordinated rudder disabled
Spinning minimised	Spinning enabled
Power Boost enabled	Power Boost disabled
Ground collisions disabled	Ground collisions enabled
Limited arms disabled	Limited Arms enabled
Vulnerability disabled	Vulnerability enabled
Spinning compass disabled	Spinning compass enabled
Decelerate Trigger Combat	Decelerate Trigger Tactical
Initiate Padlock if target is within visible range	Initiate Padlock only when target visible
Bomb weight & drag disabled	Bomb weight & drag enabled
Blackouts disabled	Blackouts enabled
Whiteouts disabled	Whiteouts enabled
Autopilot skill : Novice	Autopilot skill : Ace
Target size:	Large
Target size:	Small

Whiteouts

Auto pilot skill

Target size

Treble clef

SFX

Engine

Film

Musical note

Rectangular icon

How to get the most from your Preferences settings

On entering 3D flight you will be inside the cockpit. Press TAB and the aircraft will fly in accelerated time along the patrol route. When the enemy are very close the aircraft will drop out of accelerated time. Toggle the i key to get the full help text across the top of the screen. Switch to outside view (F6) and padlock to the nearest unfriendly aircraft (F1). The nearest enemy aircraft will be moved to the centre of the screen. Maneuver your aircraft so that it is pointing at the enemy (i.e. away from you). Switch to the inside cockpit (F7) view. Note that switching between outside and inside view does not alter the padlock status, so you are now on an inside padlock view. If you cannot keep the enemy in sight then switch back to the outside view. Keep flying until you are on the enemy's tail and can shoot him down. If you are still having difficulty then change some of the Preference options: for instance set Target Size to 'large' and Auto Pilot Skill to 'novice'.

For a more realistic game, consider enabling all of the Preference options except Power Boost and Co-ordinated rudder. Set the Decelerate Trigger to 'tactical range'. This will result in accelerated time being turned off just before enemy aircraft are visible. This will make it possible to stalk the enemy and maneuver into a position of advantage before launching an attack. Set the Initiate Padlock View to 'only when target visible'. The computer will now only padlock onto a target that has already appeared on the screen. This is quite realistic as experienced pilots tend to stay aware of previously spotted aircraft and keep them in view.

For the most realistic play, read your mission brief and go to the map screen. Plot the waypoints onto the paper maps provided. When flying do not use accelerated time, but navigate your aircraft along the patrol route using your map, looking out for important landmarks to ensure that you are still on course. Stay in the cockpit, using the number pad keys to look around. Constantly search the sky and when an enemy aircraft is spotted attempt to stalk it so that a surprise attack can be launched. Only use the Padlock View once the enemy has been spotted. When you have initiated combat you should endeavour to maintain the element of surprise as fighting from the cockpit requires considerable skill.

Joystick users should note that joysticks with four or more buttons can emulate some of the important view functions, and that a coolie hat can be used for rotating the view.

1.5 THE CAMPAIGNS

There are four campaigns in 'Flying Corps'.

FLYING CIRCUS

In this campaign you play the part of Lothar von Richthofen. On May 1st, 1917, Manfred, your illustrious older brother goes on leave having scored 52 victories, goes on leave, and places you in command of the celebrated Jasta 11.

You already have 16 victories to your credit but your objective is to exceed Manfred's score before he returns in June. To accomplish this you will not only have to shoot down enemy aircraft but also lead the squadron successfully, ensuring that morale remains high and that crack pilots apply to come and fly with you. You will be presented with a variety of typical fighter missions and must be wary of the 'anti Richthofen' unit, the crack 56 British Squadron, which has just arrived at the front.

This is a good campaign for learning the basics of squadron management and for perfecting your

dogfighting skills. Your aircraft is the Albatros DIII, which is superior to most of the enemy machines that you will encounter. You are allowed to take an unhistorical option and use a Fokker Triplane instead of the Albatros if you wish.

THE BATTLE OF CAMBRAI

In this campaign you take on the role of a German pilot based at the forward airfield of Flesquieres. The British have just launched a surprise attack, spearheaded by a large number of tanks. These are already approaching your airfield when the campaign starts.

Your first objective is to escape in your Fokker Triplane and delay the British advance while your ground crew retreat to the rear base at Proville. To win the campaign you must halt the enemy tanks and stop the British reaching Cambrai.

Tanks can be destroyed by bombing or by shells fired by field guns. You must therefore attack the British forces as they advance whilst protecting your own ground troops from enemy aircraft and artillery.

This is a good campaign for planning missions on the map, attacking ground targets and prioritising efforts against the greatest threat. For instance, if there are tanks approaching Cambrai, they must be dealt with as a matter of urgency. If German field guns are being lost, it may be necessary to fly in their support against British aircraft or artillery. Attacks against British supplies will slow the ground advances and raids against British airfields can be initiated in order to reduce the enemy air threat.

History has been slightly altered in the presentation of this campaign to allow us to place more emphasis on air operations. The weather is better than it was - in the actual battle it was foggy - and your Jasta is equipped with the Triplane. Historically this aircraft was grounded at the time after a series of fatal crashes.

SPRING OFFENSIVE

In this campaign you are a new British pilot who arrives at 54 Squadron in February 1918, just prior to the massive ground offensive which the Germans launched in March. The Germans were attempting to win the war before the Americans reached France in strength. You will need to prove yourself quickly, and your objective is to help to halt the German advance and qualify for command of your own squadron.

Initially you will take part in training missions before flying over the front to undertake balloon busting and other strike missions. When the German offensive starts, you fly a variety of close air support missions. The aim of the campaign is to weaken the German forces so that, when they launch their last effort to take Amiens, they cannot break the British defences. During this last effort you will be involved in the first ever tank versus tank battle.

This campaign features a wide variety of missions. Your first mission is in the SE5a; thereafter you will fly the Sopwith Camel. Once you become squadron leader you can choose which of these aircraft to fly.

HAT IN THE RING

In this campaign you play the part of Eddie Rickenbacker. Your objective is to equal or exceed his achievement of scoring 26 victories and becoming leader of the 94th 'Hat in the Ring' Squadron. Rickenbacker finished the war as America's 'Ace of Aces' and won the Congressional Medal of Honor.

In this campaign, the German Army is being driven back by Allied attacks but the German Air Service is still a formidable foe - especially since the crack fighter units have been grouped into Jagdgeschwaders and issued with the Fokker DVII, possibly the best all round fighter of the war.

This campaign features the Nieuport 28 and the Spad XIII as the flyable aircraft.

GETTING STARTED IN A CAMPAIGN

To start a campaign choose Campaign from the options screen. Click on the large arrows to cycle through the four campaigns available. Once you have chosen the campaign you wish to play, confirm your choice by selecting the Medal icon.

Gunsight

1st

Pencil/Paper Enlist

Medal

Arrow & Cross

Shield

News

The Introductory Campaign Screen

This screen presents you with a basic overview of the campaign on a clipboard. On the right hand side of the screen there are a number of icons which can be selected:

Gunsight

Select this to review the campaign objectives.

1st

Displays the briefing for the first mission.

Pencil/Paper Enlist

Allows you to enlist for this campaign.

Medal

Select this to start the campaign.

Arrow & Cross

Return to the previous screen.

Selecting the medal will start an animated sequence. When this finishes you will find yourself in the cockpit flying the first mission of the campaign. The animated sequence can be terminated at any time by pressing the space bar. At the end of a campaign mission you will be given a report on what occurred. Select the TICK to continue the campaign. This will lead you to the main campaign screen.

The Main Campaign Screen

This screen allows you to decide how to conduct the rest of your campaign by letting you select missions, alter your squadron formations, read news events and examine mission maps. On the top right of the screen there are a number of selectable icons:

Medal

Select this icon to fly the currently selected mission. You will start the mission in the cockpit of your aircraft. At the end of the mission you will be given a summary of what occurred.

Mission Selection

The method of selecting a mission is different in each of the campaigns.

In the Flying Corps campaign, the Left/Right arrows can be used to cycle through the three areas to patrol: Arras, Cambrai and Douai. Douai patrols are behind friendly lines and are therefore the easiest. The Cambrai area will be the most difficult because it is patrolled by the 56 squadron.

In Hat in the Ring campaign you will have no choice initially in selecting missions. Once promoted you will be able to choose which type of mission you wish to fly - balloon busting, escort, patrol or roving.

In the Spring Offensive campaign your missions are determined for you.

The Cambrai campaign requires you to plan your mission by positioning waypoints on the map.

Shield

Selecting the shield brings up the squadron information screen and preferences screen. Squadron information is where you plan the details of your mission. This allows you to ensure that the squadron is using a suitable formation for the mission, that the correct pilots are assigned and that they have been issued with necessary orders. You can also access the Paintshop, where you can assign markings and insignia to the aircraft under your command.

News

Selecting this icon brings up news about events occurring in your area. This can give useful information on local enemy activity.

Map

Select the map icon to see a map of your local area. Use this to obtain information about your patrol route, ground targets and balloon activity. In the Cambrai campaign you will need to use the map to plan your missions.

Disk

Selecting the disk allows you to save the game to a specified drive or directory.

Arrow/cross

Quit the current campaign

Selecting either the shield icon or the map icon takes you to further screens which allow you to configure the setup of your squadron or plan the campaign using a mission map. These further screens are now discussed in more detail.

The squadron screen

This screen is accessed by selecting the shield icon on the main campaign screen. There are a group of selectable icons in the top right corner of the squadron screen:

Medal

Selecting this icon takes you directly into flying a mission.

Computer

Select to adjust difficulty settings and to configure sound and control devices.

Joystick

Select to configure the controls on your joystick.

Paint Pot

Selecting this icon takes you to the Paintshop, where you are able to assign individual colours and markings to your squadron's aircraft.

Shield

This icon transfers you to the squadron information screen, and allows you to configure squadron formations and select personnel. You will be able to assign aircraft and pilots for today's mission, set the formation to be used and issue the pilots with their instructions.

Disk

Select this icon to save the game.

Arrow

Returns control to the main campaign screen

Selecting the shield icon leads to the squadron information screen:

The squadron information screen

There are a number of selectable icons in the top right of the screen:

Right/Left Arrows

Select the arrows to view the possible squadron formations for your next mission. The formations are shown as flights on the main part of the screen, with each flight of the squadron in a separate box. Select the shield icon if you want to change the number of aircraft or pilots in the flights. You can change the formation by clicking on the right/left arrows on the top right of each flight formation box.

Shield

Select the shield if you wish to transfer to the flight assignment screen, which allows you to select pilots for today's mission and to issue new pilot orders.

Arrow with Cross

Select this icon to return to the previous menu without accepting any squadron changes.

Arrow

Select this icon to confirm any squadron changes you may have made, and go to back to the previous menu.

The orders for each flight are displayed in a grid at the bottom of the screen. Any order can be changed by selecting it. A clipboard will appear and new orders can be chosen.

Map

Disk

Arrow/cross

Medal

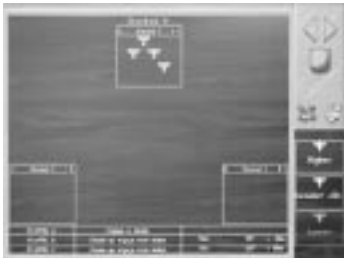
Computer

Joystick

Paintpot

Shield

Arrow



SQUADRON PLANNING AND PILOT ASSIGNMENT SCREEN

On this screen you can view the pilots in your squadron and their current assignments. Pilots are attached to A, B or C Flight (or Staffel) or are unassigned in the reserve. New pilots appear during the course of a campaign, and their quality will depend on the morale of your squadron. The higher the morale, the better the quality of the new pilots arriving. Many of the areas on this screen are selectable:

Pilot slots

Each named pilot occupies a slot within one of the four flight boxes. You can move pilots within flights, to a different flight or to and from the reserve. Select the pilot you wish to move and then select the slot to which you wish to move him. If that slot is currently occupied by another pilot then they will swap positions.

Flight select

Select or deselect an entire flight (or staffel) by selecting the tick/cross in the left hand corner of the flight's box. This will determine whether or not the flight will take part in the next mission.

Pilot select

Select or deselect a pilot by clicking on the left hand column to the left of his slot. If a pilot is selected then his numbered plane will appear in the flight's formation box in the centre of the screen.

Flight arrows

Select the left/right arrows on any flight box to view the names, skill level, position and orders of each pilot in the flight. Select the left arrow once to view information on the pilot's morale, character, skill and current number of kills. Select a second time to view details on a pilot's position in the current formation. You will be given his range from the flight leader, bearing from the leader and altitude difference. Select a third time to bring up the current orders assigned to the pilots in the flight. Select the orders to display a clipboard which lists the orders which may be issued. Click on the order you wish to give to the pilot. Note that you cannot assign orders to the flight leaders.

Formation arrows

Select the left/right arrows on the small formation box of each flight to cycle through the different combination of available flight formations.

Tick

Select the tick when you have completed your squadron planning.

It is important that you assign individuals correctly. Poor planning will lead to increased losses and this will have a detrimental effect on the moral of the pilots in your squadron. It is usually unwise to assign a rookie pilot to a rear or exposed position as this will put the pilot in extra danger. On the other hand you might wish to have your most experienced pilots next to you! Make sure that you have a clear understanding of the mission objectives as this will indicate the difficulty of the mission and therefore the

strength of the squadron required to accomplish the task.

Paintshop screen

Select the paintpot on the Squadron screen to visit the Paintshop. As it's name suggests, it is where you can decorate your squadron's aircraft. It is essential that friendly aircraft and their pilots are swiftly identified. Without radios the best way of facilitating this is to give each pilot an aircraft with a unique marking. At the top right corner of the screen there are a number of selectable icons:

Shield

Selecting the SHIELD causes all aircraft in the current flight or squadron to be painted in the leader's colours. This icon is disabled if the current pilot is not a flight or squadron leader.

Staffel/Flight arrows

Select the arrows opposite the name of the staffel or flight to toggle through the flights.

Pilot arrows

Select the arrows to cycle through the individual pilots of the chosen flight.

Arrows,+/- in circles

Select this icon to rotate and zoom the view of the aircraft in the paintshop.

Aircraft over double arrows

Select the aircraft icon to change the aircraft type in the paintshop.

Tick

Select the tick to confirm your paintshop orders.

Down the right hand side of the screen, underneath the above icons, there are further selectable icons which indicate features that can be cycled by selecting the up and down arrows next to them:

Aircraft

Selects the eight overall paint schemes for the entire aircraft.

Top wing

Selects the colour scheme for the top wing only.

Rudder & engine cowling

Selects the colour scheme for the engine cowling on rotary aircraft or tail fin if stationary-engined.

Bottom wing

Selects the colour scheme for the bottom wing.

Fuselage

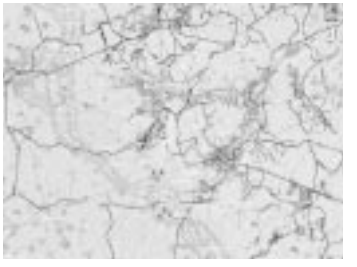
Selects the colour scheme for the fuselage.

Elevators

Select the colour scheme for the elevators.

Head/Eagle insignia

Select the individual insignia for fuselage markings.



THE MAP SCREEN

The map screen is accessed from the main Campaign screen, and displays waypoints and the course of your flight path. The flight path is displayed as a line joining the waypoints. Each map screen also displays information about strategically important Allied and German facilities and munition dispositions. The symbols you will find on the map screens are as follows:

Shield

Staffel /flight arrows

Arrows, +/- in circles

Aircraft over double arrows

Tick

Aircraft

Top wing

Rudder & engine cowling

Bottom wing

Fuselage

Elevators

Head/Eagle insignia

Waypoint


German airfield


Allied airfield


Field artillery

Important bridges


Active balloons


Tank depot


Tank convoy


Supply dump


Command centre

Each of these symbols will highlight when underneath the pointer. If the symbol is in a square box then it is a German feature, if in a circle then it is an Allied feature. Selecting any symbol will open a dialogue which gives further information about the feature as well as its map location.

The map screen is especially useful during the Tank Battle Campaign, where it must be used to alter your patrol route by clicking on the waypoints shown and dragging them across the map to the position required. You can drop the waypoint icons on top of other icons on the map. The waypoint action will then change from patrol to attack, and your Jasta will attack the item represented by the icon. When attack waypoints are set, it is possible to use the F3 key during flight to padlock on to the target.

Note that you will have to attack ground targets in this campaign to make maximum impact on the course of the ground fighting. To gain information on the current status of ground units, select them with the pointer.

In the Flying Circus, Spring Offensive and Hat in the Ring campaigns, the waypoint positions cannot be altered. However selecting a waypoint will lead to further information about that point. Click on the buttons on the panel in the top right of the map to gain additional information on places of interest, such as the locations of active balloons and the location of airfields and bridges.

1.6 THE AIRCRAFT COCKPIT

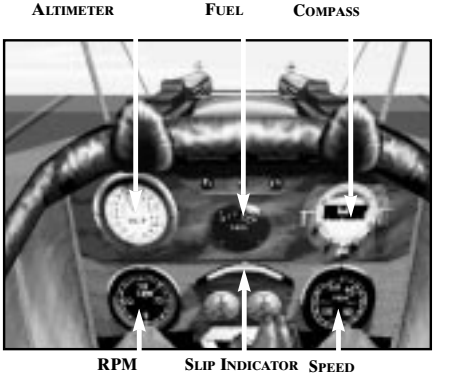
Players should note that not all cockpits have the same instruments.

To receive further information on your aircraft's flight status press the i key. There are 3 levels of information which may be obtained by pressing the i key consecutively three times. Pressing it a fourth time will remove all information from the screen.

Pressing i once gives stall warning lights (your aircraft is in danger of stalling if either of these lights is not green), current altitude (height above ground), current bearing (course), machine gun ammunition left, bombs remaining and current thrust (or rpm).

Pressing i again gives tactical information (where your target is for instance).

Pressing i the third time gives information on the current view selection being used.



CHAPTER TWO - FLYING

2.1 THE AIRCRAFT

Of the many aircraft featured in "Flying Corps", six can be flown by the player. These six have been chosen to represent the two main types of aircraft available towards the end of the war. The rotary engines group, which includes the Sopwith Camel, Fokker Triplane and Nieuport 28, were highly manoeuvrable and agile. However, when compared with the stationary engined group, they were slow and underpowered.

The stationary engined group, which is represented by the SE5a, Albatros D3 and Spad 13, were high performance aircraft with high speeds and good sustained climbs. These aircraft were relatively stable in flight and were generally easier to control than rotary engined aircraft.

The rotary engine was very temperamental and vulnerable to mistreatment. For instance, an aircraft fitted with a rotary engine could not be left to tick over. To avoid "meltdown", the aircraft had to be airborne within minutes of ignition.

Fuel delivery on the rotary engine was complicated. The pilot had to balance the air and fuel intakes and even then there was not a great range of control. In fact, on the early rotary engines the pilot had a blip switch: he could choose between no power and full power. In Flying Corps we have provided a straight forward set of controls for power. It can be changed in steps of one or ten percent. In addition, by using the comma (0% thrust) and fullstop (100% thrust) keys, it is possible to "blip" the engine.

However it was not just the fuel delivery system that made the rotary engined aircraft difficult to master. The huge mass of the engine rotating at high speed gave rise to very large gyroscopic effects which forced the aircraft to nose down in right turns and nose upwards in left turns. These large gyroscopic forces caught many inexperienced pilots by surprise and were the cause of many fatalities during training.

Fortunately in Flying Corps you will not have to deal with the gyroscopic effect when doing your initial training. The default aircraft model is fairly neutral and, to some extent, it behaves like a modern single prop two-seater. There are some differences though. For instance, in the default model even slipstream and torque effects are turned off. Also, because World War One aircraft were tail heavy, you will find that at the beginning of a mission you will need forward pressure on the stick to fly level. Generally this tail heaviness weakens during the course of a mission as fuel usage gives rise to a shift in the centre of gravity.

To see the range of effects that can be introduced into the flight model, select Preferences from the main menu and then choose the "aircraft on a grid" icon. Some effects are more apparent on certain aircraft. Obviously the rotary engined aircraft display the greatest change in manoeuvrability when the gyroscopic effects are turned on.

The co-ordinated rudder option is less obvious. This option is designed to balance the adverse yaw effect that occurs during a roll. Consider a clockwise roll as viewed from the pilot seat. The roll occurs because the lift on the left wing is greater than the lift on the right wing. Now there is always a drag associated with a lift and the bigger the lift the bigger the drag. This drag acts to pull the wing backwards. The left wing has the bigger lift and so it has the bigger drag with the result that the aircraft yaws to the left.

The effect is called adverse yaw because the aircraft ends up turning in the wrong direction. If a pilot wants to turn to the right, he will roll the aircraft clockwise. If the adverse yaw effect is not balanced then the aircraft yaws to the left.

In modern aircraft adverse yaw is designed out of the aircraft. However the effect was present on early aircraft and is most noticeable on the SE5. Adverse yaw is counteracted by use of the rudder. If you don't have rudder pedals we suggest that you enable co-ordinated rudder.

2.2 FIRST FLIGHT

"Always wear a belt or harness when flying the Sopwith Camel as there is a tendency to leave the seat when diving vertically" - Pilots' Notes

Select Preferences from the main options menu and then select the joystick icon. Configure your joystick by following the on-screen instructions.

From the main menu, select scramble. Choose to fly the "Camel" aircraft and the "First Flight" mission.

Your first flight starts at Boiry St Martin airfield which is south of the city of Arras. As you enter the cockpit, the power is already set to 100% and the speed is increasing. Press the i key to get the general information line at the top of the screen. Most of the data provided on the information line is available from the cockpit instrumentation. However for your first few flights, at least, we suggest that you use the information line because it is easier to interpret.

At about 20mph the airflow on the tail is sufficient for the tail to lift off the ground. The aircraft will pick up speed quicker now that the tail is not dragging on the ground. At about 40 mph gently pull back on the stick and the aircraft should leave the ground.

Use the stick to control the speed to 55-60mph. This range of speed will give the best climb. To speed up push the stick forward and to slow down pull the stick back. Leave the power setting at 100%.

At 500ft push the stick forward and try to fly straight and level. Don't forget that because World War One aircraft were tail heavy, you will need forward pressure on the stick to fly level.

At this stage, you should be over the main railway going south from Arras. Press m to get to the in-flight map screen. The aircraft icon represents your current position. The numbered icons represent the waypoints for the current mission. In this case the mission is a cross country familiarisation route. Starting at Boiry St Martin, the route takes you down the Ancre Valley to the town of Albert, then follows the road up to Bapaume before turning north to return home.

During the war, new pilots were sent up to get familiar with the surrounding country side. You should do the same so that you are able to find your way home after a mission. Boiry St Martin should be relatively easy to find because of the railway junction to the north of the airfield.

Return to the cockpit by clicking on the icon or pressing the return key. Now press p to pause the game and try to get your bearings. The number pad keys or joystick coolie hat can be used to rotate the view around the cockpit. The view out the front is restricted by the engine and guns and so a view to the side is often better when navigating. This is especially true when the aircraft is rolled slightly.

To get an even better view of the surrounding area, press F6 to get an outside view. The plus and minus keys can be used to zoom in and out when on the outside view. Press F7 to return to the cockpit. Press 5 on the number pad to reset the view to facing forward.

Press p to unpause the game and try some of the other views available on Flying Corps. F8 gives a forward view with the cockpit removed, F9 gives a flyby which drops into a chase view and F10 gives a

satellite view. Keys F1 to F5 are used for a set of padlock views. These will be described later when the mission involves more aircraft.

Try a gentle turn by rolling the aircraft about twenty degrees. Pull back gently on the stick to maintain altitude.

At this stage you can either try the suggested cross country route, get used to the aircraft or explore the landscape. You have about two hours of fuel.

When TAB is pressed the view changes to the map and the aircraft will follow the waypoints in accelerated time. Accelerated time is disengaged manually by clicking on the return icon.

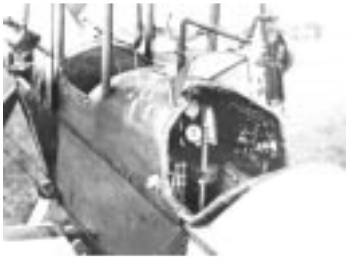
Press F12 during flight to access the Preferences. Flight difficulty factors, like the gyroscopic effect, can be turned on and off during flight.

When exploring the landscape fly high, 3000ft at least, to get your bearings. World War One pilots would then fly really low, "chasing" the contours. Around the Somme area the ground is quite flat and so you have to go really low when contour chasing. The height figure on the information line is measuring the height above the ground. Try to keep the reading below 20ft.

When you are ready to land, approach the field on a gentle glide (5-10 degrees) with the power off. You should aim to cross the airfield boundary at about 50mph and 50ft off the ground. Pull back gently on the stick. The speed should drop and contact with the ground should be made at under 40mph. When the speed has dropped to below the stall, the stick can be pulled back so that the tail makes contact with the ground. This will increase the deceleration.

Use short bursts of power to taxi the aircraft and steer with the rudder. It is also possible to steer on the ground by making use of the adverse yaw effect mentioned earlier.

In Flying Corps it is not necessary to land at the end of each mission. You can exit the mission at any point by pressing alt-x.



2.3 COMBAT MANOEUVRES TRAINING

In your first flight, the recommended manoeuvres were gentle, so you should not have lost control of the aircraft. However during combat you will be flying much closer to the "edge" and stalling and spinning is very likely. The purpose of the next training flight is to show you how to lose control, recover control and avoid losing control.

Fly the "First Mission" option again. Make sure that all the flight difficulty options, except spinning, are disabled. The spinning option should be enabled.

After take-off press the u key a few times. This key elevates the aircraft 500ft for every key press. This is a very useful cheat because in reality World War One aircraft took a long time to gain altitude.

Set up for straight and level flight and then reduce the power to 0% but maintain the altitude by pulling back on the stick. Over the course of a few seconds you will have pulled the stick back as far as it will go and the speed will slowly drop to around 35mph. At this point the aircraft will either stall or spin.

If you entered the maneuver flying absolutely straight and level then the aircraft will stall. This means that the nose of the aircraft will drop even though you are pulling back on the stick. Recovering from a stall is easy: release the stick, wait for the airspeed to build up to about 50mph and then gently pull back on the stick.

If the aircraft was rolling or yawing when you entered the maneuver then the aircraft is more likely to spin.

The spin can be guaranteed by applying and maintaining full rudder when the aircraft enters the spin. Recovering from a spin is a little more tricky: release the stick and apply full rudder to counter the spin, wait for rotations to cease and then release the rudder. Allow the airspeed to build up to about 50mph and then gently pull back on the stick.

In the above example, the spin occurred at low speed. In combat, spins will generally occur at higher speeds. Try this example: Select full power and gain some altitude by pressing the u key a few times. Roll the aircraft into a vertical or 90 degree bank. The aircraft will start to lose altitude, so pull back on the stick. Keep pulling on the stick to tighten the turn. At some point you will lose control and, depending on aileron input, the aircraft will either spin in or out of the turn. Neither situation is desirable in combat and so we need to consider how to maintain control rather than how to recover once control is lost.

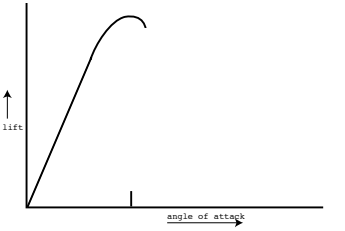
If you are going to maintain control of your aircraft during air combat, some understanding of the theory of flight is necessary. Many books have been written on the subject and we have recommended a few in the bibliography. We cannot hope to do justice to the subject in a few lines, but we do have the advantage that we can let you try things out on the flight model.

First though, we need to define some terms. An aircraft wing is design to provide a lifting force. When this force is greater than the weight, the aircraft will go up. The amount of lift provided by the wing depends on the following factors:

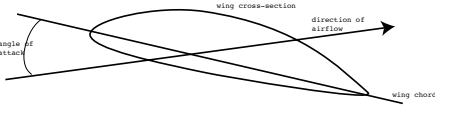
Shape Some wings are better lifters than others.

Velocity squared: The faster the air flow the bigger the lift.

Angle between the wing chord and the airflow: This angle, which is shown in the diagram, is commonly called the angle of attack.



If an aircraft which is flying straight level slows down, then there is a tendency for the lift to reduce and the aircraft will go down. To maintain level flight , the pilot compensates for the loss of speed by increasing the angle of attack. This is done by pulling back on the stick. At some point though, increasing the angle of attack no longer results in an increase in lift. At this critical point which is known as the stall, the lift actually starts to decrease as the angle of attack increases.



In Flying Corps the top general information line contains angle of attack indicators for both left and right wings:

Indicator Colour	Angle of Attack Meaning
green not stalled	<13^{o}
yellow near stall	13-15^{o}
pink at stall	15^{o}
red stalled	>15^{o}

If the conditions of both wings are indicating red then both wings are stalled. If only one indicator is red then only one wing is stalled and the aircraft will spin because the lift on the two wings is not in balance.

To maintain control, the wings should never be allowed to enter the stall zone. In a tight turn the indicators should be yellow. After a few combat missions you will develop a feel for the aircraft, you will recognise the initial signs of a spin and won't have to rely on the indicators.

Practice vertical turns by simultaneously rolling the aircraft to close to 90 degrees and pulling back on the stick until the indicators turn yellow. A tendency to roll out of the maneuver is ideally compensated for by using the rudder. Aileron can also be used but you then run the risk of stalling the top wing and spinning out. Maintain full thrust and balance the aileron, elevator and rudder controls, to turn as tightly as possible with the minimum of altitude loss. Push the aircraft to the limit until you can turn on the "edge" but retain control.

If your aircraft will not spin even when you have applied full elevator in a tight turn then you need to recalibrate your stick. When the stick is calibrated properly it is not possible to maintain control with full elevator applied.

2.4 Advanced Combat Manoeuvres

'He must be able to loop, turn his machine on its back, and do various other flying stunts - not that these are actually necessary during combat but from the fact that he has done these things several times he gets absolute confidence, and when the fight comes along he is not worrying about how the machine will act. He can devote all his time to fighting the other fellow, the flying part of it coming instinctively.' - Bishop

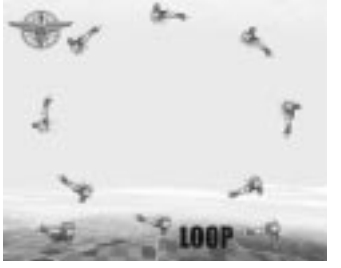
In a combat situation, most fighter pilots considered anything more than a tight turn to be tooexotic. Richthofen was not interested in aerobatics and said that he would never do a loop. He was more interested in a positive attitude and shooting ability. However some manoeuvres are useful and as Bishop said, practising aerobatics gives the pilot confidence.

You do have to be very careful when performing aerobatics in combat. There is the danger that you will concentrate too much on the maneuver and not enough on what your opponent is doing. Also many manoeuvres will slow the aircraft down and a slow aircraft is very vulnerable in combat. Even if you can see that your opponent is not in a shooting position, it is still dangerous to slow down. There are other aircraft in the sky.

The Half Roll

Yeates described this as the "only stunt useful in fighting" and in World War II, this maneuver became known as the Split S. The stunt is useful when you need to shake someone off your tail. It is performed by rolling the aircraft on its back and then pulling back on the stick.

Loop



This maneuver is seldom used in combat. It simply involves pulling back on the stick and keeping it there. The aircraft will climb. At the top of the manoeuvre, the aircraft will be inverted and facing in the opposite direction. Keep pulling back on the stick and the aircraft will dive. Eventually it will be right side up and flying on its original heading. A loop is best entered from a slight dive and with relatively high speed. In the stationary engined aircraft this maneuver is straightforward,

whereas in the rotary engined aircraft, plenty of left rudder will be required at the top of the maneuver whilst inverted.

In both types of aircraft you will need 'to feel' the amount to pull back on the stick. Too much or too little may result in a stall.

IMMELMANN TURN

This maneuver is used to reverse your direction and there are two versions. In the first, pull back on the stick and keep it back, as if you were going to loop. When the aircraft is inverted and facing in the opposite direction to which it commenced the manoeuvre, roll the aircraft the right way up. This is, in effect, the half roll in reverse. Although it has the advantage of gaining height whilst reversing direction, it should be used with circumspection in combat, as the aircraft is slow and vulnerable near the top of the manoeuvre.

There are many variations of the second version of the manoeuvre. In its purest aerobatic form it becomes the "Hammerhead". However, this is no good in combat because it involves going very slowly at the top of the climb. In fact, the combat maneuver is more like a Wingover: pull back on the stick and immediately apply rudder and aileron in the same direction. It is possible to intentionally stall the lower wing to increase the rollrate. On rotary engined aircraft, the pull back will result in a yaw to the right which will make right turns faster.

DIVE AND ZOOM

This maneuver consists of diving down on your opponent and opening fire at about 150m. When the range is about 50m, stop firing and pull out of the dive. As you fly over your opponent, he could pull up sharply and get in a snapshot at you. To avoid this, apply a little roll when pulling out of the dive. At the end of the maneuver you should have regained your height advantage over your opponent.

Dive and Zoom tactics suit the stationary engined set of aircraft. These aircraft have a high performance and can outclimb the lower powered rotary engined aircraft. However, rotary engined aircraft are better in turning fights.

CHAPTER 3 - TACTICS

'Always above, seldom on the same level, never underneath.' - Mannock (61 - 73 victories)

The function of aerial tactics is to gain an advantage, and the good patrol leader will never attack without an advantage. Many of the factors to consider when assessing advantages are just as important today as they were in World War I. It is probable that maintaining the element of surprise will always be the most significant factor. However, the patrol leader should also consider firepower, aircraft performance, pilot skill and numerical advantage. The advantage of height though is no longer as important as it was. During WWI, aircraft had little excess power and gaining height took a long time. In WWI the pilot of the higher aircraft often had the luxury of being able to choose whether he should enter the fray or disengage. Mannock's simple instruction can be paraphrased as... never attack without an advantage. By 1917 success or failure in air combat was largely dictated by the skill and ability of the patrol leader. i.e. success was to do with choosing the time to fight rather than being good at fighting

'The commanding officer is responsible that neither he nor any of his pilots are surprised by the enemy. If he cannot see to that, he is no good as a leader.' - von Richthofen (80 victories)

Tactics can largely be divided into two sections. Firstly those used by the patrol leader to approach the enemy and gain an edge for the forthcoming dogfight, and secondly those used by an individual during the dogfight. Clearly, if the patrol leader has done his job well, there will be no dogfight. The enemy will have been surprised and destroyed before he has had a chance to react.

'The best way to shoot down an enemy aircraft was to surprise him and get as close as possible before opening fire.' - Rochford (29 victories).

Fighter pilots in World War I had no previous experience to draw on to guide them in air combat and so had to devise the best methods for attack and defence themselves. The earliest example of a set of rules for air combat was the 'Dicta Boelcke'. These were drawn up by Oswald Boelcke (40 victories), Germany's leading air ace at the time and the guiding force behind the formation of the fighter Jasta (squadron) in 1916. Although he was killed later in the year, the Jastas followed his principles and decimated the Royal Flying Corps (RFC) during 'Bloody April' 1917.

As the war progressed, air combat became more complex, and solo patrols became a thing of the past. Flying in formation and teamwork became more important.

'German air strategy was intended to be scientific; they were unwilling to attack except from a winning position derived from the advantages of height, surprise and numerical superiority, and they did not hesitate to avoid or run away from combat when these factors were not in their favour. They also avoided crossing the lines, to have the further advantage of fighting above their own terrain. ... They were also adopting the idea of large circuses, flying in layers, and when you attacked one of the layers, it

melted away eastwards while the people above dived on you.' Yeates (5 victories)

It is this period of intensifying air combat that Flying Corps portrays. To be successful, a player will have to master the arts of both patrol leading and individual combat. Many Allied fliers regarded 'Mick' Mannock as the expert in both these fields, so it seems appropriate to set down his rules.

MANNOCK'S RULES

'Pilots must dive to the attack with zest, and must hold their fire until they get within one hundred yards of their target.

Achieve surprise by approaching from the East (i.e. from the German side of the lines).

Utilise the sun's glare and clouds to achieve surprise.

Pilots must keep physically fit by exercise and the moderate use of stimulants.

Pilots must sight their guns and practise as much as possible as targets are normally fleeting.

Pilots must practise spotting machines in the air and recognising them at long range, and every aeroplane is to be treated as an enemy until it is certain it is not.

Pilots must learn where the enemy's blind spots are.

Scouts must be attacked from above and 2 seaters from beneath their tails.

Pilots must practise quick turns, as this maneuver is more used than any other in a fight.

Formation flying at 25 yards apart must be practised.

Pilots must practise judging distances in the air as these are very deceptive.

Decoys must be guarded against - a single enemy is often a decoy - therefore the air above should be searched before attacking.

If the day is sunny, machines should be turned with as little bank as possible, otherwise the sun glistening on the wings will give away their presence at a long range.

Pilots must keep turning in a dogfight and never fly straight except when firing.

Pilots must never, under any circumstances, dive away from an enemy, as he gives his opponent a non-deflection shot - bullets are faster than aeroplanes.

Pilots must keep their eye on their watches during patrols, and on the direction and strength of the wind.'

'Fighting tactics varied with circumstances; there were rarely two identical situations ... consequently adjustment of tactics had to be made to suit the occasion. However, the main principle remained the same: the enemy must be surprised and attacked at a disadvantage, if possible with superior numbers so the initiative was with the patrol. To achieve this objective, it was sometimes necessary to spend over half the time of the patrol maneuvering the enemy formation into an unfavourable position. Having got it there, pilots must dive to the attack with zest ... The combat must continue until the enemy has admitted his inferiority, by being shot down or running away' - Mannock

FORMATIONS

'Formation flying ... was our great forte, our compactness and drill often intimidating superior formations.' - Fullard (40 victories).

World War I aircraft did not carry radios, and apart from some very basic signals such as flares and wing waggling, communication was impossible once airborne. Therefore pilots must be briefed,

instructions issued and the formation to be flown set out before the patrol leaves the ground. In some cases the requirements of the mission and the availability of pilots and aircraft will dictate the formation to be used.

'The formation adopted must admit of quick and easy maneuver by the formation as a whole.' - RAF Instructions

Ideally a formation should be stacked in layers, with the leader in front and all other aircraft above and behind him. The rear aircraft can convert this altitude into speed and close up with the leader when required. The leader is the strike force and responsible for manoeuvring his patrol into a position of advantage. His followers provide a look out and cover his tail. When setting up the formation, any novices should go to the immediate right or left of the leader as these are the safest positions. The tail is the most vulnerable area of the formation and this is where experienced pilots should go.

'Within the flight, each [pilot] has a distinguishing emblem on his machine.' Richthofen

Rapid identification of aircraft and pilots is vital in a dogfight, and aircraft should be clearly marked to help achieve this. This is especially true of the leader's aircraft.

THE APPROACH

'The great thing is to see things. ... Many a fresh pilot is shot down before he even knows there is a Hun within miles ... practise looking round you so that you study every square foot of the earth and sky every two minutes. Watch the region of the sun especially.' - Yeates

It is estimated that 80% of pilots shot down never saw what hit them until it was too late. Spotting the enemy before he spots you is therefore of crucial importance in becoming a successful airfighter.

'Whenever you're over the lines, you have to keep twisting your neck in all directions every minute, or you're sure to be surprised.'

- Rickenbacker (26 victories)

The very best World War I pilots could possibly glimpse an enemy aircraft at about 5 miles (approx. 8,000 m). Most pilots could start to pick out a target at around half this. In Flying Corps the range at which there is a reasonable chance of spotting an aircraft is around 2 1/2 miles. When aircraft are spotted the first thing to determine is who and what they are. The leader must fix their position, maneuver his flight to gain an advantage and gain more information.

If the aircraft is under fire from 'archie' - anti-aircraft or AA guns - , it may be possible to deduce which side it is on, since German AA shell bursts were black and the Allied white. However, the situation is complicated by the fact that the Germans developed a system of firing close to their own aircraft in order to warn them of possible attack, although these tended to be individual shells rather than full barrages. Nevertheless, if the machine is over friendly lines and being fired at, it is reasonable to assume that it is hostile.

In the absence of 'archie', the following information can be deduced from the numbers and action of the unidentified aircraft:

A formation of six or more machines, flying on no definite course = **an offensive patrol of fighters.**

A single machine low down, flying a regular oblong course = **a two-seat artillery observation machine.**

A single machine low down, flying a very irregular course = **a fighter attacking ground targets.**

A single machine, flying very high on a straight course = **a long distance reconnaissance mission.**

A formation of six or more machines, flying at medium altitude and two or three below them flying a nearly straight course = **a photographic patrol with escort.**

Two large formations one above the other flying on a straight course = **a bombing mission with escort.**

Depending on the aircraft's position relative to the front lines, it may be clear whether they are hostile or not. The patrol leader should also be aware that fighters often fly in stacked formations, so having spotted one 'layer' he should check above and below for more. Similarly, if a small group of aircraft is behaving rather recklessly, they could well be 'bait', with a large group of friends above them, ready to pounce on any ill-considered attack, or they could be part of a large fighter formation out 'looking for trouble'

'Always remember it may be a trap!'

- Lufbery (17 victories).

To approach an unidentified aircraft, patrol leaders should follow Mannock's advice, and approach from an unexpected direction, ideally using the sun and cloud cover to gain a position of advantage. If in doubt - climb! The patrol leader should be constantly thinking ahead, planning his attack and keeping a lookout for further aircraft.

'Mannock planned every maneuver like a chess player.' - Jones (40 victories)

During the approach the target should be continually observed. If it starts to climb or manoeuvre, one must assume that it is hostile and experienced; if it carries on undisturbed, it is either friendly or unaware; if it dives for home, it can probably be attacked with impunity ... unless it is bait!

'Almost every evening we would find well-laid traps set for us. It required careful manoeuvring to avoid falling into them. Several times we did, and it took a lot of trouble to get out safely. Four or five Huns would come along and we would engage them. Then suddenly as many as 15-20 would appear from all angles and join in the fight.' - Bishop (72 victories)

The leader is the strike force of the patrol. All other aircraft are concerned with keeping a look-out. This rule should apply no matter how many aircraft are in the patrol. When the enemy is spotted, it is the patrol leaders responsibility to decide what to do - attack, maneuver or disengage.

'It must be impressed on pilots that the group is the fighting unit and not the individual.'

RAF Instructions

If the patrol finds itself being stalked, the decision must be made whether to attack, maneuver or disengage. This decision may well be determined by the relative abilities of the machines involved, or by the patrol's mission. If the patrol's aircraft are superior, they can maneuver and attempt to turn the tables. If inferior, a swift decision must be made whether to immediately attack, which may be enough to scare the attacker off, or to disengage. Ideally the latter should be done by a climb towards friendly lines.

ATTACK

Once in position the attack is commenced. The purpose of the first attack is to destroy or scatter as many of the enemy as possible, to minimise the effect of a counterattack

'The leader must always ensure that his formation is well closed-up before attacking, giving the rear machines time if necessary, so that all pilots can attack their adversaries simultaneously.' RAF Instructions

Against enemy fighters, the attack will ideally have been launched from above and behind. The leader will start to fire at his target at between 100 and 200 yards, and keep firing until collision is imminent.

'Mannock would take the leader [of an enemy formation] in order to give his pilots coming down behind him a better chance of an easy shot.' - Jones

During an attack, opinion was divided on whether it was better for pilots to concentrate on a single enemy or each engage an individual target. It was important to try and eliminate the enemy leader on the first attack, yet at the same time, more targets engaged tended to mean more casualties inflicted and greater confusion. In addition, many pilots converging on a single enemy tended to be worried more about colliding with their friends than pushing the attack to the limit. They had reason - there were far more collisions in World War I air combat than in later conflicts. Mannock and von Richthofen were both of the view that it was not worth 'ganging up' on a single target.

After attacking, the decision must be made whether to stay and dogfight, entering a turning engagement with the enemy, or to pull out in a zoom climb. 'Dive & Zoom' tactics are generally safer for the attacker, especially if he turns as he zooms, since he gains separation from the enemy thereby minimising the chance of a counterattack whilst preserving the advantage of height, thereby allowing him to either attack again or disengage. This decision may well be influenced by the types of machines engaged. Rotary-engined scouts on the attack may prefer to stay and enter a turning contest with a high performance enemy.

If leading a smaller formation against a larger one, or even flying alone, it is especially important that the first attack should inflict considerable damage and confusion. Care should also be taken to ensure there is a safe retreat route. This could be a zoom climb to safety, or by using the speed built up in a diving attack a run for home. If the smaller formation cannot launch an attack with these advantages, the decision to engage should perhaps be reconsidered.

Finally, a lone pilot could launch a stealthy attack, ideally from behind or below (although the surrendering of the advantage of height is not normally recommended). The object of such an attack is to pick off the rearmost enemy, hopefully without the other enemy pilots noticing. It is suggested that a lone attack should only be contemplated if the attacker's aircraft has significant advantage in either speed or climb - or the lone pilot is supremely confident in his own abilities!

THE DOGFIGHT

When two patrols meet with neither having a positional advantage, a dogfight develops fairly rapidly.

'It was when five or six met five or six that real dog fights occurred.' - Yeates

When one formation has surprised another, a dogfight will form after the initial shock has dissipated. Formations tend to break up into a series of one on one engagements with pilots desperately trying to find a target, whilst avoiding becoming one themselves! In such confused aerial melees there is still a vital role for both teamwork and leadership. A patrol should fight as a team, with pilots looking to protect one another's tails, and the leader ensuring he remains aware of the general course of the fight.

'A patrol leader's work is to pay more attention to the main points affecting the fight than to do all the fighting himself. The main points are

1) arrival of more enemy aircraft who have tactical advantage i.e. height.

2) patrol is drifting too far east

3) patrol getting below the bulk of enemy formation.

As soon as any of these conditions occur, it is usually better to break off the fight temporarily, and to rally and climb above the enemy before attacking them again.' - RAF Instructions

Note: Turning towards an attacker is the better way to proceed. Turning away from an attacker is not recommended.

OFFENSIVE MANOEUVRES

'The main point is to make tighter turns and to stay above the opponent.' - Richthofen

'I fly close to my man, aim well and then of course he falls down.' - Boelcke

This in a nutshell is what offensive tactics are all about, keeping the advantage, manoeuvring to within 100 yards of the enemy and getting in position, ideally directly behind, to deliver the decisive burst. There are however a few more tricks that may be of benefit to budding aces.

Firstly, fight according to your strengths, not the enemies. If you are in a high performance stationary-engined scout, it is folly to enter a turning contest on equal terms with a nimble rotary-engined enemy. New pilots were told by 56 Squadron (SE5a) to 'dive and zoom', not dogfight.

Secondly, most pilots find it easier to turn to the left, so perhaps an attack from the right should be contemplated.

Thirdly, the opponent can sometimes be panicked into adopting foolish tactics. If an enemy looks as if he is outdistancing you, a few long range bursts may distract him and encourage him to start weaving. This will slow him down and allow you to get within effective range. Richthofen used this trick on more than one occasion.

'Being under fire is bad for the nervous system.' - Coppens (37 victories)

Stark (11 victories) found himself up against a Camel which continually evaded him by turning. Stark fired a quick burst which so startled the Camel pilot that he came out of his turn and flew straight, presenting an easy target. The key things to remember in a dogfight are to keep the initiative, make the enemy react to you, try to stay above your opponent and always fly with a cool head.

'He who gets excited in fighting is sure to make mistakes' - von Richthofen

Fourthly, constantly monitor what is going on around you. In a dogfight there are often no second chances, and one of the biggest mistakes that can be made is to lose awareness of what else is going on and where the other enemy machines are.

'It is well ... never to stay long after one machine.' - Bishop

Yet as Mannock said, every fight is different, there are no 'universal rules' to success in the air, only guides. Established tactics must be adapted to the situation, and sometimes ignored completely.

Finally, remember that all the great aces emphasise that it takes considerable experience and practice to become adept at dogfighting. The Flying Corps novice would be wise to bear in mind Yeates' advice to a raw pilot on what to do in an aerial combat:

'Never mind about shooting down Huns; if one gets in your way, shoot at it, but make quite sure first that no

other Hun is getting into position to put a burst into you ... give yourself a chance. Anyone can shoot you down if you don't see him coming .' Yeates

DEFENSIVE MANOEUVRES

'He was no good, the durn fool just put his nose down and flew straight. He was cold meat.'

- Maclaren (54 victories).

If you are attacked, the important thing is to do something, anything, to put the enemy off his aim. Many raw pilots simply froze and were shot down with ease. Clearly, some defensive manoeuvres are better than others, and the defender will have to make a quick decision on whether he wishes to simply evade the attack or attempt to turn defence into offence.

When you are under attack from the rear, the best defensive tactic is to turn in the direction the attack is coming from. If the attack is coming from the left, perform a hard left turn.If the attack is coming from directly behind, a turn in either direction should be made, but try to remember the relative performance of the aircraft engaged. If you are flying a rotary, a turn to the right is probably best, whilst if you are in a stationary-engined scout against a rotary, a left turn is advised.

'Watching carefully over your shoulder and judging the moment he will open fire, you turn your machine quickly so as to fly at right angles to him. His bullets will generally pass behind you during this manoeuvre.' - Bishop

With the defensive turn, timing is critical. Too soon and the attacker has time to make a smooth adjustment and keep you in his sights. Too late and you present him with a simple close range shot. If possible, climb whilst turning, as in this way you may be able to turn the tables on your attacker.

'If I am attacked by a single-seater from above, I make it a point never to let up on the throttle; rather to make all turns and dives at full speed. I turn towards the opponent and try by pulling up in each turn to attain the enemy's altitude and get the better of him' - Richthofen

As an alternative to the turn, 56 Squadron advised new pilots:

'If the enemy fire is too hot - hard rudder and no bank - sideslip!'

Richthofen was against such a manoeuvre, possibly because it limited the chance of being able to gain the initiative and turn defence into attack. Clearly these manoeuvres could be combined; many Camel pilots found the best way of throwing an enemy off his aim was a hard turn with a sideslip, which made any aimed shot at their aircraft almost impossible. German pilots could do much the same with the triplane, Voss utilising these tactics against McCudden, turning defence into attack -

'To my amazement, he kicked on full rudder without bank, pulled his nose up ... gave me a burst ... and then kicked on opposite rudder.'

A sudden zoom is another ploy which may be used, but this works best if being attacked by a single enemy who is very close, the aim being to make him overshoot. This could be combined with a roll to further reduce speed and maybe change direction, or carried on into a loop or Immelmann. Much here would depend on the relative speeds and performance of the aircraft involved. A poorly-judged zoom would almost invariably be fatal as the defender would be left at very low speed, offering an easy shot. McCudden (57 victories) describes the

result of a zoom and turn contest where the inferior machine initiated the manoeuvre -

'I zoomed, the SE just went up a little higher, then we both turned inwards and the Hun losing height, I at once did a quicker turn and got behind him.'

Most pilots thought the loop a waste of time in combat, Mannock saying that a zoom followed by a turn was far better.

A roll may also force an attacker to overshoot. Although presenting a difficult target, it has much the same disadvantages as the zoom, and was especially dangerous against multiple enemies. Most pilots advised against this ploy.

If a pilot simply wanted to escape, a spin would sometimes be deliberately induced. This made the aircraft a very difficult target and might possibly persuade the attacker he had got in a fatal burst. But this maneuver involved the loss of a great deal of height, with the added disadvantage that if the attacker followed the defender down, he was given an easy shot when his target pulled out of the spin. Most aces recommended against this ploy, but most also used it at least once to escape during their career!

'For 1,500m, with almost full motor, I spun, nose dived and slithered.' - Brooks

Lothar even sometimes used a spin to lure the enemy into close range before suddenly pulling out and surprising his attacker, turning the tables.

What all pilots were instructed not to do when attacked was simply to dive away. Even fast-diving aircraft such as the Spad and the SE5a couldn't outrun bullets, and the straight dive away simply presents the attacker with an easy shot. If you are in a fast machine and wish to disengage then you must first throw the attackers aim off or get out of the field of fire before commencing your dive to safety.

If you do find yourself under attack and are unsure what do:

'follow the very simple rule of not diving away, but turning sharply from an enemy's fire.' - Jones

ATTACKING TWO-SEATERS

Two-seaters with their lower performance were often regarded as 'easy victims', especially the poorer British aircraft such as the BE2 and RE8.

'If you sat properly under its tailplane, the Hun couldn't touch you. Of course you had to keep there and that was a matter of flying, and a scout ought always to outfly a two-seater.' - McCudden.

Despite McCudden's views a two-seater with an

observer manning the rear gun was both much harder to surprise than a fighter and had the added advantage of being able to fire both forwards and backwards. The approved method to attack one of these machines was, as McCudden said, to fire from a position about 100 yards behind and 20 yards below. The RAF instructions also advised that a short vertical dive directly onto the two-seater could work, as this would present the observer with a difficult shot. Richthofen suggested:

'One attacks the two-seater from behind at great speed... the only way to avoid the adroit observer's machine gun fire is to stay calm and put the observer out of action with the first shots'

However, a well handled two-seater could make lone attacks both difficult and dangerous, and several aces were killed attacking a so-called 'easy victim.'

A rather better method for the average flight was to attack as a team.

'At least two Camels should work together against a two-seater; while the observer was firing at one, the other killed him. The same might be said of any other scout, for it took a great man like McCudden to work alone.' - Yeates

The standard defence of a two-seater under attack was either to dive for home, hoping to prevent the attackers from getting in the observers blind spot under the tail, or to turn and lose height at as slow a speed as possible, forcing the attacker to overshoot or pull out to a point where the observer could have a clear shot.

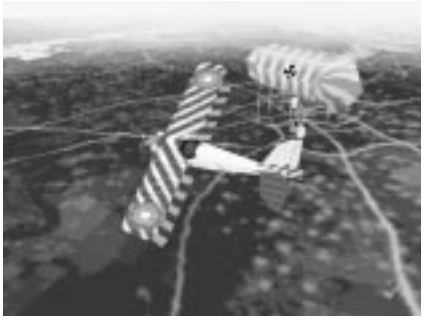
SHOOTING

Nearly all the great aces emphasised that the most important skill in aerial combat was accurate shooting

'The most important thing in fighting was shooting, next the various tactics in coming into a fight and, last of all, flying ability itself.' - Bishop

Yet, apart from a few natural shots, most World War I flyers found actually hitting the target in a dogfight very difficult indeed. Beauchamp-Procter (54 victories) and McElroy (47 victories) hit nothing during their first five months of active service whilst Jones (40 victories) took part in 16 aircombats before claiming a victory.

'When one has shot down one's first, second or third opponent, then one begins to find out how the trick is done.' - Richthofen



As with every other facet of this new war in the air, successful aerial gunnery required both practice and experience

In pursuit of successfully engaging the enemy, pilots were handicapped by their weapons. Machine guns were prone to freezing at high altitudes and there was always the risk of them jamming, especially if a long burst was fired. Most aces spent hours on the ground checking their guns and loading the ammunition themselves, to minimise the chance of a malfunction at a crucial moment

'A well- firing machine gun is better than a smooth-running engine.' - Richthofen

Aircraft on both sides carried about 500 rounds of ammunition per gun, enough for about 50 seconds of firing. German scouts could carry more but most pilots preferred not to, in order to save weight. The ammunition load normally comprised a variety of rounds, the Germans tending to have a mix of standard ball, armour-piercing and phosphorus. This was fine for short ranges, 50 yards or less, but added to the inaccuracy of long-range fire due to the different ballistic properties of the assorted rounds. According to a RAF pamphlet the cone of fire from an aerial machine gun was 10' by 15' at 200 yards and this inaccuracy made a destructive burst of long range fire unlikely.

With unreliable weapons and primitive sights, pilots, ideally, wished to be directly behind and within 30 yards of an enemy in order to have a reasonable chance of hitting and destroying him with a short burst. Short bursts were important to minimise the chance of a jam. Successful fire from outside this envelope was simply beyond most pilots. This was why the objective of every patrol leader was to attack with surprise - to give his pilots the benefit of the simplest shot possible.

However, determined pilots could work out rudimentary methods of hitting targets which were not in the ideal position. For deflection shooting, Mannock advised his pilots to sight about 5 yards in front of the target's engine, fire, and, whilst firing, bring the sight back as far as the enemy pilot and then push it forward again. Jones achieved several of his victories following this technique. In the twisting, turning dogfights of 1917 and 1918 mastery of this skill gave a pilot a huge advantage.

Recognising some of the problems the RAF gave the following advice on aerial gunnery:

'Opportunities in the air are almost invariably fleeting. Fire should therefore be reserved until a really favourable target is presented and should then be in rapid bursts. Fire should only be opened at ranges over 300 yards when the object is to prevent hostile machines from coming to close quarters. ... and should not be opened at ranges of over 500 yards under any circumstances. In offensive fighting the longer fire can be reserved and the shorter the range, the greater the probability of decisive result. Pilots must accustom themselves to judging the range by the apparent size of the hostile aeroplane ... this needs constant practice ... A reserve of ammunition should be kept for the return journey when fighting far over the lines.'

Before embarking on a full Flying Corps campaign, you are advised to practise your gunnery in the SCRAMBLE missions, for, as Mannock said:

'Good flying has never killed a Hun yet; get on with sighting your guns and practise spotting Huns. Then shoot them down before they shoot you.'

ATTACKING BALLOONS

Due to the large amount of 'archie' (anti aircraft guns) around a balloon position, attacks on these targets were normally cordially disliked by most pilots, although there were specialists such as Coppens who shot down 36. The generally preferred method was the fast, steep dive, 56 Squadron in SE5s going in at 250 mph, hoping that the speed gained would protect the attacker from archie and surprise the crew so that they had insufficient time to pull the balloon down to safety. The diving attack also allowed the assailant to either zoom to safety above the archie or streak towards the sanctuary of the front lines at low level and high speed, either way minimising exposure to hostile fire.

However, the sneak attack was also used, often by a lone aircraft. This involved approaching the target at low level from an unexpected direction. The preferred times for these raids were either dawn or dusk. Sometimes the approach would be made with the engine off, by Rickenbacker for example, to minimise the chance of detection. Allied pilots reported that German scouts employing this method were sometimes painted in dark colours to help them blend into the gloom.

Regardless of whichever method was used, the attackers often had to get perilously close to their target, British Buckingham (i.e. incendiary) ammunition being of little use beyond 150 yards.

GROUND ATTACK

Although some pilots enjoyed this work, most hated it, the feeling being that no matter how good or lucky you were, sooner or later, ground fire would get you. Attacks were normally made in pairs. Camels tended to attack the same target simultaneously, both converging on it from different directions, but 84 Squadron in SE5s preferred a method where one pilot would dive on the target from 500' and, as he

pulled out, at 50', the second aircraft would commence its attack. This latter method did appear to reduce casualties.

As for hitting the target:

'The method found by experience to give the best results is to dive the machine steeply at a point on the ground a few yards in front of the target. The lag of a bomb released from a few hundred feet on a steep dive is very little. Individual pilots must find out by experiment exactly how far ahead they must aim.' - RAF Instructions

Experienced RAF pilots preferred a rather different method, and also suggested ways in which the danger from ground fire might be minimised:

'Machine guns were difficult to attack. You had to look out for them more to avoid than encounter, for if you went diving right down on a nest, giving them a no-deflection shot, it would certainly be your last

dive. ... If you had any bombs, you could try a lucky drop without diving, but the great thing was to keep turning and side-slipping.' - Yeates.

ARCHIE (ANTI AIRCRAFT FIRE)

'It was said that he [Archie] had once brought down an enemy aircraft, but the story was apocryphal.' - Yeates

Anti-aircraft fire was not a great menace to fighters unless they were damaged, flying under 1,000' or there was a large number of guns, for instance around a balloon. Nevertheless, being under fire from archie added to the strain of a patrol, and could distract attention at a vital moment. Besides, there was always the chance of a lucky hit.

'His sudden appearance was more surprising than dangerous, but it was not advisable to go on flying straight for long when he was active.' - Yeates

If fire from archie was unusually persistent or accurate pilots were advised:

'The enemy's aim can be thrown out temporarily ... by turning sharply, diving or climbing, but it is seldom advisable to lose height, especially when far over the enemy lines.' - RAF Instructions

But archie had other uses apart from shooting down aircraft. By merely firing on a formation, 'he' tended to make it open out and become preoccupied, possibly allowing an enemy patrol to launch an attack in the confusion. Archie could also send signals to friendly aircraft, warning them of danger, or informing them of an opportunity. Archie can be laughed at, but it's better not to ignore him.

THE FLYING CIRCUS

When the First World War started in August 1914, military aviation was new and no one knew quite what to make of it. As the Western Front became deadlocked, the generals came to rely more and more on reconnaissance aircraft for information on what was going on 'the other side of the hill.' Very soon it became apparent that, not only was it essential for your aircraft to gather information behind the enemy front line, but it was also necessary to stop him from doing the same behind yours. Consequently, experiments in fitting weapons to aircraft commenced, and fighting in the air started.

After various false starts it became obvious that the most effective weapon for an aircraft was a machine gun, ideally mounted to fire directly forward. By mid 1915 the Germans had developed a synchronisation gear, allowing the pilot to simply aim his aircraft at the enemy and pull the trigger, his gun only firing when there wasn't a propeller blade in the way. With this weapon the Fokker Eindecker gained a measure of air superiority for the Germans and the first aces, such as Boelcke and Immelmann, were created. The general tone of the air war was also set with the Germans, usually having less aircraft than the Allies, being on the defensive. Strategically this defensive posture was later revealed to be a mistake, and a misuse of airpower, but tactically it gave the Germans significant advantages.

Both sides recognised the importance of achieving supremacy in the air and the first pure fighter units were created. Initially these tended to be flights, sometimes of only two aircraft, 'tacked' onto an existing reconnaissance squadron, but as airfighting grew in intensity, specialist units consisting only of fighters were formed. For the RFC, 24 Squadron arrived in France on the 27th February 1916, equipped only with a single-seat fighter aircraft, the DH2, which helped put an end to the 'Fokker Scourge'. The French formed the Cigones (Storks) at Verdun and in August the Germans introduced the Jagdstaffel (Jasta), a fighter squadron of 14 aircraft. The first to be formed was Jasta 2, commanded by the leading ace and tactician of the period Oswald Boelcke. Equally importantly, a Jastaschule was set up at Fomars, where would-be fighter pilots received final training in aerial combat from experienced instructors. By October there were seven Jastas in existence with the German Air Service, and their impact was immediate, as they had three significant advantages over their opponents:

Firstly, the pilots were generally hand-picked for their skill and aggression.

Secondly, they tended to operate in larger formations than the Allies over the front lines.

Finally, their formation coincided with the introduction of new German fighters, notably the Albatros DII. This aircraft not only had a performance advantage over many of the Allied machines in service but also mounted two machine guns firing straight forward, giving it a significant edge in firepower over Allied fighters which only mounted one.

On the Allied side, the Royal Flying Corps (RFC) was going through a phase of dramatic expansion. Whilst this would later pay dividends, it

The Battle of Arras gets underway, and the stakes become high.

meant that, for the moment, the vast majority of British aircrew had insufficient training, little experience and were flying machines of inferior quality. As losses mounted, this became a vicious circle with more and more pilots committed to action with both less training and a growing shortage of experienced leaders to look after them. In addition, the British Staff, unlike the French and German Staff, distrusted the policy of grouping the better pilots into elite units.

Boelcke (with 40 victories) was killed in a collision on 28th October 1916 but his place was swiftly filled by Manfred von Richthofen, who shot down Britain's leading pilot Lanoe Hawker on 23rd November 1916. By the spring of 1917, there were 37 Jastas, led by hand-picked pilots who had already proved themselves in combat. On 14th January 1917, von Richthofen took command of Jasta 11, arranging for his brother, Lothar, who had just finished pilot training, to be posted to the unit. The war in the air was about to enter a new phase.

For Spring 1917, the Allies planned a huge joint offensive between Arras, the British, and the Aisne, (the French). To support the British offensive, the RFC deployed 25 squadrons with around 365 serviceable machines, of which perhaps a third were fighters. There were further British squadrons to the north, including many naval units, from the Royal Navy Air Service or RNAS, which were based in France to support the ground fighting. When the Arras battle commenced on 9th April 1917 there were five German Jastas in the region. This number rose to 8 as the battle continued. The month of April 1917 was almost catastrophic for the RFC, and has since been known as 'Bloody April'. A total of 245 aircraft were lost due to enemy action during the month, with 211 aircrew killed or missing and 108 taken prisoner. This compared to a grand total of 499 aircrew lost in the five month Battle of the Somme the previous year. The average life of a RFC fighter pilot at this time was less than 2 weeks. The French lost approximately 55 aircraft in April. The German pilots claimed 298 Allied aircraft destroyed including 34 balloons, whilst the Allies claimed 196 German aircraft destroyed with a further 206 out of control but German records, which are incomplete, indicate losses of only 76.

This crushing German victory was due to a combination of circumstances.

Firstly, the average German pilot was vastly more experienced than his British counterpart. The autumn and the spring had been spent training, mastering the new aircraft and being taught the 'tricks of the trade' by experienced masters.

Secondly, the German aircraft were generally superior to those flown by the Allies (although not exclusively so). The introduction of the Albatros DIII only widened the margin of superiority, when, that is, the aircraft held together.

Thirdly, because the Jastas operated on the defensive with faster machines, they could pick and choose when to engage. A good Jasta leader would only fight when he had the advantage and there was

little the British could do about this. For the British, this meant that they tended only to be in combat when at a disadvantage over enemy lines, often having to fight their way to safety in slower machines, outnumbered and with fuel running low.

Fourthly, the Jastas normally operated over their side of the lines. This minimised the chance of capture if a machine was damaged or an engine malfunctioned. In addition the prevailing wind was usually in the German's favour. This made it easier for them to escape if things went badly whilst further adding to British problems when they, in turn, were trying to fight their way home.

Finally, because British aircraft were always on the offensive, the Germans operated in 'a target-rich environment'; there were always opportunities to score, normally against inferior machines, such as the elderly BE2 and FE2 observation machines. The French, who were rather more circumspect, and who had, in the main, better machines and pilots than their allies at this time, suffered far less. Due to the less aggressive nature of French pilots, German pilots thought of a posting to the French front as something of a rest, although there were some very capable French pilots, especially those in the elite Les Cigones.

H. A. Jones, the official RAF historian, described von Richthofen's leadership and tactics as follows:

> 'Richthofen's task was to inflict the greatest damage with the minimum of loss to his own service, and he knew that, on any day suitable for flying, great numbers of aeroplanes of the Royal Flying Corps would be over the German lines. He seldom had to seek combat and he could make his choice, and if it was ... to avoid or to break off a fight, Richthofen would never hesitate... [Richthofen's unit] was, therefore, not only extremely active, but also extremely elusive.'

Despite the Jasta's advantages it should be noted that the combat was not always completely one sided. Konig (6 victories, Jasta 2) was killed on 2nd April 1917 attacking a FE2d, Osterroht (7 victories, Jasta 12) was killed on 23rd of the same month and Festner (12 victories, Jasta 11) was killed two days later, 25th April. Lothar von Richthofen's plane was seriously damaged attacking a FE2b on the same day and he was only saved by the timely intervention of Schafer. It is sobering to bear in mind that, of the 14 top German scorers in April 1917, only 2 would survive the war, one of these being Lothar von Richthofen himself.

In addition, although the British policy of a non-stop aerial offensive has been much criticised for resulting in heavy losses, it did give an advantage in both morale and experience which would be vital in the climactic battles of 1918. No British aircraft was lost on its airfield to a German aerial attack, whilst the Germans were quite often surprised or strafed at their home base; in 1918, for example, Jasta 40 lost all its aircraft to a British attack on its airfield.

The influence of an experienced and aggressive leader on a fighter unit can be seen from Manfred von Richthofen's Jasta 11. When he took command of the Jasta, it had no victories. Only one other pilot, Schafer, had scored prior to joining Jasta 11, despite the fact that all the pilots were experienced flyers. Under Richthofen's leadership, Jasta 11 scored 36 victories from January to March and 89 victories in April, accounting for about a third of all RFC losses! Richthofen himself claimed 36 of these victories, bringing his total to 52, and making him the leading ace of the war when he went on leave at the beginning of May. His brother Lothar, meanwhile, had scored 16 victories, but Manfred was not altogether satisfied with Lothar's performance, feeling that he was too reckless, a 'shooter' rather than a 'hunter' and overly-fixated

about scoring a kill on every flight. Nevertheless, Lothar was placed in command of Jasta 11 during his brother's absence.

April had been a terrible month for the RFC but there were some promising signs.

Firstly, despite the high casualties, the RFC was still able to operate in German airspace.

Secondly new aircraft, such as the SE5 and the Bristol Fighter, were on the way or had just been introduced. Although due to faulty tactics the Bristol Fighter had been savaged by Jasta 11 in April, it was later to become one of the finest aircraft of the war.

Thirdly, future leading aces, such as Bishop and McCudden, had survived.

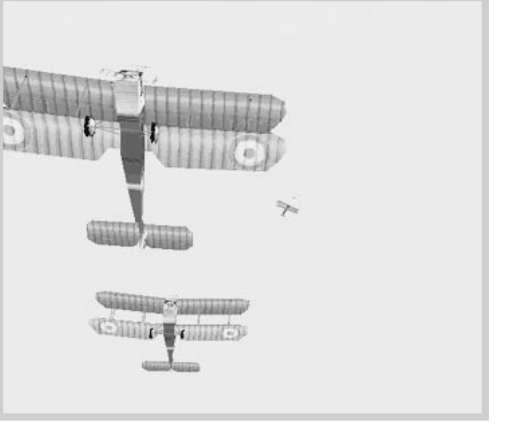
Finally, and possibly most importantly of all, 56 Squadron had arrived at the front, flying its first patrol on 22nd April 1917. For the formation of this squadron, the RFC had overcome its dislike of grouping crack pilots into a single unit and had combed France for experienced flyers. Of 56's initial complement, seven pilots would go on to become aces, and three of the pilots who joined in May 1917 would also become aces. By the end of the war, 56 Squadron would claim 427 victories. Amongst 56 Squadron's initial complement was Albert Ball, commanding A Flight, who already had 31 victories. The brand new squadron was given a brand new fighter aircraft - the SE5. For almost two months, the squadron practised with their new machine just outside London, far away from the slaughter over Arras. Although initially the new aircraft was not popular, being rather less manoeuvrable than the Nieuports which most of the pilots were familiar with, the squadron soon came to appreciate its excellent qualities, including speed, ruggedness and rate of climb. It was easy to fly and had no serious vices. The RFC now had a fighter aircraft that was equal, and in some areas superior, to the best that the Jastas were equipped with. The SE5 also mounted two machine guns and was a very stable firing platform.

Although 56 Squadron was not officially formed as an 'anti Richthofen' squadron, it was soon seen as such, and, in effect, perhaps it was, as 56's mission was to re-establish Allied air superiority over Arras, which meant that sooner or later it would have to engage and defeat Jasta 11. It is also interesting to note that 56 tended to follow Jasta 11 and later JG1 up and down the front for the rest of the war. In response, the German press indignantly claimed that the British had put a price on the head of their leading ace. Curiously some German pilots also thought that 209 Squadron, which was engaged by Manfred von Richthofen in his final fight in 1918, was also a special 'anti Richthofen' squadron, perhaps because the squadron marking was red noses!

Meanwhile, on the other side of the lines, the Germans had formed the first fighter group, combining Jasta 3, 4, 11 and 33 into a single fighting unit. This concentration of fighter Jastas would later become a permanent 'Jagdgeschwader'. It would move up and down the front, being sent to wherever the fighting was hottest, and this mobility, combined with the brightly coloured planes its pilots flew, led to it being dubbed the 'Flying Circus' by the Allies. Although April had been a successful month for the Jastas, the Germans still planned to fight a defensive air war as they were still outnumbered. The entry of America into the war on the side of the Allies meant that the numerical odds would tip further against the Germans in the future.

With his brother away on leave, Lothar steadily increased his score, shooting down three aircraft in the first week of May - an FE2b, an FK8 and a Nieuport 17. On the other side of the lines 56 Squadron got steadily more aggressive with its patrols and, with growing confidence, had several brief encounters with red Albatrosses. Ball's victory tally had reached 44 by 6th May 1917. The following day, despite poor conditions, both Jasta 11 and 56 Squadron were patrolling the front around Douai, the home of Jasta 11, as were 19 Squadron (Spads) and 8 RNAS Squadron (Triplanes) together with some Nieuports and Bristol Fighters. Jasta 3 may also have been in the area. What followed was one of the most hotly-debated combats of World War 1, the exact details of which will never be known. Taking off at 5.30 p.m., the 11-strong 56 fought a series of running battles with various numbers of Albatrosses in worsening visibility, gradually getting split up in the process. Finally Lothar was left locked in single combat with Ball, the end result being Lothar crash-landing and Ball being killed in a crash behind German lines. Eventually the Germans decided that Lothar must have shot him down, although Lothar himself claimed a triplane, but it is equally likely that Ball either became disorientated during his combat with Lothar and lost control, or suffered a mechanical malfunction, possibly due to battle damage or low fuel. Only 5 pilots of 56 Squadron made it home, one other pilot being killed and four crash-landing (with two wounded) on the British side of the lines. They claimed four definite victories and two possibles but Jasta 11 lost only Pluschow wounded, although other aircraft may have been forced down without injury to the pilot. 56 Squadron's defeat may have been due to over aggressiveness in its showdown with Jasta 11, but the Jasta seems to have had the clear edge in tactics, its various flights providing much better support for one another than the scattered individuals of 56. It was a sobering lesson for the RFC, one that it would eventually learn very well indeed.

After his battle with Ball, Lothar further increased his tally. On 9th May 1917, he shot down a Bristol, on the 10th a Pup and on the 11th another Bristol. On the 13th, flying with Karl Allmenroder,



Lothar, his score now 23, spotted a BE2 which dived away. Lothar pursued and shot it down at low level. With a light haze obscuring the area, Lothar stayed low looking for landmarks so he could find his position. Anti-aircraft guns opened fire on him, hitting the Albatros and wounding Lothar in the left hip. He managed to stagger over the lines and crash-landed, waking up in hospital at Douai. His brother, upon hearing the news, remarked 'Lothar has been playing the fool again.' His wounds would keep Lothar out of combat for five months, his only consolation being the award of the 'Orden Pour le Merite', otherwise known as the Blue Max, on the 14th, a mere four months after it was awarded to his brother. Manfred later wrote 'Had my brother not been wounded, I believe that, after my return from leave, he likewise would have gone on leave with 52 having been dispatched.' By June 18th Manfred was back in combat.

GERMAN MARKINGS

In early 1917, Manfred von Richthofen hit upon the idea of painting his Albatros red. Whilst this could be seen as an example of bravado, it did have practical benefits. During air combat it was important for pilots to instantly identify their leader, and it also helped ground observers follow the course of an engagement. Its impact on morale for both friend and foe should also not be underestimated. Before long, other German pilots were following his example. Lothar wrote:

'It had long been our wish to have all the aeroplanes of our staffel painted red... the request was granted... As we could not see each other's faces in the air, we chose these colours as recognition symbols. Schafer... had his elevator, rudder and most of the back part of the fuselage black, Allmenroder used white on the nose and spinner, Wolff used green and I had yellow'.

Indeed, most of Jasta 11's aircraft at this time were mainly, but not entirely, red. Typically, aircraft would have red fuselages and struts, sometimes red tailplanes and wings. Individual markings, applied in addition to Jasta markings, were often based on the colours of the pilot's former army regiment. Richthofen's aircraft soon became known as 'le diable rouge' or 'le petit rouge', as he referred to it. A rumour went round the RFC that it was flown by a girl in the fashion of Joan of Arc. Schafer meanwhile was referred to as 'the Pink Lady' by British pilots.

JASTA 11

On 1st May 1917, when Manfred von Richthofen went on leave, Jasta 11 included, in addition to Lothar, the following pilots who had scored victories:

Pilot	Victories to date	Final total
Wolff	27	33
Allmenroder	9	30
Schafer	23	30
Mohnicke	1	9
Niederhoff	2	7
Brauneck	7	10

Of these Lothar, Mohnicke and Brauneck would survive the war.

Lothar's wingmen on the evening of 7th May were Allmenroder (10 victories to date), Mohnicke (1) and probably Simon (1). Although there are reports that Wolff was flying, these are almost certainly incorrect as he had been posted to command Jasta 29. The confusion probably arises from Simon flying a similarly marked Albatros.

TANK BATTLE- CAMBRAI 1917

The Allied ground attacks in spring 1917 achieved little and left the French army on the verge of mutiny. To keep the pressure off the French, the British launched a series of offensives in Flanders, culminating in 3rd Ypres. In October, the British attacks were fought to a standstill in the mud and blood of Passchendaele. Above the trenches the war in the air intensified as both sides strove to achieve an advantage that would tip the ground fighting in their favour.

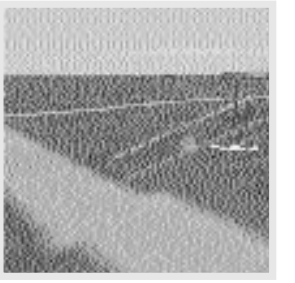
The RFC continued to expand and was bolstered by the arrival of new aircraft. The SE5 was given a more powerful engine and, as the SE5a, became one of the most successful fighter aircraft of the war. In June, the Sopwith Camel arrived, and swiftly established itself as the supreme dogfighting aircraft, claiming the destruction of 1,294 enemy aircraft by the end of the war. British training facilities had been greatly improved following the Bloody April nightmare. At the start of 1917 new British pilots reaching the front had often had less than 20 hours flying training - just sufficient to teach them the rudiments of aircraft control, but not how to fly in combat. By September new pilots arrived at their squadrons with about 48 hours flying experience. Across the lines, Jasta pilots soldiered on with the Albatros, and although a new model was introduced, the DV, many pilots complained of having to fight in inferior machines. Richthofen referred to 'this damned Albatros', whilst Osterkamp stated:

> 'The Albatros is no longer sufficient; the Camel and Spad are its superiors.'

The Pfalz DIII was introduced in the autumn but offered little in the way of improvement, and the one hope for the Jasta pilots was the Fokker DrI, or triplane. Unfortunately, although it exhibited dazzling manoeuvrability in the hands of a skilled pilot, there were a series of fatal crashes in October which resulted in it being taken out of service, whilst the reasons were investigated and modifications made. It was not until late December that the triplane returned to front-line service.

In response to numerical and equipment inferiority, the Germans officially formed Jagdgeschwader 1 (JG1) in June. This grouped Jastas 4, 6, 10 & 11 into a single unit under the command of Manfred von Richthofen, who could hand-pick his pilots. The unit was given its own transport and was fully mobile. Its job was to achieve air superiority over any critical area and so, as the British offensives continued, JG1 moved up and down the front to counter them.

As the fighting intensified, both on the ground and in the air, some massive dogfights erupted over the front lines. On 26th July 1917, up to 100 aircraft were engaged in a single dogfight near Ypres. The day of the lone flyer was all but over; what mattered now was teamwork and formation tactics. Through the skill and experience of their pilots, the Germans still, perhaps, had a slight edge in aerial combat, but this could not last forever. Allmenroder (with 30 victories) died in June, leading Jasta 11 against the British triplane squadrons. Schafer was killed in July (30 victories) and Dostler in August (26 victories) whilst Manfred von Richthofen was wounded in July. Schafer, Dostler and von Richthofen himself were shot attacking lowly two-seaters. In September Wolff (33 victories) was killed by Camels and Voss (48 victories)

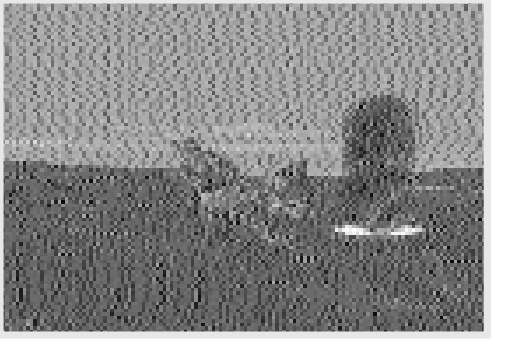


The Somme sector, south of Arras, 20 November 1917... Hundreds of British tanks are bursting through the Hindenburg line, with six infantry divisions close behind. The German defense is collapsing. Cambrai, a bastion for the German army, is menaced.

lost an epic battle against 56 Squadron. Both Wolff and Voss were flying early versions of the Fokker Triplane. Increasingly, the German aces and Jasta leaders had to fly to the limit to offset the increasing numbers and dominance of the RFC, the result being that more and more of them were killed or wounded. The war in the air was now becoming a very deadly business indeed and there were few easy victories.

Nevertheless, some daredevils still survived. In the summer of 1917 Sibley ('Squibs') and Shone in a Bristol Fighter flew over Germans on leave, who were socialising with their girlfriends on the promenade at Ostende, and showered them with rotten oranges. They later dive-bombed a German aerodrome with a bright red football and several streamers. In both cases they were careful not to fire - that would have ruined the joke!

The Third Battle of Ypres finished on 10th November 1917 and it seemed that this would be the end of serious ground fighting for the year. However, the British had one last card to play. On 20th November, they launched a surprise attack at Cambrai. After a lightning barrage, the British went 'over the top', the assault spearheaded by 374 tanks, with another 102 in reserve and supported by fighters flying ground attack missions. Handicapped by poor visibility, the German lines in many places collapsed completely, but a combination of desperate German defence, notably at Bourlon Wood and Flesquires, and poor British staffwork, meant that a complete breakthrough 'to the green fields beyond' was not achieved. Especially important in halting the British advance was the German artillery which was the best weapon to use against tanks. It often continued firing until it was overrun. At the end of the first day, 65 tanks had been knocked out, 71 had broken down and 43 were stuck in the trenches. The British continued the attack until around the 25th but, although further gains were made, the opportunity for a decisive success had passed. On the 30th, the Germans counterattacked after a one-hour barrage. German stormtroopers, who had spent the year perfecting their specialised assault tactics against the Russians and Italians, supported by dedicated ground attack aircraft, broke through the British lines. British reinforcements halted the German offensive and after several days of see-saw fighting, the battle petered out on December 6th with both sides largely in their original positions. Although not decisive, Cambrai pointed the way to how



battles would be fought in the future - with tanks, specialised assault troops and the widespread use of ground attack aircraft.

For Cambrai the British had massed 300 aircraft in the area, including 134 fighters, some of which came from 56 Squadron. In opposition, the Germans only had Jasta 5 with some support from Jasta 12 and 37. They were fortunate that Jasta 5 was one of their best fighter units, claiming 251 victories by the end of the war which made it the third most successful Jasta. On the 23rd, JG1 was rushed to the area, for once mirroring the movements of 56, and the air fighting intensified. 50 aircraft dogfights over Bourlon Wood

became common. Casualties were heavy, British squadrons undertaking ground attack missions suffering 30% losses a day. Despite these casualties, both sides continued to attack ground targets during the see-saw fighting. The objective of these missions, according to a German memorandum, was 'to shatter the enemy's nerve by repeated attacks in close formation and thus to obtain a decisive influence on the course of the fighting.' The British admitted 'the morale effect of this was very great and no doubt tended to facilitate the enemy's success.'

THE JASTAS

Jasta 5 machines had green tails with a thin red outline and red spinners. Wings were in the normal German camouflage, although later white chevrons were usually painted on these. Individual pilots often had large numbers or initials on the fuselage to aid identification. In reality, this unit received Triplanes in May 1918 from JG1 and these aircraft probably remained in their original markings. However, there is some evidence that certain aircraft had new markings painted on, but whether these were the Jasta 5 markings or individual pilots insignia is unclear. Notable pilots with Jasta 5 at Cambrai were Rumy (2 victories at the start of the battle, finishing the war with 45), Konnecke (8/35) and Mai (2/30).

Jasta 12 aircraft had black tails and white spinners. Their Triplanes had white cowlings.

Jasta 37 aircraft had tailplanes diagonally striped in narrow black and white bands. The fuselages were all black with white numerals on the nose and white symbols on the fuselage. At Cambrai, the Jasta was led by Udet, who had 14 victories (finishing the war as Germany's leading surviving ace with 62). He had a white chevron on his nose and a white 'LO' (after his girlfriend) on the fuselage.

Also in the area was 'Green Tail'. McCudden, a leading RFC ace with 56 squadron, had several encounters with an unusually aggressive Albatros Flight which had a very capable leader. On at least one occasion, this Flight forced 56 to 'run for it'. The German leader's aircraft had a green tail, yellow fuselage and red nose. There was a large capital 'K' on the top wing and an inverted white 'V'. His flight all had red noses and yellow fuselages but different coloured tails - green, red, light blue, black, yellow and black and white striped. Their first encounter with 56 was on 23rd November. On 19th December Mayberry, of 56, who had 21 victories, was shot down by 'Green Tail.' On 18th February 1918, McCudden in turn shot down 'Green Tail.'

JAGDGESCHWADER 1

Jasta 4 Triplanes had engine cowlings, wheels and interplane struts in an off-white colour.

Jasta 6 Triplanes had black engine cowlings and black and white stripes covering the tailplane.

Jasta 11 Triplanes had red engine cowling and interplane struts. Sometimes wings and fuselage were also red.

Jasta 10 was never issued with Triplanes.

GERMAN FIGHTER AIRCRAFT AT THE FRONT NOVEMBER 1917

Fokker Dr1 - 17 in October, 35 in December. Aircraft in reality grounded in November.

Albatros DIII	446
Albatros DV	526
Albatros DVa	53
Pfalz DIII	276 (in December)

BRITISH UNITS

At Cambrai, the British committed the following fighter squadrons: 64 and 68 with DH5s, 41, 56 and 84 with the SE5a, 3, 43 and 46 with Camels and 11 with Bristol Fighters. Aces included McCudden (19 victories at the start of the battle, final score 57), Bowman (20/32), Mayberry (18/21) all from 56 Squadron and Maxwell (11/27) with 11 Squadron. McCudden flew an SE5a with a white 'G' on the fuselage and a white band around the fuselage immediately in front of the tail. Later he fitted a large red spinner from a captured LVG to the nose of the aircraft and had a huge red '6' painted on the planes.

CAMBRAI IN THE GAME

We have made a few changes to the Battle of Cambrai for game purposes.

Firstly, we have made the weather better than it actually was to encourage air operations.

Secondly, we have allowed the Fokker Triplane to re-enter combat faster than it did in reality. This is to allow you to fly this classic First World War aircraft in a campaign setting.

Finally, we have allowed the Triplane to carry 4 bombs, which in reality it never did, in order to assist you against the British tank offensive.

SPRING OFFENSIVE

The winter of 1917 passed relatively uneventfully on the ground after Cambrai, with both sides preparing for 1918 which would in all likelihood prove decisive. The collapse of Russia allowed the Germans to shift large numbers of troops from the Eastern to the Western Front, giving them the opportunity to resume the offensive here once more. Indeed, they had little choice as the Americans were starting to arrive and soon the Allied strength would be unbeatable. For Germany it was a race against time. Britain and France had to be decisively beaten before the American build-up became irresistible. Extensive preparations were made for a war-winning attack. A vital factor in its success would be obtaining control of the air. To further this objective the 'Amerika Program' was drawn up. This doubled the number of Jastas from 40 to 80, although many of the new Jastas had only 8 or 9 aircraft and these tended to be the inferior types such as the Albatros DV and Pfalz DIII. Although engine and aircraft production was to be increased, and the facilities for training new pilots expanded, the new Jastas were never brought up to full strength. The two-seater ground attack units were formed into Schlactstaffels and enlarged. To further the quest for air superiority JG2 (Jasta 12, 13, 15, 19) and JG3 (Jasta 2, 26, 27, 36) were formed.

Jasta equipment remained relatively unchanged. The Fokker Triplane was back in active service, but it was seen only as a 'stopgap' measure until the Fokker DVII became operational, and relatively few Jastas were equipped with it. Jasta 6 and 11 (JG1) were all Triplane units, Jasta 4 (JG1) had some delivered in April. Jasta 10 (JG1) never received Triplanes, possibly because von Richthofen was hoping for the swift arrival of the DVII. The Jastas of JG2 all had some Triplanes, with Jasta 12 becoming all Triplane, as did JG3 (Jasta 27 all Triplane). This somewhat patchy introduction of the Triplane and the retention of the older aircraft meant that formations of mixed aircraft types were common.

The RFC looked forward with confidence to spring 1918. Nearly all of the fighter squadrons had been re- equipped with either the SE5a, the Camel, the Spad XIII or the Sopwith Dolphin. The lessons of 1917 had been taken to heart and, under experienced leaders, it was felt that the RFC could overcome whatever the German Air Service threw at them. Despite the growing strength of the enemy, the RFC continued its policy of a perpetual offensive. In addition, unlike the Germans, the British did not form specialised ground attack units, but preferred to use normal fighter squadrons for this work. This was proved to be the correct decision as it was a far more flexible doctrine, allowing fighters, normally Camels, to bomb the enemy and then undertake a normal patrol, something the Schlactstaffels were unable to do. Indeed the Schlactstaffels were to prove a disappointment in 1918, making little impact on the ground battle and operating at a disadvantage in the air.

The British Army, exhausted by the battles of 1917, and given an extra 28 miles of front line to occupy due to the weakened state of the French, adopted a

Early 1918, and the German lines are cloaked in secrecy. Plans for a last great push are afoot. Can the Germans recapture all losses since 1915? Can they break through the entire Somme front? Their goals include Arras… Amiens… and beyond.

defensive posture. It was confident that, despite the increasing number of troops recalled from Russia, the German offensive would be 'shot to pieces' when it eventually came. After all, the British had been attacking across no-man's-land since 1915 and they had never achieved a breakthrough. Why should a German advance fare any better?

The German High Command planned to smash the British Army first and then turn on the French. The attack was meticulously planned and would use the 'stormtroop' tactics seen at Cambrai. Some 1,680 aircraft were massed against the British, 730 of them to support the first attack, leaving only 367 to fight the French. JG1 and JG2 were both employed against the British, JG2 in the north around Ypres, whilst JG3 was on the border between the British and French positions. The RFC in the area chosen by the Germans for their offensive could muster 579 aircraft. The German assault commenced on 21st March after a lightning barrage. Concealed by mist, the stormtroopers rapidly broke through the British positions. At the end of the first day of the 'Kaiser's Battle', the British had suffered 38,000 casualties, lost 532 guns and been driven back 10 miles. The RFC was hurled into the battle to turn the tide. Despite its numbers, the German Air Service (Luftstreitkrafte), was unable to gain control of the air, the Jastas largely remaining on the defensive. Offensive operations were largely left to the Schlactstaffels, who fought at a disadvantage if caught by British fighters. If the German Air Service had concentrated on ground attacks with all its aircraft, it is possible that the British retreat might have been turned into a rout. As it was, the British flyers started to exert a decisive influence on the ground fighting. One German regiment reported 'Under the ... frequent attacks by air squadrons the attack cannot go on.' Nevertheless, under incessant German attacks, the British line continued to crumble, leading to the order 'Squadrons will bomb and shoot up everything they can see ... very low flying is essential. All risks to be taken. Urgent.' The British fighters accordingly attacked at very low level, one German account saying 'Lieutenant Nocke had to fling himself flat on the ground, but for all that he was struck on the back by the wheels of one machine, thus literally being run over.' The cost of such attacks was high, however. Stock of 54 Squadron wrote: 'We had very few pilots left of the old squadron by this

time. About six were missing and five had been wounded.' Many aircraft staggered back to base, riddled with holes. A mechanic noted 'Own aircraft badly shot about, rather stirring times.'

Although the priority for the RFC was to support the troops on the ground, there was still substantial fighting in the air. Trollope of 43 Squadron (Camels) scored six victories on 24th March. On the

27th, the Germans claimed 26 victories (13 by JG1) and a further seven from anti-aircraft fire. In reply, the RFC claimed 16 confirmed victories. The following day, Trollope was wounded and shot down and 43 Squadron lost five Camels from a patrol of 9 when they ran into JG1. However, despite the pressing need of their troops for air support, many of the Jastas seemed reluctant to abandon their old defensive tactics, much of the fighting being done by JG1; von Richthofen scored 9 victories during the course of this first German attack, taking his total to 75. But JG1 could not be everywhere at once. Stock, flying a bombing mission, encountered six German aircraft above his formation: 'The Huns went east, thus showing their usual spirit of avoiding a scrap unless the advantage is with them.' This led a German ground unit to complain 'The English got valuable support from their aircraft, which attacked regardless of the consequences ... Our own airmen were absent.'

The first German attack was halted on the 5th of April, 10 miles short of the vital town of Amiens. Although there was a lull in the ground fighting, the battle for air supremacy continued, 43 Squadron losing another 5 Camels on the 6th when they once again came across JG1. Meanwhile on April 1st the RFC and RNAS were merged into a new independent organisation - The Royal Air Force. Although the long term results of this were to be highly significant, to the weary British pilots at the time it meant little other than amusement that in the new uniform they tended to get mistaken for generals, and rather less happily that pay would now be paid a month in arrears rather than a month in advance. To co-ordinate the ground battle better, the French general Foch had been placed in supreme command of the Allied Armies on April 3rd.

On April 9, in poor visibility, the Germans launched a second offensive, once more against the British, who had disregarded reconnaissance reports from their pilots warning of the new German build up. The German assault troops swept through the British lines again, putting the Allied positions in grave peril. Field Marshal Haig issued an order of the day to the British forces:

> 'There is no other course open to us but to fight it out. Every position must be held to the last man. There must be no retirement. With our backs to the wall and, believing in the justice of our cause, one must fight on to the end.'

Despite some poor weather, fighting in the air intensified with JG1 being particularly active and successful for the Germans. For the RAF, 'Willie' Woollett of 43 Squadron equalled Trollope by shooting down six German aircraft in one day on 12th April. By the 18th, with the help of French reinforcements rushed to the front, British troops halted the German advance. Nevertheless, over the battlefield, the air fighting continued, with some huge, multi-layered dogfights developing.

On 21st April, Captain Roy Brown of 209 Squadron (Camels) filed the following combat report :

> 'Dived on a large formation of 15 to 20 Albatros Scouts and Fokker Triplanes, two of which got on my tail and I came out. Went back again and dived on a pure red Triplane which was

firing on Lieut. May. I got a long burst into him and he went down vertically and was observed to crash ... I fired on two more but did not get them.'

The pilot of the red Triplane was Manfred von Richthofen, who the day before had claimed his 80th victory. He was dead.

On the ground, heavy fighting continued until the 25th, when the Germans broke off the battle. Their next blow would be against the French and, although this would bring their artillery to within range of Paris, the final chance for a German victory was gone.

The RAF emerged from these defensive battles with a huge amount of credit. Although losses had been heavy, their missions had been 'an important factor in stemming the German onrush.' (Liddell Hart). For the German Air Service, spring 1918 had been less satisfactory. Although certain individuals and Jastas had scored heavily, overall they had failed to achieve air superiority for some of the most crucial battles of the war. In part, this was because they were suffering from the rapid expansion, brought about by the 'Amerika Program'. There were not sufficient experienced pilots to man all the Jastas, especially when the best ones generally went to the Jagdgeshwaders. This tended to mean that the average British squadron was superior to the average German Jasta, especially as the British had the edge in the quality of their aircraft. In addition, the Jastas seemed to have had difficulty in adjusting to offensive operations. One British pilot wrote of the German fighters:

> 'There were dangerous Huns about, circuses like Richthofen's ... [but] the German habit of draining their best pilots away into circuses, left the ordinary people very ordinary' and
>
> 'Their wind up was enormous; they were exceedingly difficult to find and never attacked without odds of four to one in their favour and the advantage of height ... The only people with any fight left in them seemed to be Richthofen's crowd.' - Yeates, 46 Squadron.

German flying operations were further handicapped by having to move forward to strange aerodromes as the British were driven back. The RAF retired onto its supply lines, but the Germans were continually advancing beyond theirs, sometimes seriously limiting the amount of support they could give to the ground battle.

Fighting in the air was now both a complex and sophisticated affair. Typical activity along the front lines would consist of the following:

1. Over the front line itself there would be ground attack and contact patrol aircraft, flying at 1,000' or less.
2. Just over a mile behind the front line would be the observation balloons, directing artillery onto enemy positions. These would be protected by anti-aircraft ('archie') batteries.
3. At about 4,000', corps aircraft (2 seater reconnaissance machines) would flit to and fro across the lines, directing artillery and photographing enemy positions. Hovering above them at around 7,500' would be fighters tasked with protecting their own observation aircraft and

shooting down the enemies; for the British, these fighters would normally be Camels, the Germans often using Triplanes at this altitude.

4. At about 14,000', there would be further fighter patrols, the British tending to use SE5a squadrons at this height, the Germans Albatros, Pfalz or Triplanes.
5. At 18,000', there would be further high-altitude fighter cover, the British having Bristol Fighters or Sopwith Dolphins here. At this height the top layer of the Jagdstaffels would also lurk (Albatros and Pfalz), usually in the sun.

In addition to all this aerial activity, Allied bombers and long range reconnaissance missions would tend to fly at between 10,000 and 14,000', often with fighter cover, and the Germans would have single high-altitude reconnaissance machines, nosing about between 18 & 25,000'.

For the British, Camels would tend to patrol up to about 10 miles behind enemy lines, the SE5s and Bristols about 20 miles, although trips of 40 miles into 'Hunland' were not unknown, whilst the long range reconnaissance and bombing machines would venture up to 100 miles behind the front.

The result of all these air operations was that there was nearly always some sort of air activity going on between ground level and 20,000', over a strip of territory at least 20 miles wide. There were constant opportunities to surprise an enemy aircraft or formation - and to be surprised oneself. Often a formation would dive on what appeared to be an easy

target, only to be jumped in turn by another enemy formation in the area. A simple flight against flight dogfight could suddenly escalate into a massive aerial melee with over a 100 aircraft engaged. In this confusing and constantly changing situation, good squadron and flight commanders were at a premium. Experienced leaders were required to keep friendly losses to a minimum whilst inflicting maximum damage on the enemy.

54 SQUADRON

This was a fairly typical RFC (later RAF) fighter unit. It was formed in May 1916. After a period in which it held its own in the air, flying Sopwith Pups, it

was re-equipped with Camels in December 1917, which it flew until the end of the war. It finished the war with something over 125 victories. During the fighting 11 pilots became aces whilst flying with 54. It was heavily engaged during the German Spring Offensive, often flying ground attack missions, losing 40 Camels between February and April, mainly to ground fire. Notable pilots with the squadron at the start of the German attack were Hackwill (3 victories by 21st March and a final score of 9), Kitto (4/9), Gonne (5/5) and Maxwell (5/9).

Unlike the Jastas, most British units tended not to use colourful markings. The Camels of 54 Squadron were in the standard British colour scheme, with metal cowlings and large white numerals on the fuselage sides, sometimes in front of the roundel, sometimes behind.

GERMAN FIGHTER AIRCRAFT AT THE FRONT - FEBRUARY 1918

Albatros DV	250
Albatros DVa	475
Pfalz DIII	182
Pfalz DIIIa	261
Fokker Dr1	143

NIEUPORT 28

TECHNICAL DATA

Speed:	128 mph at sea level, 123 mph at 6,500', 121 mph at 9,800', 119 mph at 13,100'
Climb Rate:	5.0 minutes to reach 6,500', 9.0 minutes to 9,800', 21.25 minutes to 16,400'
Maximum Ceiling:	20,000'
Wingspan:	26' 9"
Length:	21'
Weight approx:	1,540 lbs loaded
Armament:	2 Vickers machine guns firing forward.
Fuel endurance approx:	36 gallons, endurance approx. 2.25 hours

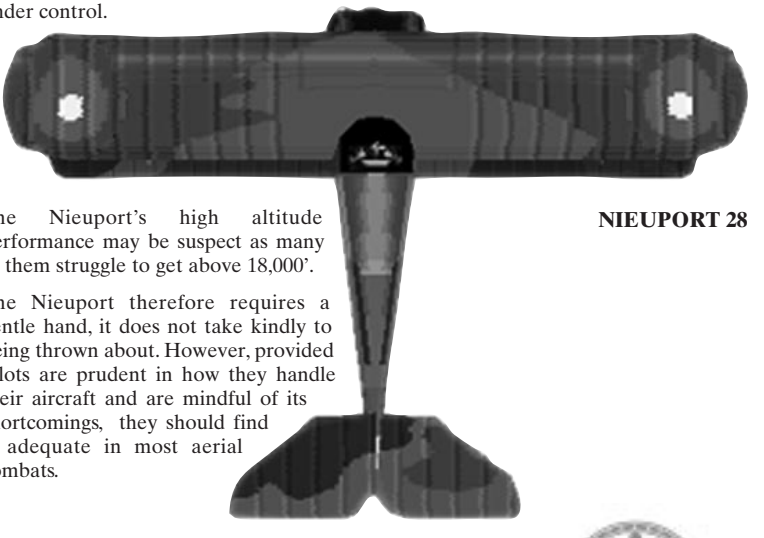
FLYING THE NIEUPORT 28

The Nieuport is a rotary-engined scout with a 160 hp powerplant. It is therefore a fast and manoeuvrable machine, but its performance is compromised by serious structural weakness. Pilots should generally attempt to outmaneuver their opponents in a turning fight for although the Nieuport is capable of competing in a zoom and dive engagement with the older German scouts (such as the Albatros and Pfalz), these tactics should be used with circumspection as the Nieuport 'has a grim tendency to shed its wings'.

Wing failure is likely either during a prolonged power dive, or when the aircraft is pulled into an overly abrupt climb at high speeds. Equally, stunting or spinning the aircraft are not recommended. Should the machine's wings start to collapse, it may be possible to crash land if the aircraft can be righted and flown with minimal throttle.

Although the Nieuport is fast for a rotary-engined aircraft, the more recent German fighting machines have a speed advantage. This, coupled with the aircraft's structural weakness, can make disengagement from an aerial encounter problematical. Consequently, pilots are advised always to maintain a height advantage over their opponents. Allowing the enemy to get above you in a dogfight is invariably hazardous; doing so in a Nieuport can be fatal as the German fighters can trade this edge for superior manoeuvrability far more efficiently than the Nieuport. Diving away from an aerial battle is always dangerous; in the Nieuport it is doubly so. Similarly, diving attacks must be executed with care. All enemy fighters are superior to the Nieuport in dive performance.

Changes in throttle setting should be gradual, as the aircraft is sensitive to sudden changes in power. This applies to both level flight and take off, where aileron assistance may be required to keep the aircraft under control.



NIEUPORT 28

The Nieuport's high altitude performance may be suspect as many of them struggle to get above 18,000'.

The Nieuport therefore requires a gentle hand, it does not take kindly to being thrown about. However, provided pilots are prudent in how they handle their aircraft and are mindful of its shortcomings, they should find it adequate in most aerial combats.

SPAD XIII

TECHNICAL DATA

Speed:	133 mph at 6,500', 131 mph at 10,000', 127 mph at 13,000'.
Climb Rate:	2.3 minutes to reach 3,280', 5.0 minutes to 6,500', 8.3 minutes to 9,800'.
Maximum Ceiling:	22,000'
Wingspan:	26' 6"
Length:	18' 11"
Weight approx:	1,850 lbs
Armament:	2 Vickers machine guns firing forward.
Fuel endurance approx:	2 hours

SPAD XIII

FLYING THE SPAD

The Spad is very fast, very powerful and very stable. To succeed, pilots need to make maximum use of these qualities. The aircraft takes considerable effort to turn and sudden changes of direction are difficult. Pilots are strongly advised not to dogfight with enemy triplanes or Fokkers but rather stick to dive and zoom tactics or the vrille manoeuvre. The Spad is immensely strong and can be dived at considerable speed. This speed can, in turn, be converted into an excellent zoom climb. Pilots should therefore dive onto their prey and climb out after the attack using the speed which has built up and prepare for another go. High-speed attacks are rendered easier as the Spad is a very stable gun platform due to its inherent stability. It is comfortable at all altitudes and a suitable aircraft for ground strafing.

To avoid enemy attacks, pilots are encouraged to utilise either the Spad's fine climb performance or a prolonged dive with evasive manoeuvres. Not even the Fokker can stay with the Spad in this area. The superior speed of the Spad makes disengagement from a difficult situation possible by the simple expedient of outrunning the enemy, but this still requires a degree of careful timing.

Pilots are advised always to keep the Spad's speed high in combat. Firstly, because this is one of its main advantages over enemy aircraft and secondly, because the Spad is difficult to handle at low airspeeds and is tail-heavy. Caution should be exercised when switching the engine off in flight, as the sole method of restarting the motor is a long dive of around 1,500' to force the propeller to revolve.

Care must also be taken when landing the Spad. It has a dauntingly high glide angle and so has to be brought in under power and it is also prone to ground looping.

FOKKER DRI TRIPLANE

TECHNICAL DATA

Speed:	110 mph at sea level, 97 mph at 3,000m, 86 mph at 4,000m.
Climb Rate:	2.9 minutes to reach 1,000m, 5.5 minutes to 2,000m, 9.3 minutes to 3,000m.
Maximum Ceiling:	19,600'
Wingspan:	23' 7"
Length:	18' 11"
Weight approx:	1,290 lbs loaded
Armament:	2 Maxim machine guns firing forward.
Fuel endurance approx:	1.5 hours

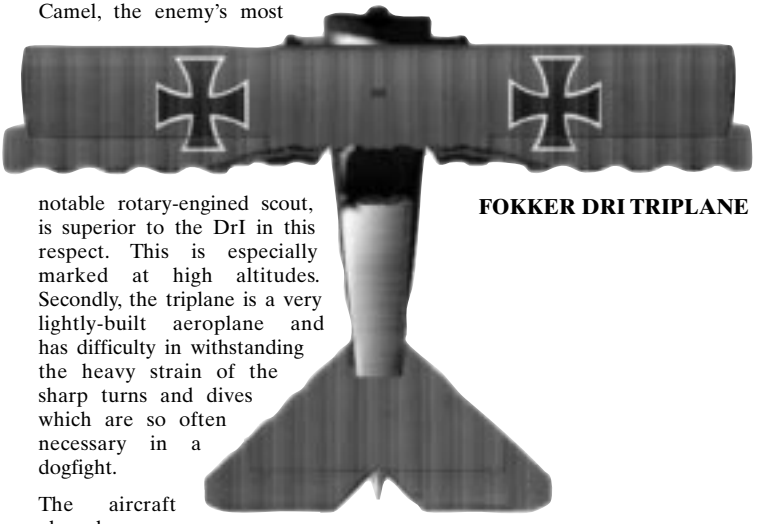
FLYING THE DRI

The DrI is a classic rotary-engined fighter, a superb aerobatic machine. Indeed, it is an inherently unstable machine which 'climbs like a monkey and manoeuvres like the devil'. It is, however, rather slow, especially when compared to the high-performance Allied machines such as the Spad XIII and the SE5a.

Pilots should be aware that the triplane is very sensitive on every axis, it is light and follows the slightest movement of the controls. One can turn on the spot like a top and the aircraft climbs like a lift. In combat, pilots should make maximum use of its manoeuvrability and stick close to their opponent. The triplane turns sharply, especially to the right and is capable of rolling rapidly. It delights in snap manoeuvres and is capable of very rapid flat turns. Because the triplane has such extraordinary climbing ability, it is superior in aerial combat to any enemy. The triplane can also hang on its prop for a considerable period of time.

When attacked, pilots should always turn to the right, as in this direction it should be able to out-turn every Allied aircraft. Left turns should be avoided, as machines such as the SE5a have an equal performance in this direction.

Pilots should be aware that the triplane does have two major weaknesses. Firstly, it is slow, both in level flight and the dive. Even the Camel, the enemy's most notable rotary-engined scout, is superior to the DrI in this respect. This is especially marked at high altitudes. Secondly, the triplane is a very lightly-built aeroplane and has difficulty in withstanding the heavy strain of the sharp turns and dives which are so often necessary in a dogfight.



FOKKER DRI TRIPLANE

The aircraft also has some idiosyncrasies which pilots need to be aware of. The nose goes down in right- hand turns and up in left-hand turns. In both cases, to maintain a constant altitude in steep turns, left rudder is required. The triplane is also laterally unstable on the ground so care must be taken during take off and landing.

In summation, pilots will find the triplane an extremely flexible machine, but possibly too slow for a truly effective fighter. Because of its manoeuvrability, it is hard for the enemy to shoot down. On the other hand, because the enemy is generally faster, it is easy for him to escape the same fate.

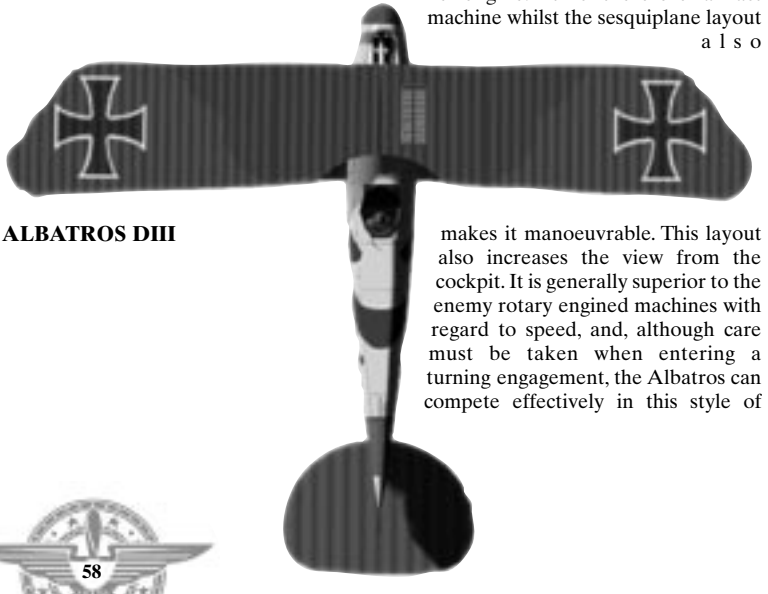
ALBATROS DIII

TECHNICAL DATA

Speed:	108 mph at sea level, 96 mph at 2,000m, 93 mph at 4,000m
Climb Rate:	3.7 minutes to reach 1,000m, 8 minutes to 2,000m, 12 minutes to 3,000m
Maximum Ceiling:	18,000'
Wingspan:	29' 7"
Length:	24'
Weight approx:	1,950 lbs
Armament:	2 Maxim 08/15 Maxim machine guns firing forward.
Fuel endurance approx:	1.75 hours

FLYING THE ALBATROS

This aircraft is a scout with a 160 hp in-line engine. It is therefore a fast machine whilst the sesquiplane layout also makes it manoeuvrable. This layout also increases the view from the cockpit. It is generally superior to the enemy rotary engined machines with regard to speed, and, although care must be taken when entering a turning engagement, the Albatros can compete effectively in this style of fighting. The Albatros performs best at under 12,000', an altitude it can reach efficiently by climbing at about 60 mph. Below this height, the Albatros can waltz around most enemy machines if its superior climb and speed are utilised. Pilots will find the engine reliable, and the Albatros is comfortable to fly due to the absence of torque effect from the powerplant. Pilots should also note the advantage they have with regards to armament compared to the enemy machines. The Albatros is fitted with two synchronised machine guns, firing through the propeller arc. Currently no Allied machine carries such a concentration of firepower.



ALBATROS DIII

Although it is a fine machine, pilots should be aware that the Albatros does have some shortcomings. At 15,000', it is an uncertain swimmer and is heavy and clumsy when turning. When fighting at this altitude, the Sopwith Pup can comfortably out-turn the Albatros so pilots will have to use their speed advantage to offset this. It is said that the enemy Nieuport can outclimb the Albatros. If this is so, pilots should use the Albatros' superior speed and zoom climb.

Regrettably the wings of this scout are relatively weak. Structural failure can occur in high speed dives or during an over-vigorous pull up.

Overall, the aircraft is easy to fly with few vices. It is unlikely to catch fire, has a comfortable gliding angle and good fields of view from the cockpit. Pilots will be pleased to learn that the radiator has been moved from the wing centre section, thereby minimising the chance of scalding, should it be damaged during combat.

SOPWITH CAMEL

TECHNICAL DATA

Speed:	122 mph at sea level, 115 mph at 6,500', 113 mph at 10,000'
Climb Rate:	6.5 minutes to reach 6,500', 10.8 minutes to 10,000', 21.8 minutes to 15,000'
Maximum Ceiling:	19,000'
Wingspan:	28'
Length:	18' 9"
Weight approx:	1,450 lbs
Armament:	2 Vickers machine guns firing forward.
Fuel endurance approx:	2.5 hours

FLYING THE CAMEL

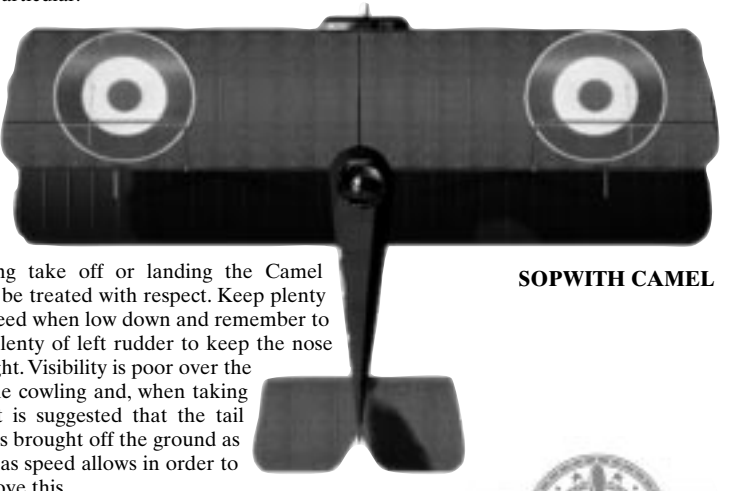
Camels are wonderful fliers once you have got used to them, which takes about three months of hard flying. At the end of that time you are either dead, a nervous wreck or a terror to the Huns. The Camel is inherently unstable and has to be held in flying position all the time as it is out of it in a flash. Steep turns are a real joy, nothing in the skies can follow so tight a circle and the Camel can turn three times to the right in the time it takes an Albatros to do two. Full left rudder is required to stop the nose from sliding down towards the earth in right hand turns and from climbing towards the sky in left hand turns. Do not be afraid to let the speed fall below 70 knots when turning. Nothing will half roll like the Camel. A twitch of the stick and flick of the rudder and you are on your back. The nose drops at once and you pull out, making a complete change of direction in the least possible time. Although the Camel can be dived at speed, care must be taken not to lose engine pressure, and at over 150 knots the aircraft does not handle so well.

The Camel will loop very quickly but this stunt requires a great deal of practice and is seldom of any use in combat.

The Camel does have a tendency to spin. To recover, centralise the controls, and after about four turns the machine will come out of the spin. It can be forced out more quickly by applying opposite rudder and pushing the stick forward briskly but this does not always have the desired result. Pilots are advised to allow lot of height for spin recovery.

The drawback of the Camel is its speed - if it was only 50% faster! A Camel can neither catch anything except by surprise, nor hurry away from an awkward situation and seldom has the option of either accepting or declining combat. Camels are happier at lower altitudes, and patrols should generally be carried out at 12,000' or below as above this the machine becomes less manoeuvrable, giving the advantage to the Hun. They are, however, good machines for ground strafing and can dive straight down on anything, and, when a few feet off the ground, go straight up again.

The Camel is generally robust and is armed with twin synchronised machine guns firing forward, being the first Allied scout to equal the Germans in this particular.



SOPWITH CAMEL

During take off or landing the Camel must be treated with respect. Keep plenty of speed when low down and remember to use plenty of left rudder to keep the nose straight. Visibility is poor over the engine cowling and, when taking off, it is suggested that the tail skid is brought off the ground as soon as speed allows in order to improve this.

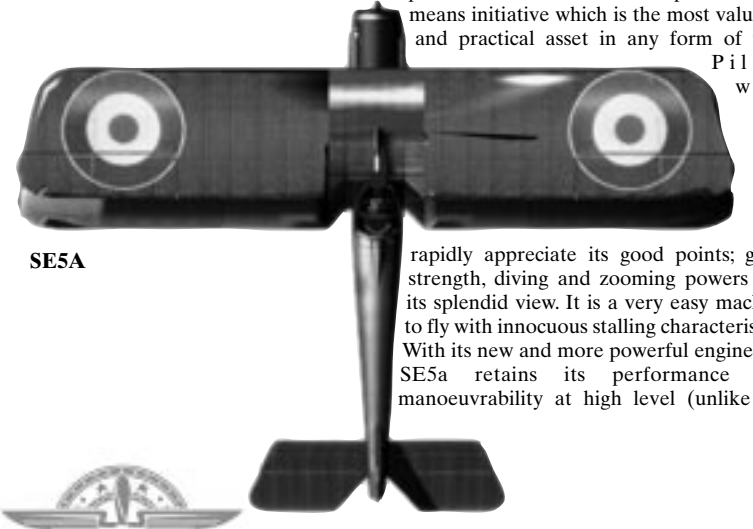
SE5A

TECHNICAL DATA

Speed:	137 mph at sea level, 126 mph at 10,000', 123 mph at 15,000'
Climb Rate:	4.92 minutes to reach 5,000', 11 minutes to 10,000, 19.9 minutes to 15,000'
Maximum Ceiling:	20,000
Wingspan:	26' 8"
Length:	20' 11"
Weight approx:	1,980 lbs
Armament:	1 Vickers synchronised to fire through propeller arc, 1 Lewis mounted on top wing
Fuel endurance approx:	2.5 hours

FLYING THE SE5A

The SE5a is a stationary-engined scout and is the fastest fighter currently in service. It is a high performance machine and performance means initiative which is the most valuable and practical asset in any form of war. Pilots will rapidly appreciate its good points; great strength, diving and zooming powers and its splendid view. It is a very easy machine to fly with innocuous stalling characteristics. With its new and more powerful engine, the SE5a retains its performance and manoeuvrability at high level (unlike the Camel). It is more agile than the Spad and easier to handle. Although the SE5a is a capable dogfighter, for best results pilots should utilise dive and zoom tactics. The SE5a has such a climb and reserve of power that it is quite usual for a machine to get some speed first and then do a vertical zoom, getting in a burst. It delights in a steep dive, and is steady and quick to gather speed whilst diving. It can be looped, rolled and dived vertically at speed without fear of breaking up. It is well-armed with two machine guns and is a stable gun platform.



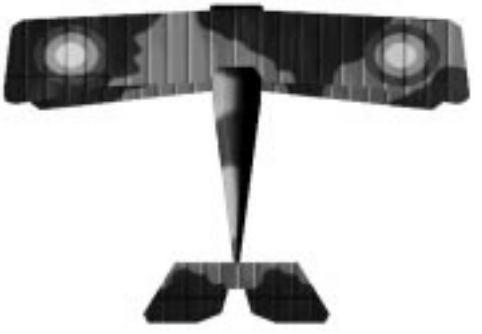
SE5A

In combat a well-handled SE5a should be able to outzoom any hostile scout encountered. Against the German triplane don't ever attempt to dogfight it on anything like equal terms as regards to height, otherwise he will get on your tail and stay there until he shoots you down. To avoid a triplane, stay in a vertical bank (preferably to the left) with full throttle, flick out of the turn as soon as the triplane appears to be changing his position and then run like hell for home, kicking your rudder hard from side to side. Pilots will find it very fine to be in a machine which is faster than the Huns, and so be able to run away should things get too hot.

The SE5a can be used for ground attacks, the suggested method being to dive from 500', pulling out at about 50'. The dive and steep pull out can be made without fear of structural failure.

The SE5a poses no difficulties with regard to take off or landing, being easy to handle at low airspeeds due to its stability. It can be floated onto the airfield.

Possessing an excellent combination of speed, manoeuvrability and performance at altitude, the SE5a can be used successfully both as an offensive and defensive machine.



NIEUPORT 17

TECHNICAL DATA

Speed:	103 mph at sea level, 99 mph at 6,560', 96 mph at 9,840.'
Climb Rate:	3.09 minutes to reach 3,280', 6.83 minutes to 6,560', 11.5 minutes to 9,840.'
Maximum Ceiling:	17,390'
Wingspan:	26' 9"
Length:	19'
Weight:	1,232 lbs loaded
Armament:	1 Vickers or 1 Lewis
Fuel:	17.6 imperial gallons, endurance 1.75 hours

NOTES

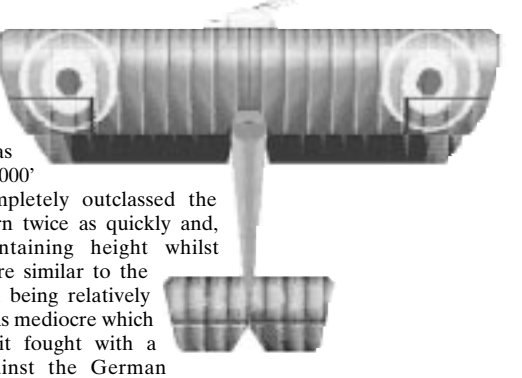
The French Nieuport was generally liked by its pilots who appreciated its manoeuvrability. Its strengths were that it could turn tightly and had a fair rate of climb. Its weaknesses were that it was slower than the Albatros, had only 1 machine gun and exhibited a tendency to shed its wings in a dive. The Nieuport 17 equipped many RFC and French squadrons in 1917. A more powerful engine was later fitted which improved performance but the Albatros still held the advantage.

SOPWITH PUP

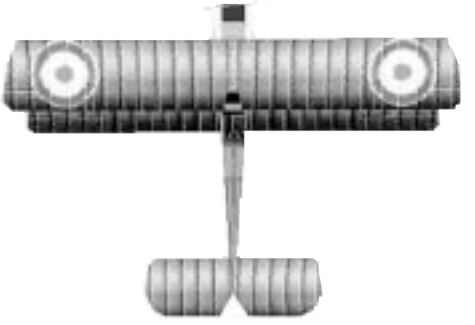
TECHNICAL DATA

Speed:	111.5 mph at sea level, 106 mph at 6,500', 104 mph at 10,000', 94 mph at 15,000'
Climb Rate:	5.16 minutes to reach 5,000', approx. 13.75 minutes to 10,000'
Maximum Ceiling:	18,500'
Wingspan:	26' 6"
Length:	19' 4"
Weight:	1,099 lbs loaded
Armament:	1 Vickers or 1 Lewis
Fuel:	18.5 imperial gallons, endurance 3 to 4 hours

NOTES



British designed stablemate to the Nieuport, the Pup, was a very popular machine being 'a delight to fly'. Its strengths were that it was fully aerobatic to over 15,000' and, at high altitude, completely outclassed the Albatros, being able to turn twice as quickly and, equally importantly, maintaining height whilst turning. Its weaknesses were similar to the Nieuports; it suffered from being relatively slow and the initial climb was mediocre which meant that at low level it fought with a definite disadvantage against the German Scouts. In common with all Allied fighters at this time, the standard armament was a single machine gun against two on the Albatros. Its wings were stronger than the Nieuports with at least one pilot diving at 180 mph, although this was not recommended.



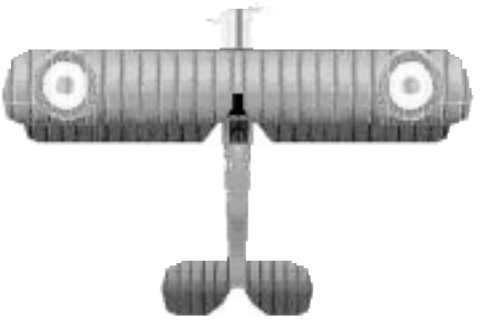
SOPWITH 1 1/2 STRUTTER

TECHNICAL DATA

Speed:	91 mph at sea level, 87 mph at 10,000'
Climb Rate:	29.5 minutes to reach 10,000'
Maximum Ceiling:	16,000'
Wingspan:	33' 6"
Length:	25' 3"
Weight:	2,223 lbs loaded
Armament:	1 Vickers firing forward, 1 Lewis manned by the observer for rear protection
Fuel endurance approx:	3 to 4 hours

NOTES

A British two-seat aircraft mainly used for reconnaissance and bombing, the Strutter was originally designed as a two-seat fighter and was the first British aircraft to carry a synchronised machine gun firing forward through the propeller, whilst the Scarff No2 mount gave the observer a better field of fire than on previous British two-seaters. Unfortunately it was rapidly outclassed by the Albatros in the fighter role. Although more capable of looking after itself in a battle than most Allied two-seaters in 1917, it still suffered when caught by the Jastas. On bombing missions it often flew without the reargunner to allow more bombs to be carried.



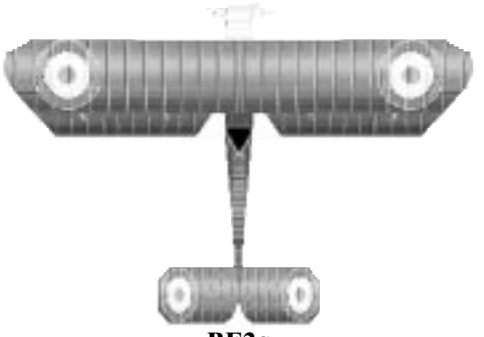
BRISTOL F2A

TECHNICAL DATA

Speed:	110 mph at sea level, 101 mph at 10,000'
Climb Rate:	14.5 minutes to reach to 10,000'
Maximum Ceiling:	16,000'
Wingspan:	39' 3"
Length:	16' 2"
Weight:	2,600 lbs loaded
Armament:	1 Vickers firing forward, 1 Lewis manned by the observer for rear protection
Fuel endurance approx:	3 hours

NOTES

The Bristols' introduction at the start of 'Bloody April' was disastrous when 48 Squadron lost four from a flight of six to Jasta 11. This was mainly due faulty tactics which relied on the rear gunners for defence. Following this easy victory, the Germans regarded the Bristol as yet another lumbering two-seater unable to adequately defend itself. However, once British pilots learnt to use the 'Brisfits' performance offensively and dogfight, German pilots learnt to treat it with respect and a degree of caution. The later versions combined the performance of a fighter (Stark commented on it being 'amazingly nimble') with the added protection of a rear gunner.



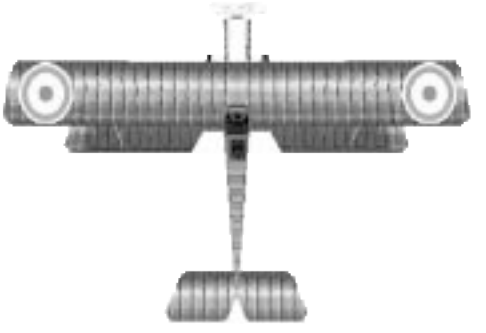
BE2c

TECHNICAL DATA

Speed:	72 mph at 6,500'
Climb Rate:	20 minutes to reach 6,500'
Maximum Ceiling:	10,000'
Wingspan:	37'
Length:	27' 3"
Weight:	1,650 lbs loaded
Armament:	1 Lewis manned by the observer
Fuel endurance approx:	3 hours

NOTES

This was the standard British reconnaissance aircraft in 1917. It had first flown in 1912 and then been modified to increase its stability, leading to the nickname 'Stability Jane.' Whilst this principle made it an admirable machine for leisurely reconnaissance, it was disastrous for a fighting aircraft. Initially unarmed, at least in 1917 it carried an observer armed with a Lewis gun for defence, but, unfortunately, as he sat in the front cockpit, his field of fire was somewhat limited. Written off as 'Fokker Fodder' in 1915, it was to suffer worse in 'Bloody April.', 75 being shot down in that month.



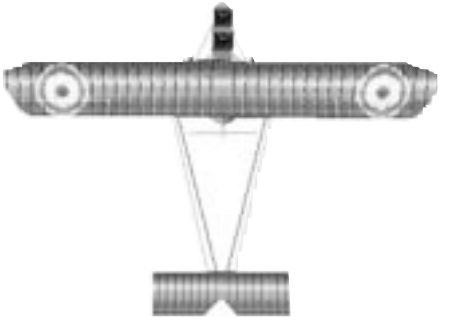
RE8

TECHNICAL DATA

Speed:	98 mph at 6,500', 93 mph at 10,000'
Climb Rate:	22 minutes to reach to 10,000'
Maximum Ceiling:	13,000'
Wingspan:	42' 7"
Length:	27' 10"
Weight:	2,600 lbs loaded
Armament:	1 Vickers firing forward, 1 Lewis manned by the observer for rear protection
Fuel endurance approx:	4.25 hours

NOTES

A reconnaissance machine conceived as a replacement for the BE2 when the requirements of air combat were becoming known, the 'Harry Tate' must rank as one of the worst designs to see action in WWI. It was slow, underpowered and unmanoeuvrable. Pilots found it difficult fly, it would spin at the slightest opportunity and was tricky to land. Structurally weak, it also showed a tendency to burn when damaged. On 13th April 1917, 59 Squadron sent out six RE8s on a reconnaissance mission; all were shot down by Jasta 11 in around five minutes.



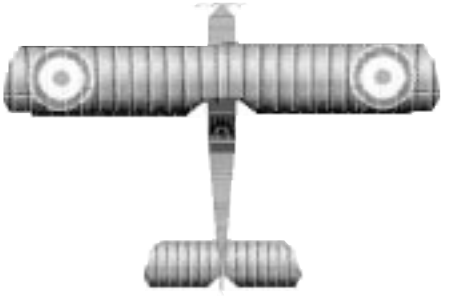
FE2B

TECHNICAL DATA

Speed:	93 mph at 6,500'
Climb Rate:	10 minutes to 6,500'
Maximum Ceiling:	16,500'
Wingspan:	42' 5"
Length:	30' 6"
Weight approx:	3,469 lbs loaded
Armament:	varied, typically 2 to 3 Lewis guns manned by pilot and observer
Fuel endurance approx:	3 hours

NOTES

Another aircraft used by the RFC for observation and bombing work, it played an important role in ending the 'Fokker Scourge.' It was a 'pusher', with the engine at the rear of the fuselage. Although this layout gave an excellent field of fire forward for pilot and observer it did increase the danger from rear attacks. Visibility behind was poor and the observer, having to stand up in the nose of the aircraft, had great difficulty in bringing his gun to bear in this direction. Although obsolete by spring 1917 'Fees' (unlike the BEs) could give a good account of themselves if cornered. The FE2 was sometimes used in the fighter role and later went on to pioneer night bombing



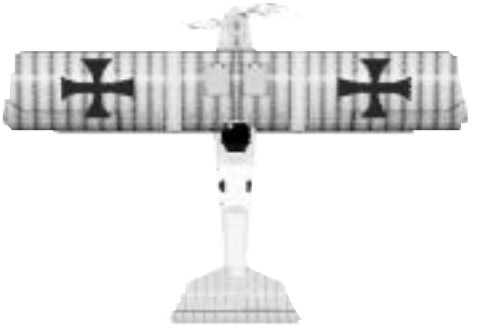
DH9

TECHNICAL DATA

Speed:	118 mph at 10,000'
Climb Rate:	11 minutes to 6,500'
Maximum Ceiling:	13,000 - 17,500'
Wingspan:	42' 5"
Length:	30' 6"
Weight approx:	3,584 lbs loaded
Armament:	1 Vickers firing forward, 1 Lewis manned by the observer for rear protection
Fuel Endurance aprox:	4.5 hours

NOTES

Based on the highly successful DH4 the DH9 was designed to be a fast strategic bomber. However, there were problems with the Siddeley Puma engine which resulted in the DH9 being underpowered, being a 'good aeroplane spoiled by a bad engine'. As a result, early DH9s with a full bomb load struggled to reach 13,000'. Consequently DH9 squadrons on long-range missions could suffer heavy casualties, being less able than the DH4 to either outdistance pursuit or fight their way out of trouble. It was not until the American Liberty engine arrived that the aircraft lived up to its potential.



PFALZ DIII

TECHNICAL DATA

Speed:	112 mph at 700m, 103 mph at 3,000m
Climb Rate:	3.25 minutes to reach to 1,000m, 7.25 min to 2,000m, 11.75 min to 3,000m
Maximum Ceiling:	17,000'
Wingspan:	30' 11''
Length:	23' 2''
Weight approx:	2,000 lbs loaded
Armament:	2 forward firing 08/15 Maxim machine guns
Fuel:	21.5 imperial gallons, endurance approx. 2.5 hours

NOTES

Introduced in late 1917, the Pfalz does not seem to have been overly popular with German pilots, whose preference generally was Fokker first, Albatros second and Pfalz last. A notable exception to this was Berthold (44 victories) who preferred the Pfalz to the Albatros. It's strengths were a very good dive rate ('a famous diver' - Rickenbacker), general manoeuvrability and fairly rugged construction. It was possibly better at high altitude than the Albatros. Weaknesses were a slow roll rate, a tendency to catch fire and a poor glide. It suffered from being unable to either outmaneuver the Allied rotary scouts or outfly the high performance Spad or SE5a.

FOKKER DVII

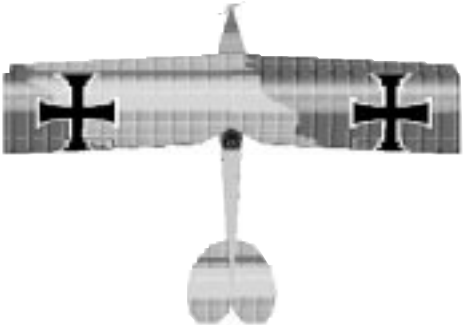
TECHNICAL DATA

Speed:	115 mph at sea level, 114 mph at 3,000m, DVIIF 124 mph at 3,000m
Climb Rate:	3.9 minutes to reach to 1,000m. DVIIF 2.5 minutes to reach 1,000m
Maximum Ceiling:	20,000' to 23,000'
Wingspan:	29' 2''
Length:	22' 10''
Weight approx:	1,900 lbs loaded
Armament:	2 Maxim 08/15 Maxim machine guns firing forward.
Fuel:	21 imperial gallons, endurance approx. 2 hours

NOTES

This was one of the outstanding fighters of the war. It was fortunate for the Allies that there were only 407 in service by July 1918. Donald Hardman (19 Squadron RAF 9 victories) detailed its strengths as follows:

'It could climb to 20,000' at terrific speed, very good speed on the level and could dive at almost any rate ... it turned at lightning speed and would perform any stunt better than any other machine. Its success was attributable to the fact that it was a fairly easy, yet responsive machine to fly.'



AVIATIK C

TECHNICAL DATA

Speed:	97 mph at 2,000m.
Climb Rate:	7 minutes to reach 1,000m
Maximum Ceiling:	15,000'
Wingspan:	42' 10"
Length:	26' 1"
Weight approx:	2,948 lbs loaded
Armament:	1 Maxim firing forward, 1 Parabellum manned by the observer
Fuel endurance approx:	4.5 hours

NOTES

The Aviatik was a two-seat reconnaissance aircraft introduced in 1917 which tended to operate at lower altitudes than the Rumpler. This, together with a relatively poor speed (despite a streamlined appearance) and a tendency to either disintegrate or burn when hit, made it vulnerable to Allied fighters. Its best defence was a dive to safety, although on occasion a skilful crew could fight their way out of trouble. McCudden (57 victories) shot down at least 12 Aviatiks but twice he was outfought by one, and it was a tougher aircraft to tackle than the RE8 was for German pilots.

RUMPLER CV

TECHNICAL DATA

Speed:	101 mph at 3,000m
Climb Rate:	4 minutes to reach 1,000m
Maximum Ceiling:	17,500', later models 20,000
Wingspan:	41' 6"
Length:	26' 11"
Weight approx:	3,400 lbs loaded
Armament:	1 Maxim firing forward, 1 Parabellum manned by the observer.
Fuel endurance approx:	4 hours

NOTES

German two-seat reconnaissance aircraft introduced in 1917. Its strengths were its relatively high speed (for a two-seater) and good performance at high altitude. The Rumpler's best defence was to fly high and alone, thereby making discovery and interception by Allied fighters problematical. If it was caught, the advantage was generally with the fighter. Although a veteran crew could make life difficult for the attacker, the best defence was usually a dive towards the German lines, and the Rumpler's speed and dive ability gave it a good chance of escaping. If the crew were inexperienced or failed to spot the attacker in time, their chances were poor.

HALBERSTADT CLII

TECHNICAL DATA

Speed:	97 mph at 3,000m
Climb Rate:	39.5 minutes to 5,000m
Maximum Ceiling:	13,500’
Wingspan:	35’ 4”
Length:	24’
Weight approx:	2,500 lbs loaded
Armament:	1 or 2 machine guns firing forward, 1 Parabellum machine gun manned by the observer
Fuel endurance approx:	3 hours

NOTES

This aircraft was designed as a specialised ground attack machine and was first seen in action at Cambrai. It was efficient in this role, having good performance below 1,000’ and a strip of armour plating on the underside. This, coupled with the pilot and observer (who had a good field of fire) being close together to facilitate a co-ordinated defence, made it a tough aircraft for Allied fighters to attack. McCudden, a master at destroying two-seaters had several encounters with this aircraft but never managed to shoot one down. Its weakness was that it was over-specialised and lacked the high level performance which the Bristol had to be a true two-seat fighter.

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FLYING CORPS CREDITS

PROGRAMMING TEAM: Paul Dunscombe, Rod Hyde, Andrew McRae, Andrew McMaster, Rob Slater, James Taylor, Dave Whiteside

ARTWORK TEAM: Richard Cook, Andy McCann, Andy Manns

GAME DESIGN: Rod Hyde, Mark Shaw

MUSIC: Paul Robotham

PHOTOS: Steve Hyde

SOUND EFFECTS: Sounds Appealing

LANDSCAPE: Andy Curry, Amanda Fair McCann, Andrew Wilkins

TECHNICAL ASSISTANCE & SPECIAL THANKS: Andy Kemp, Stuart Leslie, Andy Sephton

TESTING TEAM: Tristram Defries, Simon Flynn, Mahendra Sampath

E.I. TEAM: Tony Bond, Mark Havens, Andy Mullins, Alison Ryan, Nick Walkland, Benedict Wilkins, Sharon O'Neill and Clare Brown.

1 FLIGHT

aileron left (to bank to the left)	joystick to left or left cursor
aileron right (to bank to the right)	joystick to right or right cursor
elevator forward (to push nose down)	joystick forward or up cursor
elevator back (to pull nose up)	joystick back or down cursor
keyboard sensitivity	k
keyboard sensitivity	shift k

2 WEAPONS

fire guns	joystick button 1 or space key
drop bombs	number pad enter.

3 POWER

rpm 10%	1
rpm 20%	2
rpm 30%	3
rpm 40%	4
rpm 50%	5
rpm 60%	6
rpm 70%	7
rpm 80%	8
rpm 90%	9
rpm 100%	10
rpm 100%	full stop
rpm minimum	comma
rpm: big step up	shift equal, i.e. +
rpm: big step down	shift minus, i.e. _
rpm: small step up	equal (=)
rpm: small step down	minus (-)

4 VIEWS

4.1 Viewees

padlock next nearest enemy	F1
padlock next nearest friendly	F2
padlock next nearest ground target	F3
padlock next waypoint	F4
padlock subject of message	F5
turn off padlock	Esc
padlock nearest enemy	Ctrl F1
padlock nearest friendly	Ctrl F2
padlock nearest ground target	Ctrl F3
padlock next waypoint	Ctrl F4

4.2 VIEWS

outside view	F6
inside view	F7
invisible cockpit	F8
fly by/chase toggle	F9
satellite view toggle	F10
impact toggle	F11
reverse angle padlock	Alt F6
padlock on/off toggle	Enter
inside/outside view toggle	Backspace

4.3 ROTATE AND ZOOM VIEW KEYS

Rotate down	number pad down
Rotate up	number pad move up
Rotate right	number pad move right
Rotate left	number pad move left
Rotate down & left	number pad end.
Rotate down & right	number pad pagedown
Rotate up & left	number pad home
Rotate up & right	number pad pageup

Holding down the shift key when pressing a rotate view key will accelerate the movement.

Rotate and Zoom reset	number pad 5
Zoom in	number pad +
Zoom out	number pad -

5 SIGNALS TO OTHER PILOTS

inform squadron to break off and re-form	r
inform squadron to break off and go home	h

6 GAME CONTROLS

screenshot	print screen

The following controls are enabled during flight:

exit key	Alt x
infopanel toggle (3 levels of information)	i
pause	p
accelerated time	Tab
detail level change	Ctrl d
joystick configure	Alt j
configure menu	F12
map	m

NB When flying with 'spinning enabled', keyboard control of aileron, elevator and rudder is not recommended. When flying without rudder pedals enable co-ordinated rudder.

See TECHNICAL SUPPLEMENT for joystick button configurations.

GAME CONTROL GLOSSARY

Accelerated time - speeds up the flight time between waypoints. Cannot be used in combat.

Invisible cockpit - removes your cockpit from the screen, giving a much wider field of view. A set of cross-hairs will appear on the centre of the screen to assist you when firing.

Impact view - switches the view to target when hit.

Outside - view from behind object with heading and pitch maintained.

Padlock - lock the view onto the object indicated.

Padlock next nearest - will toggle the padlock views through all the indicated objects.

Padlock subject of message - using this view option will padlock your view onto the subject of the last message printed at the top of the screen.

Padlock reverse angle - view from the object you have padlocked (i.e. from target to you).

Satellite - view the object from above.

Viewees - the object being viewed. This will appear at the centre of the screen.

ENDING A FLIGHT

You can end a flight by either landing and coming to a halt, pressing alt-x . . . or by being shot down.

'It was him or me, and I would sooner it was him'
- Mannock

1) Install and start the game after referring to the installation instructions in the TECHNICAL SUPPLEMENT.

2) The game starts with an animated title sequence. Press any key to go to the Options screen.

3) Highlight the configure option either by using the mouse pointer and clicking with the left mouse button, or moving the highlight with the cursor key and then pressing the Enter key. All selections in Flying Corps can be made in this way.

4) The preferences are initially set up for a beginner, so for your first flight you only need to configure your joystick. Select the tick icon to return to the options screen.

5) Select the scramble option, which allows you to fly a single mission.

6) In the scramble menu screen first select Camel and then select First flight.

The first flight scramble option requires you to fly a simple circuit of the airfield. For more guidance on flying this particular mission, refer to Chapter Two of the main manual. Check the controls listed in the appendix, which define all of the keyboard and joystick definitions. If you wish to pause the game

while in flight, press p. For more information on how your aircraft is performing whilst flying, press i.

7) Use the joystick to control your aircraft's attitude and direction when flying. Pull the joystick back and the nose of the aircraft will rise and you will start to climb. Push the joystick forward and the nose will drop and the aircraft will begin to dive. Moving the stick to the left or right will cause the aircraft to roll in that direction. To turn gently, roll the aircraft into a bank and then ease the stick towards you. Extreme or sudden movement of the stick can cause the aircraft to stall. Use the number keys to control the engine power setting (1 minimum, 0 maximum). See Chapter 2 for more details on flying.

8) Once you are familiar with flying an aircraft select the second scramble mission - 'Follow the Leader'. On this mission you have to follow your leader through a series of manoeuvres. Once familiar with the basics of flying, you can move onto the scramble missions which involve combat.

9) You will get the real opportunity for long term strategy and combat when you take part in a campaign. To do this, select campaign on the main options menu and then select the left/right arrows to rotate through the available campaigns. Click on the large medal icon when you have decided which campaign to play.

The four campaigns are:

FLYING CIRCUS You are Lothar von Richthofen and must exceed your brother's score whilst he is on leave. Try this campaign first.

TANK BATTLE You lead a German Jasta and try to halt the British tank offensive before your last defences are overrun.

SPRING OFFENSIVE You fly with the RFC as the Germans make their final attempt to win the war.

HAT IN THE RING You attempt to emulate Rickenbacker to become America's 'Ace of Aces'.

For more details on the campaigns see the main manual.

10) Finally, before you start, remember the following four 'Golden Rules':

1. Every attack must be made with determination and with but one object, the destruction of the opponent.

2. Surprise must be employed whenever possible.

3. If surprised or forced into an unfavourable position, a pilot must never, under any circumstances, dive straight away from his opponent. To do so is to court disaster, since a diving machine is an almost stationary target. Moreover, the tactical advantage of height is lost by diving, and the initiative surrendered to the hostile machine.

4. Height invariably confers the tactical advantage.

RAF Instructions