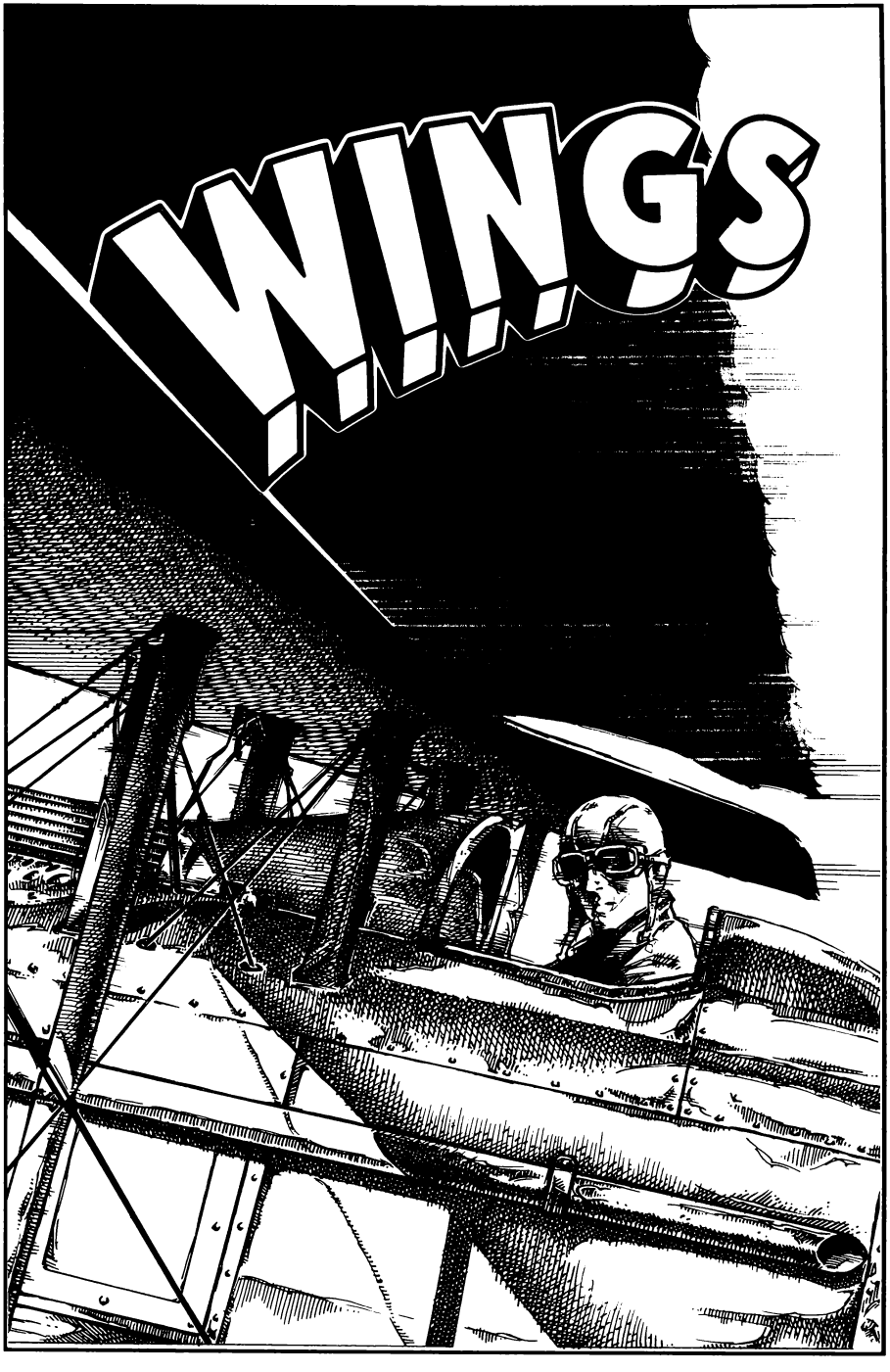

CINEMAWARE
PRESENTS
WINGS



An Aviator's Briefing Manual for the First World War

CREDITS

Game Design
John Cutter

Computography
Dan Pinal and **Tim Hays**

Additional Computography
Randy Platt

Graphic Artist
Jeff Hilbers

Original Music
Greg Haggard

Sound Effects
Jim Simmons

Executive Producer
David Riordan

Producer
Jerry Albright

Screenplay & Handbook
Ken Goldstein

Handbook Maps & Illustrations
John Duggan

Handbook Photo Reproductions
Byll Williams

Photographs Courtesy of
San Diego Aerospace Museum
(Special thanks to Ray Wagner and Dr. Mary Scott)

INDEX OF PHOTOGRAPHS

TABLE OF CONTENTS

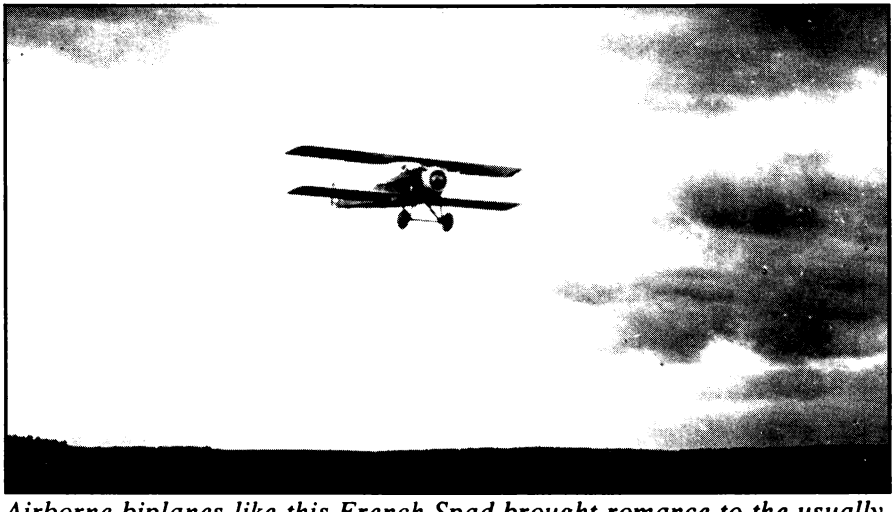
An American recruiting poster encourages the nation's most adventurous young men to consider becoming pilots.

PREFACE

19 August 1917. Had a splendid fight with a single-seater Albatros Scout last week on our side of the lines. The scrap took place at two thousand feet up, well within view of the whole front. And the cheers! It took me five minutes to get him to go down, and I had to shoot him before he would land. I was very pleased that I did not kill him. Right arm broken by a bullet, left arm and left leg deep flesh wounds. His machine, a beauty...all black with crosses picked out in white lines — turned over on landing and was damaged. Two machine guns with one thousand rounds of ammunition against my single Lewis and three hundred rounds! I went up to the trenches to salve the "bus" later, and had a great ovation from everyone. Even Generals congratulated me. He didn't hit me once.

The Personal Diary of Major
Edward "Mick" Mannock

Capturing the intensity of a moment in battle is no easy task. Justly simulating that same reality is even harder. In page after glorious page, the renowned pilot Mick Mannock rose to the occasion in leaving history with an unpolished record of his daily experiences in the First World War. It is with this inspiration that Cinemaware has created its own involving interpretation of World War I aviation — WINGS!



Airborne biplanes like this French Spad brought romance to the usually grim warfront.

The aircraft is all very well for sport — for the army it is useless.
Ferdinand Foch, French Marshal who became General-in-Chief of all Allied Armed Forces (statement dated 1910)

WINGS is no ordinary 3-D flight simulator. Combining the elements of joystick flight operation and historical reenactment, WINGS offers a very personal sense of interactive storytelling. Through the character of a rookie pilot progressing through the various stages of World War I, players will actually relive the total experience of becoming a heroic flying ace. Participating in the action of WINGS creates a unique adventure exploring all the emotions of a desperate time: fear, pain, success, triumph, failure, defeat, and victory.

There was much more to being a pilot in the Great War than surmounting the moments of battle. There were friendships, personal struggles, bouts with loneliness and longing for home. There were bars, brothels, and brawls. And most of all, there were the trying hours of being extremely young and having to grow up in a complex world that would never be the same.

The unfolding Company Journal of No. 56 Aerosquadron, written for posterity from the player's point-of-view, offers something very special: insight into the joys and setbacks of being barely out of school and suddenly in full command of the greatest responsibility of one's life — survival! At times during The War, pilots were estimated to have a life span of no more than three weeks. Did this affect one's flying ability? Indeed, fear became as much an influence on a pilot's performance as proficiency at the controls.

The pioneers of flight in World War I knew little of the high tech frills that became standard as soon as twenty years later. There was no fancy instrumentation, no radio contact with the ground or other pilots, no electronics to point out or cover pilot errors. What kept pilots going were guts, their constantly developing skills, and determination. If a pilot could live past his first few sorties, he might learn enough about flying to keep himself alive. In some ironic respects, this may have been the original Catch 22!

Heroics were a way of life for the first fighter pilots, and WINGS recreates those heroics in all their glory! Take a step back in history with WINGS to a time when the United States was still unproven on the European battlefront, the Allies were locked in a desperate struggle that would make or break all future ideals of freedom, and the airplane was a strange vehicle that could lend an advantage or prove a detriment to any day in combat. WINGS takes players directly to the skies over the Western Front and puts them in the midst of the long, grueling struggle for air supremacy in this, "The War to End All Wars."

INTRODUCTION

The Wright Brothers Change War Forever

We thought we were introducing into the world an invention that would make further wars practically impossible. Orville Wright

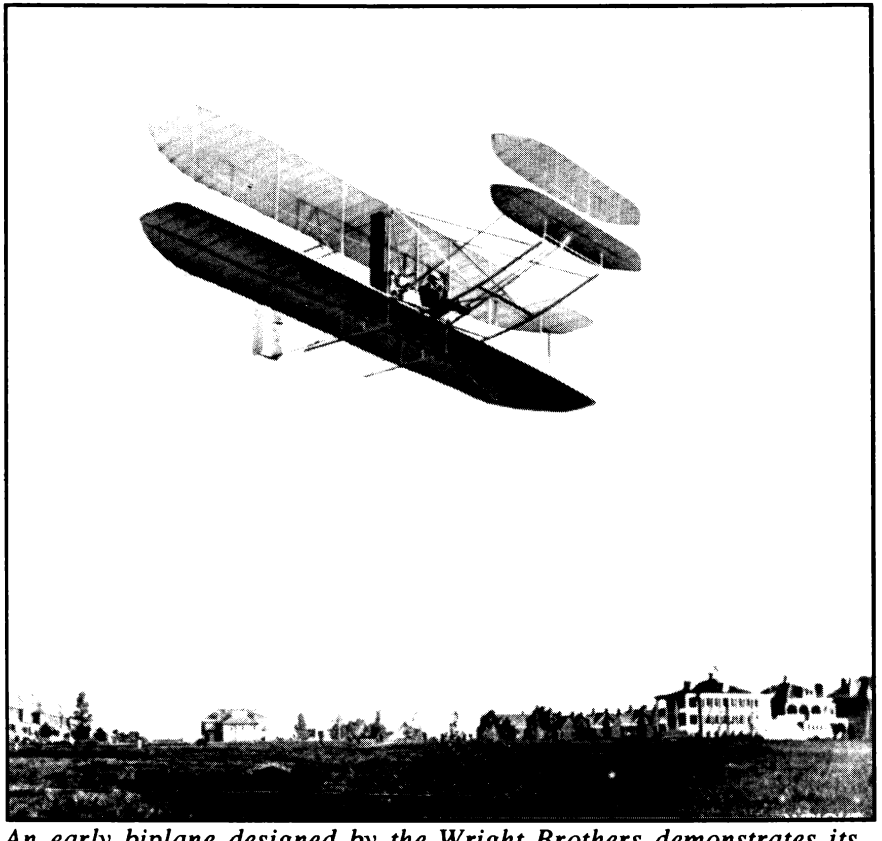
Orville and Wilbur Wright's first successful motor-powered flight didn't last long: twelve seconds and one hundred twenty feet, give or take a few. Yet one wonders whether, on December 17, 1903, as the Wright Brothers walked their mysterious flying machine out to the sandy dunes of Kitty Hawk, North Carolina, they had any idea of the degree to which their invention would affect the course of all future military actions throughout the increasingly hostile world.

While man had left the earth before with varying degrees of success in hot air balloons, primitive gliders, and with sometimes laughable wing devices attached to the human body, the problem remained as to whether a self-powered heavier-than-air vehicle could overcome the forces of gravity to emulate that in nature which allowed birds to fly of their own volition. The remarkable accomplishment of the Wright brothers was in solving "the flying problem" by adding an engine and propellers to one of these gliders. The massive fuel-driven apparatus that would create "lift" had to be constructed in proper weight proportion to raise the aircraft and its pilot off the ground and carry the entire load forward.

As the Wright Brothers were not so much scientists as they were problem-solvers, they applied their extensive reading on the subject of flight until their mechanical abilities realized what long seemed in their minds a certainty. Everything they studied told them that man could fly; all they had to do was calculate, invent, and build until they had a vehicle that encompassed their best instincts. Needless to say, the task they faced was monumental. Their success guaranteed them a place in history.

Orville piloted the first successful takeoff of this motorized boxed kite. As he later wrote, he was ultimately amazed that the ungainly contraption, sure enough, "...raised itself by its own power into the air in full flight...sailed forward without the reduction of speed...and finally landed at a point as high as that from which it started." There was no doubt in his or his brother's mind that a revolution had begun. Man no longer needed to jump off hills and soar into the valleys below to fly; it was clear that he could now determine his own course in the skies. The possibilities seemed unlimited, the potential without end.

As the Wrights immediately devoted themselves to improving their aircraft for longer and more stable flights, they were strangely unable to convince the U.S. government that they had designed something fantastic in scope. Perhaps it was the many crashes inherent in the testing process, or perhaps it was the fear of the unknown that is as much a part of human nature as the will to inquire and explore, but it wasn't until 1908 — five long years later — that the Wrights' machine inspired President Teddy Roosevelt to arrange a formal demonstration for the War Department.



An early biplane designed by the Wright Brothers demonstrates its capabilities for the U.S. War Department.

After a rough start, the Wrights received their first government contract a year later under the infant Aeronautical Division of the U.S. Signal Corps. The military applications of their invention had been clear to them from the outset — above all as a frightening deterrent to grand scale war — and they were now empowered to build the first military plane in history. While their social philosophy may have proven itself naively optimistic, the timing of their innovations couldn't have been better. Astonishing progress in this fledgling field called aviation would be accomplished in no more than the ensuing decade. The relevance of the airplane to the changing international landscape and feverishly tense world political climate would soon become all too apparent in a new kind of war. Indeed, the state of modern warfare was about to see some radical changes. All the world needed to see these become a reality was a war.

We at once packed our goods and returned home, knowing that the age of the flying machine had come at last.

Wilbur and Orville Wright, upon receiving their first official commission to build a plane for the U.S. Signal Corps.

EUROPEAN POLITICAL TENSIONS SPARK THE GREAT WAR

This, the greatest of all wars, is not just another war — it is the last war. *H.G. Wells, The War That Will End War*

Marne. Verdun. Somme. Argonne. Long before the world knew anything of Nazis, kamikazes, or nuclear weapons these words brought dark memories to the minds of men and women everywhere. The battles of the Great War — "The War to End All Wars" — created a new sense of awe, fear, and damnation in the human imagination. How an entire planet could become locked in bloody combat for four years made as little sense to those who fought as those who would write the history books. Yet it happened, and it would happen again.

Who would have thought the assassination of a relatively unknown political leader could have set the world on fire? While hindsight provides anything but an accurate assessment of how events could have gone otherwise, many historians still believe that the Great War was inevitable. With the Industrial Revolution in full swing and all the western nations developing countless weapons capable of mass destruction, the eventual use of these sophisticated killing tools loomed daily on the European vista. Where political ideals and governments in power clashed internationally, grand alliances were signed committing each sovereign nation to one of two sides in a great split down the middle of Europe.

Europe was an armed camp when on June 28, 1914, Archduke Francis Ferdinand of Austria-Hungary was assassinated in Sarajevo. Believing Serbia to be behind the killing as the result of a long festering feud, Austria-Hungary declared war a month later on its Balkan neighbor. With the previously signed treaties of the Triple Alliance on one side and the Triple Entente on the other, it was only a matter of days before all of Europe was officially in a state of war.

A few steps backward sheds some light on how all this happened. The roots of World War I reach deep into the previous century with the rising sense of nationalism throughout the world. As European colonies sprang up all over the globe, patriotism took on a whole new meaning. Loyalty to one's country became primary in the individual's mind. National unification of the previously divided provinces in Germany and Italy were one result. Cries for freedom and self-determination of conquered lands amid the great Russian, Ottoman, and Austro-Hungarian Empires were another. Wherever cultural identities ran contrary to the flag overhead, the potential for conflict was ever brewing. Tensions ran especially high in the Balkan territories, where Serbia led a movement contested by Austria-Hungary and supported by Russia to unite the Slavs of the region.

With the popular rise of nationalism came each nation's ability to secure taxes that could be ceremonially invested in military strength. Germany's impressive army became the best trained ground fighting unit in history. Britain's navy was virtually without equal and sailed the oceans as it so desired. With memories of the Franco-Prussian war anything but faded,

retribution-seeking France strengthened its forces along the German-annexed regions of Alsace and Lorraine. As Germany began to develop its own navy, Britain armed its warships with increasing firepower.

Throughout Europe, modern-equipped factories produced weaponry with revised priorities now focused on defense over consumer needs. Railroads allowed faster transportation of equipment and troops to strategically designated areas. Teams of engineers experimented with ways to attach machine guns to the still imperfect first generation of airplanes, while military experts assumed that all these innovations would make future wars shorter.

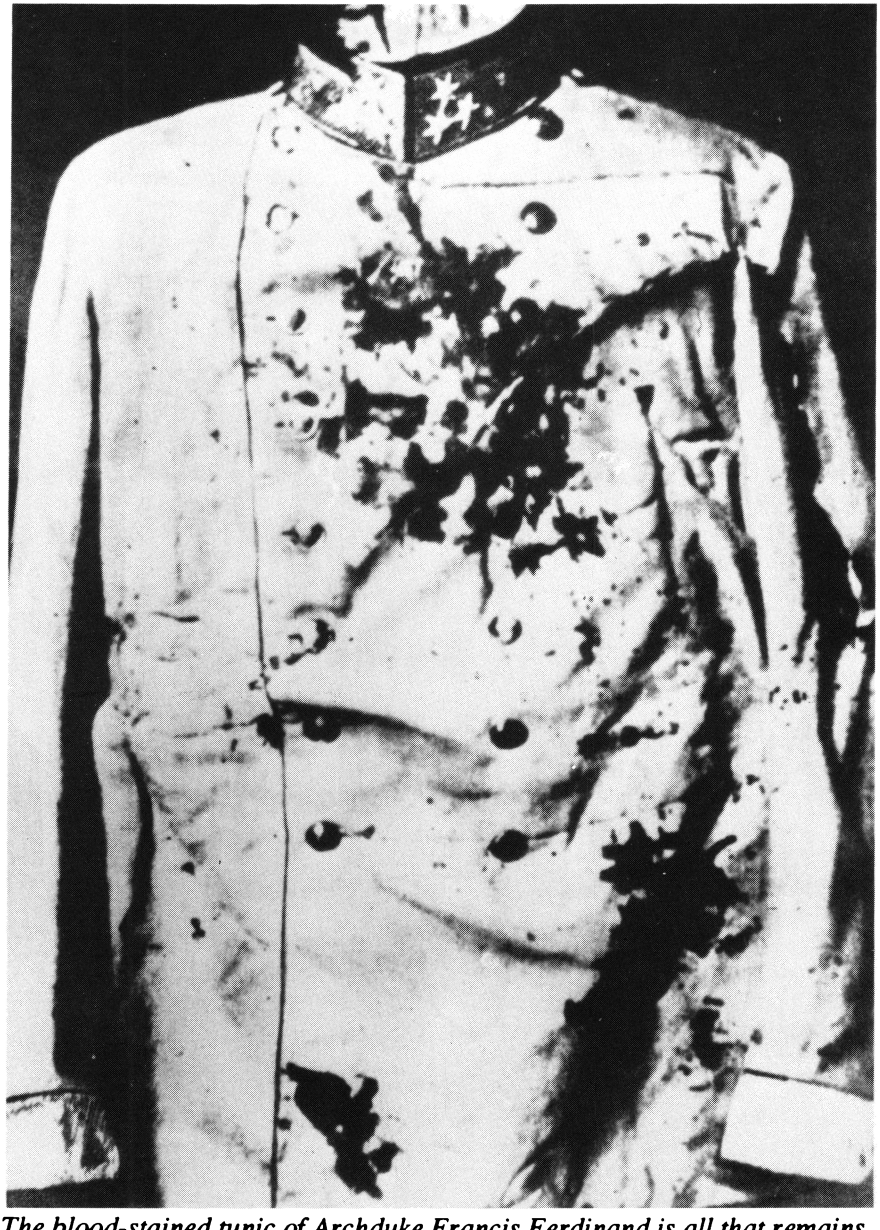
Military alliances were originally intended to be security measures. By allying itself with other great forces, a country would hope to discourage enemy attack simply by making the success of a potential conquest an impossibility. Not surprisingly, as nations looked to deal with each other through positions of supported strength, the magnitude of the alliances increased and every nation felt it had to take sides, formally or informally. The result was that if two nations became involved in a dispute, a host of others would be dragged by default into the conflict. Nations were thus poised to go to war against those with whom they might not have a quarrel or over issues that were of no relevance to their home front. With many alliances signed secretly, nations risked getting into a struggle with those they might even have thought friendly.

Two agreements stood paramount in Europe: The Triple Alliance and the Triple Entente. Crafted by Germany's preeminent Otto von Bismarck, the Triple Alliance came to include Germany, Austria-Hungary, and Italy. The Triple Entente provided a less binding but still operative link between Great Britain, France, and Russia. Various other treaties throughout the world linked nations to one side of the European theater or the other. Those supporting the Triple Alliance became known as the Central Powers, while those opposite called themselves simply the Allies. Adrift in its own spirit of isolationism, the United States initially chose for its own national security to remain neutral.

With these kinds of stakes and choices predetermined, it becomes understandable how the global clash unfolded in 1914. Though a number of weak-hearted attempts were made at keeping the peace in the immediate weeks following Austria-Hungary's declaration of war on Serbia, Russia's mobilization in support of Serbia on July 30 brought Germany's declaration of war on August 1. Anticipating France's honoring of the Triple Entente in coming to the aid of Russia, Germany then declared war on that front with troops sweeping into neutral Belgium in the process. The invasion of Belgium on August 4 posed a threat to the entire balance of power in Europe and obligated Great Britain to declare war on Germany. The Great War had fully begun; by the end of it, no corner of the world would go untouched.

No less than ten million soldiers were to lose their lives in this struggle over land, national pride, and ideology. Another twenty million would be wounded. To understand the specter of World War I is to take a hard look at the heroes and villains of a complex saga no novelist could possibly have written. World War I was a time of change, an era in which technological advances brought the science of killing to previously inconceivable levels.

The world was becoming an all too different place. All vestiges of innocence were becoming progressively obsolete.



The blood-stained tunic of Archduke Francis Ferdinand is all that remains of the "shot heard round the world."

THE LIFE OF A PILOT

As retrospect allows a certain amount of romance to pervade even the most frightening epoches, so The Great War introduced a new hero to the public perception: The Aviator. It was in World War I that the pilot came to light as a new kind of soldier pioneering a redefined front line. By the end of the war, 8212 German pilots would be dead or missing. Britain alone would lose 9378 of these new airborne heroes. To become a pilot was to roll the dice and assume a lifestyle of taking chances previously inconceivable. Perhaps that's why pilots sought to learn all they could about their primitive planes before taking them from their makeshift hangars to be flown on missions even their designers didn't know they could fly.

PATROLS

For a World War I pilot, the word "patrol" was rather loaded. While for the Allies flying on patrol almost always consisted of crossing enemy lines, the intention of entering hostile airspace could involve anything from engaging an airborne opponent to bombing an unspecified ground target. A reconnaissance patrol out to photograph the position of troops might at any moment become an attack unit intent on blowing a challenging squadron out of commission. In essence, the term patrol described any day's mission where specific objectives had not been determined by Wing Headquarters.

The average patrol lasted around ninety minutes, with a team of two to five planes flying in formation. A squadron's day was structured around maintaining constant patrols so as to maintain an ongoing threat to those on the other side — who were usually building their flight schedules around the exact same principle. Of course, schedules were subject to drastic modification due to the unpredictable results of any given battle.

Caught off guard or outnumbered, planes encountered by an enemy patrol would usually allow themselves to be forced down; stopping and fighting where the odds were bad was not encouraged by any commander. The traditional dogfight was most often the result of finding an enemy in equal numbers or an opposing patrol led by an especially adventurous pilot. As patrols broke formation to skirmish in one-on-one situations, an individual's piloting skills were put to the supreme test. These entanglements might only last a matter of minutes or even seconds, yet it was almost immediately determined who was going to live and who was going to die.

Flying alone! Nothing gives such a sense of mastery over mechanism, mastery indeed over space, time, and life itself, as this. A hundred miles, north, south, east, west. Thirty thousand square miles of unbroken cloud-plains! No traveller in the desert, no pioneer to the Poles had ever seen such an expanse of sand or snow. Only the lonely threshers of the sky, hidden from the earth, had gazed on it. Only we who went up into the high places under the shadow of wings!

Cecil Lewis, R.F.C. Pilot in his published memoirs

Pilots of the American Expeditionary Forces pose for company photo at their aerodrome in France.

Second chances were not the rule; a few hits to strategic areas of a plane or pilot's body would send an aircraft into an immediate downward spiral. Everything a pilot learned and trained for would come into play in these brief moments of soaring adrenalin. While the many boring flying hours that could pass without seeing anything of importance could set a pilot off guard, the best pilots knew how to make use of every living moment — on the ground as well as in the sky.

BASE CAMP OPERATIONS

In the same way that infantry in the trenches lived day to day without knowing where they would spend the next night, pilots traversed a network of movable bases on an immobile front. With the exception of a few permanent landing fields constructed a safe distance from enemy lines, airstrips were crude and simple. These "aerodromes" might consist of only a few huts and tents near an open field which could be active for several days and then abandoned. As it was in so much of the war, flexibility was key in maneuvering for position to gain the much coveted element of surprise. With makeshift quarters sometimes no more than seven miles from the front, the pilot lived in readiness. The alleged glamor and romance of aerial combat was entirely offset by the hardships of daily survival.

A pilot's day would typically begin with dinner. At the evening meal in the mess tent, squadrons received their orders outlining the nature of their next twenty-four hours of patrols. To maintain security, Wing Headquarters dispatched a driver with a sealed envelope to be delivered to a squadron's commander, who then passed along word to his men. Anxiety levels raised or lessened by these orders often determined appetites, though the smart pilot knew the importance of proper nutrition to his performance in the air.

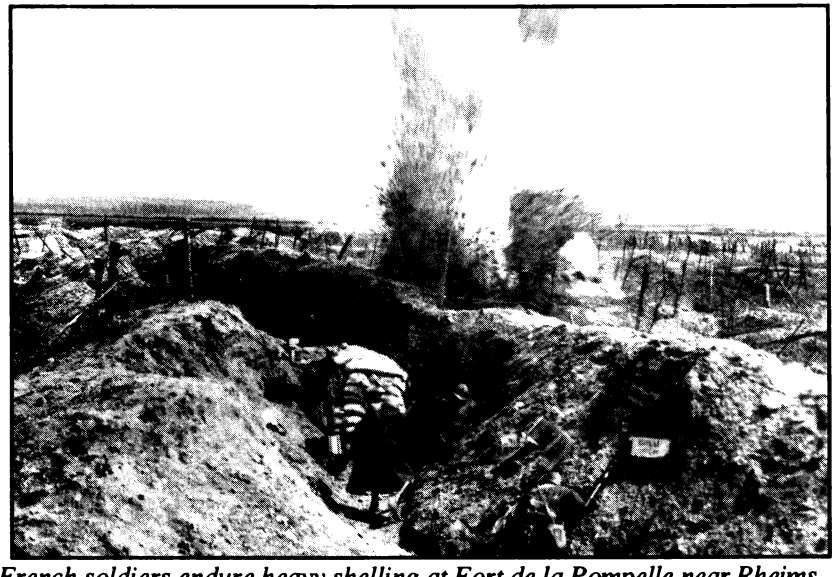
Indeed, most pilots learned to separate themselves from their fears so they could eat heartily under any circumstances. Flying on an empty stomach usually meant air sickness, which included nausea and projectile vomiting.

Orders from Wing Headquarters were often quite general, identifying a target behind enemy lines or informing a squadron of a ground offensive over which they would be needed to fly cover. The details of execution were left to the wisdom of the squadron's experienced Commanding Officer who usually operated with the expressed input of his talented young flyers. Most C.O.s understood the importance of communicating with their men, who knew best what it took to come home each day from their assignments.

DAILY ROUTINE

The dawn patrol would rise around 3:45 a.m. and be airborne as soon as a half hour later. Others would follow at regular intervals throughout the morning, afternoon, and into the night if necessary, each going out as close to the time of the previous patrol's landing as possible. Days without assigned patrols were less for rest than they were for training. Marksmanship was one of the most important survival skills that could always be improved, and time reserved for target practice was much welcomed.

To endure the cold air at sub-50 degrees centigrade to which they were exposed in their open cockpits, pilots would wear silk underwear beneath a layer of woollen underwear, a cellular two-inch squared vest, a silk inner shirt, army regulation khaki shirt, two pullovers, and a leather jacket lined with lamb's wool. The trademark flowing silk scarf was wound carefully around the pilot's throat to protect the constantly turning neck area from stiffening or frostbite. Whale oil was smeared on the pilot's face, which was then surrounded by the balaclava helmet and covered with a fur face mask. Goggles prepared with various anti-fogging ointments were essential, as were fur-lined boots and gauntlets.



French soldiers endure heavy shelling at Fort de la Pompelle near Rheims.

Without the benefit of intelligence reports, a pilot's final briefing before takeoff would usually consist of his C.O. seeing to it that an official form was signed as follows: "I swear on my honor that I do not have on my person or on my machinery any letters or papers of use to the enemy." The pilot would then proceed to his aircraft and check it out mechanically in detail: rudder bar, elevators, control column, rigging, throttle, fuel pump, fuselage, instrumentation, and weaponry. Satisfied with his plane's condition or after instructing the awaiting team of mechanics to fine tune anything that instilled the least lack of confidence, the pilot would then climb into the cockpit and belt himself in firmly. When he had gauged his fuel mixture in the proper ratio of air and petrol, he would holler the immortal command, "Contact!" A mechanic would crank the propeller hard and the pilot would rev the engine for takeoff. Soaring down the runway ahead of a dark cloud of tail exhaust, the aircraft would then fill its environs with the roar of its horsepower and lift its load slowly into the air.

ATTACK MISSIONS

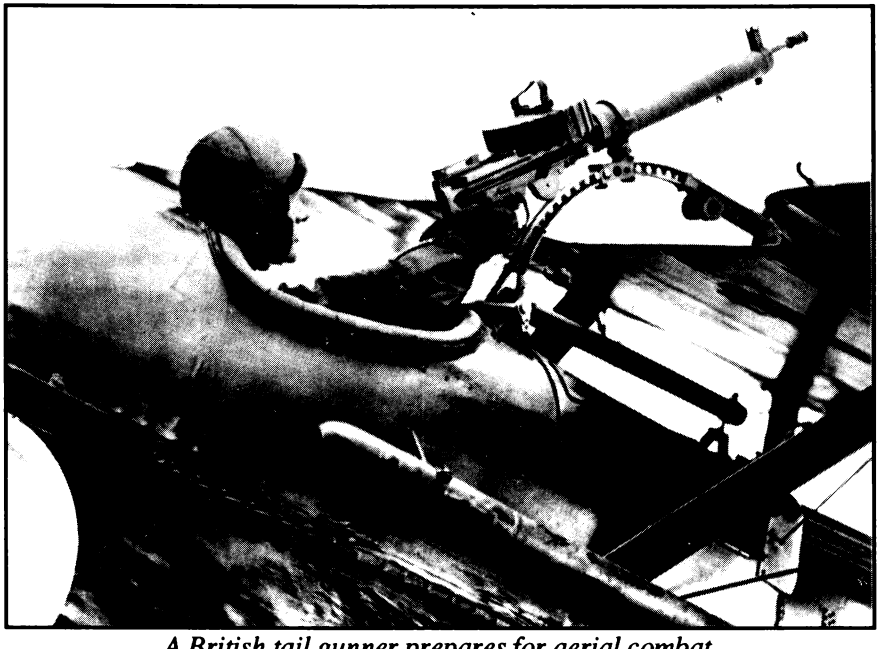
Once over enemy lines and without challenge from an enemy fighter, a pilot would carry out the specific business for which his patrol had been dispatched. Various targets included observation balloons, dirigible bombers, enemy troops needing to be dispersed for infantry advancement, strategic bridges, reinforced trenches, even off-shore ships carrying supplies or reinforcements. Such targets provided pilots with grand scale goals that often took weeks of patrolling to accomplish. Meanwhile, the rigors of daily flying brought pilots into contact with enemy patrols requiring interception en route to their own targets. With circumstances likely to change at any moment, flexibility went hand in hand with survival. There were no specialists. Every pilot was required to be a master of all skills and adept at all types of missions.

Crossing enemy lines, planes were most likely to first encounter anti-aircraft fire from the ground. While shrapnel and other early forms of phosphor-based anti-aircraft shelling were often considered harmless, improvements in anti-aircraft shells soon changed all that. By 1916, pilots could no longer depend on the great distances slow moving ammunition from the ground would have to travel to meet their swift aircraft. Impact was no longer easily avoidable, nor could safe deflection be calculated with accuracy. While even as late as 1918 British anti-aircraft batteries defending London claimed it took some 14,500 shells for a single killing, a pilot who returned home with a hundred or so holes in his tail learned not to underestimate any gun trained on his fragile wooden wings.

Past the anti-aircraft zone, the real threat loomed in encountering an enemy patrol. Nothing could bring down a plane faster than another plane, and there was nothing a pilot feared more than an opponent with more talent than his own. Once the synchronized machine gun was introduced, it became the key to aerial combat.

Gone were the days of the two man pilot-observer teams where duties were split between the man at the controls and the man on the gun. Even if a pilot flew with a tail gunner, he had to be as good with his own guns as he was with his joystick. Forward firing machine guns could let go some eight hundred rounds per minute, with deadly ranges increasing to upwards of

five hundred feet. Likewise, accuracy became far more a consideration as pilots grew accustomed to their constantly improving equipment. Pilots were no longer satisfied with simply hitting the enemy, but rather would strive to take aim and hit him at some critical point.



A British tail gunner prepares for aerial combat.

In all engagements, one of the most commonly expressed considerations was that of brevity. One pilot reported that his first aerial fight was so brief he didn't remember anything about it at all — other than that seeing his airborne enemy left him quite breathless. Fuel supplies and flight ranges dictated that everything happened quickly. Timing was rudimentary, as an encounter with the enemy of just five minutes was considered painstakingly long. A three minute encounter was thought to be average, with as few as twenty seconds considered anything but insignificant. Any single maneuver could instantly bring victory or defeat, and in no case was this more true than in the most famous aspect of military flying: the dogfight.

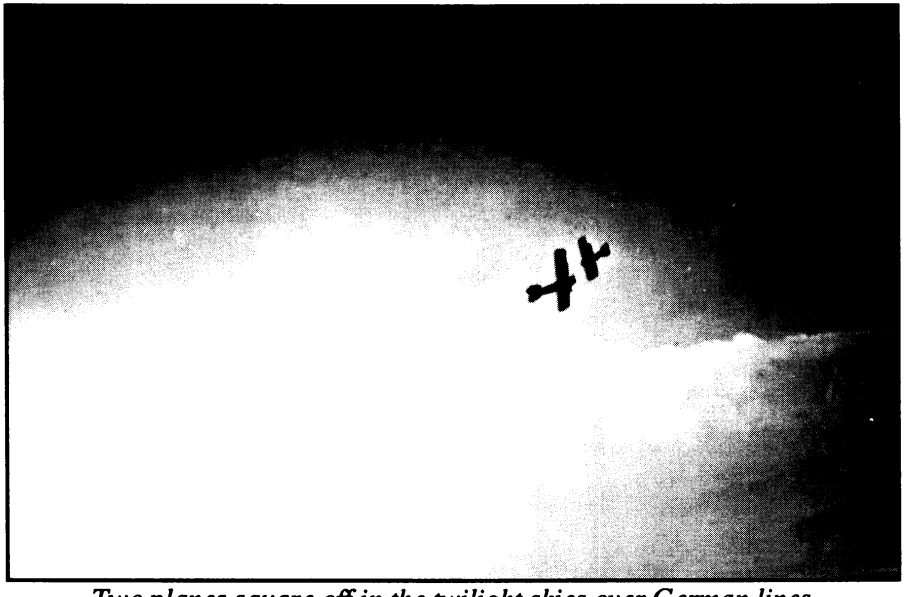
A HERO'S TRIAL: THE DOGFIGHT

The word "dogfight" can be traced back to November 1916, when it was first used in an official military report to describe thirty British planes engaged in aerial combat with forty from the German side. Loosely applied, the term dogfight came to refer to any two or more planes of opposite sides engaged in an aerial challenge, the stakes of which were the survival of only one side.

Technological advances in the second half of the Great War brought changes to the art of flying that made the dogfight possible. More efficient engines and improvements in aerodynamic engineering allowed planes to reach higher altitudes with better maneuverability. It was at these higher altitudes that the combination of relatively low speeds and high turning capabilities allowed as many as fifty planes to occupy the same three square miles of airspace (in contrast, a modern jet fighter at combat speed now needs five to ten miles simply to turn). In its truest form, the dogfight was solely a phenomenon of World War I, for the specific conditions that allowed these very personal encounters would never exist again.

The concentrated violence of aerial dogfights has to be experienced to be known.

Cecil Lewis, R.F.C. Pilot in his published memoirs



Two planes square off in the twilight skies over German lines.

Where planes would almost always regroup after takeoff and maintain strict formation for much of their patrolling activities, the dogfight would see the orderly dispersal of individuals. For a pilot, knowing the fine line between when he was covered and when he was on his own — or when he was needed to cover a buddy — meant the difference between coming home a medal recipient or not coming home at all. What often looked like a whirlpool of randomly swirling planes trying everything they could to gain advantages on each other was actually a systematic cluster of leaders and wingmen covering their partners' tails and blind sides. While some pilots gained reputations (and even renown) for renegade aerobatics, most only dived on their opponents when they had a clear shot and something that approximated an open escape route. Trigger happy soloists who only thought of their own tallies were usually grounded by their C.O.s.

In the same dispassionate way that human life had a value in the total war effort, no commander answering to cost-conscious politicians was without criticism for the unruly pilot who consistently lost or brought back damaged government property. Planes were expensive and hardly in abundance. Like every well-trained flyer, every salvageable plane was needed in the air.

The emotional experience of the dogfight as a whole was described by almost every aerial combatant as intense, extreme, virtually indescribable to anyone who hadn't actually lived through it. The concentration of violence, the unpredictability of the equipment, and the daily writing of the textbook on workable maneuvers made for a test of nerves that quickly aged even the freshest nineteen and twenty year olds. If a pilot had not entered the war with the maturity necessary to meet the task of flying a fighter plane, the dogfight quickly taught him the meaning of sensibility and wise judgement.

Quick decisions on which not only his life but the lives of any other four pilots depended arose with lightning speed: whether to break formation or hold one's position; whether to blow off a round of ammunition or save it for the next pass; whether to come to the aid of a friend or stay with a target in sight. Formal training at flight school offered few precedents for scenarios invented daily by the enemy, which required spontaneous responses without the benefit of a commander on the radio.

Downed planes crashing into civilian dwellings were not an uncommon sight.

Elijah is reputed to be the patron saint of aviators, but as he went to heaven in a chariot of fire, this is something we aren't too keen about.

Kiffin Rockwell, Member of the Lafayette Escadrille.

A HERO'S QUANDARY: FIGHTING TO THE DEATH

A dark footnote to the war was that for the most part, Allied pilots were not issued parachutes. This macabre decision by flight commanders came with the consideration that planes were an extremely valuable financial resource. With the high cost of manufacturing aircraft, those in command didn't want to give their pilots any reason not to bring their planes home if it was in any way possible. Not only were Allied strategists worried about pilots bailing out and letting their planes crash, they didn't want to see their latest technical discoveries fall into enemy hands.

While pilots understood and resented this valuing of machinery over life, they knew with their lives on the line that they always had to fly their best. The last thing an aviator who had earned the right to fly wanted was to spend the rest of the year in a prison camp, so landing behind enemy lines and sacrificing one's plane intact was already out of the question for most aces. Getting home safely was as much of a pilot's responsibility as his daily target or mission; this was what was meant by escaping attack, with the only alternative not requiring long argued explanation being death.

WAR RECORDS AND MILITARY HONORS

As Allied aviators could ultimately be honored by receiving the Victoria Cross and German pilots went after the coveted Blue Max, each nation maintained an official record of victories won by their pilots. A victory was awarded for shooting down any enemy plane or airship (regardless of whether the opposing pilot was killed), but each victory had to be verified by airborne witnesses or infantry who found the downed craft. Ace status was commonly achieved by an airman on his fifth victory, while more formal commendations and medals of valor were awarded at the discretion of top ranking officers and government officials.

Pilots were often frustrated by the many unconfirmed victories for which they would not receive official credit. The final "score sheet" for the top pilots of the war thus did not include any unconfirmed kills, which in some cases could have made the statistics much higher.

The following medals signify the highest honors that nations used to express their esteem for valiant individuals, on the ground as well as in the air.

Victoria Cross: Britain's highest award for exceptional valor, and one of the most coveted of war medals. Only 633 were awarded in the First World War, 187 of them posthumously.

Distinguished Service Order: Britain's second highest honor for gallantry, awarded exclusively to commissioned officers.

Military Cross: Instituted on December 31, 1914 for special recognition of warrant officers and above.

Legion d'Honneur: France's highest decoration, awarded only for gallantry in action or twenty years of distinguished service in military or civilian life.

Croix de Guerre: Instituted by France in 1915 and awarded to fighting men of all ranks when recommended by a general or commanding officer.

Pour le Merite: The highest award that Germany could bestow, awarded for singular acts of gallantry, career service in the military, or a combination of both. Commonly known as the "Blue Max," it was established in 1740 by Frederick the Great when French was the official language of the Prussian Court.

Iron Cross: The only other national medal awarded by Germany for military distinction, instituted by Prussia in 1813. All other medals were issued by the individual states of the German Empire.

THE CODE OF CHIVALRY

From the very beginning, pilots of all warring factions considered themselves part of an elite club. While the Great War brought many new armaments to the endeavors of combat — among them the tank, the submarine, the machine gun, and chemical warfare — the airplane offered a unique challenge to the men who chose to fly them. Most pilots were volunteers from other branches of military service who had to apply for transfer several times before being accepted to flight school. As officers, pilots took their commitment to gentlemanly conduct a step further and adopted a loosely defined code of etiquette that governed their actions on the ground as well as in the air. It was a code of chivalry and, for the four years of the Great War, it would exalt the hostile skies over Europe.

They are the knighthood of this war, without fear and without reproach; and they recall the legendary days of chivalry, not merely by the daring of their exploits, but by the nobility of their spirit.
David Lloyd-George, Britain's Prime Minister referring to pilots in a speech to the House of Commons.

All pilots lived with an unnerving sense of uncertainty brought about by the imperfections of their fledgling machines. Yet while unequalled courage and dead-set tenacity were their only remedy to these anxieties, as pilots they maintained a sense of honor never seen before or again in the throes of mortal combat. Likened to the great medieval knight of old, the pilot would often allow an enemy whose guns had jammed to escape until he could compete equitably. Even as bombing civilians became a tolerable practice, the act of shooting down a helpless enemy pilot in cold blood was abhorrent to the commanders of most aerosquadrons. When a respected opponent had been defeated, it was not uncommon for the victor to pay tribute to his dead victim. While some pilots found it hypocritical to salute the individual whom only moments earlier they had savagely attacked, all officers were expected to conduct themselves with decency. Decency in the air meant a fair fight.

Advances in armaments and desperation for victory would soon make such practices obsolete, but for the first fighter pilots of combat, the Great War offered conditions that would not be experienced by others. Flying with expertise and lining up an enemy in one's sights were only part of being a pilot. As a club, pilots knew they were all simply guinea pigs for the technology on which their lives depended. The emotional thrill of daily survival and the understanding that everyone was in the same "boat" created a time that would live forever in the spirit of these valiant champions. While

previous international conflicts knew almost nothing of planes, this one would set a frightening, often dazzling, indeed romantic standard for years to come.

We meet 'neath the sounding rafters,
The walls all around are bare;
They echo the peals of laughter;
It seems that the dead are there.

So stand by your glasses steady,
This world is a world of lies.
Here's a toast to the dead already;
Hurrah for the next man who dies.

Cut off from the land that bore us,
Betrayed by the land that we find,
The good men have gone before us,
And only the dull left behind.

So stand by your glasses steady,
The world is a web of lies.
Then here's to the dead already,
And hurrah for the next man who dies.

Favorite mess song of the U.S. expatriate *Lafayette Escadrille.*

WAR STORIES: AN AERIAL VIEW

The Strange Inversion of Lt. Louis Strange

May 1915. Lieutenant Louis Strange had only recently graduated from two-seater reconnaissance missions to flying the Martinsyde Scout with its Lewis machine gun mounted on the upper wing. Well over German lines and obsessed with making full use of his firepower, he attacked an enemy two-seater Aviatik, only to quickly exhaust his ammunition without so much as a single hit. As the Aviatik came after him with its own machine guns erupting, Strange attempted to change his drum, only to discover that it wouldn't release. Urgently needing to reload, he unbuckled his seat belt and stood up in the cockpit in an attempt to force the drum free. It was at that moment that the Martinsyde stalled and flipped over on its back!

Strange was tossed out of the cockpit, clinging for his life to the loosely mounted Lewis drum as his plane glided in an inverted position eight thousand feet above the ground. Where moments earlier Strange had been swearing at the drum for not releasing, he now prayed that it would remain jammed in place as he hung from it above the clouds. Seconds later, the Martinsyde went into a spin, leaving its dangling pilot to fight his way back into the combat only by virtue of some rather impressive improvised gymnastics.

At last gaining a foothold in the cockpit and a hand on the center strut, Strange repositioned himself at the controls and took the plane under his command. Unfortunately, as he righted the plane from its inversion, he dropped into his wicker seat with such force that he literally broke through the bottom of it. Pieces of the seat became jammed in the controls, and as the wayward plane once again dived, Strange was left desperately attempting to clear his cockpit of its wreckage.

Though his crash seemed all but unavoidable to a nearby German pilot (who later reported "an Englishman hanging upside-down from his airplane"), Strange levelled out at the last possible second and returned to his aerodrome. While Strange had a hard time explaining to his C.O. how he had kicked out all the instrumentation in his plane, he lived through the war to share this tale back home.

THE WAR IN THE AIR

As hostilities erupted in Europe, Germany had a grand total of 218 planes; Britain had 179 and France all of 82. Curiously, not one of these was armed for aerial combat. During the earliest days of the war, planes were used primarily for reconnaissance and observation. As Germany launched its first major offensive on the Marne River in 1914, the technical status of the airplane had not yet reached a stage where the airborne duel was possible. Pilots on both sides carried pistols or rifles in their cockpits and took sporadic pot-shots at one another, with the Allies looking occasionally to ignite a hydrogen-filled German dirigible and the Germans dropping crude bombs on the outskirts of Paris. In general, planes themselves were so imperfect and unpredictable that flying in and of itself was risky. Engaging in combat was practically suicidal.

German infantry take aim as the Western Front is stabilized in the Battle of the Marne.

As trench warfare became the way of the war following the Battle of the Marne and both sides stubbornly dug themselves into fixed positions, the role and capabilities of the airplane soon changed. French and British troops had halted the German drive along the Marne and thrust the invaders back to the Aisne River. The Germans thus had all the more reason to seek new ways to purge the Allies' position, while the Allies came to understand that offensive flying was one of their best means of forcing the enemy to commit resources to defense. Throughout the deadlock of 1915, engineers and manufacturers worked assiduously to refine their aircraft, while commanding officers and pilots endured trial and error to shape the strategic use of these untested fighter planes.

It is important to remember that until April 6, 1917, the United States was not yet officially at war with the Central Powers. Indeed, it wasn't until almost two years after the sinking of the Lusitania (which carried a significant number of American civilians) that President Woodrow Wilson and Congress gave up on Germany's feeble attempts at conciliation and committed American troops to the European battlefront. How was it, then, that important pre-1917 battles saw American aviators running cover for Allied trenchmen?

With cultural ties and the common tenets of freedom both essential motivations, many patriotic Americans had long been sympathetic to the Allies' cause and yearned to fight the invading menace that had overrun neutral Belgium. The problem they faced was that to enlist in a foreign army meant a *de facto* renunciation of U.S. citizenship. There was one exception: the French Foreign Legion. One such branch of the French Foreign Legion became a wing of flyers first known as the *Escadrille Americaine*, later renamed for diplomatic reasons the *Lafayette Escadrille*. In France as early as 1915 and officially organized in April 1916, these volunteers provided a much needed boost to their entrenched European friends and set the stage for America's later part in the air battles over German lines.

THE BATTLE OF VERDUN (1916)

WINGS Game Sector: Luxeuil

Europe's line of warring trenches stretched north from Switzerland through Alsace and Lorraine, past the French fortress city of Verdun, and along the Aisne River. Hoping to cut off communication between British units and their home bases, German troops sought to reach the French seaports while their bombing dirigibles relentlessly patrolled the English channel. Like the many smaller battles that had preceded it, the Battle of Verdun (initiated as an offensive by Germany with the capture of Fort Douaument) was an attempt by both sides to break the stalemate of entrenchment. While the ten brutal months of fighting gave neither side the decisive victory on which terms of an armistice might hinge, the long days and nights gave pilots of all armies the time they needed to develop strategy and tactics that would last for the remainder of the war.

A ceaselessly bitter struggle throughout the winter and spring of 1916, The Battle of Verdun was particularly difficult for Allied pilots. These months marked the last phase of the Fokker Scourge, also known infamously as the Fokker Menace. Though it had been a French pilot, Roland Garros, who had first implemented metal deflector plates on the blades of his propeller so that he might be able to fire a machine gun through them, a stalled engine forced him to land behind enemy lines and surrender his firing device to the enemy in April 1915. Examining Garros' innovations, the Dutch aircraft designer Anthony Fokker — then for financial reasons under contract to the German government — took the forward firing mode to its next level with a timing device that allowed synchronized firing through the propeller without hitting the blades.

It wasn't until mid-1916 that Fokker's technology was leaked back to the Allies, providing the Central Powers with a distinct advantage for most of the early part of the year. The synchronized firing Fokkers pelted the Allied

Nieuports over Verdun, as additional advances in German formation flying (the *Jagdstaffeln*) attempted to halt the determined French observation planes from penetrating enemy lines in search of desperately needed information on ground troop positions. Regular patrols from dawn to dusk on both sides of the front became an exhausting routine.

Why all this fuss about airplanes for the Army? I thought we already had one.

Anonymous utterance in U.S. Congress during 1911 debates over appropriating $125,000 to establish a flying school in California.

What the Germans had going for them in technology, the Allies soon countered in increasing plane production to outnumber their counterparts. In fact, when hostilities had cooled at Verdun, Germany had lost its air superiority. Allied cooperation of air servicemen under the leadership of the R.F.C. commanding officer, General Hugh "Boom" Montague Trenchard, had introduced one offensive after another, leaving the Germans to strike primarily on their side of the line. True, the airplane was not a decisive weapon in 1916 and trench warfare on the ground remained a stalemate, but Allied pilots had if nothing else come from behind and given their side a shot of moral support. The onetime airborne underdog now set the standard for future aerial combat.

The morbid remains at Dead Man's Hill near Verdun show how the dead were often left unburied in the trenches.

THE BATTLE OF THE SOMME (1916)

WINGS Game Sector: Amiens

By the time active combat erupted on the Somme River, aerial strength on both sides of the war had just about reached equal proportions. Formation flying was being perfected by the Allies and Central Powers alike, and synchronized forward firing machine guns shot back and forth at each other. Conditions now existed ideally for a phenomenon that became known as the dogfight.

The Allies' ground offensive launched at the Somme July 1, 1916 (aerial combat had begun in late June) was their answer to Verdun — an attempt to take some of the heat off the Germans' desire to set the pace of the war. With the majority of France's military resources still committed at Verdun, it was the British who truly took Germany to task in the Somme initiative. Again, both sides suffered immense casualties for minimal territorial gains. Yet the attack showed the Central Powers that, of their two enemies to the west, it was Britain who was emerging as the more formidable strength. Consequently, the air battles of the next full year became a contest between rivals Britain and Germany; it was the Royal Flying Corps against whom Germany would measure the status of its own air service.

I am a hunter. My brother, Lothar, is a butcher. When I have shot down an Englishman my hunting passion is satisfied for a quarter of an hour.

Manfred von Richthofen

Allied strafing and bombing runs sent German infantry running for cover. Low flying planes backed English artillery to the extent that German troops wondered what had happened to their once brilliant Fokkers. Still, while the Sopwiths and Nieuports harried enemy aircraft, trenching positions on the ground were little changed. Though extraordinarily well planned, the five month British ground strike was an unmitigated disaster, with catastrophic losses all around: 420,000 British casualties; 195,000 French; 650,000 German. At the same time, the German War Ministry was anything but ready to concede to Allied superiority in the air. It was time for the German Air Service to regroup — and regroup it did! Technical advances in airframe design were already in the works that would bring the more powerful, agile, and heavily armed Fokker D.I, D.II, and D.III series to the skies. Future clashes would soon prove their prowess.

ARRAS, YPRES, AND CAMBRAI (1917)

WINGS Game Sector: Amiens

The deaths in 1916 of two great German pilots, Oswald Boelcke and Max Immelmann, provided as much of a moral defeat for Germany as they did a spiritual lift for the Allies. With these first two folk heroes of the *Luftstreitkrafte* gone, the task of leading the German Air Service fell upon the shoulders of Boelcke's protege, a talented young pilot by the name of Manfred von Richthofen. It was in his trademark scarlet Fokker triplane that "The Red Baron" provided German pilots with the leadership they needed as

the Allies launched their next substantial offensive. The Spring of 1917 put Richthofen to his greatest test as the Western Front exploded at Arras.

The second wave of valiant British troops advance from the trenches at Arras.

General Trenchard now employed his philosophy as adamantly as ever, demanding that his squadrons "carry the war into enemy territory and keep it there." Ironically, his worst fears became reality when bureaucratic paper shuffling among his superiors failed to provide Allied pilots with the technical improvements in aircraft he requested with fervor. The year 1917 had begun with a "let's win the war this year" optimism, though Trenchard was aware that the German Albatros D.IIs and D.IIIs would outclass his Nieuports and Spads. Worse, German pilots on the average were living longer than Allied pilots and coming into combat with significantly more flying experience. The Allies outnumbered the Central Powers in total planes, but this wasn't enough of an advantage where the deadly double Spandau machine guns were concerned.

Originally scheduled as an early year definitive advance along a hundred mile sector of the front from Arras to the Aisne, the Allied offensive was trimmed in scale and pushed back to April. Though troops were depending on their brother pilots for strafing cover, when fighting commenced it was as if the Allies were facing the Fokker Scourge all over again. On land, British infantry (primarily the elite Canadians) accomplished a tactical success in taking Vimy Ridge, but overall the month long offensive resulted in the too common slight gains/heavy losses scenario. With Richthofen's brilliant defensive strategies, Allied pilots fared even worse. Suffering some of their worst losses of the war — with an astounding one hundred and fifty planes blown from the sky — French and British pilots would remember the Battle of Arras as "Bloody April."

I hope he roasted the whole way down.
Mick Mannock, on hearing of Richthofen's death.

Though the Allies took a beating in early 1917, their demoralizing losses were more due to ace marksmanship by individual German flyers than any overall advantage that the Central Powers had gained. In fact, ever since the Battle of the Somme the Allies had been gaining superiority over their German counterparts both in total numbers of aircraft and the technical flair of their vastly improved fighters. While this was hardly apparent at Arras, the arrival of the sleek S.E.5 in the days following Bloody April would breathe new life into the Allies' hopes. The give and take roller-coaster of air superiority continued to bewilder governments and military personnel alike, though the teeter-totter of balance took an especially wild tilt that same month when the United States of America officially entered the war.

Fighting throughout the rest of 1917 can in some senses be described as the futile search for mobility on the Western Front. Pilots of the R.F.C. supported the Third Ypres Campaign (the First and Second Battles dated back to 1914 and 1915) in hopes of neutralizing the unrestricted submarine warfare of U-boats being launched from the ports of Ostend and Zeebrugge. When retooled British tanks took to the battlefield at Cambrai, Allied aircraft flew valiantly overhead to mask the incessant noise. In all, the strategic withdrawal of the Central Powers to the dynamic Hindenburg Line left the Allies searching for a way to break through Germany's defense mechanism. All factions wanted to enter 1918 with a true eye on ending the war.

LUDENDORFF'S "PEACE OFFENSIVE" AND THE ALLIED COUNTERATTACK (1918)

WINGS Game Sector: Rheims

As hoped, the S.E.5 brought the Allies once again on par with the German flying machines, and the advent of the Sopwith Camel (with which the S.E.5 best flew in tandem) put the Allies back in the lead of the race for technical supremacy. With the downing of the Red Baron by Captain Roy Brown in April 1918, the Allies achieved an uncontested advantage as the German war machine went into a tail spin and at last began to collapse.

There won't be any after-the-war for a fighter pilot.
Raoul Lufbery, American ace with the Lafayette Escadrille and later the U.S. Air Service.

Still, victory for the Allies would not come easily. The Russian Revolution had essentially eliminated Germany's worries in the east. In March 1918, the Bolsheviks signed a peace treaty with Germany and more than a million German soldiers were released to fight on the Western Front. General Erich Ludendorff came to believe that a series of victories at Lys and Flanders could be parlayed into a peace settlement favorable to the Central Powers if his troops were able to exhaust the British and French before American reinforcements arrived in full strength. Setting his sights on certain gains on the Aisne that he could use as bargaining chips, Ludendorff thus launched a series of devastating spring offensives. The ensuing bloodshed brought the Allies their darkest hour and left them with only one recourse: their first totally cooperative counteroffensive.

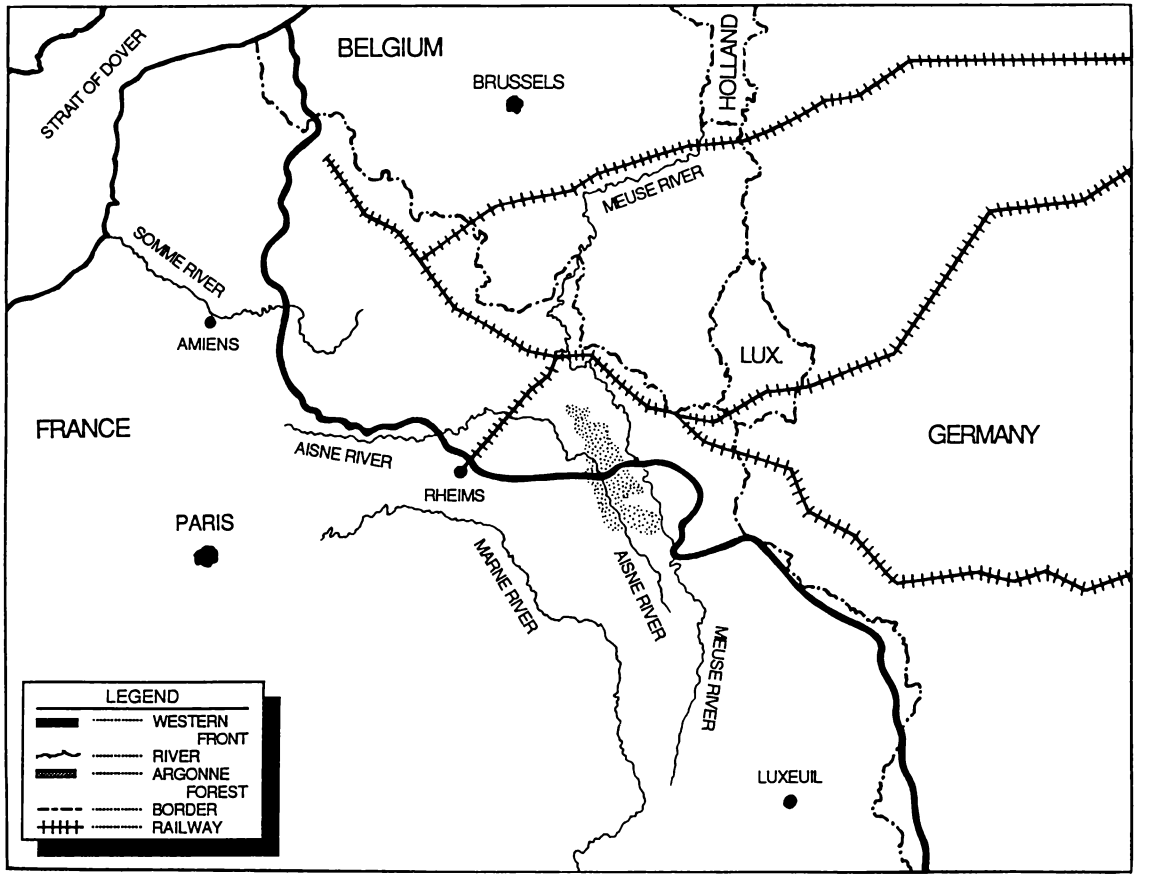
In one of the finest action photographs of the war, American soldiers man a machine gun nest in the Meuse-Argonne offensive.

French, British, Italian, and American infantrymen embarked on an immense inter-Allied venture with a new series of successful attacks at the Marne beginning on July 18, 1918. Pushing the Germans back through the month of August at Chateau-Thierry and Belleau Wood, the Allies won another victory at St. Mihiel. Allied military experts soon came to believe that a triumph at the Meuse River would lead to the collapse of the Central Powers. It would take unified air power to deliver the necessary punch.

Fighting at Meuse-Argonne began in September 1918 with the Allies enjoying superiority in numbers, quality of troops, and excellence in equipment. It was primarily French and American pilots who flew the bulk of cover through the much needed conquests of October. Light bombs, machine gun strafing of German front line positions, and long range bombing of German fortified rear positions (with formations of literally several hundred planes) constituted the first mass intensive air support of ground

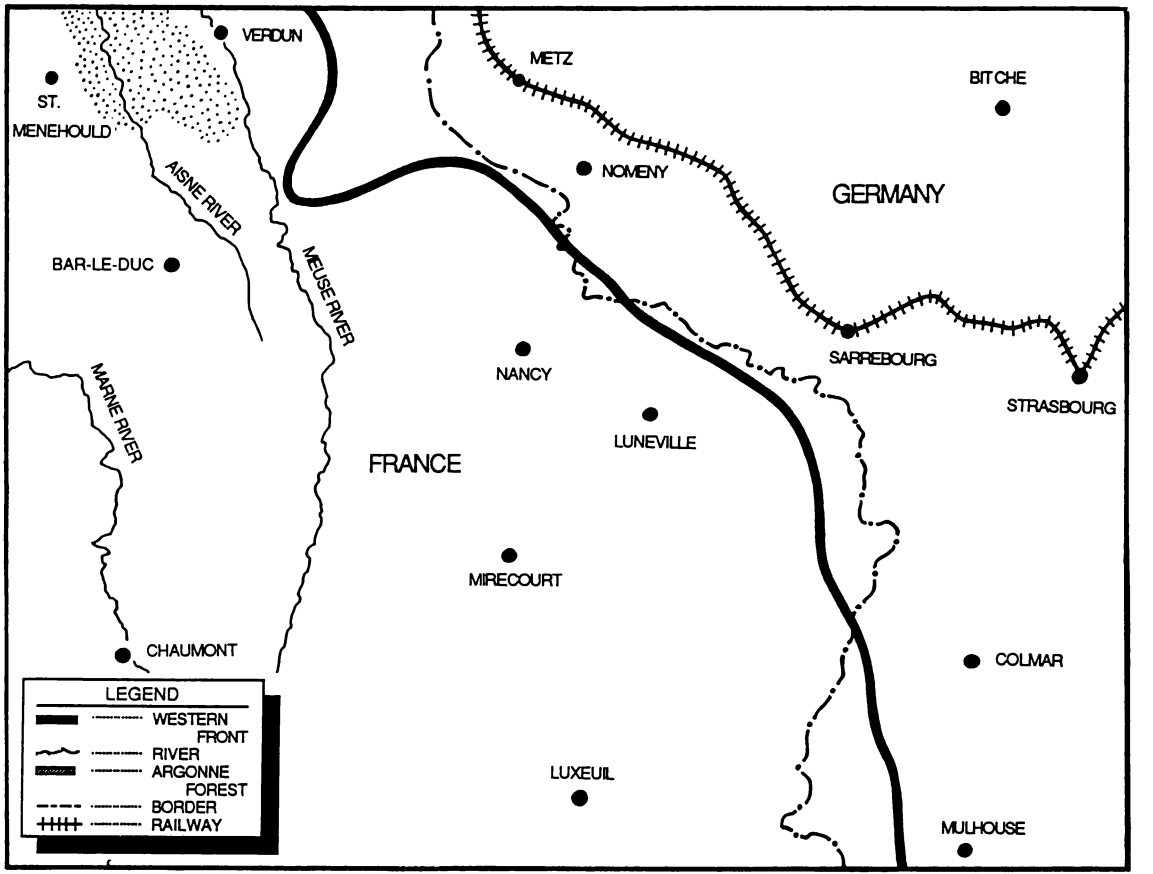
troops formally organized as part of a major attack. The undaunted stand of the Central Powers in the Argonne Forest provided the last days for pilots to go home aces. Some American pilots like Eddie Rickenbacker would find glory; others would fall prey to the last ditch attempts of committed German pilots bent on flying their best to the final moments of war.

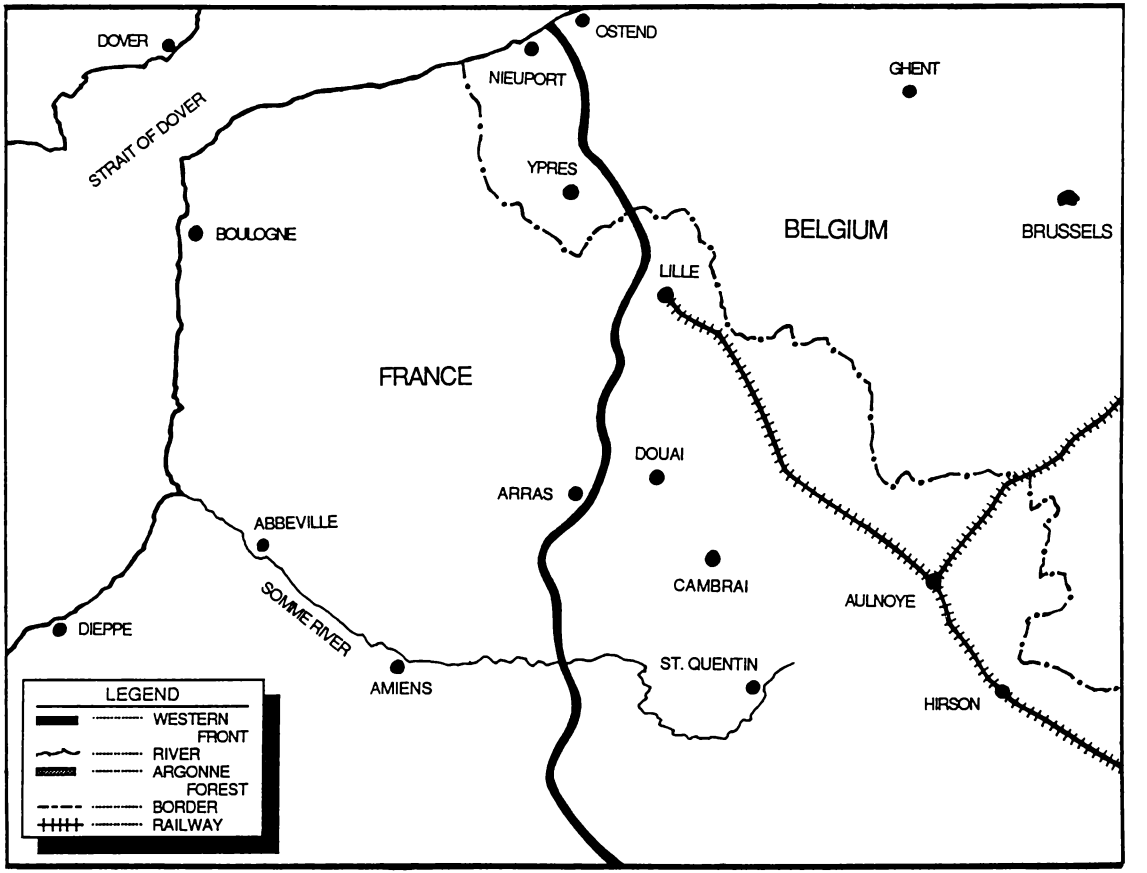
By November 1918, there were approximately 8000 active Allied planes to Germany's 3300. Clearly, the war had turned both in terms of manufacturing and combat success. The defeat of Germany, the end of the war, and the beginnings of peace were all within reach. With the unconditional surrender of the Central Powers and the Armistice treaties of November, the ever-increasing role of aviation in all future military actions was absolutely ensured.



EUROPE'S STABILIZED WESTERN FRONT 1914

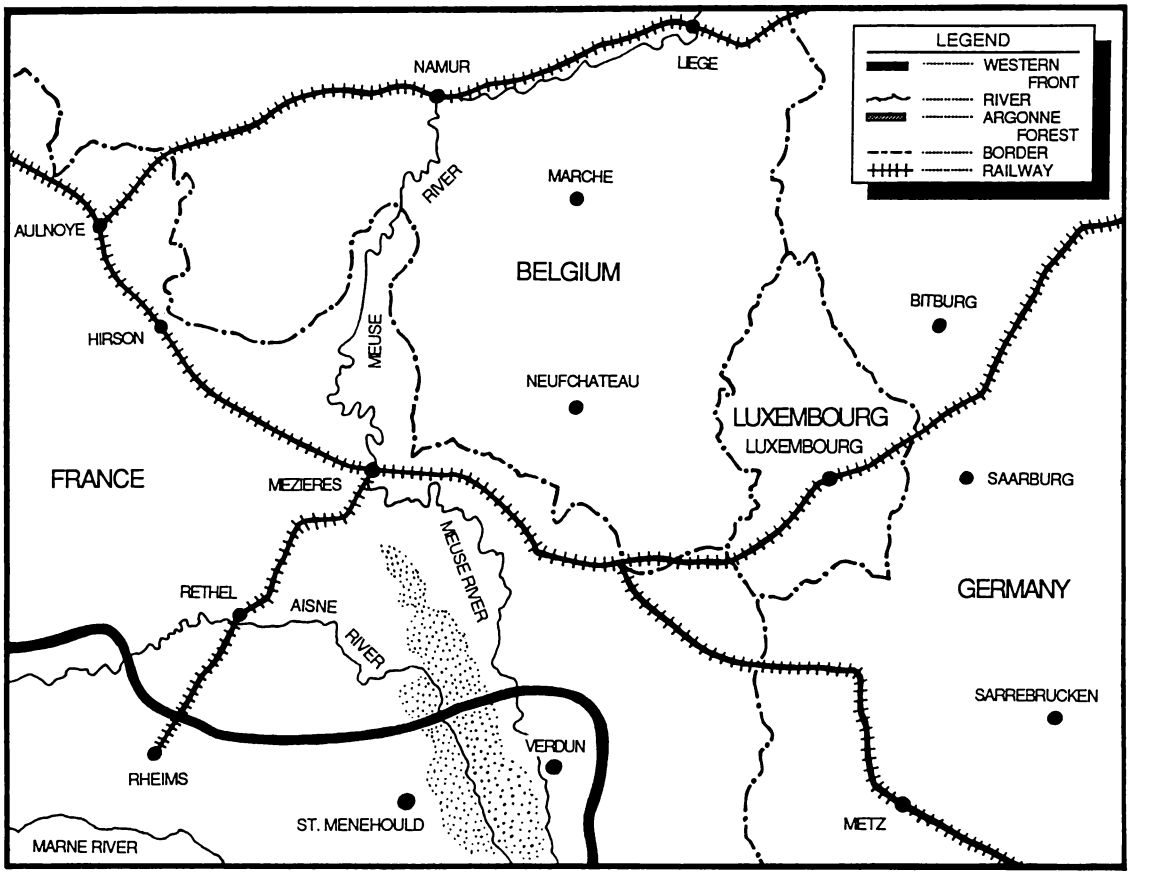
LUXEUIL SECTOR





AMIENS SECTOR

RHIEMS SECTOR



PRINCIPLES OF FLIGHT

PLANE DESIGN & BASIC ENGINEERING

The Allies

For the same reasons that the S.E.5 was the plane of choice for many Allied pilots, it is the S.E.5 that is reproduced in modified form on-screen in WINGS. What is most important to know about this fighter as it is represented in WINGS is that in terms of its potential in combat, it stands somewhere in the middle when compared to its enemy counterparts. As a biplane, it is more dependable than the Fokker E.III but less acrobatic than the Dr.I. In terms of speed, it flies on par with most Fokker biplanes, though in the hands of the better pilots, it proves its overall superiority in design via its dogfighting performance. A favorite among the great aces, it offers pilots an extremely stable gun platform and dual machine guns synchronized with precision to fire directly through its propeller slightly upward at an angle of five degrees.

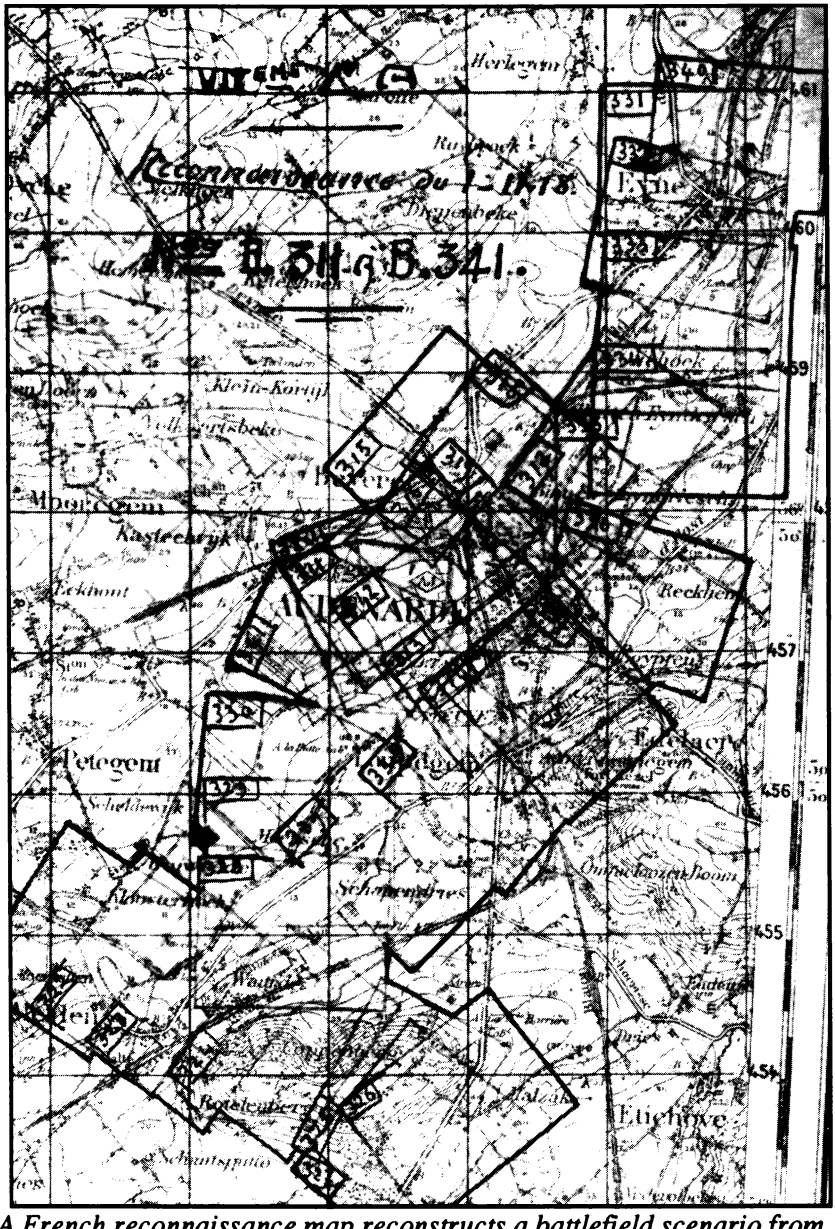
Of British design, the S.E.5 incorporates the joystick responsiveness of the Sopwith while improving on the diving capacity of the Nieuport. While not quite as maneuverable as the Camel, it is faster and maintains a much higher ceiling. Changing the ammunition drum can be awkward, but the 150 horsepower V-8 engine more than compensates for this problem by giving pilots the power needed to safely obtain position for reloading

The Central Powers

The planes of the Central Powers represented on-screen in WINGS are the Fokker E.III, the Albatros D.II, the Fokker D.VII, the Fokker Dr.I, and the Gotha bomber. In the air, it is clear which of these is at bay by referencing whether the opponent is a monoplane (E.III), biplane (D.II & D.VII), or triplane (Dr.I). The Gotha is distinguished by its extended wingspan. Just as in the skies over Europe, there are distinct advantages to knowing who one is challenging and how an opponent's aircraft flies in comparison to one's own.

While monoplanes were commonly thought to be more maneuverable than larger aircraft (in many instances they were), they were notorious for structural failings that made them extremely unstable. At high speeds or when pushed to their limit under severe gravitational pressure, they could literally disintegrate in mid air. A smart pilot flying a monoplane thus employed caution; of the three types of enemy aircraft, the monoplane was the Allies' least worry. Still, it was a threat and not to be discounted or underestimated.

Second in speed and maneuverability was the trusty biplane — the staple of World War I flying. In the case of the Fokker D.VII, it cruised smoothly and steadily at medium speeds. The Fokker Dr.I triplane was the Allies' main concern. Whenever one appeared on the horizon, pilots were put to their most extreme test. The high speed, excellent maneuvering capabilities, and awesome target range of the German triplane always required the best of an Allied ace.



A French reconnaissance map reconstructs a battlefield scenario from aerial surveillance.

Take the cylinder out of my kidneys,
The connecting rod out of my brain, my brain,
From the small of my back take the camshaft
And assemble the engine again.

R.F.C. Mess Song

Taking-Off

As with all planes, leaving the ground is a result of high air pressure building up under the wings while air pressure decreases above. This is initially accomplished by thrusting forward down the runway to create "lift." With its throttle shoved forward, the S.E.5 under most conditions must reach 75 to 80 m.p.h. and run 150 to 250 feet to become airborne. Taking off into the wind is always preferable (ideally at 10 – 15 knots), as it forces the plane upward at a faster and more fuel efficient pace. Climbing then commences at an average of 850 to 900 feet per minute, with no appreciable torque and a relatively low noise level.

One must first overcome the inner schweinehund.

Manfred von Richthofen

Landing

It is important to remember that most World War I planes had no rear wheels, but rather a tail skid that brought the aircraft to a quick stop on any grassy field. Because of the nature of the tail skid, landings on pavement were not recommended. Optimal landing speed was 50 to 55 m.p.h. Several hundred feet of open terrain made for the smoothest landings, though when necessary a plane could be dragged to a quicker stop in less space by an experienced pilot. The best landings were made into the wind, with the plane's wings kept level.

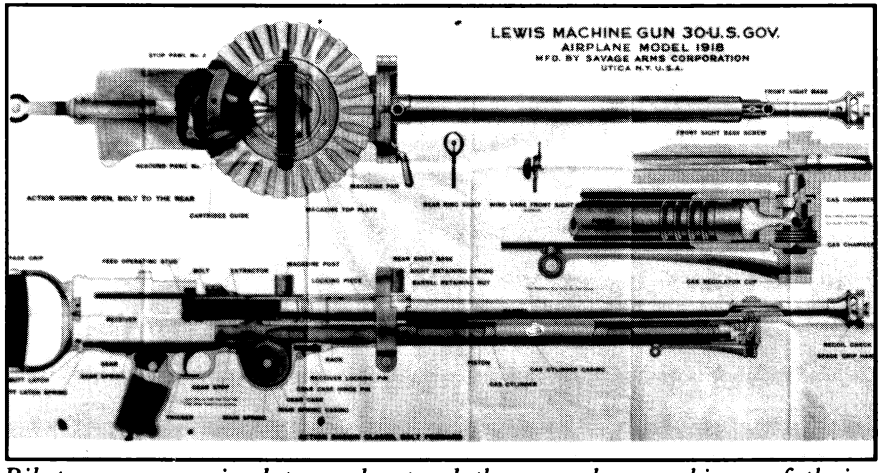
In-Flight Operations

Basic flying consisted of climbing, diving, and turning. Stalling could be intentional or unintentional — either purposefully employed as part of a turn or the accidental result of poor judgement in executing some other maneuver.

Control over the plane was exerted through engine speed, elevators, and the tail rudder. Joystick position controlled banking, diving, and climbing. Air speed (measured in knots) was controlled by the throttle, which was lowered in a dive and advanced in a climb. Strategic stalling would drop a plane's nose and position the plane for a diving sequence, often used for a quick escape.

Looping, flying inverted, and barrel-rolling were all fanciful variations of controlling the aircraft. While masters like Boelcke sneered at excessive turning and aerobatic tricks, others chose to be mavericks and learned to use wild maneuvering to their offensive as well as defensive advantages. Though all of these tactics were used at times as evasive measures, they tended to burn a great deal of fuel, could dizzy a pilot, made deflection shooting (hitting a moving target from a moving aircraft) extraordinarily difficult, and compromised a pilot's ability to quickly recover level control if his plane was hit by anti-aircraft fire.

Maximum speed for the S.E.5 and comparable aircraft in its class was 132 m.p.h., best attained at an altitude of 3000 feet. Top r.p.m. was 1650, and stall speed was 52 m.p.h. The S.E.5 had a service ceiling of 19,000 feet, with a maximum ceiling at 22,000. Endurance was timed to two and a half hours and necessitated appropriate planning.



Pilots were required to understand the complex workings of their weaponry, represented by this illustration of a Lewis machine gun.

The synchronized machine gun...was an inevitable device.
Anthony Fokker

WEAPONRY

Initial aerial armaments consisted of the occasional grenade dropped on the enemy or a series of flechettes (pencil-sized steel darts) that could be released on infantry or cavalry. These crude forms of ammunition were soon replaced by the much more efficient machine gun, which became even more dependable as synchronized firing through the propeller became a reality. Pilots on both sides of the war knew there was a great deal more to shooting at the enemy than simply pulling the trigger. Sighting the enemy, lining up a target, calculating range, and creating a safe escape route were all part of the task. As advances in equipment and improvements in the accuracy of weapons progressed with the months, knowing how and when to use firepower became as important as the developments in the technology themselves.

— • —

Vickers Machine Guns were the Allies' premier strike tool. Usually mounted in pairs on the platform directly in front of the pilot, they could release 800 rounds per minute. Dual firing Vickers in conjunction with the Constantinesco hydraulic synchronizer provided the Allies with what was commonly recognized as the deadliest weaponry in the air — the bread and butter of the most successful Allied attacks.

—•—

Lewis Machine Guns were lightweight, reliable, and most often mounted on the upper wing of Allied biplanes to fire over the propeller. This .303 caliber machine gun could be used in conjunction with the Vickers, allowing a pilot to fire at a different angle while reloading his primary munitions.

—•—

Spandau Machine Guns were Germany's answer to the Vickers. Also known as the LMG .08/15, they were Anthony Fokker's primary tool in perfecting his experiments with synchronization. Named for the town outside Berlin where they were manufactured, these fixed, forward-firing weapons performed best when mounted in pairs, and could pack up to 600 rounds each.

—•—

Bombs were of many varieties, ranging from four pounds in 1914 to six hundred pounds in 1918. Explosive capabilities also ranged widely, from a bomb that could eliminate a single soldier in a trench to one that could destroy an entire supply train. Bombs took the form of either artillery shells with fins or less sophisticated incendiaries encased in crude steel vessels. First used in aerial missions by German dirigibles, they later became an important threat carried by fighters and eventually the huge bomber planes designed specifically for maximum efficiency in carrying the heavy payloads. Significant factors to be taken into account when dropping bombs involved the direction the wind was blowing as well as its velocity. Wind in conjunction with a plane's speed always played a major role in determining where a bomb would land or whether it would hit its target.

—•—

Le Prieur Rockets were a late development in the war on the part of the Allies. Mounted in tubes under a plane's lower wings (either two or four per wing with no more than a total of eight per flight), they were best used for attacking dirigibles and observation balloons. Often inaccurate and always unpredictable, they were used sparingly.

Oil in the Eyes — And Another Surprise

Flying in World War I without sophisticated instrumentation was hard enough for pilots with 20/20 vision. It's safe to assume that flying blind was one of the quickest ways to becoming the guest of honor at a memorial service. Not so for the miracle-man Albert Ball, who in the midst of one dogfight saw an oil pipe from his engine explode in his face.

As reported in the January 1918 issue of *National Geographic* by then Major William Avery Bishop, Ball had been luring four oncoming Germans into one of his infamous games of head-on "chicken." While three of the enemy pilots swerved as Ball had predicted they would, the fourth kept coming without any indication of flinching. As the two planes approached each other — each at the speed of 125 m.p.h. — Ball was certain that his opponent had set his mind on a mid-air suicide collision that would certainly kill them both. Equally unwilling to pull out, Ball locked his fingers on his trigger and both pilots mercilessly fired rounds of machine gun fire directly into the sights of the other.

With the ramming maneuver all but a *fait accompli,* several rounds from the German plane ripped into Ball's engine and tore open an oil pipe. Carried by the force of wind, leaking oil poured into the air and splashed into Ball's eyes. Unable to see and suddenly resigned to death, Ball closed his eyes and continued to fly straight — expecting at any second the impact of the crash, ever the more determined to take his attacker with him. When far too many seconds had passed for Ball reasonably to still be alive, he wiped the oil from his eyes and could hardly believe what he saw: his opponent was diving for the ground!

The German had fallen from his crash course with but twenty yards to spare, leaving Ball to see him drop all the way to the earth. Ball ultimately concluded that he had killed his adversary with an early round, but that the dead pilot had collapsed in his seat in such a way as to lock his finger around the trigger and his hand on the previously aimed joystick. The incident became legendary, Ball's success and survival leaving him ever the more bull-headed and fearless in his ongoing use of radical tactics.

AERIAL TACTICS AND TIPS

MANEUVERS

Patrolling

Pilot's Objective: To fly in formation, search out airborne enemy aircraft, engage the enemy in combat, and reduce enemy air strength through elimination.

WINGS Game Sequence: 3-D Flight Simulation

Pilots generally understood their primary role in the war to consist of flying patrols. For the Allies, this most often consisted of crossing into enemy airspace; for the Germans, it involved maintaining position on the Western Front by enforcing the sovereignty of that airspace. In simpler terms, the whole idea of the patrol was to find the enemy and drive or shoot him down. Maintaining constant patrols to intimidate the enemy and keep him at bay was only half the task; when planes of opposing forces encountered each other, the result was almost inevitably a dogfight.

A French aviator uses a specially designed camera to practice lining up a target in the sights of a machine gun.

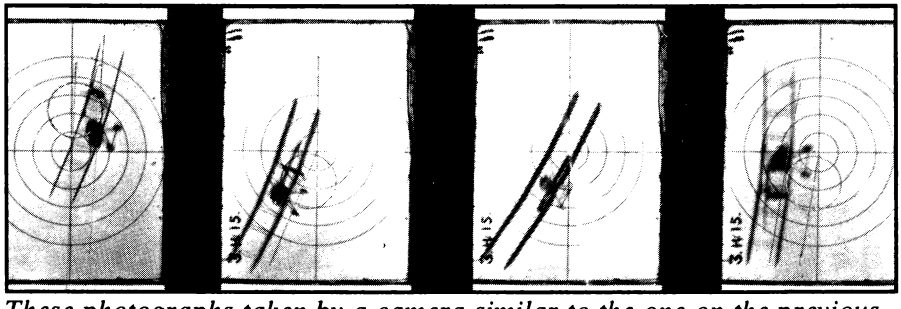
Dogfighting tactics varied from pilot to pilot, though as a whole they involved the techniques of diving, climbing, turning, looping, rolling, lining up an enemy in one's sights, and firing. Combining maneuvers for effective combat success was a very personal talent that had to be developed over time. While getting tail position on the enemy and playing pursuer in the game of chase could provide a pilot's best shot, having a feeling for how to

shake an enemy from one's own tail was equally important. Swerving left and right while quickly altering one's altitude not only prevented one from being an easy target, it reduced the chances of shelling impact and at the very least prevented multiple hits to the same critical component.

Pilots learned to dodge oncoming enemy aircraft as well, while judging speed and distance to determine where to aim and fire. Leading the nose of an enemy plane with machine gun fire was another skill that required perfecting, as was protecting the wing of one's partner when engaged in multiple plane dogfighting.

There were few flyers with any experience of air fighting who were not obsessed to some degree, though usually secretly, with the thought of being shot down in flames.

Arthur Gould Lee, later an Air Vice Marshal

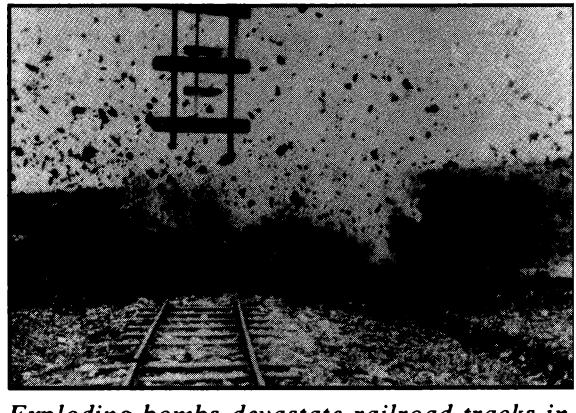


These photographs taken by a camera similar to the one on the previous page show how a targeted plane appears to the gunner.

Bombing

Pilot's Objective: To fly high above a strategic ground target impregnable by strafing, mentally calculate the angle at which a payload should be dropped, and eliminate said target from operation.

WINGS Game Sequence: Designated 2-D Missions



Exploding bombs devastate railroad tracks in Germany.

Any time a bomb was released, a pilot risked exposing his position. When sighted by the enemy, bombing missions could be attacked from below by anti-aircraft fire. Since the smaller fighter aircraft could only carry a limited supply of bombs, selecting the optimal moment to release one's explosives was of the essence. Altitude, flight speed, wind direction, and wind velocity were all factors that influenced hitting one's target. Strategic maneuvering

could involve anything from hiding behind cloud cover to executing wild aerobatics that hopefully would leave artillery gunners dumbfounded.

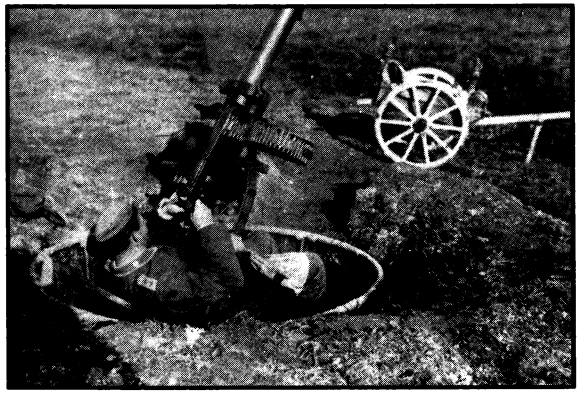
Larger biplanes on the order of German Gotha bombers also provided a menace to Allied positions. Able to carry larger loads of explosives, they were not as agile as fighters and provided larger targets for anti-aircraft fire, yet they were often flanked by their own escort fighters. For the Allied fighter pilot on a bombing mission, flexibility was essential. Sighting an enemy bomber often forced the pilot to rethink his orders and switch from offense to defense within seconds.

Strafing

Pilot's Objective: To fly low to the ground, disperse enemy troops with machine gun fire, and eliminate strategic land targets inaccessible to bombing runs.

WINGS Game Sequence: Designated 2-D Missions

Second only to the dogfight in bringing adrenalin to bear was the strafing scenario. Virtually invulnerable to rifle-firing infantryman, a plane on a strafing run could clear enemy trenches to allow the advancing of its own troops. While the larger mounted anti-aircraft guns did pose a threat to strafing planes, the main obstacle faced by a pilot was the ground itself. As in bombing, calculating the angle of attack was vital; flying too high was a wasteful exercise and flying too low could result in unforeseen collisions with the ground, buildings, or other objects.



A German soldier handles a menacing anti-aircraft gun with precision readiness.

While the thrill of strafing was in some senses a reward for more risky flight assignments, swift winds could slam a low flying plane to the ground when the pilot was not ready to pull up. Likewise, excited pilots on strafing runs unaware of the enemy's air defense strategy could find themselves becoming targets to expert marksmen on the ground. Strafing meant keeping an eye on the ground as well as the sky. Mastering the joystick was essential to hitting one's chosen targets.

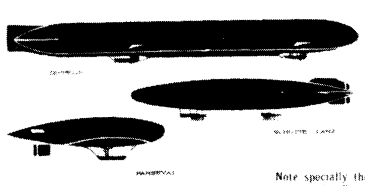
PUBLIC WARNING

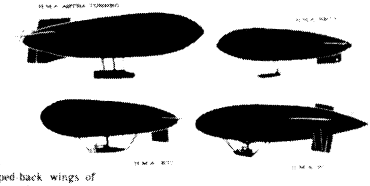
The public are advised to familiarise themselves with the appearance of British and German Airships and Aeroplanes, so that they may not be alarmed by British aircraft, and may take shelter if German aircraft appear. **Should hostile aircraft be seen,** take shelter **immediately** in the nearest available house, preferably in the basement, and remain there until the aircraft have left the vicinity: do not stand about in crowds **and do not touch unexploded bombs.**

In the event of **HOSTILE** aircraft being seen in country districts, the nearest Naval, Military or Police Authorities should, if possible, be advised immediately by Telephone of the TIME OF APPEARANCE, the DIRECTION OF FLIGHT, **and whether the aircraft is an Airship or an Aeroplane.**

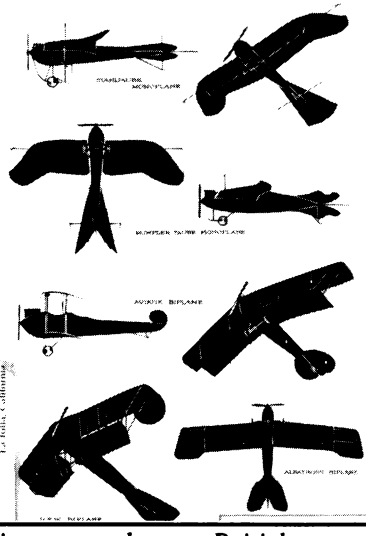
RMAN | BRITIS

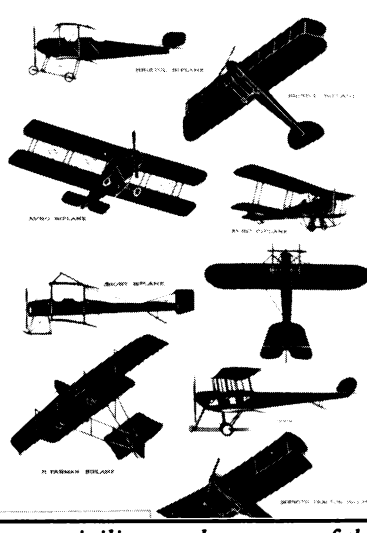
Note specially the shape of the Airships and the position of the passenger cars





Note specially the sloped back wings of the German Aeroplanes





This commonly seen British poster warns civilians to be aware of the new aerial threat.

BALLOONS AND DIRIGIBLES

"I rated the Zeppelin much lower as a weapon of war than almost anyone else. I believed that this enormous bladder of combustible and explosive gas would prove to be easily destructible. I was sure the fighting aeroplane, rising lightly laden from its own base, armed with incendiary bullets, would harry, rout, and burn these gaseous monsters."

Winston L. S. Churchill
First Lord of the British Admiralty

The rivalry between airplanes and airships was a contest of endurance between those aircraft that were lighter than air and those that were heavier. While both Allied and Central Power armies made use of the round observation balloons for reconnaissance, the German armed dirigible known as the Zeppelin became a force with which the Allies would have to contend.

A hydrogen-filled, lighter-than-air British observation balloon rises in the skies over France.

As entrenchment along the Western Front progressed, Germany increasingly used Zeppelins to raid the channel ports of France in hopes of cutting off communications between British troops and their homeland. These four hundred foot long airships were supported by aluminum frames,

highly maneuverable via engine driven propellers, and capable of carrying heavy loads of bombs. The thick fabric walls of the balloons were filled with hydrogen gas, which indeed proved volatile if ignited by enemy fire. Still, as the Germans bombed the northern docks and railroad terminals of France throughout 1914 in the so-called "Race to the Sea," British airplanes of the Royal Naval Air Service (R.N.A.S.) had their work cut out for them.

Winston Churchill made it a priority to keep Zeppelins away from the important ports of Boulogne, Calais, and Dunkirk. Yet even as machine gun fire from fighter aircraft proved a deadly enemy to Zeppelins, the higher ceilings of these great airships often kept them high above British patrols and out of hearing range from the ground. Zeppelins embarked on long flights to drop their bomb loads on Britain itself, with raids on London as early as May 1915. Britain fought these bombings — which for the most part took place at night — by launching its own captive balloons carrying great steel cables to entangle the attacking airships. Still, the major defensive tool against the Zeppelin was the airplane, and Allied aces rose to the challenge in well organized attacks that would often end with spectacular explosions.

As Zeppelin bombs increased in size through 1916 from one hundred to six hundred pounds, improved anti-aircraft machine guns made the dirigible missions all the more risky for the Germans. Raids on the British homeland continued through 1918, though as skillful Allied pilots caused such bombing runs to be ineffectual, the Germans increasingly began to concentrate their Zeppelin attacks on British submarines in the North Sea. Britain's notorious foul weather and gale winds were also disastrous to long range expeditions. Where German strategists had hoped bombing London would shatter British morale and curtail manufacturing efforts, the costs of these campaigns were too great for the minimal success they would eventually bring. The sheer magnitude of each exploding Zeppelin brought tremendous moral defeat to the Germans, who came to realize the total damage being done to Britain was slight. While Zeppelins over the French coast and British capital kept a certain number of British planes on patrol and off the Western Front, they actually accomplished very little in the overall scope of the Central Powers war effort.

GAMING APPLICATIONS

Pilots on both sides of the lines underwent extensive training at various levels of flight school. Still, there were no lessons quite as instructive as those learned through experience. Compiled below are two summaries of the most universal strategies utilized by Allied and Central Power squadrons alike. While the first represents an early German view and the second speaks for a much later American assessment, it's interesting to note that all the rules mentioned were basically acknowledged and employed by both sides of the war — for the most part unconsciously and without argument.

Boelcke's Code for Aerial Combat

Under orders from the German high command, Oswald Boelcke compiled the following rules as the official doctrine of fighter pilots in the German Air Service. For the most part, his sage advice would be well taken by any pilot flying under similar circumstances of the times or in a modern simulation.

1. It is always best to attack your opponent from behind.

2. Always keep an eye on your opponent. At no time should you allow yourself to be deceived by ruses.

3. Maneuver to gain an advantage over your opponent before opening fire.

4. Once you have committed yourself to attacking, always follow through on your maneuver.

5. When flying over the enemy's lines, always keep in mind your own line of retreat.

6. It's best to attack in groups of four or six. When a fight breaks up into a series of individual combats, make sure that the fray is balanced and that several of your cohorts do not go for one opponent.

7. Open fire only when your opponent is lined up in your sights. Close range is highly recommended to avoid wasting ammunition.

8. If an opponent is diving on you, do not try to evade the attack. Instead, position yourself such that you are ready to fight back.

Each day brought also a fresh harvest of heroic actions, bloody sacrifices. Each day aviation reaped new honor and new glory.

Captain Jacques de Sieyes

Blesse's Basic Principles for Fighter Pilots

While The Allies had no formal flight code of their own, word of mouth passed along the strategies of such influential fighter pilots as Mick Mannock. Still, it is interesting to note that when in the 1950s Major Frederick C. "Boots" Blesse of the U.S.A.F. compiled a summary of what he learned flying jets in Korea, many of his observations matched what Boelcke and other World War I flyers had claimed from the beginning. Like Boelcke's less intricate scheme, the simple lessons recommended by Blesse prove that all fighter pilots are governed by the same basic guidelines. What follows is an abridgement of Blesse's "No Guts No Glory" writings, which has proven as applicable to the First World War as the second. Purists may claim that such hindsight is always twenty-twenty, yet it is worth noting that many of the outlined practices have remained in practice long past the Korean War and through the extremely complex engagement of jet fighters tested in simulation today.

OFFENSE

1. Know the performance data of all planes you are likely to fly. Especially be aware of your "Big Three" Be familiar with glide characteristics, air start procedures, and fuel consumption.

2. When in doubt — attack! Yet don't shoot unless you're sure it's an enemy aircraft; if you can't tell, you are out of range.

3. Always be looking around. You can't shoot anything until you see it.

4. Keep the aircraft you are attacking in sight. One glance away can be fatal.

5. Try to attack from low and behind — that's a fighter's poorest visibility area.

6. If you have an enemy aircraft in front of you, assume there is one behind you as well; there usually is.

7. When in doubt in a dogfight, trade airspeed for altitude.

8. The "element" of two planes comprises the most effective basic fighting team. Fly in twos whenever possible, including on the way home after a fight. Beyond that, always play on the team. The most effective fighting unit encompasses two "elements." The best wingmen become element leaders. Flagrant individualists get shot down or are grounded.

9. Do not continue turning with an enemy aircraft once you are unable to track him in your sight. Pull up immediately and keep your nose behind his tail. If he pulls up, you'll always end up on top because of your attacking airspeed.

10. Divide the enemy and conquer. If you can split the tactical formations of the enemy, his mutual support efforts against you will be ineffective.

11. There are three distinct phases in destroying another aircraft in the air:

a) Maneuvering = 85%
b) Positioning the pipper = 10%
c) Firing and sighting the burst = 5%

The majority of all lost kills are the result of attempting (b) and (c) before the challenges of (a) have been adequately met.

12. No guts, no glory! Guts may be no substitute for skill, but you can't become an ace if you don't get in there and mix it up with your opponent. Maneuver, engage, and shoot to kill.

DEFENSE

1. Your best defense is a strong offense.

2. Always keep an eye on your fuel level.

3. Maintain higher airspeeds when patrolling.

4. If you lose your wingman, both of you should leave the combat area.

5. Avoid staring only at the aircraft in sight. For every one you see, there are plenty of others out there.

6. If you slow down, have an element high and fast for support.

7. Except at extreme ranges, always turn into an attack.

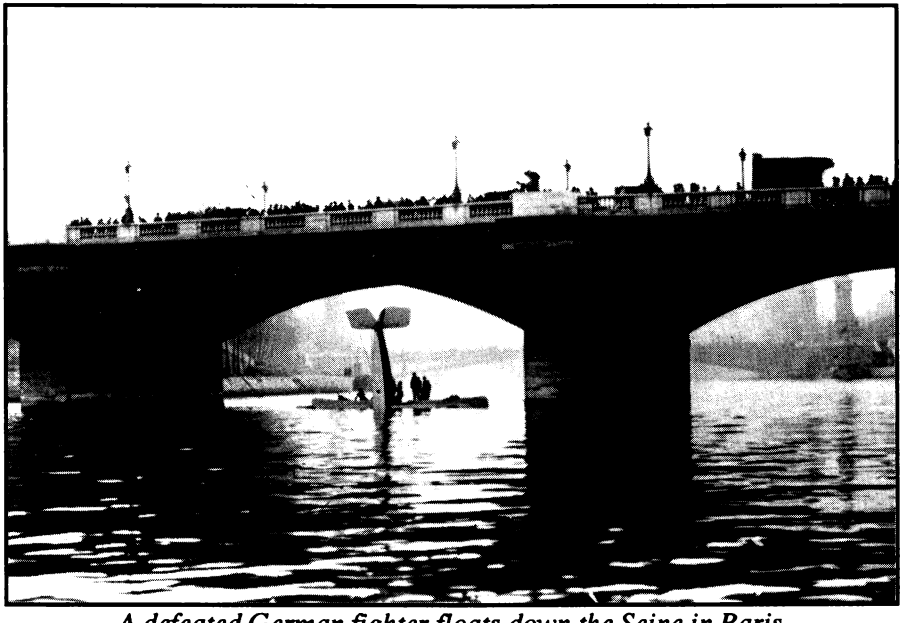
8. Don't ever reverse a turn unless you have your attacker sliding to the outside of the radius of your turn.

9. Keep your attacker at a high angle off.

10. Watch the sun — a well-planned attack will come out of the sun when possible.

11. The object of any mutual support maneuver is to sandwich an attacker between the defending aircraft.

12. Above all, don't panic! Panic is your worst enemy.



A defeated German fighter floats down the Seine in Paris.

In case of a European War...both sides would be equipped with large corps of airplanes, each trying to obtain information on the other, and to hide its own movements. The efforts which each would exert in order to hinder or prevent the enemy from obtaining information...would lead to the inevitable result of war in the air...by armed airplanes against each other. This fight for the supremacy of the air in the future wars will be of the greatest importance.

British Committee of Imperial Defense, Report of February 1912

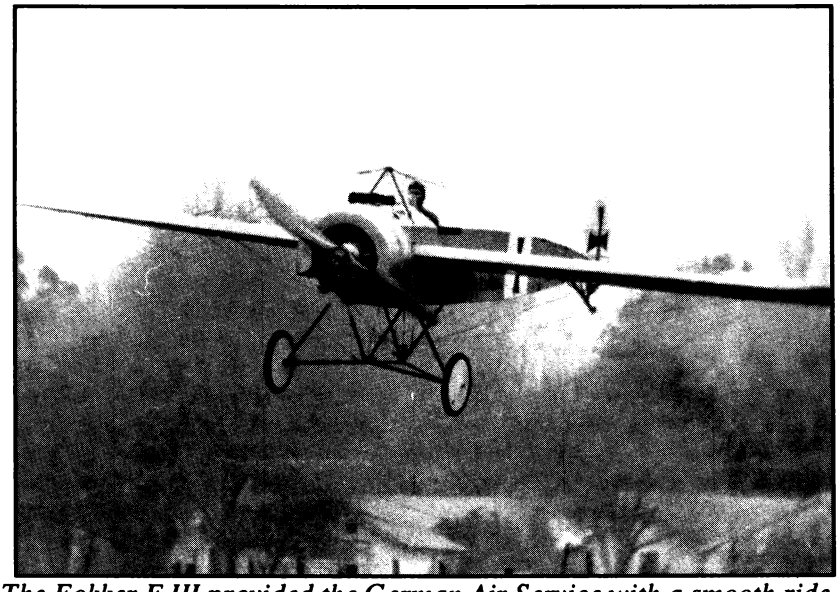
THE AMAZING FLYING MACHINES

A CATALOGUE OF LEGENDARY WORLD WAR I AIRCRAFT

As improvements in the engineering and armaments of the first fighter planes improved literally with each passing week of the Great War, technological advantages shifted from one side to the other. Trade-offs in these fleeting gains provided an endless game for inventors and pilots alike. The only reward for winning a round was the anxiety that today's victory meant tomorrow's new challenge. Each step forward undoubtedly would be surpassed by the other side. With security over information almost impossible to maintain, any knowledge gained by one side was almost simultaneously obtained by the other. Examination of a downed enemy craft meant the ability to reproduce and improve on its capabilities.

Pilots became either heroes or statistics, but in their visual magnificence it was the airplane that became the focus of dreams and legends on both sides of the front. The following selections are representative of the period's major achievements in aviation design, illustrating the most significant developments in improving the sciences of flight and aerial combat. Even today, the majesty of these aircraft remains an inspiration to all who possess the spirit of one who would fly.

Triumphant Americans parade with their French planes in the streets of Paris.

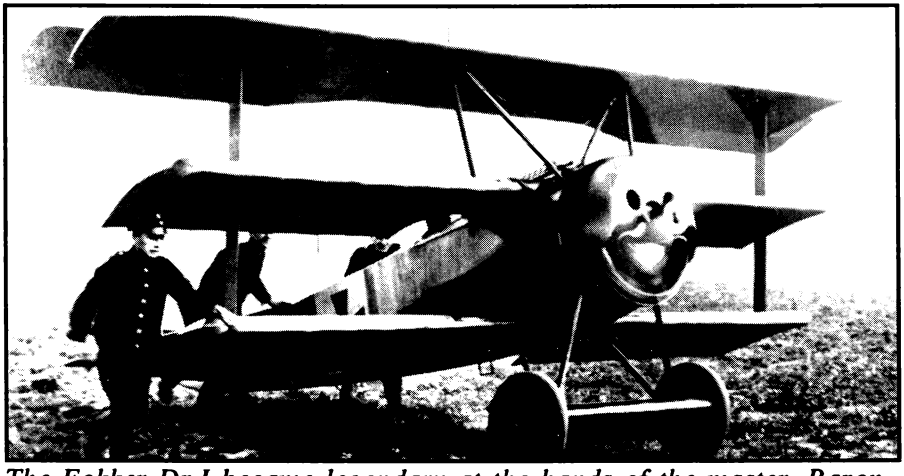


The Fokker E.III provided the German Air Service with a smooth ride and a stable gun deck during the middle years of the war.

FOKKER E.III
Nation: Germany
General Configuration: tractor monoplane
Engine: Oberusel UI 9-cylinder air-cooled rotary (100 h.p.)
Wingspan: 30' 10"
Length: 23' 11"
Height: 9' 2"
Weight: 1,342 lbs.
Maximum Speed: 87 m.p.h.
Ceiling: 11,483 feet
Endurance: 1 hour, 30 minutes
Armament: 1 – 2 machine guns
Crew: 1
First Available: August 1915
Comments: One or two fixed forward firing Spandau machine guns and a 100 horsepower engine were the deadly keys to this early German champion. The Fokker E.III brought fame to Germany's first great ace, Max Immelmann, who persuaded the genius Anthony Fokker to customize his own craft with an ear-shattering three machine guns. The "E" series (from the German *Eindecker*) denoted that it was an armed single seat fighter monoplane. Solidly constructed of welded steel tubing, it was responsible for yet another lethal stage of the Fokker Scourge. Though it would prove itself structurally imperfect, its responsiveness allowed Immelmann to originate a myriad of outrageous maneuvers, most notably the unexpected reversal of direction in the midst of a steep climb that is still known as the "Immelmann Turn."

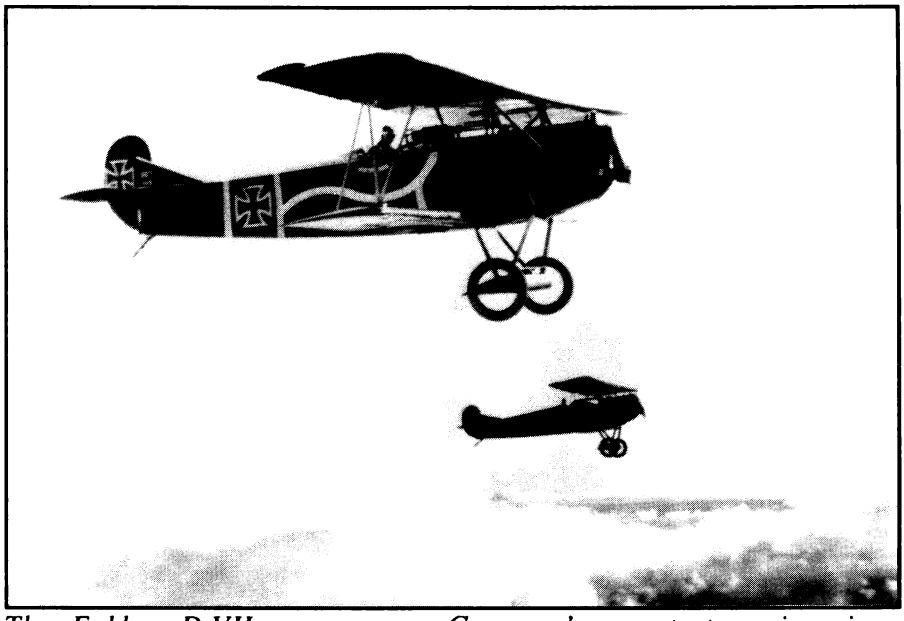
Germany's Albatros D.II gave Oswald Boelcke the speed and firepower he needed to perfect the art of the dogfight.

ALBATROS D.II
Nation: Germany
General Configuration: tractor biplane
Engine: Mercedes DIII 6-cylinder liquid-cooled inline (160 h.p.)
Wingspan: 27' 11"
Length: 24' 3"
Height: 8' 6"
Weight: 1,954 lbs.
Maximum Speed: 109 m.p.h.
Ceiling: 17,060 feet
Endurance: 1 hour, 30 minutes
Armament: 2 machine guns
Crew: 1
First Available: September 1916
Comments: With a plywood body, strong inline engine, and twin machine guns, the Albatros D.II was for all practical purposes the staple of the *Luftstreitkrafte* and perhaps the most abundant plane in use by the Central Powers. The "D" class (*Doppeldecker*) signified that it was a single seater, single engine fighter biplane. A stream-lined favorite of early heroes like Oswald Boelcke, it had twice the firepower of its contemporary Allied counterparts and rapid climbing ability to match. The vastly improved Albatros D fighters were a significant factor in Germany's air domination over the Western Front in the notorious "Bloody April" of 1917.



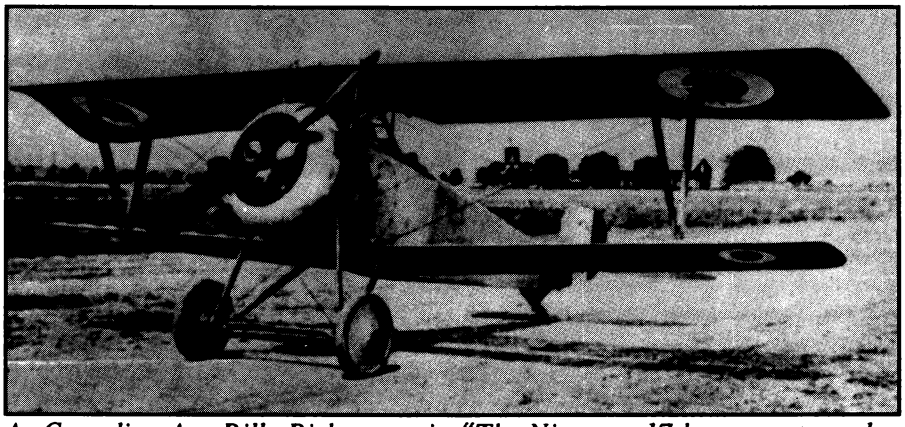
The Fokker Dr.I became legendary at the hands of the master, Baron Manfred von Richthofen.

FOKKER Dr.I
Nation: Germany
General Configuration: tractor triplane
Engine: Thulin Le Rhone 9J 9-cylinder air-cooled rotary (110 h.p.)
Wingspan: 23' 7"
Length: 18' 11"
Height: 9' 8"
Weight: 1,289 lbs.
Maximum Speed: 103 m.p.h.
Ceiling: 19,685 feet
Endurance: 1 hour, 30 minutes
Armament: 2 machine guns
Crew: 1
First Available: August 1917
Comments: Though Richthofen scored only the last twenty-one of his towering eighty victories in the Fokker Dr.I (*Dreidecker*), it was in the cockpit of this impressive triplane that he is best remembered. With its renowned scarlet paint job, it brought the nickname of its top pilot "The Red Baron" forever into common lore. Able to outclimb and outmaneuver virtually any opponent of its day, it had one weakness: its relatively small engine made it vulnerable from above. It was on this weakness that Canadian Captain Roy Brown hoped to capitalize when he dove on the Baron and at last sent him spiraling to the ground.



The Fokker D.VII was among Germany's greatest engineering achievements in advancing the technology of aircraft design.

FOKKER D.VII
Nation: Germany
General Configuration: tractor biplane
Engine: Mercedes DIII 6-cylinder liquid-cooled inline (160 h.p.)
Wingspan: 29' 3"
Length: 22' 11"
Height: 9' 2"
Weight: 1,870 lbs
Maximum Speed: 120 m.p.h.
Ceiling: 23,000 feet
Endurance: 1 hour, 30 minutes
Armament: 2 machine guns
Crew: 1
First Available: April 1918
Comments: One of the easiest German planes to fly, the Fokker D.VII was forgiving of many mistakes and over-reactions by rookie pilots. In production throughout 1918 and adding much to the Central Powers' final surge in the closing months of the war, it was in some senses considered the ultimate German weapon of the air. With swift climbing capabilities and exceptional high altitude maneuverability that outshined all Allied aircraft, it was the only plane included in the official list of war items to be surrendered by the Germans in the Allies' demands of the Armistice.



As Canadian Ace Billy Bishop put it, "The Nieuport 17 has an extremely lethal look about her, as if she were the mistress of some nabob of the Quai d' Orsay on her way to shoot her lover."

NIEUPORT 17
Nation: France
General Configuration: tractor biplane
Engine: Le Rhone 9J 9-cylinder air-cooled rotary (110 h.p.)
Wingspan: 26' 10"
Length: 18' 11"
Height: 8'
Weight: 1,246 lbs.
Maximum Speed: 110 m.p.h.
Ceiling: 17,390 feet
Endurance: 2 hours
Armament: 1 machine gun
Crew: 1
First Available: March 1916
Comments: Sleek, agile, and an exceptionally fast climber, the one-man Nieuport 17 could reach 10,000 feet in about ten minutes. Brought into prominence by the great pilot Georges Guynemer, it was the culmination of a line of Nieuport fighters that provided the Allies with a serious challenge to the threatening enemy Fokkers. While not recommended for steep diving (it had a tendency to shed its wings under this type of extreme pressure), it could carry Le Prieur rockets for attacking balloons and provided a stable upper wing atop which was mounted a Lewis machine gun. British pilots were quite receptive to flying the French-made Nieuport, which was supplanted later in 1916 by the much coveted Spad.

The Spad VII was France's resounding answer to the Fokker Scourge.

SPAD VII
Nation: France
General Configuration: tractor biplane
Engine: Hispano-Suiza 8Ac 8-cylinder liquid-cooled inline V (175 h.p.)
Wingspan: 25' 6"
Length: 20' 1"
Height: 7' 8"
Weight: 1,550 lbs.
Maximum Speed: 119 m.p.h.
Ceiling: 18,000 feet
Endurance: 2 hours, 15 minutes
Armament: 1 machine gun
Crew: 1
First Available: September 1916
Comments: Ace Georges Guynemer traded in his longtime friend the Nieuport Scout for the new and faster fighter known as the Spad. Its name an acronym derived from its manufacturer, the *Societe Pour l'Aviation et ses Derives*, the Spad was also extremely popular with American squadrons and pilots like Eddie Rickenbacker. More rugged than the Nieuport, it fared well in pulling out of power dives. Its solid body could absorb multiple rounds and its synchronized Vickers machine guns gave the Allies just what they needed to fight back the Fokker Scourge. Still, it required great skill to put the Spad to full use. Without the inherent stability of other Allied planes that somewhat flew themselves, Spads were not known for gliding and required high speed landings.

Perhaps the most famous plane of its time, the Sopwith Camel accounted for more victories than any other plane of the war.

SOPWITH CAMEL
Nation: Britain
General Configuration: tractor biplane
Engine: Clerget 9B 9-cylinder air-cooled rotary (130 h.p.)
Wingspan: 28'
Length: 18' 9"
Height: 8' 6"
Weight: 1,453 lbs.
Maximum Speed: 115 m.p.h.
Ceiling: 19,000 feet
Endurance: 2 hours, 30 minutes
Armament: 2 machine guns
Crew: 1
First Available: July 1917
Comments: The result of improvements in the already impressive Sopwith series, the "Camel" was so nicknamed for the hump over its twin Vickers machine guns. This highly maneuverable British fighter was known for its tight turning radius and provided its best performances at altitudes in the range of 12,000 feet. Often flown in tandem with the S.E.5, Sopwith Camels tallied more victories than any other planes in World War I. It was at the controls of the Camel that Roy Brown sent the Red Baron to his death, proving that the Sopwith could more than hold its own with the once dominating enemy Fokkers.

An S.E.5 soars on patrol over the French countryside.

ROYAL AIRCRAFT FACTORY S.E.5
Nation: Britain
General Configuration: tractor biplane
Engine: Hispano-Suiza 8A 8-cylinder liquid-cooled inline V (150 h.p.)
Wingspan: 26' 7"
Length: 21' 4"
Height: 9' 5"
Weight: 1,940 lbs.
Maximum Speed: 132 m.p.h.
Ceiling: 22,000 feet
Endurance: 2 hours, 30 minutes
Armament: 2 machine guns
Crew: 1
First Available: April 1917
Comments: Thought by most of its Allied pilots to be vastly superior to any plane it went up against, the S.E.5 was the perfect plane for diving on the enemy from above. Confidence in the overall design that allowed excellent visibility in every direction led pilots to discount the fact that it was slightly less maneuverable than the Camel. Compared to the Sopwith, it was easier to fly, faster in level flight, and capable of climbing smoothly to altitudes of 19,500 feet. Mastered by the likes of Albert Ball and Billy Bishop, it forced the Germans to re-think the design of the suddenly outdated Albatros — which unfortunately led to a much more challenging opponent in the advent of the Fokker D.VII.

The Long Way Home

To call Major William Barker of the R.F.C. a survivor may be one of the greatest understatements of the war. Airborne since 1915 when he turned a ridiculously unstable RE 8 on its nose after a horribly damaged landing, he had previously served with the Canadian Mounted Rifles — which had been blasted with poison gas at the Battle of Ypres. Barker himself couldn't remember the number of times he was "almost" killed, and his rise to the distinction of ace was no less colorful. His last flight would prove his most outlandish of all.

On his last flight, Major William Barker took on sixty enemy planes, shot down four, and lived to tell the tale.

With forty-six victories to his credit in October 1918, Barker had been flying a Sopwith Snipe with No. 201 Squadron on the Western Front when his orders came to return home to England. Twenty minutes into his homeward journey, he spotted a German two-seater and did what any respectable pilot would do: he diverted his course and went after it. Barker got the kill, but as he followed the Rumpler down he allowed his concentration to wander and was suddenly under attack himself. As a bullet ripped through his right thigh, he found himself facing the full strength of *Jagdgeschwader 3*!

Squaring off alone against some sixty Fokker D.VIIs (arguably the best fighters in the sky), Barker for the first time in his military career didn't think he was going to survive. Though he managed to shoot down two planes including the one that had first attacked him, his own aircraft was soon victim to some 300 bullet holes. Clusters of five D.VIIs attacked him in sequence, and within seconds his left leg was spurting as much blood as his right. Barker passed out cold and his Snipe went into a spin, though at 6000 feet he miraculously regained consciousness and somehow managed to level out!

Barker shot down another Fokker before a bullet tore into his elbow and he became unconscious for the second time. Barely regaining consciousness just before reaching the ground, he desperately gripped the joystick and slammed the Snipe down at 90 m.p.h. The plane was torn to shreds, yet when the infantry pulled Barker from the wreckage, they found that his heart was still beating. His blood-soaked legs were held in place by sinew alone and he remained in a coma for ten days, but Barker later recovered full use of all his limbs and was awarded the Victoria Cross. He had taken down four planes in just forty minutes — only twelve days before the end of the war!

MAX IMMELMANN

Reverently dubbed the "Eagle of Lille" for the northern French town over which he often prowled, Max Immelmann emerged in 1915 at the age of twenty-five as Germany's first star pilot. Proclaimed a hero throughout his native land, he enjoyed a sense of cult worship that followed him throughout his brief flying career. Though his final career tally of but fifteen victories would be surpassed many times over, Immelmann's sheer skill at the controls and always increasing understanding of flight tactics set a standard that all pilots would strive to emulate.

Max Immelmann, the Eagle of Lille, was Germany's first great hero of the skies.

Immelmann endured boredom in railway service through the earliest days of the war before his long awaited acceptance as an aviation recruit. Unfortunately, the technical ability he had displayed in his railway regiment didn't shine in his new role as a student pilot. His peers would anxiously await his landings at the airfield, chuckling as they laid odds as to whether he would destroy his craft upon touchdown. For an individual who displayed almost no natural talent in his training days, he would soon surprise all his contemporaries in his brilliant mastery of the Fokker E.II monoplane.

It wasn't until August 1915 that Immelmann actually scored his first air victory. Having endured the miserable inferiority of the German LVG two-seater, the petulant young lieutenant proved himself a new man in control of the radically superior monoplane designed by Anthony Fokker. Where Fokker had created a machine gun that could be synchronized to fire directly through the arc of a propeller, Immelmann showed the world just what a machine specifically designed for air combat could do. Blowing an English opponent out of the sky over the aerodrome at Douai, Immelmann began a streak of victories that propelled him to instant fame.

Immelmann never treated flying lightly, but rather as a science that needed constant exploration. He practiced marksmanship as much as tactical maneuvering, and found even greater renown for coining what came to be known as the "Immelmann Turn." By building up speed in diving toward an enemy and then pulling up into a climb and opening fire from below, Immelmann created a deadly element of surprise that would leave his opponents dreading the very sight of a Fokker. After firing, Immelmann

would then continue to climb until he was in a near vertical position, after which he would apply hard rudder, stall-turn, then dive on his adversary to finish the kill. Other Fokker pilots would employ this maneuver well into the war, until Allied planes were enhanced with more powerful engines that put Fokkers using the stall-turn at critical risk.

Immelmann shoots faster than one can write.

Kaiser Wilhelm II, personally modifying a scroll of congratulations to Immelmann for his twelfth victory, as he was advised that Immelmann had shot down his thirteenth.

Reassigned to one of the newly organized Fighter Squadrons known as *Jagdstaffeln*, Immelmann and his good friend Oswald Boelcke saw fierce air combat in the June 1916 Allied preparatory bombardments that signified a preamble to the Battle of the Somme. June 18 was to be Immelmann's last day in the sky. While the British claimed the Eagle of Lille had been shot down cleanly, others who examined the wreckage concluded that his gun synchronization had failed and that he had shot off his own propeller. Regardless, all of Germany mourned Immelmann's death. His legendary status continued to increase with time, and upon his memory was founded a tradition of great young pilots who would follow his spirit into the air.

OSWALD BOELCKE

When the Kaiser learned of Immelmann's death, he was so troubled by its effect on the Air Service that he ordered a rest for Immelmann's more experienced former partner, Oswald Boelcke. Assigned to make a goodwill tour of the air squadrons of Germany's ally Turkey, the veteran flyer Boelcke soon returned to the Western Front to organize a new *Jagdstaffel*. He also began training another talented young pilot by the name of Manfred von Richthofen.

One of the first aces of aerial warfare, Boelcke was every bit as great a pilot in his own right as he was a much needed leader of others. Flying reconnaissance missions from the earliest days of the war, he became bored with what he considered his dull routine and applied in 1915 for transfer to a fighting unit. Mastering the two-seater LVG, he won his first victories while awaiting the new forward-firing single-seaters being designed by Anthony Fokker.

It was at the controls of his first Fokker monoplane that Boelcke created flight strategies that to this day influence fighter pilots world-wide. Initially a lone wolf who loved to cross enemy lines in search of an adversary, Boelcke quickly learned that it was virtually impossible to seek out an opponent while simultaneously keeping a look-out for those who might zero in on him. He thus devised a strategy where Germany's fighters would work together in pairs, the lead man's partner flying off to one side and some distance behind to post guard on the explorer's tail. His first partner was his prized student, Max Immelmann, and together these two pilots proved a formidable team — feared by the Allies, respected on both sides of the line.

With the loss of Immelmann, Boelcke turned for support to the great Richthofen and rose to the challenge of fighting back the massive offensive of British pilots over the battlefields at the Somme. Insisting that his pilots know as much about servicing their planes as flying them (in order to carry out emergency repairs when forced to land), Boelcke won admiration from his men while running up his own tally of personal victories. With forty kills on his record, he lost his own life in a bizarre accident in October 1916 when one of his own pilots and closest friends, Erwin Boehme, collided with him in the confusion of a grand dogfight. With his unsurpassed skill, Boelcke may have someday out-scored even Richthofen, but instead he left something equally important — a spirit of chivalry, teamwork, and bravery that lived on in his "cubs" throughout the most desperate battles of 1917.

Oswald Boelcke was renowned for leadership, excellence in the cockpit, and a doctrine of flight tactics still respected today.

To the memory of Captain Boelcke, our brave and chivalrous foe. From the British Royal Flying Corps.

Message accompanying laurel wreath dropped at Boelcke's base after his fatal accident.

MANFRED VON RICHTHOFEN

To this day, no single pilot's name evokes the kind of emotion raised by mere mention of the infamous Red Baron. While the tremendous accomplishments of the Baron in every aspect of aerial combat left his name etched in the minds of his would-be opponents, one single statistic says everything that need be said about the greatest of all World War I aces: a stunning 80 victories!

Manfred von Richthofen joined the flying corps in May 1915. Discovered by the great flyer Oswald Boelcke, he was recruited to join the prestigious *Jagdstaffel 2*, and it was here under Boelcke's command that he won his first victory. With Boelcke's untimely death in October 1916, Richthofen and the other pilots of *Jagdstaffel 2* continued to fly valiantly in the memory of their great leader. With sixteen kills under his belt by the end of that year, Richthofen was given command of his own squadron, *Jagdstaffel 11*.

During the fighting of "Bloody April" 1917 (in the first week of which the British R.F.C. lost seventy-five aircraft in combat), Richthofen's *Jagdstaffel* was expanded into a *Jagdgeschwader* — a fighter wing consisting of three squadrons. Soon recognized by the international press as "Richthofen's Flying Circus," Richthofen's new unit gave him just the right posturing to run his own personal tally literally through the sky. Assigning himself to air patrol at every possible opportunity, Richthofen led teams of the vastly improved Albatros fighters against what he considered the no-match British Bristols. As his personal victories continued to climb, additional squadrons were assigned to his *Jagdgeschwader* until it seemed virtually indestructible.

No World War I flying ace is better remembered than Manfred von Richthofen, the Red Baron of Germany.

In August 1917, the *Richthofen Geschwader* was re-equipped with Fokker triplanes, among them the scarlet painted trademark craft of Germany's greatest air hero. A man whose later military service saw him increasingly the loner, Richthofen maintained a simple philosophy of aerial combat: "Never shoot holes in a machine — aim for the man and don't miss him!" True to his word, he left bullet holes in the bodies of most of his victims. Students who trained under his authority mastered this ruthless approach quickly or were reassigned.

All of Germany seemed to worship the great Red Baron, and when he was shot down and killed on April 21, 1918, it was all of Germany that mourned his death. Canadian-born Captain Roy Brown got credit for the victory, as the Baron's triplane fell prey to Brown's sleek Sopwith Camel. Crashing behind enemy lines, Richthofen — only twenty five years old — was buried with full military honors by the British Royal Air Force. In 1925, his body was removed to Berlin, his long-remembered death itself a reminder of Germany's ultimate defeat by the Allies.

I am not one for breaking records. Besides, generally speaking, we of the flying service do not think of records at all.
Manfred von Richthofen

GEORGES GUYNEMER

After a particularly notable day of flying in 1916, French ace Georges Guynemer found the following note left in the mess tent by his comrades:

Recipe for boiled egg a la Guynemer: Take an egg. Put it in boiling water when Guynemer goes into action. Wait until he has shot down three aircraft, then remove and eat.

Inspired by Guynemer's incredible solo downing of three oncoming Fokkers in a matter of minutes, the note said all that need be said about the deep admiration Guynemer had earned from his fellow pilots. An amazing tactician who chose to master the frontal attack when the most common maneuver of choice was lining up on an enemy's tail, Guynemer won his victories and fame by concentrating on destroying what he considered the most vulnerable parts of the plane: the propeller and its engine.

Georges Guynemer, one of the first French aerial champions, set an inspiring example of valor throughout his nation.

Had young Guynemer's father not had connections at the highest levels of the French military, his talented son might never have gotten his handle on a joystick. As a boy, Guynemer was rather frail, more prone to enjoy his studies in Latin and mathematics than to pursue sports or athletics. His interest in things mechanical led him to join the French Air Corps, but after failing several medical examinations the best position he could secure was that of a mechanic. With his father's influence, he eventually was accepted into flight training, where once in the cockpit he needed no further intervention to vouch for his exceptional abilities as a fighter pilot.

Guynemer racked up fifty-four total victories for the war, a tally second in France only to that of his friend, Rene Fonck. Posing one of the only serious threats in the air to his German rival Immelmann, Guynemer flew like no pilot before him. Later in the war, during the summer months of 1917 when the struggle for air supremacy on the Western Front reached its most critical stages, he became the most decorated of all French pilots. Humble both in the air and on the ground, Guynemer for much of the war led a charmed life. Forced down by the enemy on eight separate occasions, he escaped each time with only minor injuries and returned almost immediately to patrol.

Battle fatigue wore heavily on Guynemer, and as the months passed he became convinced that his luck was running out. He predicted that he wouldn't last much past his fiftieth victory, and his prophecy proved unfortunately true. Guynemer's own father saw the changes in his son's saddening face and was anything but surprised when the young pilot was

shot down on September 11, 1917. At the age of 22, he had logged 666 flying hours, earned 26 citations, and found his way into the popular lore of French school children who sang of his legend. His body was never found.

He will remain the purest symbol of the qualities of his race. Indomitable tenacity, ferocious energy, sublime courage; animated by the most resolute faith in victory, he bequeaths to the French soldier an imperishable memory which will exalt the spirit of sacrifice.

Guynemer Memorial, Marble Plaque at the Pantheon

RENE FONCK

A notorious braggart, Rene Fonck was not a well-liked man. Yet his claim to World War I ace distinction couldn't have been more clear: he was the top scoring Allied flyer of all. With seventy-five victories, he placed second in the overall war only to Richthofen. Perhaps even more impressive is that unlike his German counterpart, he lived to tell the tale.

Rene Fonck, the Allied Ace of Aces, tallied more victories than any pilot in the war other than Richthofen.

A cunning tactician who picked up where Guynemer left off, Fonck was a mature individual whose youth was hidden behind his less impetuous, more studious nature. He joined the French Air Corps in 1915 and spent two years flying reconnaissance missions. It was during this time that he learned everything there was to know about two-seaters, and everything he could possibly later use to blow the other side's more vulnerable aircraft from the sky.

Fonck didn't wait for assignment to a fighter plane to score his first victories. Over the battleground at Somme in the summer of 1916 he engaged the enemy during routine photographic missions. Miraculously outmaneuvering the attacking Fokkers, he positioned his Caudron at high altitudes in such a way as to force the Germans below him straight to the ground or within firing range of his own plane. For these efforts, he was at last transferred in April 1917 to the famous scout unit known as the *Escadrille des Cigognes*.

Avenging the death of Guynemer, Fonck seemed unstoppable throughout the fall months of 1917. Where Germans had breathed a brief sigh of relief with the downing of Guynemer, they soon found the ace Fonck every bit as dangerous in the sky. As the war grew more intense in the Spring of 1918, the twenty-four year old Frenchman began to understand the

primary importance of Allied air power in halting the German offensive. His approach became increasingly scientific, as he would inspect bullet holes in enemy aircraft that had been shot down to calculate the blind spots in his opponent's field of vision. With knowledge as his one punch and supreme marksmanship his follow-up, he was a force to be reckoned with through the closing days of the war.

With as many as six victories in a single day at the expense of just fifty-two rounds of ammunition, Fonck reached the end of the war without ever receiving a wound or seeing his own aircraft suffer serious damage. A publicly decorated veteran, he found a rewarding career in civil aviation that later led him to a social encounter with a former German commander named Hermann Goering. Fonck's innocent association with Goering ultimately proved devastating. Almost thirty years later, with the close of the Second World War and the trial of the leaders of Vichy France, Fonck was openly chastised and his brilliant war career forgotten. Once a national hero without equal, he died in disgrace with only his own memories of triumph embedded in his heart.

ALBERT BALL

In the same way that Immelmann was the first German pilot popularly glorified by his countrymen, Albert Ball was the first British pilot to become a national hero in his homeland. A talented mechanic who nonetheless almost failed flight school after two bad crashes, Ball was a quirky individualist whose love of engines was equalled only by his passion for playing the violin.

Posthumously awarded the Victoria Cross, Albert Ball never got the one thing he most wanted: a chance to fight the Red Baron.

Ball came to the Royal Flying Corps from his native Nottingham at the age of nineteen — at a time when the life expectancy of his fellow pilots of No. 13 Squadron was often measured in weeks! It was early 1916 and the Fokker monoplanes were taking their toll in battle after battle over France. Though he had once thought himself incapable of killing another human being, his devotion to the British cause sent him into battle with the fierce determination of a daredevil. His aggressive tactics in the BE2c two-seater led to many kills for his observer, though his transfer to No. 11 Squadron sent his reputation soaring to new heights. He was given the Nieuport Scout he had wanted for months, and he soon became the focus of a far reaching publicity campaign he had never expected.

It was in the Battle of Somme that Ball firmly established himself with tactics that seemed revolutionary for their time. Allowing an enemy to get tail position on him, he would wait until the last possible second before spinning hard right or left to gain the element of surprise that would leave his enemy in flames. Approaching the enemy head-on with grim determination, Ball would wait until his German counterpart lost his nerve and swerved to avoid collision — at which time Ball would have a split second of advantage and send his enemy to the ground.

After an assignment training new recruits in the fall of 1916, Ball was given command of his own squadron and equipped with the latest British Fighter, the S.E.5. As an individual who always preferred solitary work, he was uncomfortable with being given responsibility for six aircraft and the leadership of their pilots. Running up his total victories in a much celebrated rivalry with French ace Georges Guynemer, Ball continued to display the kind of wild scrapping tactics that led his own men to think him rather weird. Nevertheless, No. 56 Squadron went out as a team time and again in skirmishes against Richthofen's *Jagdstaffel 11*. Ball himself never fulfilled his hope of fighting the elusive Red Baron.

In May 1917, with Richthofen on leave from his unit, Ball and company set out to do some real damage to *Jagdstaffel 11*. Unfortunately, a terrible rain storm interrupted one attack sequence and No. 56 Squadron became separated in an exchange of gunfire led by Richthofen's brother, Lothar. Ball disappeared in a cloud as he dived on a Fokker triplane. Buried by the Germans at Lille, he was remembered ultimately by his men for the courage he instilled and the determination he exemplified in light of his hatred of war. With forty-three victories in the books, he was posthumously awarded the Victoria Cross.

BILLY BISHOP

When Canadian Captain William Avery Bishop received the disheartening news in June 1918 that his superiors were transferring him back to England, he had no idea of the unparalleled feat he was about to accomplish. With forty-seven victories already in the bag, Bishop went on a flying rampage that in the next twelve days landed him an astounding twenty-five additional kills in only thirty-six-and-a-half hours of flight time. With a career record of seventy-two victories, he was second only to Rene Fonck as a top scoring pilot who survived the war.

For he had that courage which Napoleon once said was the rarest — the courage of the early morning.

Montreal Gazette, in a feature article on Billy Bishop.

Billy Bishop was literally obsessed with bringing down his opponents. Born in rural Ontario, he grew up with a rifle in hand and spent three years perfecting his marksmanship on horseback at Canada's Royal Military College at Kingston. When the Great War erupted, he was sent to England and then France with his ground unit before discovering his desire to become a fighter pilot. Persistent requests for transfer brought him a slot in flight training and eventually a slot with No. 60 Squadron in March 1917.

Though his earliest days at the controls of his Nieuport were shaky, Bishop soon got his first victory on March 25. Though he almost lost his own plane and life in that exchange of gunfire, it was nothing compared to the trial by fire he would endure in the "Bloody April" that would follow. Taking up loads of tin cans for target practice whenever he wasn't assigned to an actual mission, Bishop set an example in devoting himself to developing the kind of marksmanship that led him to be a survivor. His ambitions to be a top scorer for the war were evident, and his dedication to always pushing himself to his personal physical and emotional limits won him the respect of his peers.

Billy Bishop was referred to by Eddie Rickenbacker as "the only man I ever met who was incapable of fear."

Bishop received the Victoria Cross in June 1917 when his plan to locate a German airfield and blow the enemy out of the sky as they took off went haywire. Ambushed on all sides by ground fire, Bishop soon found himself single-handedly forced to evade an entire German squadron which managed to take off despite his best efforts. While Bishop inflicted his share of damage and returned home without being wounded, his Nieuport was left in shambles with no less than a hundred bullet holes. Amazingly, none of them had pierced any vital areas of his craft.

In 1918 he was given command of his own squadron, No. 85. The legendary shooting spree of his last fortnight in the air was a testament to his never-say-die philosophy, which would take him into the Second World War as an Air Marshal in charge of recruiting for the Royal Canadian Air Force.

EDDIE RICKENBACKER

America loves a hero and, in Eddie Rickenbacker, men and women miles away from the turmoil of European dog-fighting found one. Celebrated in his day by the American press, Rickenbacker brought the Yankee spirit to a battlefront far away from his home in Columbus, Ohio.

When America entered the war in 1917, Eddie Rickenbacker was one of the nation's premiere race car drivers earning the princely annual sum of $40,000. Enlisting in the American Air Service for a chance at the thrill of flying, he offered his expertise as an engineer and found himself assigned to fixing planes rather than flying them. At twenty-eight, he was considered too old to fly in combat and his requests for transfer to a fighter squadron were repeatedly rejected. It took no less than the direct orders of General Pershing to get Rickenbacker re-assigned in 1918 to the 94th Squadron, a unit under the command of an aerial war hero in his own right, Raoul Lufbery.

Rickenbacker proved as cool and logical in the air as he had been on the race track. He won his first airborne victory on April 29, 1918 and the status of ace by bringing down his fifth plane on May 30. Relatively older than the other pilots in his squadron, he brought a sense of patience and judgement to combat that ensured his ascent to command. He displayed expertise at the controls of his Nieuport, and as the American First Pursuit Group was re-equipped in 1918 with the much faster Spad, Rickenbacker was put in charge of the 94th Squadron. With their new highly respected leader, even the most reckless American flyers displayed exemplary teamwork in holding their own against the once domineering enemy Fokkers.

Eddie Rickenbacker was America's top scoring ace with an impressive twenty-six victories in the few short months he flew.

Rickenbacker returned to America after the war a national hero. With twenty-six victories to his credit, he was the top US scorer of the Great War, a feat that no doubt contributed to his receiving America's highest honor, the Congressional Medal of Honor. Though American airmen had joined their trans-Atlantic allies three full years after the outbreak of hostilities, Rickenbacker played a major role in establishing the tradition of courageous young American pilots who would always be remembered in the skies over Europe.

OTHER NOTABLE CONTENDERS

There were many other serious threats in the air, and even the many volumes that have been written on the great aces cannot do justice to fairly documenting them all.

With only one functioning eye, the courageous **Mick Mannock** (whose world-famous diary remains a testament to how war plays upon the soul) was Britain's number one ace with an amazing seventy-three kills.

Ernst Udet was Germany's second best scorer of the war with sixty-two victories and lived to revive the German Luftwaffe in World War II.

Though his entire career as a fighter pilot lasted but ten months, the esteemed **Werner Voss** downed forty-eight planes for his native Germany and came to be known as the "Flying Hussar."

Charles Nungesser flew valiantly for France in the early days of the war, and with forty-five kills was his nation's third top ace behind Fonck and Guynemer.

Amassing seventeen victories of his own before losing his life in a dogfight, French born U.S. emigre **Raoul Lufbery** proved himself a brilliant tactician with the famed *Escadrille Lafayette* and was later given command of the First American Pursuit group.

"Balloon Buster" **Frank Luke** placed second to Rickenbacker among U.S. flyers with his twenty-one downings, though he was killed in action just seventeen days after his first victory and never returned home to Arizona.

TIME TABLE OF WWI: MAJOR AERIAL-RELATED EVENTS

December 17, 1903	First successful flight of the Wright Brothers
1907	U.S. Signal Corps establishes aeronautical division
1910	French Air Service established
1911	First airplanes in combat: Italo-Turkish War in Libya
1912	Britain forms Royal Flying Corps
1913	Germany organizes Imperial German Air Service
June 28, 1914	Archduke Francis Ferdinand assassinated
July 28, 1914	Austria-Hungary declares war on Serbia
August 4, 1914	Germany invades neutral Belgium
September 1914	Allies stop Germans in France at Battle of the Marne
May 7, 1915	German submarine sinks the Lusitania
May 23, 1915	Italy declares war on Austria-Hungary
June 1915	Anthony Fokker develops synchronized machine gun
August 18, 1915	Immelmann and Boelcke initiate "Fokker Scourge"
August 19, 1915	General Trenchard appointed commander of R.F.C.
February 21, 1916	German offensive opens Battle of Verdun
June 18, 1916	Max Immelmann shot down
July 1, 1916	Allied offensive opens Battle of the Somme

September 1, 1916	French Spad VII & German Albatros D.II introduced
October 28, 1916	Oswald Boelcke dies in bizarre flying accident
February 1, 1917	Germany resumes unrestricted submarine warfare
March 15, 1917	Russian Revolution forces Czar to abdicate
April 1, 1917	British Royal Aircraft Factory S.E.5 becomes available
April 1917	Allies suffer their worst air losses in "Bloody April"
April 6, 1917	United States of America declares war on Germany
May 7, 1917	Albert Ball dies under mysterious circumstances
June 24, 1917	American troops begin landing in France
July 1, 1917	Sopwith Camel becomes available
August 1, 1917	Germans start using Fokker Dr.I
September 11, 1917	Georges Guynemer shot down
December 15, 1917	Russia under Bolsheviks signs armistice with Germany
January 1, 1918	Germans start using Fokker D.VII
March 21, 1918	Germany launches final Western Front offensives
April 21, 1918	Manfred von Richthofen shot down
July 18, 1918	Allies commence decisive counterattack
July 26, 1918	Mick Mannock shot down
September 26, 1918	Massive Allied air strike at Meuse-Argonne
November 11, 1918	Allies sign armistice with Germany

A NOTE FROM THE DESIGNER

There Shall Be Wings...

Leonardo da Vinci
in the year 1500

Thank-you for purchasing WINGS. It took the combined talents of many dedicated individuals here at Cinemaware to bring you this World War I flying experience. We all hope you consider the effort worthwhile.

Ironically, I never imagined myself designing a World War I flight simulator. I wasn't sure my background in interactive storytelling was well suited to this environment. These hesitations were completely overcome during my first research trip to the library. What incredible stories I read that afternoon! There were personal accounts of unbelievable courage and dedication — reflections of man's indomitable spirit struggling valiantly against his enemies, the elements, and the dangers of an infant technology.

Today, fighter pilots rely heavily on their instruments and high-tech weaponry, while battles are fought in terms of miles and kilometers. My imagination ran to the clouds as I contemplated how the great aerial knights of World War I fought within a few yards of each other, relying primarily on their own skills and courage for survival. It was in the very human stories of these airborne pioneers that I discovered the path to making our game unique: WINGS would not be a "flight" simulator but a "life" simulator! We'd explore what it was really like to be a rookie Allied pilot in the Great War — not just in the air, but off the battlefield as well.

Drawing inspiration from numerous historical books, memoirs, *National Geographic* articles written just after the war, and films like *Dawn Patrol* and *The Blue Max*, I began to see a shape and sense a tone for WINGS. I wanted to make a player feel like he was part of the action, to transport him to another era and bring to life the fantasy of flying for the Allies in World War One. I knew that achieving this would depend as much on graphic as historical detail and thus looked to combine the rougher three-dimensional images with our artist's two dimensional renderings. Bombing and strafing missions would be done entirely in 2-D, and movie-like scenes would be added to enhance the storytelling. It all came together when I considered how we could best introduce a narrative. The idea of a Company Journal — a personal diary of sorts — came out of round table design meetings. All the elements of WINGS were then integrated and refined by the final creative team which consisted of myself, an artist, three programmers, a professional screenwriter, and a producer.

The following people made valuable contributions to the design of WINGS:

Tim Hays wrote one of the first flight simulators in 1983 and was responsible for the aerial 3-D sequences and bombing missions in WINGS.

Dan Pinal wrote the game "shell," which tied together all the action sequences, artwork, and story elements.

Randy Platt was responsible for writing the aerial strafing sequences.

Jeff Hilbers was responsible for all the artwork and the visual design of WINGS. He worked closely with the programmers to make sure the look was just right.

Ken Goldstein is a professional screenwriter and was responsible for writing the game manual and the on-screen diary which tells the story of WINGS.

Jerry Albright produced WINGS, settled disputes, added his own ideas, and made sure the product came out on time.

Bob Jacob, Pat Cook, Tim Hays, Jeff Hilbers, and Jeff Godfrey were all members of the preliminary design group.

I can only pray that WINGS will be remembered for its ability to educate and entertain, and not as a glorification of war. I would like to devote my own contributions on this project to my daughter, Autumn, for it is her tiny wings that will help carry our world peacefully into the future.

John Cutter
Westlake Village, California
June 1, 1990

GLOSSARY

The following words appear throughout the WINGS Company Journal. They are briefly defined for quick reference.

ace: a fighter pilot of notable talent; usually reserved for those with at least five verified airborne victories over enemy aircraft.

aerodrome: a landing field or military base for aircraft.

Albatros: a popular class of German fighter and bomber biplanes.

The Allies (a.k.a. **The Allied Powers**): common reference to those who fought originally or eventually on the side of the Triple Entente, including the British Empire, France, Russia, Belgium, the United States, Serbia, Rumania, and Italy.

"archie": slang term for anti-aircraft batteries or artillery, also known as AA guns.

biplane: an aircraft with two wings, upper and lower.

Blue Max: medal of membership in the *Pour le Merite*, highest military honor of Prussia, established in 1740 by Frederick the Great when French was the official language of the Prussian court.

bomber: a larger, heavier plane not intended for dogfighting but rather for carrying greater loads of explosives to be dropped on predetermined strategic targets.

Central Powers: the aggressors of World War I — Germany, Austria-Hungary, Bulgaria, and Turkey.

C.O.: Commanding Officer, often in charge of a squadron.

dirigible: a huge, oblong hydrogen filled balloon-like airship used by the Germans for bombing raids or transportation; also known as a Zeppelin, for the original design by Count Ferdinand von Zeppelin.

dogfight: informal term for aerial combat between fighter aircraft.

escadrille: French designation for an organized unit of planes and pilots.

Fokker: extremely successful class of German fighter planes, primarily created under the leadership of Dutch designer Anthony Fokker.

Gotha: huge bomber aircraft used by the Germans for long range missions.

Holy Joe: a chaplain.

Huns: slang term used by Allies to refer to Germans; other references to the German enemy included Boche (French for "hard-headed ones"), Fritz, Heine, and Jerry.

Iron Cross: A Maltese cross awarded by Germany for conspicuous military service; often the insignia denoting a German plane or other combat vehicle.

Jagdgeschwader: literally "fighter wing," a group of three to five *Jagdstaffeln* assigned to fight under the same command, the most famous of which was the Richthofen Jagdgeschwader (or *Richthofen Geschwader*, referred to by the Allies for its renowned aerobatic excellence as "Richthofen's Flying Circus").

Jagdstaffel (a.k.a. **Jasta**): literally "hunting echelon," the German designation for the type of squadron originally organized by Oswald Boelcke when the *Luftsperre* tactics proved ineffectual.

Luftsperre: early defensive air strategy of Germany comprised of pairs of fighters patrolling sectors of the front to form an "air blockage;" cumbersome and ineffective, it was replaced by the *Jagdstaffeln* with the Fokker Scourge of 1916.

Luftstreitkrafte: official designation for the German Imperial Air Service.

monoplane: single winged aircraft, usually smaller than a biplane.

Nieuport: a popular French class of fighter used by all the Allies.

R.A.F.: Royal Air Force; organized officially on April 1, 1918 when the R.F.C. and the R.N.A.S. were integrated.

R.F.C.: Royal Flying Corps; original airborne fighting regiment of the British military organized in 1912.

R.N.A.S.: Royal Naval Air Service; created in 1914 as war broke out, splitting Britain's air force into two commands, this one loyally reporting only to the Admiralty until the splinter groups were once again amalgamated.

reconnaissance: a patrol flown in search of information or photographs only, with aggressive engagement to be avoided.

scout: any of a variety of single-seater fighter planes with forward firing synchronized machine guns

Sopwith: a popular British class of fighter plane produced from the designs of Thomas Sopwith; included the Pup, the Snipe, the Dolphin, the Tabloid, and the Camel.

sortie: any flight of a combat warplane.

Spad: French class of fighter, its name an acronym for its manufacturer, the *Societe Pour l'Aviation et ses Derives.*

squadron: a unit of pilots, usually ranging from six to twelve, assigned for a period of time to live and fly together under the command of an officer who served as group leader.

strafing: maneuver of flying low and parallel to the ground for extended distances while raking a target with machine gun fire; used to attack troops and trenches, provide cover for infantry advances, or damage fortified enemy holdings (bridges, buildings, etc.).

synchronized firing: a system that allows a pilot to shoot his machine gun directly through the propeller of his aircraft with special interrupter gear timed to prevent rounds from hitting the rotary blades.

trench warfare: main mode of ground fighting in World War I where troops on both sides of the Western Front dug themselves into a series of reinforced ditches from which they would launch sporadic offensives throughout the four years of the war.

triplane: an aircraft with three layers of wings.

Triple Alliance: the military treaty binding the Austro-Hungarian Empire, the newly unified states of Germany, and Italy (though Italy never committed troops to the efforts of the Central Powers and in 1915 entered the war on the side of the Allies under the secret Treaty of London).

Triple Entente (a.k.a. ***entente cordiale***): a mutual defense agreement linking Great Britain to the previously signed military pact between France and Russia.

U-boat: common abbreviation for *Unterseeboot*; literally "underwater boat," the German classification for submarines.

Victoria Cross (V.C.): highest military honor awarded by royal order of the British government.

wings: flight insignia worn on the uniform designating one as a pilot.

Zeppelin: see "dirigible."

BIBLIOGRAPHY

The following books and periodicals were consulted as information sources both for this book and the narrative structure of the game design in WINGS. All of them are recommended as excellent references for further reading on the aerial history of World War I.

Bishop, William Arthur. *The Courage of the Early Morning.* London: William Heinemann Ltd., 1966.

Bowen, Ezra. *Knights of the Air.* Arlington, VA: Time-Life Books, 1980.

Clark, Alan. *Aces High: The War in the Air Over the Western Front 1914-1918.* New York: G.P. Putnam's Sons, 1973.

Driggs, Laurence La Tourette. "Aces Among Aces," *The National Geographic Magazine,* XXXIII, no. 6 (June 1918).

Dupuy, Col. Trevor Nevitt, U.S. Army, Ret. *The War in the Air (The Military History of World War I Series).* New York: Franklin Watts, Inc., 1967.

Griess, Thomas E., ed. *Atlas for the Great War.* Wayne, New Jersey: Avery Publishing Group, Inc., 1986.

Griffiths, William R. *The Great War.* Wayne, New Jersey: Avery Publishing Group, Inc., 1986.

Groth, Richard. *50 Famous Fighter Aircraft.* New York: Arco Publishing Co., Inc., 1975.

Hallion, Richard. *The Rise of the Fighter Aircraft 1914-1918.* Annapolis: Nautical and Aviation Publishing, 1984.

Hamlen, Joseph. *Flight Fever.* New York: Doubleday & Company, Inc., 1971.

Jackson, Robert. *Fighter Pilots of World War I.* New York: St. Martin's Press, 1977.

Jablonski, Edward. *The Knighted Skies.* New York: G.P. Putnam's Sons, 1964.

Mannock, Edward. *The Personal Diary of Major Edward "Mick" Mannock.* London: Neville Spearman Ltd., 1966.

Marshall, Samuel Lyman Atwood. *The American Heritage History of World War I.* New York: American Heritage Publishing Co., Inc., 1964.

Marshall, Samuel Lyman Atwood. *World War I.* New York: American Heritage Press, Inc., 1985.

Robertson, Bruce, ed. *Air Aces of the 1914-1918 War.* Fallbrook, CA: Aero Publishers Inc., 1964.

Strokesbury, James. *A Short History of World War I.* New York: William Morrow and Company, Inc., 1981.

Tallman, Frank. *Flying the Old Planes.* New York: Doubleday & Company, Inc., 1973.

Tulasne, Joseph. "America's Part in the Allies' Mastery of the Air," *The National Geographic Magazine,* XXXIII, no. 1 (January, 1918).

Whitehouse, Arch. *Legion of the Lafayette.* Garden City, New York: Doubleday & Company, Inc., 1962.

Wilson, Trevor. *The Myriad Faces of War.* Cambridge, England: Polity Press, 1986.

Winter, Dennis. *The First of the Few: Fighter Pilots of the First World War.* Atlanta: University of Georgia Press, 1983.