

ON THE GROUND

After each mission, you'll want to check on the status of things at the base. Take a few minutes to explore Squadron #23's aerodrome.

Common Room. From the common room you can access nearly all the areas important to the game. To initiate a conversation with the different people you'll meet, point and click on them. Other pilots often give you valuable tips that help in your next mission.

Kill Board. Point and click on the blackboard on the wall to see the total of each pilot's kills. To exit the kill board, move the cursor to the bottom part of the screen and click.

Commander's Office. The door next to the stairs takes you into the commander's quarters. Before you begin a mission, enter this room and listen to the mission briefing.

Hangar. To go to the hangar, click on the door beneath the propeller in the common room, then click on the hangar. You'll find at least one plane here, sometimes several. To begin a mission, point and click on a plane.

Note: For the first nine missions, only Sopwith *Pups* are available. Other planes will appear in the hangar later. You can choose any plane in the hangar.

Upstairs. Upstairs you can save a game by clicking on the closed door at the top of the stairs (or the lower left bunk in the barracks in the American Camp) and then clicking on the SAVE button. Then type in a short description for the saved game (up to 8 characters). You can save an unlimited number of games. You can only save from the barracks, between missions. To overwrite an existing saved game, click on the door (British) or bunk (American), click on the saved game to be overwritten, and select SAVE. You can change the name by entering a new name before selecting SAVE.

To load a game you previously saved, click on the bunk (in the British camp) or the footlocker (in the American camp) to bring up the load game screen. Click on the game you wish to load (highlighting it), then click on the LOAD button.

ORIGIN Systems, Inc. LIMITED 90 DAY WARRANTY. ORIGIN warrants to the original purchaser of this computer software product that the recording medium on which the software programs are recorded will be free from defects in material and workmanship for 90 days from the date of purchase.

If the recording medium is found defective within 90 days of original purchase, Origin agrees to replace, free of charge, any such product upon receipt at its Factory Service Center of the product, postage paid, with proof of date of purchase. This warranty is limited to the recording medium containing the software program originally provided by Origin. This warranty shall not be applicable and shall be void if the defect has arisen through abuse, mistreatment or neglect. Any implied warranties applicable to this product are limited to the 90-day period described above. If failure of the software product, in the judgment of Origin, resulted from accident, abuse, mistreatment or neglect, or if the recording medium should fail after the original 90-day warranty period has expired, you may return the software program to Origin, at the address noted below with a check or money order for \$5.00 (U.S. currency), which includes postage and handling, and Origin will mail a replacement to you. To receive a replacement, you should enclose the defective medium (including the original product label) in protective packaging accompanied by: (1) a \$5.00 check, (2) a brief statement describing the defect and (3) your return address.

Except as set forth above, this warranty is in lieu of all other warranties, whether oral or written, express or implied, including any warrant of merchantability of fitness for a particular purpose, and no other representation of claims of any nature shall be binding on or obligate Origin. In no event will Origin be liable for special, incidental or consequential damage resulting from possession, use or malfunction of this product, including damage to property and to the extent permitted by law, damages for personal injury, even if Origin has been advised of the possibility for such damages. Some states do not allow limitations on how long an implied warranty lasts and/or the exclusion or limitation of incidental or consequential damages, so the above limitation and/or exclusion or limitation of liability may not apply to you. This warranty gives you specific legal rights. You may have other rights that vary from state to state.



© 1995, ORIGIN Systems, Inc. Origin and We create worlds are registered trademarks of ORIGIN Systems, Inc. Wings of Glory is a trademark of ORIGIN Systems, Inc. Electronic Arts is a registered trademark of Electronic Arts.

THIS BOX CONTAINS:

- (1) CD (your game!)
- **Install Guide** (12 pp.) with quick installation instructions, directions for creating a floppy boot disk, configurations for a variety of memory management systems and **Troubleshooting** answers to possible problems. It also includes a step-by-step **Introductory Flythrough**.
- **Player's Guide** (32 pp.) covering movement, fighting, interaction, and so forth.
- **Wings of Glory Manual** (64 pp.) with a brief description of the history, characters and places that set the stage for your World War I adventure.
- **Reference Card** to act as an at-a-glance reminder of the keyboard commands.
- **Registration Card** – we'd love to know who you are!

Scanned and compiled by Underdogs for Home of the Underdogs
<http://www.theunderdogs.org/>

WINGS OF GLORY® INSTALL GUIDE

Welcome to *Wings of Glory*. This guide includes quick installation instructions for users more familiar with the process, and a detailed, step-by-step guide to installing the game. If you experience any difficulty, consult **Troubleshooting** (p. 7). To avoid compatibility or memory problems, please take a moment to confirm that your machine matches the system requirements described below. Remember, you may safely stop at any time during installation and return to the previous menu by pressing **[Esc]**.

compression utility that shipped with MS-DOS version 6.0 and 6.2. We cannot guarantee the compatibility of our games with other disk compression utilities.

QUICK INSTALLATION

Note: If you are running a disk cache such as *SMARTDrive* prior to installing, you need to disable it to insure a clean installation. Refer to your documentation or make a system boot disk as described in **Optimizing Your System** (p. 4) to disable this cache. This only affects the installation of the game. *SMARTDrive* will work normally during gameplay.

1. Turn on your computer and wait for the DOS prompt. Some machines boot directly to *Windows*, or a different shell environment. Be sure to exit *Windows* (or other shell program), and install directly from the DOS command prompt (C:).
2. Insert the CD for *Wings of Glory* into your CD-ROM drive.
3. Type the name of that drive (usually D:), then press **[Enter]**.
4. Type INSTALL and press **[Enter]**.
5. When prompted, follow the installation program instructions.
6. To begin play, type WG at the game's directory and press **[Enter]**.

For more details, see **Installation** (p. 2).

SYSTEM REQUIREMENTS

Computer. *Wings of Glory* requires at least an Intel486/33 or 100% compatible system, and MS-DOS version 5.0 or higher.

Video Card. VGA video card.

Hard Drive. You must have a minimum of 15 free megabytes on your hard drive to install and play this game.

Mouse. *Wings of Glory* requires a Microsoft or 100% compatible mouse using Microsoft software driver version 7.0 or higher.

Memory. *Wings of Glory* uses conventional RAM (base memory) and extended (XMS) or expanded (EMS) memory. You must have a minimum of 8 megabytes of RAM installed in your machine.

INSTALLATION

Note: If you are running a disk cache such as *SMARTDrive* prior to installing, you will need to disable it to insure a clean installation. Refer to your documentation or make a system boot disk as described in **Optimizing Your System** (p. 4) to disable this cache. This only affects the installation of the game. *SMARTDrive* will work normally during gameplay.

Wings of Glory will install *without* sound or music configured unless you specify otherwise.

Use **↑** or **↓** to move the highlighter up and down.

1. Insert the CD for *Wings of Glory* into your CD-ROM drive.
 2. Type the name of that drive (usually D:), then press **Enter**.
 3. Type **INSTALL** and press **Enter**.
 4. Highlight a language and press **Enter**.
 5. Highlight **INSTALL WINGS OF GLORY** and press **Enter**.
 - 6a. Check the default choices. If the information on the left matches your system, press **Enter**. Go to Step 7.
 - 6b. Highlight **NO** if you need to adjust the information, and press **Enter**.
 - If you wish to install to a destination other than the default drive: highlight the drive where you wish to install the game. Press **Enter**.
 - If you wish to install to a directory other than the default (C:\WINGS): highlight **NO** to change the destination path, then **Enter**. Backspace over the default destination and enter your new path. Press **Enter**.
 - If the Sound System, I/O (Input/Output) port, IRQ setting, and/or DMA setting default does not match your system: highlight the appropriate configuration for each setting, then press **Enter**.
- When the installation is complete, the installation program returns you to Step 6a (above). If the information on the left matches your system, press **Enter**.
7. Highlight **EXIT** and press **Enter** if you are confident about your sound card configuration. If you are not sure about your configuration, see **Changing Your Sound Card Config** (p. 3).
 8. Go to the drive and directory where the game is installed. (If you used the defaults, go to C:\WINGS.)
 9. Type **WG** **Enter** to begin the game.

CHANGING YOUR SOUND CARD CONFIG

At the end of a successful installation, a Sound Test menu will appear. You can choose to **CHANGE CONFIGURATION**, **TEST SOUND EFFECTS**, **TEST MUSIC** or **EXIT**.

CHANGE CONFIGURATION. This allows you to reconfigure your system. There are five stages: Sound Effect System, I/O Port, IRQ Setting, DMA Channel and Music System. If you are unsure about what any of these are, consult your sound card documentation (or you can experiment, returning after each change to the Sound and Music tests to see if they work). **Enter** advances you to the next screen.

TEST SOUND EFFECTS. This is to test that your system is correctly configured for sound effects. If you do not hear the voice of your commander greeting you, your sound card is incorrectly configured. Press **Enter** to leave this screen.

TEST MUSIC. This is to test that your system is correctly configured for music. If you do not hear the flight music, your sound card is incorrectly configured. Press any key to leave this screen.

EXIT. This ends the sound test portion of installation. You can run the sound test at any time by typing **SNDTEST** at the game directory.

CHANGING SOUND CARDS

If you ever add a sound card (or change from one sound card to another), you must reconfigure your sound card for *Wings of Glory*.

Return to the drive and directory where you installed the game (default: C:) and type **INSTALL** **Enter**. Next, highlight **CHANGE THE HARDWARE CONFIGURATION** **Enter**. This allows you to change the selections you made when you originally installed the game. Follow the instructions as they appear.

IF YOU HAVE TROUBLE INSTALLING ...

If you have not already done so, please review the **System Requirements** (p. 2) for *Wings of Glory* to be sure your hardware setup and *Wings of Glory* are compatible.

MEMORY REQUIREMENTS

Wings of Glory uses conventional RAM (base memory) and extended memory (XMS). You must have a minimum of 8 megabytes of total RAM installed in your machine. Of this memory, you must have at least 6,225,920 bytes (6080K) free XMS or EMS memory for *Wings of Glory* to run. An Expanded Memory Manager driver (we recommend **EMM386.EXE**) may be loaded. (Consult your memory manager's documentation and **Optimizing Your System**, p. 4, for more information.) This will allow you to load necessary drivers into upper memory and load *Wings of Glory*. If you are unsure about these different types of memory, consult your DOS manual. To find out how much DOS, XMS or EMS memory your computer has available, use the **DOS MEM** command. From the DOS prompt, type: **MEM** **Enter**.

When the memory information is displayed on the screen, look for the following listings:

- **LARGEST EXECUTABLE PROGRAM SIZE** — This number indicates how much DOS conventional memory is available. You must have at least 552,960 bytes (540K) listed here.
- **TOTAL EXTENDED (XMS) or TOTAL CONTIGUOUS EXTENDED** — This is the amount of extended memory in your computer. **BYTES FREE OF EMS or FREE EXPANDED (EMS)** — This is the amount of expanded memory in your computer. You must have at least 6,225,920 bytes (6080K) listed in one of these lines.

OPTIMIZING YOUR SYSTEM

If you are experiencing problems running *Wings of Glory* or cannot free the appropriate amount of memory, it might help to create a separate boot disk and decrease the number of memory resident programs (TSRs) you have loaded.

Without them, your computer will not function.

CREATING A BOOT DISK

Before creating a boot disk, we recommend that you make a paper copy of your hard drive's CONFIG.SYS and AUTOEXEC.BAT start-up files. Type at the DOS prompt:

```
TYPE CONFIG.SYS
```

Either hand-copy or, if you have a printer, use **Print Screen** to generate a printout of this startup file. Now at the DOS prompt, type:

```
TYPE AUTOEXEC.BAT
```

Hand-copy or use **Print Screen** to generate a printout of this startup file.

To create a separate boot disk, insert a blank high density disk in your A: drive. (**Your computer will not boot from the B: drive.**) From the DOS prompt, type:

```
FORMAT A: /s Enter
```

MODIFYING CONFIG.SYS

When the DOS prompt returns and the format is complete, type:

```
EDIT A:\CONFIG.SYS Enter
```

When the new screen appears, determine which memory management system you are using (if any) from those listed below and type the commands shown under that system:

CONFIG.SYS using EMM386.EXE (Expanded Memory with DOS 5.0, 6.0, 6.2, Windows 3.1)

```
FILES=25
```

```
BUFFERS=25
```

```
DEVICE=C:\DOS\HIMEM.SYS
```

```
DEVICE=C:\DOS\EMM386.EXE 6144 RAM
```

If you are using *Windows*, you may replace the above lines with

```
DEVICE=C:\WINDOWS\HIMEM.SYS and
```

```
DEVICE=C:\WINDOWS\EMM386.EXE 6144 RAM.
```

```
DOS=HIGH,UMB
```

```
SHELL=C:\DOS\COMMAND.COM C:\DOS /P
```

```
DEVICEHIGH=C:\<path>\<your CD-ROM driver> <exceptions>
```

Type in the information for your CD-ROM driver line from the printout of your CONFIG.SYS. It will usually be a line containing the driver name (example:

SBCD.SYS) followed by the device name of your CD-ROM (example: /D:MSCD001).

CONFIG.SYS using EMM386.EXE with DoubleSpace and DOS 6.0/6.2

```
FILES=25
```

```
BUFFERS=25
```

```
DEVICE=C:\DOS\HIMEM.SYS
```

```
DEVICE=C:\DOS\EMM386.EXE 6144 RAM /I=B000-B7FF
```

```
DOS=UMB
```

```
DOS=HIGH
```

```
SHELL=C:\DOS\COMMAND.COM C:\DOS /P
```

```
DEVICEHIGH=C:\<path>\<your CD-ROM driver> <exceptions>
```

Type in the information for your CD-ROM driver line from the printout of your CONFIG.SYS. It will usually be a line containing the driver name (example:

SBCD.SYS) followed by the device name of your CD-ROM (example: /D:MSCD001).

```
DEVICEHIGH=C:\DOS\DBLSPACE.SYS /MOVE
```

CONFIG.SYS without EMS driver (will not work with more than 16 megabytes of RAM)

```
FILES=25
```

```
BUFFERS=25
```

```
DEVICE=C:\DOS\HIMEM.SYS
```

```
DOS=HIGH
```

```
SHELL=C:\DOS\COMMAND.COM C:\DOS /P
```

```
DEVICE=C:\<path>\<your CD-ROM driver> <exceptions>
```

Type in the information for your CD-ROM driver line from the printout of your CONFIG.SYS. It will usually be a line containing the driver name (example:

SBCD.SYS) followed by the device name of your CD-ROM (example: /D:MSCD001).

After typing these lines, you should exit and save your file. Do so by typing:

```
Alt F
```

```
X
```

```
Y
```

MODIFYING AUTOEXEC.BAT

Next you need an AUTOEXEC.BAT file on your boot disk. Type:

```
EDIT A:\AUTOEXEC.BAT
```

When the new screen appears, type:

```
PROMPT $P$G
```

```
PATH=C:\DOS
```

```
SET COMSPEC=C:\DOS\COMMAND.COM
```

```
C: (or the drive where the game is installed)
```

```
LH C:\MOUSE\MOUSE.COM
```

```
C:\<path>\MSCDEX.EXE <exceptions>
```

Type in the information for the above MSCDEX.EXE line from the printout of your AUTOEXEC.BAT. This line should be identical except for two items: delete the /E parameter (the /E and so on – but not past the next space), and change /M:##

to /M:5. For example, C:\DOS\MSCDEX.EXE /E /M:15 /L:F would change to

```
C:\DOS\MSCDEX.EXE /M:5 /L:F.
```

```
CD\WINGS (or your game directory, if different from the default)
```

```
WG
```

The AUTOEXEC.BAT file does not vary with different memory drivers.

(Your mouse driver may need to be loaded differently. Refer to **Mouse Setup** (p. 6) and the printout of your original AUTOEXEC.BAT.) Exit and save this file by typing:

```
Alt F
```

```
X
```

```
Y
```

TO USE YOUR NEW BOOT DISK

Turn your computer off, insert your new boot disk in your A: drive and turn the computer back on. The boot disk should run and automatically take you into *Wings of Glory*.

MOUSE SETUP

Be sure that you are using a 100% Microsoft-compatible mouse driver – a Microsoft version 7.0 or higher mouse driver is preferable. If you are using a boot disk, this driver must be loaded within your boot disk configuration. Since the command line may differ from mouse to mouse, consult your hard drive's AUTOEXEC.BAT. (If you have not made a paper copy (p. 4), you may view your AUTOEXEC.BAT by typing at the DOS prompt: TYPE AUTOEXEC.BAT.) Look for your mouse driver line and copy it into your boot disk's AUTOEXEC.BAT, replacing the mouse driver information (C:\MOUSE\MOUSE.COM) that we suggest above. Consult your mouse user's guide for more detailed instructions on loading the mouse driver for your computer.

DISK CACHE SETUP

Before installing *Wings of Glory*, we recommend that you temporarily disable your disk cache. Occasionally, "DOS error" messages can erroneously appear when installing with a disk cache active. To temporarily disable your disk cache program, make a boot disk with one of our recommended configurations. Refer to **Creating a Boot Disk** (p. 4) for how to create such a boot disk. Now reboot your computer with this boot disk (which does not include the disk cache). Then install the game normally. If you have *SMARTDrive*, when you have completed the installation, follow the instructions below to reconfigure your boot disk to include the disk cache program.

SMARTDRIVE

If you decide to install *SMARTDrive* (a disk caching program), you will need to add the following line at the beginning of your AUTOEXEC.BAT file. (You may need to change the path on this line depending upon where your disk cache program is located.) If you use *SMARTDrive*, we recommend using the *SMARTDrive* versions from *Windows 3.1* or *DOS 6.0*.

Type:

```
C:\DOS\SMARTDRV.EXE 1024 C (the final letter being the drive where you installed  
Wings of Glory)
```

On an 8 megabyte machine, substitute 256 for 1024 (above).

Note: Though other disk cache programs may work with *Wings of Glory*, we cannot guarantee their compatibility with this software.

INSTALLATION FAILS

In the unlikely event that the installation fails, an error message should tell you the nature of the problem. See **Troubleshooting** (p. 7) for solutions to some common problems.

GENERAL MIDI

Wings of Glory has joined the next generation of music quality with its support of the General MIDI standard as defined by the MPU-401 instruction set. At the time of publishing, only a few cards support MPU-401. These cards include the Roland SCC-1, Roland RAP-10, Creative Labs Sound Blaster 16 with attached Wave Blaster daughterboard, and Creative Labs Sound Blaster ASP 16 with attached Wave Blaster daughterboard. Other manufacturers have already released, or are planning to release, sound cards that utilize the MPU-401 instruction set. However, sound cards that use a memory-resident program (TSR) to emulate MPU-401 may not work with this software.

Note: Some General MIDI sound cards offer digitized speech or sound effect capabilities. However, in the case of the Roland RAP-10, customers will need to use a second sound card such as a Sound Blaster, Sound Blaster Pro or 100% compatible sound card for digitized speech and effects. Review your sound card documentation or contact its manufacturer if you have any questions.

TROUBLESHOOTING

COMMON QUESTIONS

Q: When I installed Wings of Glory it said NOT ENOUGH DOS MEMORY DETECTED. 528K ARE NEEDED TO PLAY WINGS OF GLORY. So I freed up 530K and it still won't work. What else am I supposed to do?

A: Unfortunately, there is an error in the error message. You have to free up 540K to have the game run. The game won't run on 528K.

Q: Wings of Glory fails to load or run and generates an error code. What's wrong?

A: Certain error messages can easily be interpreted and remedied:

- YOU MUST HAVE AT LEAST 15 MEGABYTES OF HARD DRIVE SPACE FREE.

Wings of Glory needs this much hard drive space to store saved games. Make room on your hard drive by deleting unused files or upgrade to a larger drive.

- NOT ENOUGH MEMORY TO RUN WINGS OF GLORY.

If you have at least 8 megabytes of RAM installed on your computer, then too much of your memory has been used by another program. *SMARTDrive* or other memory-resident programs may be taking up your base memory. See **Creating a Boot Disk** (p. 4) to make a boot disk.

- THE EXISTING MEMORY IS TOO FRAGMENTED.

You have some piece of software (like a disk cache or an expanded memory manager) that is fragmenting too much memory for *Wings of Glory* to use. See **Creating a Boot Disk** (p. 4) to make a boot disk to solve this problem.

- YOU SHOULD HAVE AT LEAST A 486/33.

Wings of Glory will not run on 286 machines or IBM-XT compatibles. Though this game may work on a 386 or 486SX computer, we require an Intel486/33 (or better) for speed and playability.

Q: Why does my computer crash when I try to play Wings of Glory while I am logged into a local area network?

A: LAN software often tries to take over the same system resources that *Wings of Glory* uses. We recommend that you boot from a clean boot disk that does not load your LAN drivers. Please refer to **Optimizing Your System** (p. 4).

Q: I have a sound card that is 100% compatible with Sound Blaster, but I'm not getting any sound. Why not?

Q: Wings of Glory says that it cannot find my sound card or that the sound initialization failed. What's wrong?

A: If your sound card is not one of the cards listed on the box or in the installation program, but is "100% compatible" with one of the cards listed, it may have to be put into "SB" (Sound Blaster) emulation mode through its software or a switch setting on the card. Consult your sound card manual or its manufacturer. You may also try running SNDTEST from your game directory to check your settings.

Q: My mouse is not working with Wings of Glory. My mouse works with all of my other software applications. Why not with Wings of Glory?

A: You should first check to see if your mouse has been loaded into either DOS (in your AUTOEXEC.BAT or CONFIG.SYS file) or onto the boot disk that you are using to play the game. If neither, it cannot interact with your game. *Windows* and many other "multi-tasking" shell environments load their own built-in mouse driver. These mouse drivers will not operate outside their shell environment. Loading a mouse driver into the DOS environment can be as simple as typing at the command prompt (C:\>):

```
MOUSE [Enter]
```

A: Your mouse may not be 100% Microsoft compatible.

- If you have *Windows* or DOS 6.0, you can edit the AUTOEXEC.BAT file by adding C:\WINDOWS (or DOS)\MOUSE and typing REM at the beginning of your previous mouse line.
- If you have the disks to *Windows 3.1*, you can copy the mouse driver. Check each disk's directory (by typing DIR) to find MOUSE.CO_. Copy it to your WINGS directory or boot disk. Then type EXPAND C:\WINGS\MOUSE.CO_ C:\WINGS\MOUSE.COM. (If copied to your boot disk, type EXPAND A:\WINGS ... etc.) Lastly, add the line C:\WINGS\MOUSE.COM to your AUTOEXEC.BAT and type REM at the beginning of your previous mouse line.

Q: My copy of Wings of Glory is defective. Every time I play, it quits to DOS with an Out of Memory Error.

A: This indicates that not enough memory existed to continue game play. Make sure that you have enough free memory in either conventional/base RAM or extended memory (XMS). Use the DOS MEM command to determine how much free memory you have available. There must be at least 6,225,920 bytes free in conventional memory and XMS combined. Refer to **Optimizing Your System** (p. 4).

Q: Wings of Glory runs slowly and occasionally locks up.

A: You may be loading other software that is not compatible with *Wings of Glory*. First, try running the game from a boot disk. Refer to **Creating a Boot Disk** (p. 4). Also, you may not be meeting all of the necessary system requirements. Refer to **System Requirements** (p. 2). Finally, if you are not running *SMARTDrive* you may want to add that line to your AUTOEXEC.BAT file (see **Disk Cache Setup**, p. 6).

Q: Why does my game crash when I play Wings of Glory through Microsoft Windows or Windows NT, IBM OS/2 or Desqview?

A: Multi-tasking environments such as these often conflict with *Wings of Glory* in their use of memory and other system resources. We do not recommend playing *Wings of Glory* under any of these circumstances. In general, we recommend that you exit out of *Windows* (or similar applications) and play from the DOS prompt.

Q: Wings of Glory still doesn't work after I made a boot disk and/or modified my CONFIG.SYS and AUTOEXEC.BAT files.

A: Copy down the error code and information the computer displayed when it quit to DOS. Then see **ORIGIN Product Support**, next page.

ORIGIN PRODUCT SUPPORT

If, after reviewing **Troubleshooting**, you are still having a problem with the *Wings of Glory* software, please read this section and call us. We have a staff of product support technicians ready to help you with any problems you may encounter with the game. Today's PCs run with millions of different hardware and software combinations. Because of this, you may also have to refer to your computer dealer, hardware manufacturer or system software publisher in order to properly configure their product to run with our game. When you do call us, if at all possible, be near your computer. If it is not possible to be near your computer, be sure to have the following information:

- The contents of your CONFIG.SYS and AUTOEXEC.BAT files
- A listing of your machine's type and hardware contents
- The DOS version number and publisher that you are currently running
- The type and version of mouse driver you use
- The contents of a CHKDSK and MEM /C statement
- The error message displayed when the problem occurred (if any)
- The brand of your sound card, and its IRQ, I/O address and DMA setting

Contact ORIGIN Product Support at (512) 335-0440, Monday through Friday, between 9 a.m. and noon, or 1 p.m. and 5 p.m., Central time (1 p.m. to 4:30 p.m., Friday afternoons). The ORIGIN fax number is (512) 331-8559.

ONLINE SERVICES AND BULLETIN BOARDS

Many of the most popular online services provide access to ORIGIN company news, product updates, release dates, technical support and game hints. In addition, ORIGIN has established its own electronic bulletin board as a customer service.

America Online. You can e-mail Customer Support at ORIGIN CS or Marketing at OSI. To reach our Customer Support board in the Industry Connection, press **[Ctrl][K]** for "Go to Keyword." Then type ORIGIN in the Keyword window. In addition to reading messages, you can download files from the "Origin Software Library." For membership information and a free starter kit, you can call America Online toll-free at 1-800-827-6364.

CompuServe. To reach our Customer Support board in the Game Publishers Forum, type GO GAMAPUB at any "!" prompt. Then select the Origin Section (Section 12). In addition to reading the messages, you can download files from the "Library Files" menu. To reach our Customer Service department by e-mail, our address is 76004,2612 (or you can post a message in the ORIGIN Game Publishers' Section). You can reach ORIGIN Marketing at 71333, 136. For membership information and a free starter kit, you can call CompuServe toll-free at 1-800-848-8199 and ask Representative #361 for your free introductory membership and \$15 usage credit.

ORIGIN BBS. The ORIGIN BBS is located in Austin, Texas and has a modem support of: 300/1200/2400/9600/14,400 bauds with N,8,1. It is operational 24 hours a day, 7 days a week. Full support is provided. Call 1-512-331-4446 to contact. No membership is required and the only cost is any long distance charges that you may incur.

Internet. You can e-mail technical support and upgrade questions to ORIGIN Customer Support at support@origin.ea.com. You can reach the ORIGIN Marketing Department at marketing@origin.ea.com. You can also retrieve demos, patches, press releases and screen shots from ORIGIN's anonymous FTP site at ftp.ea.com.

INTRODUCTORY FLYTHROUGH

Now that you have installed the game, this brief **Flythrough** will guide you through your first dogfight in *Wings of Glory*. In your first couple of flights, you should concentrate on mastering basic flight maneuvers and cockpit controls. Since missions become increasingly difficult, you need to have a good grasp of the mechanics of flight. If you want to get in a few rounds of practice, replay the first mission or two, or use the CREATE A MISSION option in the main menu to improve your combat skills. Good luck!

STARTING THE GAME

When you start *Wings of Glory*, you'll see a brief introductory animation followed by a menu. Select NEW GAME. Type your last and first names on the appropriate lines of the enlistment form. At the end of each line press **[Tab]** or **[Enter]** to go to the next line. Note your photo on the passport. Then press **[Enter]** to launch into the adventure.

You begin the game in your commander's office. You are with your friend, Charles, and you're both in trouble.

Interaction is always done by clicking either mouse button on people (to talk to them), places (to go there) or objects (to use them). Click on Charles and your C.O. to talk to them. Click near the bottom of the screen to exit. Talk to Charles and Walter – it's always a good idea to talk to everyone in the common room. When you realize the aerodrome is under attack, click on the door to the right to exit, click on the hangar to enter, and click on a Sopwith *Pup* to fly it.

PRE-FLIGHT CHECK

Before you take off for the first time, we suggest that you complete the following checklist. This may take up valuable mission time, but you can repeat the first mission as many times as you like:

- [F2]** Test the Chase Plane view.
- [F1]** Return to the Normal view.
- [F3]**, **[F4]**, **[F5]** Test the views. (Displays Left, Right and Back views, respectively.)
- [F1]** Return to the Normal view.
- [F6]** Test the External view. (It shows a rear external view of your plane.) Once in the air, you can use **[I]** or **[O]** to zoom in or out, respectively.

Note: If you are using a joystick, press and hold Button 2. At the same time, push the joystick any direction for a panoramic view. Push forward on the stick to view your plane from above.

- [F9]** Activate the Victim view (allows you to see action from the victim's viewpoint when he crashes). Once you turn Victim view on, it remains active throughout the mission.

Once you complete this pre-flight check, you are ready for takeoff!

TAKING OFF

Autopilot Takeoff. If you wish, you can perform an autopilot takeoff and let the system take over – press **[A]**. You'll watch your plane lift off the ground and climb to a level cruising altitude. When the game returns you to the cockpit view, you regain control of the airplane. Be sure to keep the nose of the plane level with the horizon by using your joystick, mouse or keyboard.

- [A]** Autopilot takeoff.
- [A]** Autopilot to the next stage of your mission.

Manual Takeoff. For more detailed information, see page 12 in the *Playguide*.

- [O]** Increase your throttle to 100 percent.
- [↓]** Gradually raise the nose of the plane to lift off the ground. Keep climbing until you're 1,500 or 2,000 feet above ground level.
- [↑]** At around 2,000 feet, lower the nose of your plane until the horizon splits your screen.
- [A]** Autopilot to the next stage of your mission.

IN THE AIR

Once in the air, you have to contend with the Germans who are approaching to attack the airfield. There are three enemy aircraft: one Albatros CIII two-seater bomber and two Albatros DIII fighter planes. Your first mission objective is to eliminate the enemy before they destroy your airfield. Avoid climbing straight up to attack the planes. Instead, gain altitude by slowly climbing.

You have several minutes in which to shoot down the attacking planes. Try not to waste ammunition. It's better to wait until the enemy is about fifty yards away – close enough for you to see details on the plane.

- [Alt][B]** Tell Charles to break away from formation, so that he can use his formidable talents in attacking. Otherwise, your wingmen only break away and enter combat once shots have been fired.
- [T]** Once you have the advantage of altitude, press **[T]** to select the nearest plane as your target. A "sparkle" appears on the target. (After you've shot him down and his plane begins to crash, press **[T]** to select another plane. See page 19 in the *Playguide* for more targeting information.)
- [F7]** Press **[F7]** to activate the Player-to-Target view. This camera lets you view your enemy's position relative to your plane. If you can't see the enemy with this camera, your plane is interrupting the view. You can aim your plane at the enemy by maneuvering your plane so that its nose points away from the camera.

When you've accomplished your mission objective, a plaque will appear at the bottom of the screen, saying mission accomplished, return to base.

- [A]** Autopilot back to the base.

LANDING

If you want to land automatically, press **[A]** for an autopilot landing. You can press **[Esc]** at anytime thereafter to skip the remainder of the autopilot sequence and return to the hangar. If you want to land manually, drop to about 150 feet above the ground. When the runway is several hundred feet away, slowly throttle back, in stages, to 40 percent power (setting **[4]**). Gradually descend to about 25 feet above the runway. Gently raise the front of the plane **[↑]** and turn off the engine **[↵]**, dropping onto the ground.

FLIGHT RECORDER

You can record flights up to 20 minutes. After a mission you always have the opportunity to view or save the tape from the Flight Recorder. Changes made to a saved tape do not affect the overall game flow. If you immediately view tape after a mission (before you save it), and refly the mission, the new conclusion becomes the "true" result of the mission.

Click on VIEW TAPE if you wish to review the mission. Click on ENTER MISSION if at any time you would like to "jump in" and take over.

WING OF GLORY™

REFERENCE CARD

Page numbers refer to where additional information may be found in the *Wings of Glory Playguide*.

KEYBOARD COMMANDS

WEAPONS (PP. 18-19)

Next air target out	.T
Next air target in	.Shift T
Next air friendly out	.Alt T
Next air friendly in	.Shift Alt T
Next ground target out	.Ctrl T
Next ground target in	.Shift Ctrl T
Deselect target	.Ctrl Alt T
Fire machine guns	.Spacebar
Toggles between guns (only for S.E.5a)	.G
Fire rocket	.R
Drop bomb	.B
# of bullets left	.W
Show weapons	.Alt W
Show number of bombs and rockets	.Shift W

MANEUVERING / NAVIGATION

Engine power (p. 11)	.T-O
Step up engine power (p. 11)	.+/-
Step down engine power (p. 11)	.-
Shut off engine (p. 11)	.~
Left, right rudder (p. 11)	.<, >
Maximum rudder (left, right)(p. 11)	.Alt <, Alt >
Autopilot (p. 12)	.A
Navigation map (p. 15)	.N
Tell wingmen to build formation (p. 18)	.Alt F
Tell wingmen to break formation (p. 18)	.Alt B
Height from ground (in feet) (p. 21)	.H
Damage (cycles through plane) (p. 21)	.D
Speed (in knots) (p. 21)	.S
Engine blipper (risks fire) (p. 14)	.E
Time burst while key is held (p. 16)	.Tab
Time compression (p. 16)	.Shift Tab

GAME INTERFACE (p. 29)

Return to main menu (not during flight)	[Alt] M
Advance conversation	[Spacebar]
Exit conversation or cinematic	[Esc]
Game options (flight only)	[Alt] O
Pause	[P]
Sound (Speech) on/off	[Ctrl] S
Music on/off	[Ctrl] M
Recalibrate joystick	[Alt] J
Exit the game	[Alt] X

FLIGHT RECORDER (p. 7)

Pause/Play toggle	[Ctrl] P
Fast Forward	[Ctrl] F
Super Fast Forward	[Shift] [Ctrl] F
Rewind/Restart	[Ctrl] R
Single step	[Ctrl] A
Enter game	[Ctrl] E
Information bar on/off	[Ctrl] H

CAMERA VIEWS (pp. 22-23)

Cockpit camera (front view)	[F1]
Chase camera	[F2]
Left view	[F3]
Right view	[F4]
Back view	[F5]
External camera	[F6]
Zoom in, out	[I] [J]
Cycle through ground targets	[Ctrl] [F6]
Target view	[F7]
Overhead camera	[Alt] [F7]
Change angle on Overhead camera	[F]
Victim camera	[F9]
Weapon camera	[F10]
Lewis gun camera (p. 19; only for S.E.5a)	[L]
Invisible cockpit (toggle)	[C]
Eyes fixed on locked (T) target	[Y]

 **ORIGIN**[®]
We create worlds.[®]

An Electronic Arts® Company
P.O. Box 161750 Austin, TX 78716

WINGS OF GLORY PLAYGUIDE

TABLE OF CONTENTS

Starting the Game.....1	Combat.....17
Saving, Exiting and Loading	Death.....21
Saving Games.....1	Camera Views.....22
Naming the Saved Game.....2	Game Options.....24
Exiting.....2	World Detail.....25
Loading Games.....2	Object Detail.....25
Main Menu.....3	Realism Options.....26
Object Viewer.....4	Active Cameras.....28
Create a Mission.....5	Audio.....28
Flight Recorder.....6	Flight Control.....28
Cockpits & Instrumentation ..8	Interface Shortcuts.....29
Flight Tactics	
Flight Controls.....10	
Taking Off.....12	
Maneuvering.....13	
Navigating.....15	
Landing.....16	
Time Burst / Compression..16	

A complete **Flythrough** of the first mission can be found at the back of the **Install Guide**.

STARTING THE GAME

1. First, install *Wings of Glory*. Check the **Install Guide** for details on installation and troubleshooting advice.
2. Begin the game by going to the *Wings of Glory* directory on your hard drive and typing WG **[Enter]**. For a brief flythrough of the first mission, see **Introductory Flythrough** in the *Install Guide*.
3. Clicking on items (either left- or right-clicking) "uses" them. Click on doors to go through them, on people to talk to them, etc.

SAVING, EXITING AND LOADING

SAVING GAMES

You can only save from the barracks, between missions.

1a. British Camp

Left-click on the stairs (in the common room), then click on the closed door.

1b. American Camp

Click on the lower left bunk in the barracks.

NAMING THE SAVED GAME

2. Type in a short description for the saved game (up to 8 characters).
3. Click on the SAVE button.
(You can save an unlimited number of games.)

Overwriting an Existing Saved Game

1. Click on the door (British) or bunk (American), click on the saved game to be overwritten, and select SAVE. To change the name, type in a new name before selecting SAVE.

EXITING

To exit the game, press [Alt X]. Press [Y] to confirm, or [N] to cancel the exit process.

LOADING GAMES

1. Go to the game location in which you saved the game.
(See *Saving Games*, p. 1.)
2. Click on the bunk (in the British camp), or the footlocker (in the American camp) to bring up the LOAD GAME screen.
3. Click on the game you wish to load (highlighting it), then click on the LOAD button.

MAIN MENU

Click on an option using the mouse or joystick. When using the keyboard, use [↑], [↓], [←] and [→] to move the cursor over the option you want, then press [Enter].

NEW GAME begins a game from the very beginning.

CONTINUE GAME returns you to wherever your last mission started (common room, hangar or commander's office). This does not load a game you have previously saved — to return to a saved game, choose LOAD GAME.

LOAD GAME returns you to a game you have previously saved.

CREATE MISSION hones your flying expertise with practice missions. The outcome of these missions does not affect your status in the game, but you can practice both air combat and bombing techniques. (See **Create a Mission** on page 5 for more information.)

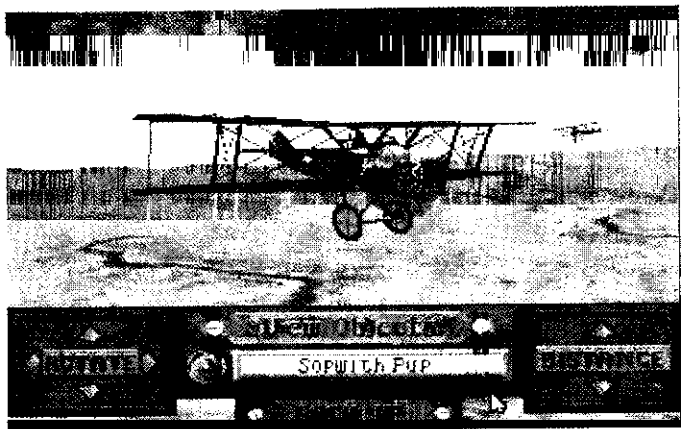
FLIGHT RECORDER replays any saved tapes — recordings — of missions. It allows you to “jump in” and see how different maneuvers affect the outcome. (See **Flight Recorder** on page 6.)

VIEW OBJECTS lets you check out all the planes and several other 3-D objects in *Wings of Glory*. (See **Object Viewer** on page 4.)

OBJECT VIEWER

The Object Viewer displays 3-D pictures of all the airplanes and several other game objects.

- To change your view of the object, click on the ROTATE arrows, the top DISTANCE arrow (farther view) or the lower DISTANCE arrow (closer view).
- To view another object, left-click on the button to the left of the object's name. Right-clicking cycles backwards through the list.
- To exit the Object Viewer, click on the BACK UP button.



CREATE A MISSION

Wings of Glory has a training feature that lets you fly different types of practice missions. You can further customize the missions by using the Option Screen.

AIR COMBAT lets you choose your altitude, plus your enemies' number and skill level.

BOMBING RUN helps you perfect the tricky skill of bombing ground targets. Anything and everything on the ground is a target.

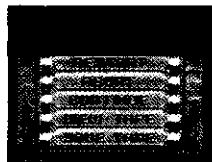
RANDOM MISSION puts you in air combat against the Germans. The specifics — the altitude level, how many enemies there are, plus their skill levels and plane types — change every time.

GAUNTLET pits you against waves of enemy aces — you automatically have unlimited ammunition. The computer randomly generates planes one at a time until you have killed four. Then you face two at a time until you have killed eight more. The numbers continue to increase. More points are awarded for killing faster, more maneuverable enemies (such as a Fokker D. VIII) and lower scores for slower targets (such as bombers or balloons).

CANCEL exits the Create a Mission option.

FLIGHT RECORDER

During each mission, your computer is recording a "tape" of your maneuvers. After each mission, a menu appears asking if you wish to view the tape or save it.



VIEW TAPE. At the end of a mission, whether it was successful or fatal, you may view the tape and jump in at any point to affect the outcome. If you modify the tape *immediately* after playing the mission and the outcome is different, the new result will be recorded as the "true" mission result — if you exit, however, the mission is counted as "failed," even if you were successful. If you fail a mission, it is usually a good idea to go directly into VIEW TAPE and try again. You can save a game at the end of a mission, even if that mission was modified by using VIEW TAPE.

SAVE TAPE. This creates a record of the mission you just flew. You can view the game at a later date, and jump in at any time to change the outcome. However, changing the outcome of a tape *loaded from the tape logs* does *not* affect the outcome of the game.


RESTART. This starts the mission over from the point of take-off.

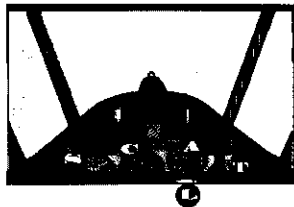
CONTINUE. This returns you to the hangar, common room or commander's office.




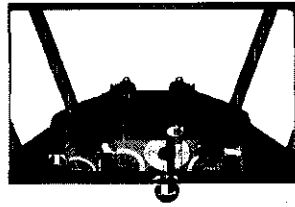
- **COUNTER** keeps track, in minutes and seconds, of what point in the replay you are viewing.
- **REWIND** (**Ctrl** **R**) returns instantly to takeoff.
- **PLAY** (**Ctrl** **P**) toggles on and off) progresses tape at real-time speed.
- **PAUSE** temporarily halts the tape.
- **FAST FORWARD** (**Ctrl** **F**). Click on the fast forward button:
 - First click gives 2 × normal speed.
 - Second click gives 3 × normal speed.
 - Third click gives 4 × normal speed.
 - Fourth click returns you to normal speed.
- **SINGLE STEP** (**Ctrl** **A**) advances the tape by one frame.
- **ENTER FLIGHT** (**Ctrl** **E**) puts you in the game at the moment on the screen.
- **Ctrl** **Shift** **F** progresses the tape at maximum speed.
- **Ctrl** **H** Toggles the information bar visible and invisible.


COCKPITS AND INSTRUMENTATION

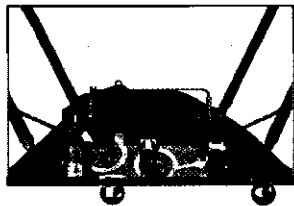
Sopwith *Pup* 



Sopwith *Camel* 




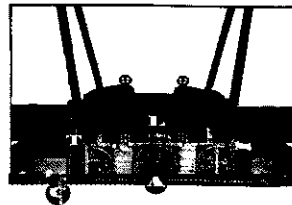
S.E.5a 



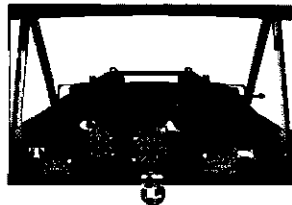
Each plane you fly has a unique cockpit. Some offer terrific visibility, while others limit what the pilot can see, making flying — and dogfighting — more difficult. World War I pilots rarely flew straight for long — they tended to

weave a bit up and down, thus increasing their field of vision. Take a few moments to study the cockpit instruments. In flight, and especially in combat, it is easy to lose track of your position.

Fokker Dr. I 



SPAD XIII 



- A = Altimeter. How high you are above the ground in 1000-foot tick marks.
- C = Compass. The needle always points north. If the needle is pointing to the right tick mark, you are heading west.
- L = Level Flight Indicator. This device indicates the roll of your plane. When you are level, the floating black marker centers in the arc. As your plane rolls to the right, the marker floats “upwards,” moving to the left.
- S = Speedometer. How fast in knots ($1.15 \times$ knots = miles per hour) your plane is traveling.
- T = Tachometer. Your engine’s revolutions, in hundreds, per minute.

FLIGHT TACTICS

FLIGHT CONTROLS

When in the air, you control the flight of your plane with the keyboard, mouse or joystick. You can also use any of these, in the Cockpit or External views, to look at your surroundings. You can select the method of flight and panning control in the Option Screen (p. 24).

Joystick Control. A joystick gives you the most realistic experience and is the suggested interface for the game. Pulling the stick toward you pulls the nose of the plane up, while pushing the stick away from you dips the nose down. Moving the joystick left or right rolls the plane left or right.

Mouse Control. Pushing the mouse away from you noses the plane down, and pulling it toward you pulls the nose up. Moving the mouse left or right rolls the plane left or right. The left mouse button fires your guns.

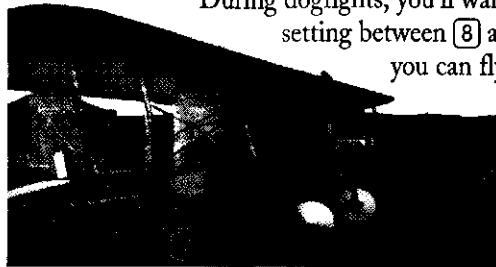
Keyboard Control. Holding **[↑]** down noses the plane down, while **[↓]** pulls the nose up. Holding down on **[←]** or **[→]** rolls the plane left or right. **[Spacebar]** fires your guns.

Rudder. **[←]** and **[→]** control your plane's rudder, yawing your plane left and right (see page 49 in the *Reference Manual*). *Use of rudder is vital to success.* Use the rudder to better control your turns, or to change your direction while keeping your wings level. Use a to maximize the effect of your rudder.

Throttle. Both the number keys **[1]** through **[0]** and your joystick wheel (if you are using a CH Flightstick or Flightstick Pro) can control the engine throttle setting. Each number represents a 10 percent step, with **[1]** as 10% power and **[0]** as 100%. **[~]** cuts the throttle to zero.

[+] and **[-]** increase and decrease your engine's power by one step each time you press them.

During dogfights, you'll want to maintain a setting between **[8]** and **[0]**. Otherwise, you can fly at 50 or 60 percent throttle. When you autopilot, your throttle automatically resets to **[7]**.



TAKING OFF

Autopilot Takeoff. If you wish, you can perform an autopilot takeoff and let the system take over — press [A]. You'll watch your plane lift off the ground and climb to a level cruising altitude. Press [Tab] to speed up the autopilot takeoff. When you return to the cockpit view, you regain control of the airplane. Be sure to keep the nose of the plane level with the horizon by using your joystick, mouse or keyboard.

Manual Takeoff

- ⓪ Increase your throttle to 100 percent. As you gain speed, your tail rises and you are able to see the runway or ground.
- Ⓣ Gradually raise the nose of the plane (move the joystick or mouse toward you, or use Ⓣ) to lift off the ground. As you continue to climb, watch the altimeter turn counter-clockwise as your altitude increases.
- Ⓢ Once you gain enough altitude (between 1,500 and 3,000 ft.), lower the nose of your plane (move the joystick or mouse away from you, or use Ⓢ) until the horizon splits your screen.
- ⓐ If there are no enemy craft nearby, press [A] to autopilot to the next stage of your mission.

NAVIGATING

Your navigational map shows your position relative to the aerodrome and nearby towns. It also shows waypoints and target locations. Your position is within the large circle with your name by it. Target names and the name of your aerodrome also appear on this screen.

- ⓐ Autopilots to your next destination, unless your mission is completed. In that case, if you press [A] you land automatically.
- Ⓝ Opens and closes the navigational map. ([Esc] also closes the map.)
- Ⓢ To switch between Nav points, open the map and move the mouse (or use the keyboard arrows). The current navigational point appears as a yellow circle with white text description. (Nav points that you have already visited appear as a dark yellow circle with *yellow* text description. Nav points that you have not visited — and that are not selected — appear as a dark yellow circle with *green* text description.)

Text on the right side of the map lists information on your wingman, current Nav point, the primary objective for that Nav point, and notes concerning the objective. When you switch Nav points, some of the text changes.

MANEUVERING

Once in the air, you have to perform aggressive and evasive maneuvers when you fight the enemy. You may want to review **Flight Tactics** in the *Wings of Glory Reference Manual* (pages 50-51) for detailed information on maneuvers and tactics you can use in the game. Here are a few basic moves to get you started:

Climbing. To climb, pull back on the stick, move the mouse toward you or press **[↓]**. You should climb whenever you can during combat, because you gain extra speed by diving. Descending on an enemy gives you a decided advantage. Be careful not to climb too steeply — it's easy to stall these early fighters!

Diving. To dive, move the joystick or mouse away from you or press **[↑]**. You gain a lot of speed during a dive — be careful not to dive steeply or for a long time. There is a danger of your wings shearing off at high dive speeds.

Stalling. If your plane loses speed and stalls during a climb, let it fall until you regain control again. Not enough air is flowing over the wings for it to fly. Once the plane gains enough speed, you can pull out of the fall.

Rolling. You “roll” the plane by moving the joystick or mouse left or right. On the keyboard, press **[←]** or **[→]**. To watch your moves from outside the plane as you practice, use the **[F2]** Chase view or **[F6]** External view.

Turning. To turn the plane, roll until your wings are at an angle to the ground: 30° from the ground gives a gentle turn, while 90° is the sharpest turn possible. Then pull the nose of the plane up. Simultaneously using the rudder (**[←]** to go left and **[→]** to go right) is useful in tightening the turn.

Blipping. You can control your plane's speed by turning the engine off and on. Press **[E]** to turn off the engine, then almost immediately press **[E]** a second time to turn it back on. World War I pilots used the “blipping” method when they did not have throttles to control their speed. There is a risk of catching the



plane on fire, so using the throttle is a better idea.

LANDING

Autopilot. When your mission is complete, you can land automatically by pressing **[A]**, unless you are out of fuel. You can also land manually.

Manual Landing. To make a manual landing, follow these steps:

- ↑ Drop your altitude to 150 feet above the ground.
- [6]** or **[7]** When you are several hundred yards from the runway or landing area, reduce your throttle to 60 or 70 percent.
- ⏏ At the beginning of the runway, you should be about 25 feet above the ground. Press **[⏏]** to turn off your engine.
- ↓ Gently raise the nose of the plane and drop down onto the runway.

TIME BURST / COMPRESSION

[Tab] accelerates the game time sixfold, for as long as you hold the key down. Releasing it stops the time burst.

[Shift Tab] activates "2X" time compression, meaning everything occurs twice as fast. You can press **[Shift Tab]** again to double the compression to 4X. Press **[Shift Tab]** a third time to return to normal time.

COMBAT

During combat your first objective is to find the enemy before he spots you. The second objective is to outmaneuver him. Both require good flying techniques.

Finding Enemy Planes. Enemies are hard to see from far away, especially if you're flying with clouds turned ON. (To turn them OFF, press **[Alt O]** to bring up the Option Screen and set the clouds to 0%.) Whenever you see a *brightly colored plane* in the distance, you can be sure it is an enemy. Once you spot one, you can mark it as your selected target. (See **Selecting Targets**, p. 18.) This helps you locate it when it is out of view.

If you can't see your enemy in front of you, press **[T]** to target an enemy, then **[F7]** to "get a line" on him. (In other words, the camera will center on your plane, and the enemy is *on the other side* of your plane.) You can also try switching to **[F6]** External view. In this mode, press Button 2 on the joystick and pan around your plane in a 360-degree view. Once you spot an enemy, turn toward him. Switch to the Normal view by pressing **[F1]**.

Wingmen. There were no radios in World War I planes, so all communication was by hand signs and plain, old-fashioned yelling. For this reason, your wingmen must be within 900 feet (close enough to see the pilot) before they will follow your commands:

Alt B tells wingmen within range to break and attack.

Alt F tells wingmen within range to fly on your wing and *not participate* in combat.

Using Guns and Weapons

W shows how many bullets remain.

Alt W lets you see the bombs and rockets your plane is carrying, in external views.

Shift W shows the number of bombs and rockets you carry.

Spacebar or the joystick trigger fires your machine guns.

L switches to the S.E.5a's Lewis gun view to let you aim.

G switches between the S.E.5a's Vickers and Lewis guns.

R launches one rocket.

B releases one bomb.

Selecting Targets. After you find a target, "mark" it by pressing **T**. Notice that a white "sparkle" appears on the targeted plane.

T (pressed repeatedly) cycles through enemy air targets, from closest to farthest.

Shift T cycles through enemy air targets (farthest to closest).

Alt T cycles through friendly air "targets" (closest to farthest).

Shift Alt T cycles through friendly air "targets" (farthest to closest).

Ctrl T cycles through enemy ground targets (closest to farthest).

Shift Ctrl T cycles through ground targets (farthest to closest).

Ctrl Alt T deselects current target.

Y keeps your "eyes locked on target." Your "head" swivels in the cockpit to face the targeted enemy. Once you press **F1** to return to the Front view, you must press **Y** again to regain the "eyes locked on target" feature.

Attacking Enemy Planes. After you detect and target an enemy, it's time to attack. Your tactics depend on what plane you are flying, as well as the type of plane you're fighting.

Your first objective is usually to gain more altitude than your enemy. You can convert height into speed and dive down to attack your enemy. (A prolonged dive, however, often endangers your plane's wings.) Your second objective is to shoot the enemy. When firing at your enemy, remember that both you and your target are moving. This means you have to fire *leading shots* ahead of your enemy and estimate where he will be when the bullets reach him. Position your gunsight just in front of a moving target (especially if you're both turning), then unleash your bullets. Watch your tracers and adjust your aim accordingly.

Attacking Enemy Ground Targets. Depending on the object, you can either bomb or strafe the target.

Bombing. In a WWI aircraft, dives could not be very steep.

- ↑ Approach your target at a 20-degree angle descent. Begin your attack from an appropriate distance away — farther away than necessary is better than too close.
- Release your bomb when you are over your target.
- ↓ Pull up the nose of your plane and increase your throttle to evade anti-aircraft fire.

Strafing. Strafing refers to firing a volley of bullets at a ground target. You can strafe from a dive or a low approach.

- ↑ ↓ Dive strafe as though you were making a bombing run, but fire your guns instead of releasing your bomb.
- ◁ ▷ Low strafe by flying level past a target and firing while alternately turning the rudder (◁) and (▷).

Information. During flight, there are a number of ways to gain information about your surroundings.

- H gives your current altitude (height above sea level) in feet.
- D (pressed once) cycles through your plane's conditions.
- S gives your current speed in knots per hour.

DEATH

In the event that you die, a menu appears with five options.

RESTART begins the mission over again from take-off.

ABORT quits the mission and returns you to the base as though you had never spoken to the commander.

CONTINUE, after a fatal mission, takes you into the funeral sequence.

VIEW TAPE begins a tape of the mission you just failed.

SAVE TAPE brings up the log of your saved missions.

CAMERA VIEWS

Panning. Extremely important! To look around outside, without having your wings block your view, use Button 2 on your joystick while moving the stick. The view returns to normal when you release the button. You can change the method of control during flight by opening your Option Screen (Alt O). Your plane will continue in its current direction during panning.

NOTE: You must have separate devices selected for FLIGHT CTRL and PANNING CTRL to pan while in flight.

Y Automatic Target Tracking follows the target. Once you have an object targeted, pressing Y from the F1 view keeps the camera on your target so it stays in your field of view at all times. Press Y again, or F1, to turn this camera off.

C Invisible Cockpit gives you a much better view by eliminating the cockpit. Pressing C again returns the view to normal.

F1 Normal Front View (Cockpit). Pressing F1 returns you from the current camera angle to the forward cockpit view.

F2 Chase View provides a view from behind your aircraft.

F3 Left View provides a view down the wings to your left.

F4 Right View provides a view down the wings to your right.

F5 Back View provides you with a view to the rear of your plane.

F6 External View shows your airplane from different angles. You can change the direction of the camera's angle by panning with your joystick (hold down Button 2 and move the stick). Hit F6 again and your view switches to another nearby object. Hitting F6 repeatedly cycles through all planes and air targets in the area. Eventually, F6 returns your view to your plane.

I or J **Zoom** closer and farther while in External View.

Ctrl F6 **Cycle** through ground targets.

F7 Target View lines you up with the target, so that you view your plane in direct alignment with your chosen target. *It can only be used after you've targeted an object by pressing I.* Press F7 again to reverse the view, with your enemy in the foreground and your plane in the distance.

Alt F7 **Overhead View** provides a view from above your plane. Press F when you are in Overhead to change the view angle.

F9 Victim View, for the duration of one mission, switches you to a close-up of each target upon its destruction. Hit F9 to toggle this view on or off.

F10 Weapon View, for the duration of one mission, follows the path of each weapon you dropped, and provides you a view of the damage done. Press F10 to toggle this option on and off.

GAME OPTIONS

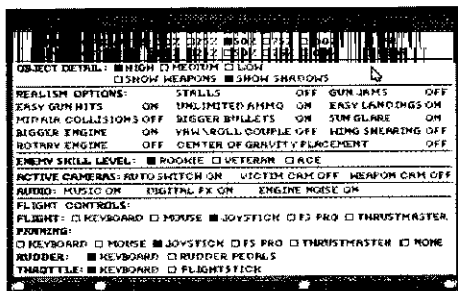
Press **Alt O** anytime you are in your plane to bring up the Option Screen. To toggle an option, click on it — the words **ON** or **OFF** will let you know if the option is active. Otherwise, a darkened square means that particular option is chosen. Try different combinations to find the best match for your skills and computer system.

There are interface commands at the bottom of the screen.

SAVE implements your changes for all following missions.

RETURN TO MISSION puts you back in the game at the point from which you left — with the options you selected enable for the duration of the current mission only (unless you first hit **SAVE**).

EXIT MISSION gives you the option to **RESTART** the mission, **ABORT** mission, or **CONTINUE**. (**CONTINUE** lands you at the base runway — your accomplishments are noted, but the mission is counted a failure.)



WORLD DETAIL

Slower computers may benefit from turning off some of the game detail — the frame rate usually increases.

TERRAIN DETAIL adjusts the level of detail:

100% = all detail

75% = full texture/vital 3-D objects

50% = partial texture/all 3-D objects

25% = no texture/all 3-D objects

0% = solid color/all 3-D objects

NUMBER OF CLOUDS controls the cloud cover in 25% increments.

NUMBER OF TREES controls how many trees appear.

HAZING provides greater (**FAR**) or reduced (**NEAR**) visibility.

OBJECT DETAIL

This adjusts the detail levels of objects: **HIGH** gives full detail, **MEDIUM** gives some detail and **LOW** provides the least amount of detail, giving just the basic shape.

SHOW WEAPONS allows you to see the bombs and rockets that you and other aircraft carry. Otherwise they are “invisible.”

SHOW SHADOWS toggles plane shadows (both yours and your enemies’) on and off.

REALISM OPTIONS

Listed below are the default game options. Options with an * are *more* realistic with the option turned *on*. Click on SAVE to carry changes to the option setting from mission to mission. Click on RETURN TO MISSION for changes to affect the next mission *only*.

For maximum realism, options marked with an asterisk should be *on* and other options should be *off*.

*STALLS OFF prevents your plane from losing lift at severe angles.

*GUN JAMS OFF prevents your machine guns from jamming.

EASY GUN HITS ON gives each bullet a larger sphere of damage, so that "close" counts as a hit.

UNLIMITED AMMO ON gives you unlimited ammunition supplies for whatever weapons are appropriate for your plane and mission.

EASY LANDINGS ON is more forgiving during rough landings.

*MID AIR COLLISION OFF prevents you from crashing into your opponents or wingmen.

BIGGER BULLETS ON does three times as much damage per hit.

*SUN GLARE ON means you can be blinded when flying into the sun. (OFF produces a white disk that won't impair your vision.)

BIGGER ENGINE ON gives your plane more speed and climbing strength.

*YAW/ROLL COUPLE OFF keeps your plane from yawing (and straightening out) when you make a banked turn. This also keeps you from starting a banked turn whenever you use your rudder to yaw. (For term definitions, see *Reference Manual*, pp. 48-49.)

*WING SHEARING OFF keeps your wings from ripping during steep or prolonged dives.

*ROTARY ENGINE OFF keeps a rotary plane from turning right due to the internal forces of the engine.

*CENTER OF GRAVITY PLACEMENT OFF. Realistically, the center of gravity varies from plane to plane. With CGP ON, the Fokker Dr. I and Sopwith *Camel* are tail-heavy. The rest are nose-heavy. With CGP OFF, planes simply fly straight.

ENEMY SKILL LEVEL

This sets your overall enemy's intelligence at ROOKIE, VETERAN or ACE level. ACE is the highest level. Some enemy pilots are better than others, regardless of this setting. The default level is ROOKIE.

ACTIVE CAMERAS

AUTO SWITCH ON switches you to the Front view when you are hit or in danger.

VICTIM CAM ON follows your target, through the Victim view, when you shoot down a plane or destroy a ground object.

WEAPON CAM ON switches automatically to the Weapon view whenever you drop a bomb or fire a rocket.

AUDIO

[Ctrl] [M] **MUSIC ON/OFF** toggles the musical score.

[Ctrl] [S] **DIGITAL FX ON/OFF** toggles the sound effects.

ENGINE NOISES ON/OFF toggles the sound of the engine.

FLIGHT CONTROLS

FLIGHT sets flight control interface — **KEYBOARD**, **MOUSE**, **JOYSTICK**, **FLIGHTSTICK PRO** or **THRUSTMASTER**.

PANNING sets panning control interface — **KEYBOARD**, **MOUSE**, **JOYSTICK**, **FLIGHTSTICK PRO**, **THRUSTMASTER** or **NONE**.

RUDDER chooses between **KEYBOARD** and **RUDDER PEDALS**.

THROTTLE gives throttle control to either your **KEYBOARD** or **FLIGHTSTICK**.

INTERFACE SHORTCUTS

[Alt] [M] takes you to the main menu from ground scenes.

[Spacebar] advances the conversation or cinematic scene. The joystick button also works.

[Esc] skips a conversation or cinematic scene altogether.

[Alt] [O] brings up the Option Screen during flight.

[Ctrl] [M] toggles music on and off.

[Ctrl] [S] toggles digitized sound and speech on and off.

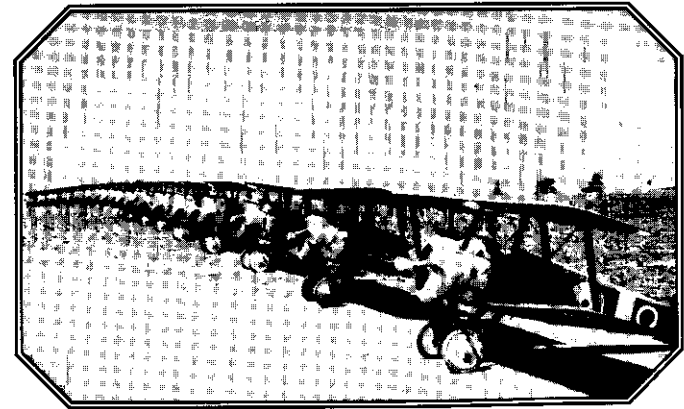
[Alt] [J] recalibrates your joystick.

[Alt] [X] exits the game.

[P] (toggle) pauses flight or ground sequences.

WINGS OF GLORY®

REFERENCE MANUAL



By Melissa Mead and Lisa Smith

©1995 ORIGIN Systems, Inc. Wings of Glory is a trademark of ORIGIN Systems, Inc.

Origin and We create worlds are registered trademarks of ORIGIN Systems, Inc.

Electronic Arts is a registered trademark of Electronic Arts.

1003590

CREDITS

Programmers

Bill Baldwin (Project Leader), Stephen Balkum, Tony Bratton, John Talley

Designers

Bruce Adams (Design Leader), David Beyer

Writer

Lisa Smith

Artists

Whitney Ayres (Art Leader), Karl Dolgener, Darrin LeBlanc, Terry Manderfeld, Johari Templin

Composer

Laura Barrat

Sound Effects

Barry Leitch

Quality Assurance

Scott Shelton (Quality Assurance Leader), Ed Ball, Jason Habel, Kevin Kushner, Jeremy Mappus, John Moreland, Michael Songy, David Thacker, Richard Zinser

Documentation

Melissa Mead, Lisa Smith

Graphic Design

Jennifer Davis (Box and Manual Cover), Trey Hermann and Catherine Cantieri (Manual Interior)

Additional Programming

Chris Comparini, Gary Scott Smith

Additional Artwork

Brennan Priest, Paul Steed

Additional Music

George Oldziej, Nenad Vugrinec

Translations Manager

Kirsten Vaughan

French Translations

Dominique Jumeau

German Translations

Frank Dietz, Kirsten Vaughan

French QA

Karl Strand, Didier Jumeau

German QA

Andreas Köhler, Jörg Neumann

Producer

Warren Spector

Associate Producer

Kevin Potter

Special Thanks to

Aviation Heritage, The Film Bank, Adam Foshko, Craig Halverson, The Image Bank, Prem Krishnan, Suzanne Taylor, *WWI Aero Magazine* (Leonard E. Opdycke, Editor)

Photographs on pages 1, 5, 12, 23, 24, 48, 50, 56, 61, and the front cover provided by Aviation Heritage Books. For information on ordering these photographs, and for information on additional related products, see page 64.

TABLE OF CONTENTS

Credits	2	Flying Primer	42
Table of Contents	3	Principles of Flight	42
Player's Letters.....	4	Lift	42
Lisette's Diary	8	Thrust	43
Gertmann's Journal	11	Drag	43
Characters	13	Gravity	43
History	16	G-Forces	43
Airplanes?	16	Maneuvering Vectors	44
Lighter-than-Air Flying	16	Pitch	44
Military Balloons.....	17	Roll	44
Gliders	17	Yaw	45
The Start of the First Air War	18	Bank	45
Unarmed Planes	18	Control Surfaces	45
Combat	19	Flight Tactics	46
Dawn Patrol	19	Taking Off	46
Dressed and Ready	20	Climbing	46
A Last Look	20	Descending	46
Training	21	Recovering from a Stall.....	47
Basic Tactics	22	Landing	47
Flight.....	22	Flight Maneuvers	48
Offense	22	Roll	48
Defense	23	Barrell Roll	48
Aces	24	Dive.....	49
William Avery Bishop.....	25	Break Turn	49
Edward Vernon Rickenbacker.....	25	Loop	50
Georges Guynemer	26	Split-S	50
Lanoe George Hawker	26	Immelmann.....	51
Theodore Osterkamp	27	Wing Over	52
Battles	28	Chandelle	52
Nivelle at Verdun	28	Scissors	53
Somme Offensive	29	Combat	54
Nivelle Offensive	30	Detecting the Enemy	54
Third Battle of Ypres/Passchendaele.....	31	Homing in for the Kill	54
Cambrai.....	32	Taking the First Shot	55
Lys Offensive.....	33	Attack Passes	56
Montdidier	34	Engaging a Fighter	56
St. Mihiel	35	Engaging a Bomber	56
Argonne.....	36	Attacking Ground Targets	58
Planes.....	37	Wingman Defense.....	58
Sopwith Scout (Pup).....	37	Awards of World War I	59
R.A.F. S.E.5a	38	United States.....	59
Sopwith F.1 Camel	39	Britain	60
SPAD SXIII	40	France	61
Fokker Dr.I	41	Belgium	61
		Glossary	62

May, 1916
Thetford, England
Dear Dad,

TRANSATLANTIC POST

I arrived in England a week ago. The crossing was very tense, with everyone watching for Jerry submarines. I kept my life preserver close at hand the entire trip, just as you asked. One strapping fellow, Frank Marconni (whom everyone calls Macaroni or Mac for short), refused to take his off after the first life boat drill. He said he'd rather crash from 18,000 feet than drown.

Mac is from Boston, and we've become quite good friends since we're both at Thetford now. He has a lovely tenor singing voice, Dad, though you'd never guess it to look at him. I think you'd like him. He could always be persuaded to sing in the evenings during the crossing, when the darkness closed in and there was no way to see what lurked in the waters around us.

I know that you didn't want me to go, Dad. I just hope that you can understand why I had to. France helped America win her independence, so it's only fair that some of America's sons come to help now. We'll not let the Kaiser take French soil without a fight. It won't take long, I'm sure. More and more British soldiers, Tommies they call them, are going over there every day. I fully expect to see you again in time for next year's Halloween Ball.

They've finally moved us to a small village called Thetford. It's a lovely little town where the war seems very far away, except for the noise of the aeroplanes stunting about the Ground School. From the air it looks like one of Mom's fancy patchwork quilts. Everywhere you look there are lovely, rolling, green fields like something out of a fairy tale. It's nothing at all like Chicago. This is where we are to receive our flight training, as well as machine gun and code training.

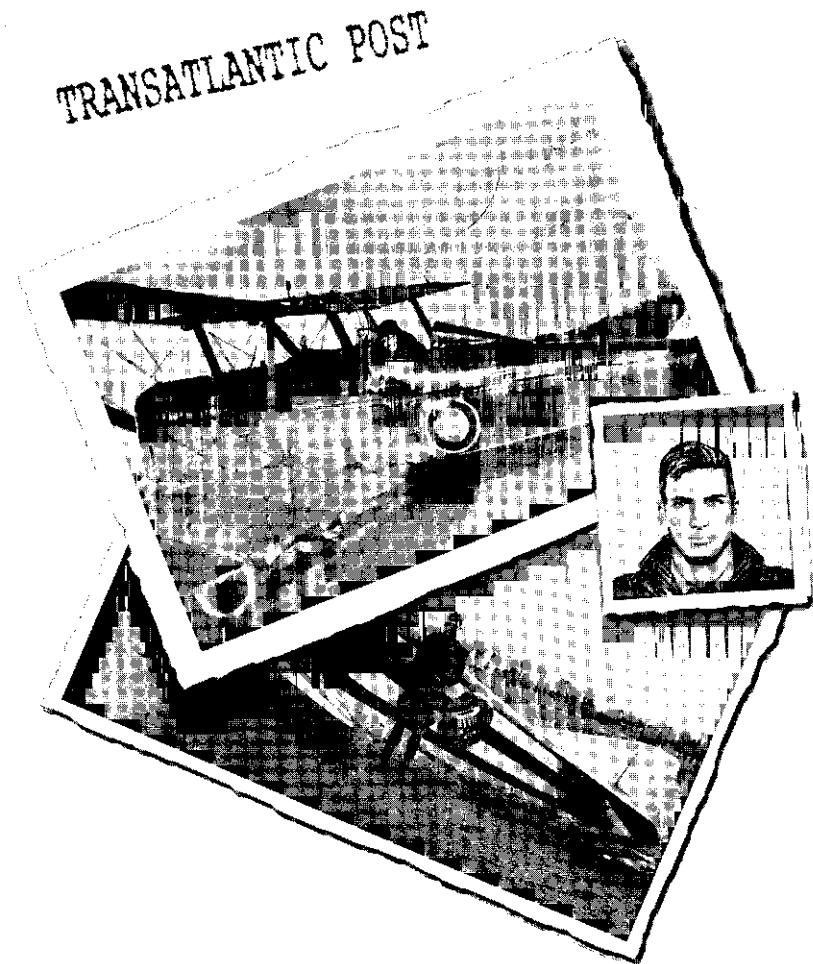
It looks like we're going to be stuck flying the Rumpitees, which is what they call these ugly Henry Farman planes. They are called Rumpitees because they are pusher planes, or planes with their engine behind the pilot. I was hoping we could stunt in the de Havilland D.H. 6's (a tractor plane, or front engine plane), which are virtually impossible to put into a spin. But no such luck.

The machine gun training is going to be harder than I thought. It's hard to hit your target if you have your eyes squeezed shut at all the noise. They're training us with Vickers machine guns, and I'm told that they aren't so loud when you're flying. Guess I'll have to wait and see. I'm not allowed to say anything about the coding because it's restricted information.

The people of Thetford are so nice, Dad. If you're in uniform, they'll buy you drinks or ask you home to dinner like they've know you all your life. Anything to make you feel more at home. It helps most of the time, but at other times I can't help but feel even more homesick.

I'm having a hard time understanding the people here. Their accents are so thick they sound like a phonograph player that has wound down. There's one tall drink of water named Charles Dearing training with us who teases me unmercifully, but seems to have decided to become my translator. He told me that I look like his family's Spaniel when I'm confused. Sometimes he makes me so mad I could just brain him, but he really is a card and I'm usually laughing too hard to hit him.

I have to go to machine gun practice now, so I'll stop here so I can post this. I have no idea how long it will take you to get this. I promise to write as often as I can. Take care of yourself, and I'll be home in no time. You'll see.



October, 1916
Thetford, England

Dear Dad,

Today the skies held off their barrage of rain for a bit so we got to go up for a few hours. Everyone has been so blue from being cooped up on the wrong side of the Channel that our instructor let a few of us take the Sopwith *Pups* up for a jaunt. They are nothing at all like those miserable Rumpitees! They can maneuver so quick it makes your head spin.

In fact, Charles got his into a nice tight turn, going round and round like a dog chasing its tail. Then he dove down and ran his wheels just over the heads of the poor fellows in the trenches doing machine gun practice. You should have seen them scramble! I think he would have gone back after them, if Dunnigan (the gunnery sergeant) hadn't taken a bead on him and put a hole or two in Charles' elevators.

Charles came back screaming that Dunnigan had tried to kill him. But the instructor said that the sergeant could have brought him down easily at that distance. So now Charles is out loading machine gun coils under Dunnigan's watchful eye, and will be for the next week. No flying for him, even if the weather does clear. But Charles said it was worth it, all the same. "What's life without a little adventure?" he says.

Speaking of Dunnigan, I didn't believe I would ever be able to say it, but I've finally gotten fairly good with these blasted machine guns. If you have to fire one on the ground, mounted on a tripod, they shake you hard enough to knock your teeth right out of your mouth. And I'm sure they're loud enough to be even heard over a train! But in the air, what with the rush of the wind and the whine of your engine, you barely notice them at all. And the awful vibration seems to vanish when they are secured to your aeroplane's frame. In fact, Dunnigan was flabbergasted when I passed our airborne target tests. He said I was a fine shot in the air, but he would never trust me with one on the ground. Guess it's just as well that I'm to be a pilot.

I have some sad news to pass on to you, Dad. Do you remember little Richard Shaw who I used to play baseball with when we lived on the north end? I heard the other day that he was killed over at Waddington when his Avro hit a suspended wire. His squadron was practicing night navigation techniques and he strayed too far from the field. I'm told it took his head right off along with the top wing. Rough way to go. He was a good chap, even if he couldn't catch a fly ball with a bucket.

Word is that we are to ship out for France anytime now. And all I can say is that it can't happen too soon. I've cooled my heels here long enough. It's about time I got to do what they've spent so long training me to do — shoot down Huns. The quicker we get over there and get to work, the quicker we get to go home to our families. So, who knows? Maybe my next letter will be from France. But knowing the Royal Flying Corps, I may still be in Thetford when they pension me out. We'll see.

January 12, 1917
Dunkirk, Belgium

Dear Dad,

Had a rousing send off celebration last night. We were staying at a hotel in London, and the party took up four rooms, at least. I don't believe that I have seen that much liquor in my life, nor do I think I ever drank as much. What with everyone wanting to toast our health and wish us God speed, I'm certain I accounted for half a case of Scotch on my own. And I sure am glad Dunnigan hosted the party, so they won't come looking for me with the bill for the breakage. It sure was a wild night.

Lord, I felt terrible this morning! Could have sworn there was a Vickers gun banging away inside my head. Mac didn't look half as bad as I felt, but then he snuck off early with his girl. Charles, on the other hand, looked like a week-old corpse. He had still been drinking last night when I staggered off to bed. Poor fellow was still hoping his father would come by to wish us well. I don't know why Charles was expecting him to come, for all that we invited him. Charles' father practically disowned him when he enlisted, so I wasn't surprised when the old man didn't come. I'm just sorry that he had his hopes up. I'm sure glad that you didn't do the same thing when I shipped out, Dad.

We took off in formation to put on a good show for those who had risen from the dead to see us off. Fourteen planes in close order is a magnificent sight to see. It almost made me proud enough to forget about my headache for a few moments. I'm not sure, but I think I did catch a glimpse of Charles' father out there by the field just as we were taking off — at least he was the spitting image of Charles. So the old man must really still care, even if he couldn't bring himself to say so face to face to his son. And I'm pretty sure that Charles saw him as well, because he broke off from the rest of us and roared back over the crowd, waving like a lunatic at a parade. Then for good measure, he buzzed them again... upside down. He's a better man than I, because I would have been sick if I had tried anything like that after drinking so much the night before.

The first part of our flight took us to Lympe, and at times the fog was so thick I could barely see the other planes around me. The wind was horribly strong and bounced me about quite a bit. I don't think I've had a more miserable flight. My head was so fuzzy that I had a hard time telling what gauge I was looking at. You wouldn't believe how complicated these planes are, Dad. I've got a compass, an airspeed indicator, an oil gauge, a gas tank gauge, a pressure control, an altimeter, gas pipe shut-off cocks, a thermometer, a throttle, a joystick and a rudder bar. More than enough to keep a man busy at the best of times, and this was not one of them. Needless to say, I'm grateful we didn't run into trouble. I'm certain my head would have exploded.

I can't tell you anything about Dunkirk yet, as it was nearly dark when we landed. I shall write with more details later. For now, I want to post this quickly so that you know I have finally gotten "over there" to do my bit for pushing the Kaiser backward. Tell your friends the war will soon be over because I plan to show these Huns what a good Chicago boy can do.

WINGS OF GLORY

November, 1915

Dear Diary,

All anyone can talk about is the war! How has far the Boche army advanced this week? How many men have been sent to the trenches? How many have died? Who has come home without an arm or a leg? Where will all the refugees live now? I'm so sick of hearing about it, I could scream!

What has happened to the world? Where are the harvest festivals? The long walks under the winter stars? How can any of us hope to marry if all of the boys have gone off to fight? Those few who have returned thus far are pitiful shadows of themselves, withdrawn and grim, nursing some grievous wound. Will no one ever smile again?

At first, I thought all of the men looked so handsome in their uniforms and their jaunty little caps. We'll just march over and send the Boche slinking home. It will be over in a year. But it's been nearly two years and the godforsaken invaders are only digging deeper into our land. Now, whenever I see some handsome lad strutting about in his new uniform, all I can see is a stupid boy parading around in his funeral shroud.

Even those who would remain apart from the war are not safe. The Boche bomb villages without consideration of the babies, or the old and sick. A bomb does not care if you are not wearing a uniform. And the person who fired the shot never has to see the carnage he has created. But I know. Papa gives vegetables to those who are fleeing the fighting. I have heard their stories, and now I can't sleep at night without seeing the horror they have described. I can't help but look around and envision my town shattered and dead.

I sometimes think about leaving with the refugees, going to Paris. There must be somewhere where they can still laugh. But Papa is determined to remain here. He says that he would rather die than give up our farm. I can only hope that he is not prophetic. His joints pain him more every day. Sometimes it is all Maman and I can do to help him out of bed in the morning. I wish I could find some way to protect Papa and Maman, if they will not go to safety. But what can I do? I am only a young girl.

I long to run without care through the fields, or have snow fights with my friends. I fear the rationing will make our holiday celebrations more of a fast than a feast. Perhaps this year my Christmas wish for peace will come true. But it doesn't seem likely.

Lisette

LISETTE'S DIARY

March, 1916

Dear Diary,

War makes for ugly choices. Flee or fight, surrender or die. And it looks as if the time for such choices may be quickly on poor St. Marie-Cappel. Each day the Boche army pushes closer and closer. I do not see how we could possibly offer anything more than token resistance. All our able-bodied men have already gone to the trenches, and God alone knows whether or not they still live. Those few men that remain are old or lame. There are women enough here, even though many have gathered up their children and joined the trickle of refugees headed further south and west, but we have no way to stop war-trained men with only the farm implements at hand. I fear that my little town shall become another casualty to men's violence upon one another.

Each Sunday Father Broussard preaches to his dwindling flock, telling us of the strength to be found in our faith in God. But I cannot find solace in his words. He is a holy man, well advanced in years. He has seen life. I have not. I want to live, to find someone to love. I want to raise my children in a world not torn by terror and bloodshed. I want my children to have the innocent childhood that I have forgotten.

How can anyone but a holy man look at our shattered land and be sure of God's love? I'm afraid to die, because I obviously don't have enough faith to be taken into God's kingdom. But I think I'm more afraid to live in a world where lives are so cheaply bought, and then spent in fields of mud. Some days I feel as old as Maman when I go out to weed the garden, cringing at the sound of each distant shell. How long until the shells fall on St. Marie-Cappel? What will happen to those who are caught in the tide of war? Will there be a place for a frightened young girl? Only time will tell.

L.



December, 1916

Dear Diary,

We can still hear the shelling on the front, but it has come no closer. The brave British troops seem to be holding off the Boche, though they have not managed to regain any of the ground the invaders have taken. Perhaps there is hope for St. Marie-Cappel after all.

Maman is worried about me taking our vegetables to the British supply master. She says that I should not be too trusting of any of them, even if they are Allied soldiers. I shall not tell her that they are far nicer than others I have met. Done is done, and I don't wish to upset her.

Papa says that war can make a man forget civilized behavior. If you ask me, there are some that have never learned more than a veneer of civilized behavior. So far, all of the British soldiers I have met have been friendly and polite, but I do not wish Maman and Papa to worry. So I have promised I will not tarry too long when I make the deliveries, though it is nice to talk to someone closer to my age for a change.

The British soldiers all seem eager just to have someone listen to their stories. Each man trying to top the other, and each story more outrageous than the first. It's so good to be able to laugh with them, if only for a little while. I try hard not to think that their smiles may soon be smothered in icy mud.

But along with their tall tales I also hear the echoes of truth they try so hard to hide. Death follows them like a hungry wolf, and they are afraid. I do not wish to know where they go, though they tell me, "Pray for me, Mademoiselle, for I go to Ypres." It hurts to see their unguarded eyes and tired faces when I leave. There must be some other way to win our freedom.

Today I learned from the British supply master that there will soon be an aerodrome outside of St. Marie-Cappel. British pilots to help hold the Boche at bay. It seems foolhardy to hang our hopes on such fragile wings of glory. But perhaps God watches out for them more, since they are closer to the angels than those who cling to the earth and pray for deliverance. Perhaps they will prove to be our guardian angels. Heaven knows I need one.

L.

Tagebuch von Oberlieutenant Ulrich Gertmann

November, 1916

It has been alternating between rain and sleet for days now, making it impossible for anyone to take off. Not that I am anxious to go up again any time soon. Flying in this weather, even when it is clear, is abysmal. Within a few moments at altitude any skin outside of our sheepskin flight suits begins to freeze. I thought my nose would peel off with my goggles after our last trip aloft. When I finally pulled the strap free and looked at my reflection in a bottle of brandy, even my eyelashes were frozen solid. It's no wonder the war has ground to a virtual standstill.

Most of my fellow pilots have decided to drink themselves into a stupor during our enforced inactivity. But I decided that if I cannot further the Kaiser's war in the air for the moment, perhaps I could find something else to do that would benefit our troops. So yesterday I took the opportunity to go out on a private hunting expedition.

It's possible that this was once beautiful country, but not any longer. The fields have been swallowed by shell holes that have long since filled with water. A thin crust of ice covers many of them, making progress tricky at best. One incautious step and you're in freezing water up to your waist. Where once there were grand forests full of game, now there are only shattered sticks littered with the bodies of the dead. These stubborn Poilus don't have the common sense to know that they have met their match. If they would throw down their weapons and let us march into Paris now, we could all get in out of the cold. We might have been there already, if those arrogant British Tommies hadn't interfered.

I finally found the quarry I was seeking, some miles behind enemy lines. My prey was young and easily-cornered, and shall feed the Kaiser's efforts well. It would have been exhilarating to find out how long I could have remained undetected, but duty outweighs the pull of one's pride. The Commandant was a bit piqued when I returned to the aerodrome, but I mollified him with the spoils of my hunt. Let the others drown themselves. History will note that it was a Gertmann whose cunning led the way to Paris!

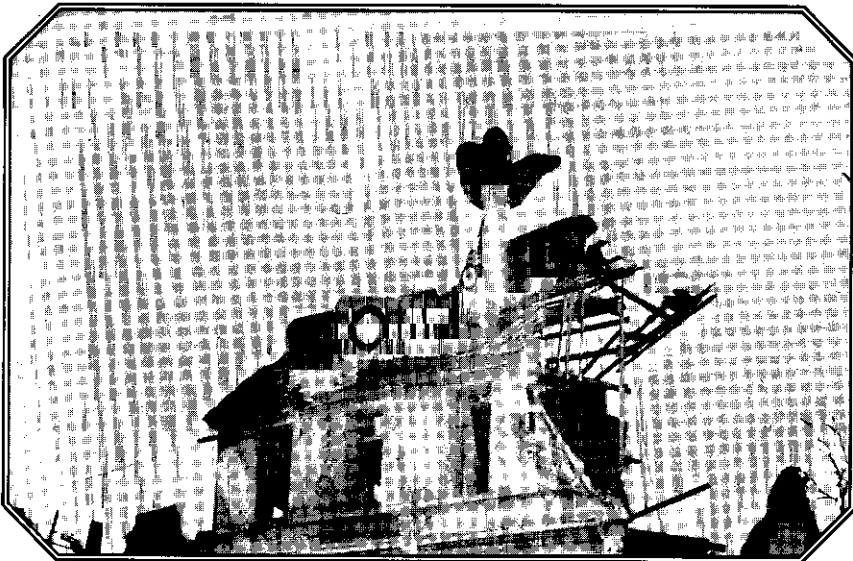
December, 1916

We have moved our squadron up to a small villa near Douai. Most of its furnishings are serviceable, though of poor quality. It seems as if even the aristocracy of this country are little more than peasants. Certainly there is nothing here reminiscent of the grand houses in Germany. Father would turn over in his grave at the very thought that such a mean abode should house a Gertmann. But such are the vagaries of war.

Georg and I went up against four pilots from one of the French escadrilles today. Georg and I were in our Albatros D. IIs. They were in patched-up Morane-Saulnier Bullets. Three of them put on a poor show and then turned tail to run. Georg peeled one away from the rest and dove on him, stitching him across the wing. I didn't see what happened next because I was busy shaking the remaining fellow off my rudder.

When I looked over for Georg again all I saw was an incredible tangle of machines as that damn-fool Poilu pulled up right into Georg's prop. There was a brilliant explosion as the two planes collided and then they went spinning down into the trees. What an unjust world this is when a veteran like Georg gets taken down by some ignorant French peasant.

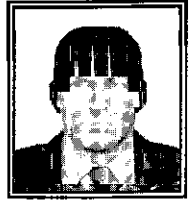
I chased down the Poilu that thought to take me down and showed him how to do it properly. He spun down trailing heavy smoke, but managed to pancake near Georg's burning wreckage. When I saw poor Georg engulfed in flames, I put another round into the Poilu and his plane for good measure. Let him burn on earth as well as in hell.



CHARACTERS

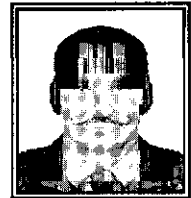
Major Daniel McBride, RFC

The Major comes from a long line of McBrides who have served proudly in England's military. So there was never much of a question about what he would do with his life. His only rebellion against family tradition came when he joined the Flying Corps. Daniel proved to be cool under fire and quickly became an Ace. However, his rapid rise in rank took him away from his aeroplane and put him behind a desk. He yearns for the freedom of the skies and hates being the one to send boys out to die. But an officer's duty is to obey orders without complaint, no matter how much he hates them. Now that he can no longer fly, Daniel must cling to the only other thing he has ever known: the lonely life of a commander.



Staff Sergeant Walter Newberry, RFC

Walter is career military, having served in the artillery division for years. He was afraid that there wouldn't be a place for an old soldier in The Great War, and was grateful to be selected to serve in the 23rd. He's very proud of "his" boys, always willing to lend a sympathetic ear or a bit of advice. Many of the pilots find that Walter's thick Scottish accent is far more understandable after a few drinks.



2nd Lieutenant Charles Dearing, RFC

Charles is a happy-go-lucky daredevil, the clown of the squadron. He is from a slightly better social stratum than most of the other pilots of the 23rd. His father is a history professor at Eton, where Charles was a student until the beginning of the war. Charles' enlistment drove a wedge between father and son. So now the only communication he has from home is from his sister, a nurse. Charles is haunted by the premonition that he will die young, and treats each day as a taunt at Death to do its worst.



2nd Lieutenant Oliver Hallock, RFC

Oliver is the son of a London butcher and a Welsh milkmaid. He is very tight-lipped about his somewhat common background, and would rather the others thought of him as a member of the gentry. Recently, Oliver's sister added to his sense of familial shame when she became a tram conductor in London. The other pilots of the 23rd call him the Scholar, or the Spectacled Wonder, because of his passion for reading. Oliver enlisted for "God and country," and has no concept of empathizing with the enemy. To him, all Germans must be evil incarnate.



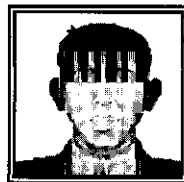
2nd Lieutenant Edmond Shikes, RFC

Edmond was raised by his grandparents after his parents died in a house fire. As a consequence, he is deathly afraid of fire. He considers Charles the older brother he never had, mimicking his mannerisms and attitudes. However, when the real Edmond peeks out, it is clear to see that he is young and enthusiastic, with none of Charles' cynical affectations. He is also a deadly shot in the air.



2nd Lieutenant Ned Lifeson, RFC

Ned comes from a large farming family in northern England. His easy-going, down-to-earth, common sense makes him a natural leader in the air. Although Oliver refers to him as "the rock," Ned is quite a vest-pocket philosopher. As much at home with aeroplanes as with animals, Ned can often be found in the hangar helping Harry with the repair work.



Sergeant Harry Thompson, RFC

Harry is an irascible London lorry mechanic whose thick accent is only made worse by the unlighted cigar he habitually chews on. The pilots of the 23rd like to joke that Harry cares more for their aeroplanes than for them, but there's no hiding that Harry is nothing short of a miracle worker when it comes to getting his "buses" back in the air. Much of Harry's bluster stems from his fears that he won't live to return to take over his father's lorry business.



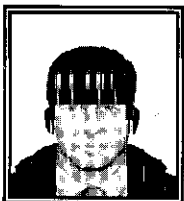
Major Kenneth Logan, AEF

The Major is a sympathetic fellow who hasn't learned that a Commanding Officer can't afford to be a friend to those he commands, and it shows. Kenneth is a career Army man who jumped at the chance to fly. Unfortunately, he turned out to be a better administrator than a pilot. It eats at him that he has to send men far more talented than himself, and boys far less capable than himself, to their deaths. For him, the war can't end soon enough.



2nd Lieutenant Wilson Turvey, AEF

Wilson is terribly shy, but a talented pilot. He was an ivy-league track star for Cornell before the war, and he says that's why he's able to remain incredibly cool under fire. His biggest problem is that Jimmie finds him an easy target to bully. The Turvey family is heavily involved in the war effort. Wilson's older brother, Frank, was killed in the trenches in 1916. His younger brother, Lewis, is in the navy somewhere off the coast of Italy.



2nd Lieutenant Henry Brooks, AEF

Henry is an average pilot who plays it safe. He's also good-looking, and he knows it. With three sisters and half a dozen girlfriends back home and in France, Henry's the squadron's Don Juan. He can sometimes be coerced into passing the evening hours reading his letters from female admirers out loud to the other pilots, generally in return for chocolate bars that he sends back to his kid sister in Virginia.



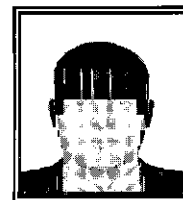
2nd Lieutenant Jimmie Shaffer, AEF

Jimmie is an Iowa farm boy, just 17 years old. He's an impulsive flier who has no grasp of tactics. His only desire is to "kill the evil Jerries." Jimmie dreams of being a hero, knowing that it would impress the girls. He pals around with Henry because Henry always catches more girls than he can handle.



Sergeant Earl Glover, AEF

Earl is a well-muscled New Yorker of Irish descent. Before the war, he worked as the major-domo at the Waldorf Hotel. The pay wasn't great, but the uniform was spiffy and the tips were grand. Earl thinks of himself as lord of all he surveys, and makes sure that the pilots know what a favor he's doing letting them ride in "his" aeroplanes. Despite his size and manner, he won't ever start a fight. But he won't hesitate to end one.



Lisette Beauregard

Lisette is only 18, but she has forgotten the carefree life of the young. For the last four years she has watched the enemy swallow more and more of her country. Lisette does what she can to help care for her aging parents, selling vegetables from her father's garden in the town and at the Allied aerodrome. She spends much of her time talking with the pilots there... something they don't seem to mind at all.



Oberlieutenant Gerhard Hoffstatter

The Oberlieutenant is the son of minor Austrian nobility. Gerhard laments the loss of chivalry the later years of the war have necessitated. He is an honorable, proud man who has found himself in an army being beaten by sheer numbers. Although Gerhard is dismayed at being forced down, he is glad that the war is over for him. He can only hope that there will be a place for him in his shattered homeland after the fighting is done.



HISTORY

AIRPLANES?

Were airplanes really important in World War I? Some say “no.” These people are half right, but they fail to see the whole picture. Planes were not a superweapon. Strategically, however, they were vital. They changed the way people fought wars. Planes gathered information on enemy numbers, location, movement, weaknesses, weapon strength and more. The difference they made was almost unimaginable. Before air travel, surveillance meant running close to the enemy’s camp and counting how many men they had. Spies who were brave enough to sneak closer might be lucky to overhear people talk about their destination. The boldest might hope to steal some battle plans, or destroy some maps. It was not a very good way to gather information — and in war, information is worth more than gold.



LIGHTER-THAN-AIR FLYING

The idea of getting a man in the air was not born with airplanes. Surveillance from the air was an obvious idea. Even a high hill or cliff was better than squinting through trees or risking being caught by an alert camp sentry. Some sources even say that on at least one occasion a soldier strapped himself to a giant kite to get a better view. Those sources don’t say whether it worked, however. On the other hand, we do know that balloons were successful.

Manned balloons were an idea that came around the end of the 18th century, not long after the birth of America. A Frenchman by the name of Montgolfier was the first to use hot air to fill and lift a balloon made of fabric. At the time people saw it as a revolution in the world of science, and the idea of manned trips became immediately popular. Mere months later a fellow by the name of Pilâtre made a successful attempt, floating up in a basket under a balloon securely tied to the earth. That was the beginning. It was approximately ten years before the military got around to using them.

MILITARY BALLOONS

Once again it was the French who carved a new path for aviation. Guyton de Morveau suggested, strongly, to the Committee for Public Safety that the armies of France would benefit from aerial observation. The idea was that sentries “hidden in the clouds” could note the movement of their enemies. Realistically, the Committee probably just thought the observers would be high enough to get a good view. The authorities accepted the new idea. They quickly hired people to design and build experimental balloons!

June 1794 was the date of the first manned ascent for the French military. The balloon, called *Entreprenant*, was securely tied to the ground. Then the army moved it, still inflated, to Charleroi for further reconnaissance. The French, who won the battle at Charleroi, considered it an invaluable success. The French armies used balloons often during the next few years, but there was a serious drawback to balloons that the military strategists had originally either overlooked or ignored.

Inflated, balloons were bulky and very, very slow to move. Deflated, they were terribly heavy and awkward. More than that, rats liked to chew holes in them, and a balloon with rat-holes in it is just a huge, useless pile of fabric. There were also other problems. Accidents happened that made people wonder if these things were really such good ideas. If they got loose and rose too high, the riders might come back suffocated. It was more than just a fear — it happened. Sometimes, also, they would catch fire, and the people underneath would either burn or fall to their deaths, or sometimes both. Still, people did not give up on the idea of touching the clouds, and the technology improved gradually. Designers refined airship design, while elsewhere inventors explored other means of flight.



GLIDERS

The next great step was gliders. In theory, they were really quite similar to airplanes, and definitely a step in the right direction. In the first place, they were heavier than air. More than that, what made a glider successful was the shape of its wings. Wings that worked were the ones that provided both lift and equilibrium. The Wright brothers were the first to discover a wing design that worked well, and after thousands of experiments they invented an amazingly effective glider. That very glider, with the addition of an engine and propellers, on December 17, 1903, made Wilbur and Orville Wright famous. The world’s attention belonged to the canvas birds in the sky, and once again aviation had military outlets: the airship and the airplane.

THE START OF THE FIRST AIR WAR

The military's interest in reconnaissance was more than simple curiosity — the generals knew war was brewing. They didn't know at the time that it would be World War I, or even that it would be the Great War. They thought it was going to be just another expansionistic scrabble. The nations' leaders didn't realize that the alliances between Austria and Germany, or Serbia and Russia would cause a political explosion of team-choosing and saber-rattling. The armies of Europe just thought that it would be a good opportunity to experiment some more with aerial observation. In that, at least, they were right.

Obviously, Europe was not really ready for there to be a high demand for airplanes. After all, they had only existed for about ten years. With 258 planes, Germany had the most at the start of the war. France and Britain combined had 219, so the odds were almost equal, except that Germany had many more balloons and airships. Since the only purpose at this stage in the war was observation, the Germans were well ahead. At first, all pilots could do to each other was wave. No one had thought to bring guns.



UNARMED PLANES

At the onset of the war, pilots were generally just men who already knew how to fly. In their previous civilian lives, they had been pilots. They sometimes belonged to flight clubs, and quite often knew their opponent pilots by sight. At the very beginning, the skies were one of the safest places to be. A pilot would simply fly around behind enemy lines, his observer taking pictures of the ground. Then things started to get rough. New planes, new pilots and new ideas entered the scene. As the pictures taken from the air started to affect the outcome of battles, it was quickly clear that enemy observer airplanes overhead meant lives lost on the ground. Patriotism blossomed, and war entered the third dimension.

Observers started carrying rifles, if they could get them. Pilots carried their service revolvers. If they couldn't get pistols, they brought up bricks. It was difficult enough keeping a stalling, contrary plane in the air — suddenly you had to defend yourself as well. It was a strange new concept, and no one was quite certain what to do. Some people brought up chains, hoping to tangle them in an enemy's propeller. Some brought up little steel-tipped flechettes, but it was too hard to fly directly over an enemy plane and drop the little arrows at the same time. Everyone had plans for weapons. It was only a matter of time before the idea of an aerial machine gun was born.

COMBAT

Roland Garros was the one who thought of mounting a machine gun on his plane. To him it made perfect sense. A bullet was so small, and the space between the propellers was so large, that statistically speaking, it should be no trouble to fire between the blades. His superiors doubted him, but let him give it a try. He started the engine of an obsolete Scout, mounted a machine gun in front of the cockpit and fired a round over the nose of his plane. The propeller, of course, disintegrated into splinters. Garros thought some more. He had a special propeller the next time he tried. On the cockpit-side of each blade there was a small triangle of iron. Any bullet that struck the propeller deflected to the side. The pilot tried shooting another round through the propeller... and just to be safe, he used soft-nosed slugs. It worked. Garros' little Morane Scout was immediately the deadliest plane in the skies.

Thus were born the fighters. They ran escort duty to the slower, steadier and much less maneuverable reconnaissance planes. Sometimes they ran sorties against aerodromes, submarine pens or enemy stations and supply lines. Mostly, however, they flew patrols. They started as early as half past three in the morning, and flew in continual patrols until dark. Usually the patrols were in enemy territory, but only by a few miles. The goal was to find any enemy planes, and either shoot or force them down. It sounded glamorous. The truth was that it was far from easy or fun.



DAWN PATROL

Early in the morning, before the sun began to rise, an orderly shook awake the dawn patrol pilots. A pilot never shaved before flight, because scraping at his skin would cause frostbite. The first breakfast would be sparse: boiled eggs, toast and tea. There was a good reason for that. Coffee, bacon, sausage, or any rich food might cause intestinal gas. At ground level that would not be a problem. At higher altitudes, however, the air inside their bodies would expand to double the volume. The pain would be intense. A little too much tea, even, might mean an urgent need for the bathroom — and no way to get to one until the end of patrol. If the pilot skipped breakfast entirely, he would feel even worse. An empty stomach meant air sickness. The nausea, retching and vomiting, clammy skin and racing heartbeat made flight a misery. Then there was the cold to consider.

DRESSED AND READY

Right before climbing into the cockpit, a pilot would put on his flight clothes. If he dressed in the barracks and walked to the planes, the sweat that built up in the layers of clothes would freeze at higher altitudes. Dressing was always in a particular order. First was silk underwear, comfortable, light and warm for its weight. Next came the loose woolen underwear that covered, but did not extend beyond, the silk. Then came the cellular two-inch-squared vest and silk inner shirt. An army khaki shirt followed these, and then two pull-over sweaters. Next came the gabardine suit lined with lamb's wool. On his hands he wore muskrat-lined gloves with silk on the inside. After that he pulled on thigh boots and fur-lined goggles with green triplex glasses, then wrapped a scarf around his neck. The scarf was silk, and very important. It kept the cold wind from getting inside the suit around the neck area, and also prevented chafing as the pilot looked for enemy fighters. His face was then rubbed with whale-oil, over which went a knitted cap covering the head and neck with holes for the nose and eyes. Lastly, a face mask covered what the helmet and goggles missed. Usually the face mask was of dogskin from China or wolverine fur — two materials that were popular because breath would not freeze on them. The pilot would then get into his plane.



A LAST LOOK

While a mechanic fastened the harness that kept the pilot secure in inverted flight, the pilot checked the basic controls: the rudder bar, the throttle, the wooden emergency fuel pump. Then he inspected the instruments: radiator thermometer, oil pressure, temperature gauge, speed indicator and compass. Finally he looked over the incidentals. He made sure he had his watch, the wooden map-boards, and clean gun sights. Lastly he checked that he had his pistol, fire extinguisher, and prisoner-of-war kit with silk pajamas, shaving and toothbrushing kits, spare socks and cigarettes. Often the pilots even customized their planes, adding different windscreens, a more comfortable chair, and good-luck mementos. Then it was time for flight.

The secret and necessary mixture for flight was eighteen parts air to one part fuel vapor. When the mechanic stepped up to the propeller, he could move the blade in its natural direction to add more air, or in reverse to add fuel. Then "contact," and the pilot would flick the ignition, push the fine adjustment (choke) lever, and open the throttle halfway. The engine would catch, and a terrific wind would blast back from the propeller. Thick smoke and castor oil fumes would rip back in a terrific wind and buffet both the pilot and the unfortunate mechanic chosen to hang onto the fuselage. He then moved the throttle to 800 revs a minute until the oil reached 70° Fahrenheit. At last, when the instrument panels were all reading correctly, the pilot signaled the mechanics to remove the chocks and let go of the wingtips. He then taxied carefully down the field.

TRAINING

Truthfully, pilots in the early years of the war were lucky to survive training. At first there was too great a need for pilots for the British to turn down unlikely candidates. It was easy to get in. They asked prospective fliers questions — had they had ever ridden a horse, sailed a boat or driven a car? Anyone who had done any of these things, they figured, would probably make a good pilot. The medical test consisted of a test for color-blindness, borrowed from the test for train engineers. Anyone who passed was supposedly fit to fly solo after two hours of training. That was the official theory. In practice, it was deadly.

At the end of the war, 8,000 British fliers had died while training for active duty. That was a lot, considering that only 14,166 British pilots died in all. More than half, therefore, died simply learning how to fly. There was obviously something dangerously wrong in the British methods — until Smith-Barry straightened things out.

Smith-Barry, an English squadron commander, was responsible for halving the training death-rate overnight. His program of training rolled out more aces in the last two years of the war than any other nation, and WWII training camps also used his methods. Basically, the method was to make sure only suitable young men passed the exam in the first place. Then they taught the men, in a practical way, what to expect when in the air. The lesson was simple: panic and ignorance killed.

The test flight came first. The pupil and the instructor went up in a two-seater, with the trainee as the passenger. While talking to the student through the speaking tube, the pilot would stall the engine and observe the other's reaction. If he "clung to the side with an unintelligent expression instead of conversing fluently and with confidence," the instructor crossed him off the list of future pilots. The medical exam became vigorous. The amount of time a student spent in the air with an instructor increased dramatically. Moreover, Smith-Barry sought to make his students cocky.

Always in the past the rule was to fly safely: stunt flying would only get you killed. It certainly seemed like sound advice, assuming the unexpected never happened. Unfortunately, the unexpected was the one thing sure to occur.

Smith-Barry's ideas approached safety from an entirely new direction. "The object has not been to prevent fliers from getting into difficulties or dangers but to show them how to get out of them satisfactorily and having done so, to go and make them repeat the process alone." Telling students that anything out of the ordinary would be certain death would only make them afraid to push themselves. If, when flying dual, the plane ran into trouble, the instructor would intervene only after the student had run out of ideas. Still, no one went solo until he had mastered the basic maneuvers.

BASIC TACTICS

Men such as Reinhold Boehm and Oswald Boelcke developed the basic elements of combat flying during these years, and these elements have mostly remained the same throughout the century's dizzying technological advances. Today, military instructors still teach many of the same offensive and defensive principles learned by the first airborne fighters.

Flight

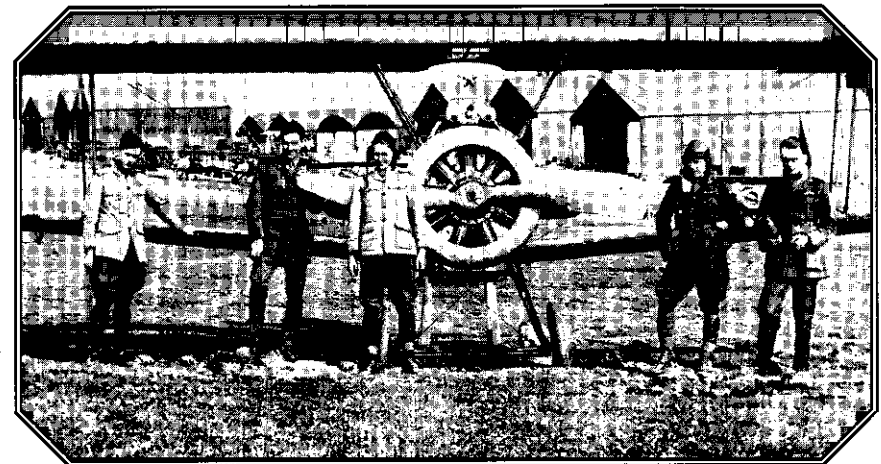
- When in doubt in a dogfight, trade airspeed for altitude.
- Know how well your plane glides, how to restart it in the air, and how much fuel it consumes.
- No guts, no glory!
- Patrol at a high airspeed.
- Don't panic! Panic is the primary enemy you have to defeat.

Offense

- Practice at least twice a week to stay in practice. Only practice keeps your skills up.
- Never continue turning after another aircraft once you've lost him from your sight. Pull up immediately and stay on his tail. If he pulls up, you'll always end up on top because of your attacking airspeed.
- Look around, always. You can't shoot someone until you know he's there.
- Keep the aircraft you are attacking in sight. If you look away, you'll lose him.
- Climb before the attack and dive from the rear. Altitude imparts speed in a dive and widens the patrol area.
- Attacking from low and behind your opponent is also good. It takes advantage of his blind spot.
- If you see an enemy ahead of you, assume there is one behind you. There often is.
- Assume every enemy you see is the best of the best, and take action accordingly until he proves how good he is (or isn't).
- Don't shoot unless you know beyond a doubt it's an enemy aircraft. If you can't tell, you aren't close enough to hit him.
- There are three phases in destroying another plane in the air: maneuvering (85%), getting him both in range and in your sights (10%), and firing (5%).
- When in doubt — attack!

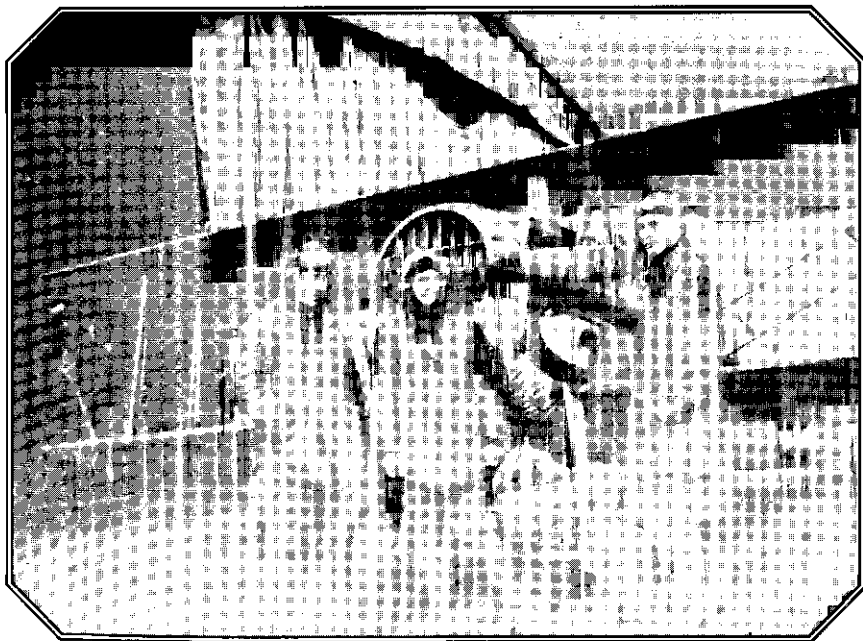
Defense

- Except at extreme ranges, always turn *into* the attack. The goal is to turn so tightly that your opponent comes into your sights.
- Use natural cover — clouds and sun.
- If attacked from behind, keep your attacker above and slightly to the side. Turn tightly to prevent him from staying on your tail.
- If attacked from ahead, turn directly toward your opponent and present as small and fast a target as possible.
- Don't ever reverse a turn unless you have your attacker sliding to the outside of the radius of your turn.
- Know how your plane acts at low airspeeds. Don't assume all evasive action occurs at high speeds.
- Have a "last ditch" maneuver and practice it.
- The best defense is a good offense — but know all your defensive maneuvers as well.
- Avoid staring at the only aircraft in sight. There are always more around.
- Watch the sun — if your enemy is smart, that's where the attack will start.
- In any dogfight, the objective for the defender should be lateral separation.



ACES

The fliers who learned these tactics had the best chance of survival. It was obvious, though, that becoming an ace involved something more than tactics. Naturally, the commanders and others whose job it was to choose pilots tried to guess who would make "aces," pilots who shot down an unusual number of enemy craft. Often their guesses were wrong. They usually looked for physically healthy, obedient, young men who seemed "well adjusted" and showed potential leadership abilities. They called men who insisted on doing things their own way "impulsive." Impulsive pilots would often be brave but would never be leaders, thought the examiners. Critical or hostile men who complained about inefficiency and their commanding officers were "paranoid" according to the standard. That kind of pilot would never excel, they said. A third type the examinations tried to eliminate from the lists was the "psychopath." They were moody and reclusive, or possibly hostile and violent. They were the ones who destroyed planes by demanding more than the machines could deliver. However, examiners learned, but did not like to admit, that these social misfits produced more top combat-pilots than the stable variety of recruits.



Edward Vernon Rickenbacker (l.) and two fellow pilots of the 95th Aero Squadron.

William Avery Bishop

This Ontario-born Canadian crossed the Atlantic in a boat carrying 700 seasick horses. When he arrived in Europe he lived in the trenches — wet, covered in mud and miserable. Going airborne seemed a very logical way to improve his situation. It was. Determined to down as many enemy planes as possible, he was aggressive in his attack. It seemed sheer recklessness to some. In truth, in the beginning it was mostly luck. However, with practice Bishop became a skilled pilot and excellent marksman. Being a huntsman from Ontario convinced him that a good shot had a much better chance of survival than just a good pilot. His aim was sure, and his piloting ability was enough to keep him alive in the air and get him home.

Bishop appeared to be the "impulsive" type of pilot that the RFC was so wary about. In fact, it earned him the Victoria Cross. Bishop thought of a plan, and set it into action early one morning. The idea was to attack a German airfield and shoot down enemy pilots as they tried to become airborne and return the attack. He arrived at his destination at dawn, while the camp was still asleep. Even his machine-gun fire did not stir them. When he turned for home, however, he saw another airfield beginning their early morning routines. The pilots ran to their planes. Bishop took out two as they were only feet from the ground. The next he shot down from a mere 1000 feet. Chased by a swarm of furious DIIs, he skimmed the ground and made it home safely. Even later, toward the end of the war, he continued to rack up an incredible score. In thirty-six-and-a-half hours of flying time, he shot down twenty-five enemy planes — even though he was under pressure not to risk his life. A top ace, he was invaluable for recruitment, as well as a symbol that you could fly against the Boche and survive.

Edward Vernon Rickenbacker

In the early days of the war, recruiters thought that anyone who could drive a car could fly a plane. Rickenbacker certainly embodied that belief. A one-time car salesman, he went from mechanic to star driver on the racetrack. He quickly became famous, and was quickly becoming rich from leading a team of Maxwell Specials. When he went to join the war in 1916, he saw the young pilots training to fly. It was exciting and captured his imagination. He applied for a transfer, and was promptly accepted. His experience with engines quickly earned him a position as Chief Engineering Officer. During his free time he took flying lessons and discovered that he was a naturally gifted pilot.

In combat, Rickenbacker was a clear-thinking, methodical pilot. Within six weeks he shot down an Albatros, and became an ace with his fifth victory only a month later. He was given the rank of flight commander, and earned the respect of his fellow pilots. At twenty-seven years old, he was older than his comrades by nearly a decade. Some people thought that the reflexes of anyone who was approaching thirty would be too slow, but Rickenbacker proved them wrong. He had twenty-six confirmed victories when he returned home. Most of those victories he had won in SPADs, which some people described as "racing cars with wings."

Georges Guynemer

Born on Christmas Eve, 1894, Guynemer was not the healthy, poster-perfect young soldier that the recruitment officers would have preferred. The French recruiters turned him down, actually, a number of times. But Guynemer was determined to fly. He decided to sneak into the world of pilots the back way. He became friendly with the commander of a nearby military airfield, who arranged his enlistment as a student mechanic. Later, Guynemer's father discreetly arranged for him to attend a flying school, where he proved that a frail physique was not nearly as important in the air as in the trenches. Within three months he was on patrol, and just one month later scored his first victory.

In 1915, shooting down even one enemy machine was so unusual that the French government awarded him the *Médaille Militaire*. His first was only the beginning. Once he was piloting a machine with a forward-firing machine gun, he was in his element. The frontal attack was his favorite technique. Taking a plane head-on meant attacking all its most vulnerable places: the cockpit, engine and propeller. Planes could take an amazing amount of perforation before becoming critically damaged. Pilots could not.

Then Guynemer and the other French pilots received the first of the SPADs. Not nearly as maneuverable as their Nieuport predecessors, they could climb more steeply, as well as faster and higher. The frail young man's score blossomed. One day he shot down three Fokkers in only five minutes. Artillery from a French 75 field gun then struck his plane. Spiraling down 4000 feet he managed to regain control just in time to make a crash-landing. He had a reputation for multiple victories, and his name became legendary throughout France. One day he did not return. A rumor stated that the Germans had found a downed pilot, killed by a chance bullet through the head, but British bombardment from a nearby battle destroyed any evidence, leaving only mystery behind.

Lance George Hawker

In 1911, Hawker left the Royal Engineers to be a pilot in the Royal Flying Corps (RFC) as soon as it came into existence. He got his certification in March 1913, and when Britain joined the war, Hawker went to France. On a mission in April, he successfully avoided ground fire, bombed a Zeppelin shed from merely 200 feet up, and returned — thus earning the DSO and starting his path to fame.

During those years anything that was unusually good or popular was “ace.” Singers, athletes even clothing fashions were described as “ace.” Somewhere along the line, any pilot who shot down five or more enemy planes gained the title of being an “ace” pilot. Bringing down an enemy plane was rare in those early years. For that matter, not a lot of German planes were even crossing the Allied lines. Those who did would usually face, if anything, nothing more than an armed observer from a two-seater plane. Hawker brought his own armament, though, and struggled with ways to pilot and shoot at the

same time. He mounted a rifle to the side, aimed at an angle, but attacking sideways was almost impossible. He also thought of mounting a Lewis gun on the top wing of a Bristol Scout No. 1611, and then he began to score. On one July day, over the course of two patrols, he shot down three planes; that earned him the Victoria Cross. People noted that the machines he attacked had observers manning the machine guns, not the pilots — he won even though the odds were against him.

On his final flight, Hawker encountered a patrol of Albatros biplanes. A barrage of bullets damaged his engine, forcing him to head for home. One Albatros followed him, piloted by Manfred von Richthofen, the Red Baron. Hawker tried to maneuver out of his sights, trying loops and rolls, sideslips and ground skimming, but Richthofen stayed close, firing over 900 rounds from his twin machine-guns. Hawker tried for a tight turn that might shake the German, but it left him momentarily exposed and vulnerable. Dead of a head wound, Hawker crashed to the ground seconds later.

Theodore Osterkamp

The Prussian army refused to take Osterkamp when he tried to enlist. He was not healthy enough, and at twenty-two years old, he was a little older than what they wanted. They had no way of knowing that he would be one of Germany's greatest fighter pilots — or that he would still be scoring victories against the enemy through World War II. After the Army turned him down, Osterkamp turned to the Voluntary Naval Flying Service, where he learned the basics of flying. His first position, instead of being in a swift fighter, was as observer in a slow, unarmed reconnaissance machine. It made him nervous. He was especially unhappy about the lack of power and weapons as the French aim improved. When offered the chance to go solo, he rejoiced and accepted.

A few months later, as a certified pilot in his own right, Osterkamp joined Sachsenberg's unit on the coast. Osterkamp's career would follow his commanders' closely for years. It was an inauspicious beginning, though, when Osterkamp crashed his plane on one of his first landings. Sachsenberg promptly grounded him. Ignoring his commander, Osterkamp took off in a new aircraft. He would have faced serious trouble on return had he not shot down an S.E. during his illegal flight. As it was, the victory made up for the previous landing problem. His skill matured, and eventually he achieved a temporary command. During his brief time as a leader, he led a formation that scored nineteen victories without a single casualty. His own tally of kills continued to rise steadily.

After a bout of influenza, he returned to the front just in time for the Armistice. Times then became harder. Pilots were often unable to adapt to civilian life, and Osterkamp was one such. He followed whatever path would lead him to aerial combat, and when that was impossible he became distraught. World War II brought about ample opportunity for him to flourish again, both as crack pilot and as “Onkel Theo,” commander of all the combat planes of the *Luftflotte 2*.

BATTLES

What was happening on the ground while the airmen made their patrols, took their pictures and flew into combat? The battles continued to rage. It seemed almost like separate worlds, the air and the ground — each equally dangerous, each bearing death in a dozen different ways.

Nivelle at Verdun

(February 21, 1916)

Nivelle believed in fighting to the last man, and he had the position to command it. His opponent, Knobelsdorf, believed in never giving up, as well, and that is where the horror of Verdun began. Both sides struggled for control of the dominant high ground on the Meuse, but in fact there were two hills about 100 yards apart: France held point 295 and Germany kept 265. No one could decisively win both. The battle dragged on, became more intense and widened. Nivelle's goal was to keep the Germans on the north side of the Somme, facilitating an attack on the Aisne that would break German lines.

The infantry never really saw their enemies. Bombers rained shells on the enemy side from a distance. During heavy bombing periods the air seemed thick with shells, looking in the distance like rain. Rarely did officers command raids — it was easier and safer to throw bombs, let the distance bombers shell the enemy, and gun down any advance from the other side. Still, it was anything but easy or safe. Rain poured from the skies for twelve days, and the trenches were two-feet deep in water. Men became sick, but could not rest. The shells destroyed roads, trees and every recognizable landmark. The dead remained unburied, units knew no replacements would arrive in time, and any wounded were doomed. The ground was a waking nightmare.

Verdun was the first time the Germans tried to use airplanes as strategic instruments. They attempted to get the planes in the air on a regular schedule, with a central base of command. Command designated four planes to photograph the area held by the French army. To protect their reconnaissance planes and further the battle, both sides brought in fighters and bombers. On the ground, they set up cannon to attack the observation balloons and long-range guns to fire on the French airfields.

In a way, though, the Germans crippled themselves. Staff officers considered the advice of the air officers to be inferior to the training of the tactical advisors. The high command did not understand the differences that resulted from various plane designs. They would order planes designed for fighting on bombing missions, and they would order bombers on raids that were of no military value. If German Command had ordered the bombers to destroy the supply roads, the battle might have ended differently. The generals did not understand air power. They would not listen to the pilots, a practice they continued throughout most of the war. The battle dragged on and on, with no clear victor emerging.

Somme Offensive

(July 1, 1916)

The best thing that the Allies could say, after it was all over, was that they had control of the skies. The Royal Flying Corps managed to wrest air superiority from the Germans, and make recon flights over the battle zone. Eighteen planes were "trench fighters," which consisted of strafing, destructive bombardment and, of course, surveillance. Trenchard called the Somme "the greatest success the air had in the first war." The price of success was high, though. Two-hundred fifty-two RFC pilots killed to only forty-three Germans pilots killed, and eight hundred planes lost compared to the Germans' three hundred fifty-nine. It was a costly battle.

General Joffre, the Allied senior commander, chose the location of the battle because it was at a junction between the British and French armies. The Germans had a strong grip on the land, but Joffre was sure that an attack would relieve pressure on the soldiers fighting at Verdun. His arguments convinced General Haig that the immediate attack was necessary, even though Haig thought the formations needed another six weeks before they would be ready to face a major battle. The soldiers were mostly volunteers, eager but inexperienced. Keeping this in mind, General Sir Henry Rawlinson devised a plan that would keep the infantry as safe as possible. His idea was that the gunners would bomb a certain area for a period of time, then would bomb slightly farther away. The bombardment would destroy the barbed wire, kill the soldiers on the other side, and let the Allies just walk across the area that held the most dangers. Unfortunately, he miscalculated how well-entrenched the Germans were. It was a serious error.

The Allied gunners began their assault a week before the infantry campaign began. They were confident it would work. After all, the same idea had worked for the Germans at Verdun. However, the Germans had fired almost twice as much artillery per square mile, and their artillery was heavier and more modern. When the British soldiers crossed no-man's land, they made a horrible discovery. The German wire was largely uncut, and thicker than British wire-cutters could break. Much worse was the fact that the Germans had dug deep and resilient dugouts that the bombs had not destroyed. In brief, the Allies found themselves trapped, with the Germans armed and waiting. It pretty much set the pace for the rest of the battle, which lasted 140 days.

It wasn't entirely bleak for the Allies. The Australians, whose informal style and lack of discipline disconcerted the British, captured the ruined town of Pozières. Four British divisions launched a dawn attack, capturing the German second line of defense. There were small successes for both sides as the months wore on. Mostly, however, it was a battle of no surrender and no victory.

Nivelle Offensive

(April 16, 1917)

The purpose of the offensive was to keep the Germans north of the river Somme, so that General Micheler's attack along the Aisne could penetrate enemy lines. However, deep gullies gouged the ground; wooded hills and impassable plateaus fenced the area. The nearby Aislette river was marshy, and was paralleled by a deep canal. Even worse, the main strategic plateau that the Germans held had deep limestone quarries and tunnels. The Germans had prudently turned these into secure underground bunkers. Some of the wells were 70 feet deep and could withstand the heaviest artillery barrage. Not only could the Allies not hope to destroy these stone foxholes, but they were also impossible to see from the front lines. Just to make things harder, there weren't many roads for the advancing army to use. The only way to cross the difficult terrain was to go straight across.

The main problem was surprise. If the Allied forces did not attack the Germans' strongest point, and thus catch the Germans unawares, they might win. Strategically, that was a problem. In the first place, two weeks of artillery barrage always preceded an assault. The Germans would be aware, certainly, what was coming. They would not know, however, exactly when. Nor would they know exactly where. So a surprise was still possible, and with that advantage, victory was possible. Unfortunately, they were not able to keep their plans a secret.

One of the French sectors "lost" a sergeant-major. With him disappeared a copy of the plan of attack for his and other units. There was no doubt that the enemy now knew exactly what the Fifth Army had planned. There was to be no surprise. Nivelle knew that they had lost their only advantage but worried about the huge amount of changes, rescheduling and rearrangement that would result from postponement. It was a badly considered decision.

The Allies were at a disadvantage in the air, as well. Half of their machines wouldn't fly. The ones that did work were older models, seriously outclassed by the German squadrons. German pilots chased back the planes sent out for observation, and the Germans flew openly over Allied lines. Germans fired on Allied trenches, but remained untouched by the artillery batteries firing at them. It was bad for morale, and even worse for reconnaissance information.

Then the battle began. A "quick, brutal destruction of all the enemy's dispositions in one sharp thrust" was the Allies' plan. At six in the morning, the infantry and tanks attacked. The gray, wet weather seemed to partially cover their approach, and they made good progress. However, by the end of the day, the advance had slowed to a crawl. Eventually progress completely stopped. Losses were enormous on both sides, enough that both sides refused to yield any hard-won ground. The battle, hopeless from the beginning, struggled for two weeks before ending. The Germans' "deep" defense of a three-tiered resistance with light initial defense, a second line of machine-gun based defense and a final, strongly entrenched line proved itself a masterpiece of planning by the German High Command. It was a practice that would serve the Germans well in the future.

Third Battle of Ypres / Passchendaele

(July 31, 1917)

It took six weeks to set up the Third Ypres battle. The Allies commanders planned that it would happen in three parts: valiantly take Ypres, land behind the German flank on the coast near Ostend, and pursue and conquer. The whole thing was to begin outside a little town called Passchendaele.

It started quite well. The air force kept the Germans out of the sky. They moved in the huge guns and stockpiled a formidable amount of ammunition. Planes flew reconnaissance until they had recorded every inch of enemy ground. Reports were favorable. The Allies barraged the Germans for two weeks in preparation. Everything was looking good.

Early in the morning on July 31, the soldiers put on their gear and began the advance. They made good headway, and gained about two miles. They managed to control every German counterattack, and the advance never faltered. It began to look like a textbook offensive. Then it began to rain.

It rained, hard and non-stop, for two weeks. It continued to rain off and on after that. The area had no natural drainage, and years of battles and heavy bombardment had destroyed the farmers' extensive systems for removing rainwater. There was nowhere for the rain to go. It soaked into the soil and dissolved the clay beneath. The bombings churned up the strange mud, and it became a semi-liquid, semi-gel. This was a serious problem for the attackers. A soldier with eighty pounds of weight in his backpack couldn't get up if he fell in the mud, and would drown or smother. Crawling was impossible, and men had to walk over boards laid across the mud. The soldiers trying to balance on a plank were like targets in a shooting gallery for the Germans. The Germans were miserable, too, but they weren't having to advance through gunfire. They were able to hold their positions. The battle raged through August, September and October. By the end they were not fighting to win, but just to gain a position they could defend through winter. The Canadians managed to get control of Passchendaele, the nearby town, and hold it. Third Ypres was over. With a quarter of a million dead, the Allies had gained four and a half miles.

Cambrai

(November 20, 1917)

The Battle of Cambrai was the first real tank battle. The Allies had tried unsuccessfully to use tanks before. The first time, at Somme, they had not done well. Later, at the second Aisne, German reconnaissance pilots found them, and directed the German bombers so they could destroy the armored vehicles with artillery.

At Cambrai, however, there were more than 300 tanks for the Allied offensive, and they were better than any previous variety. They could cross trenches that were not too wide, and climb obstacles that were not too tall. Some tanks even carried materials to drop into ditches, making a kind of bridge for the following infantry. The Allied commanders chose the location of the battle primarily because it was the easiest area for tanks to cross.

Another difference in this battle was that there was no initial “wearing down” period of bombardment. Instead, the Allied gunners waited until the first tanks began to roll across the field, then provided a covering fire directly ahead of the tanks. Tanks could roll across and flatten any barbed wire, and could provide extra ground support. With tanks, long-distance bombardment was unnecessary — it could even be a disadvantage if it tore up the ground too much.

When the Allied forces began their assault against the Germans, they were behind the entire Tank Corps and under the protective wings of three hundred airplanes. The pilots were hardly happy about the day's fog, but it made excellent cover for the troops. With the tanks clearing the way, the troops surprised the Germans. They advanced with dramatic swiftness, reaching the rear zone of the Germans nearly four miles behind the front. It looked for a moment as though it was going to be easy. Then the tanks were gradually stopped by either malfunction, enemy fire or just from getting stuck in the mud. Another problem was that orders rarely took individual situations into account. The men should have walked through the lanes cleared by the tanks, but instead they fanned out and had to navigate the barbed wire. Where there should have been an easy victory, there was instead an open opportunity for a German counter-attack. They did not hesitate to use it. The made a play for the British flank, and all the well-thought out plans won nothing.

The result was that people did not trust tanks. Instead, aerial reconnaissance began to work more closely with gunners. Gunners used maps sketched out by aerial observers in their calculations of range. Planes would also determine the best targets from above. Balloon observers would help fine-tune the aim by signaling the necessary corrections. Artillery was much more effective than machine-gun fire, and it owed its accuracy to the eyes in the sky.

Lys Offensive

(April 9, 1918)

Things were not looking good. The previous two German offensives, *Michael* and *Mars*, had been poorly executed and a complete failure, respectively. Ludendorff, the German commander, knew his position was strong enough to make an attack and disable the British. The Portuguese Allied soldiers, conscripted and with no notion why they were fighting, were a weak link that the Germans exploited. After a preliminary bombardment of gas and explosives, the Germans settled down to firing on trenches and strong points. They then began the advance.

The first three miles offered no resistance to the Germans. In this war, such large-scale gain was virtually unknown. Germans began to get lost, and orders were both slow in arriving and inappropriate when they finally got there. When the Germans finally reached the Allied lines, though, the British met and nearly stopped their advance. The casualties for both sides were intense as the British tried desperately to stop the Germans. They struggled to hold their positions, and Haig issued his famous “Backs to the Wall” command. “There is no other course open to us but to fight it out,” it went, “every position must be held to the last man. There must be no retirement. With our backs to the wall and believing in the justice of our cause each one must fight to the end. The safety of our homes and the freedom of mankind alike depend upon the conduct of each one of us at this critical movement.” These words motivated not only his men but the people at home.

The men in the air were in the midst of all this, as well. They flew over the heavy fighting zones — skimming so low that they were in constant danger not only from ground fire, but from ground *objects* as well. The German airmen received virtually no orders from high command. The few orders that were received hardly made use of the strengths of the air force. German ground troops and pilots did not act together in anything. Pilots fell to British ground fire, even as they were inflicting their own considerable damage to the Allied air force.

German pilots also had to deal with fog. Useful to the ground forces as cover, fog meant flying half-blind, or not flying at all. Low-flying ground work such as strafing and light bombing attacks were often all the German pilots could do. In fact, with the speed of the German advance, one Allied squadron commander had to abandon his aerodrome — burning the planes behind him because his pilots could not see well enough to fly them.

Two notable events occurred during the battle of Lys. Manfred von Richthofen, the Red Baron, was shot down. His death meant the loss of a hero to the Germans, and the consequential decrease of morale. Secondly, it saw the first large-scale deployment of aircraft, tactically speaking. Pilots fired over 60,000 rounds of machine gun ammunition and dropped hundreds of bombs in a systematic manner. Moreover, Germans successfully used air-to-ground techniques. With Richthofen's death and the birth of new techniques, it was both the end and beginning of an era in aerial warfare.

Montdidier**(July 18, 1918)**

The Germans had done a good job of maintaining their superiority. Montdidier was a vantage point that had gone from one side to the other and back again, many times — but in August, 1918, the Allies captured it again. What's more, this time it stayed captured. General Foch of the French Army designed the battle operations, and they worked exactly as expected.

His first objective was to clear communication lines between the northern and eastern sectors of the front. The French achieved this in a forceful counter-offensive that pushed the Germans back to the Aisne/Vesle line. Foch then had the British army unite with the French army to launch an offensive at the junction of their two fronts. This never-before-seen unity between the two forces worked beyond all expectation. His next step would be to push the Germans to the line Morcourt-Hangest, and then continue to chase them toward Chaulnes and Roye. It was a simple enough plan, and it worked.

Troops moved only at night. The roar of low-flying planes covered the noise of their movement. Once in place, the troops benefited from "morale preparation," such as taking bridges, to raise their confidence and spirit. These small strikes were successful, both in bolstering the troops' self-esteem and in establishing excellent jumping-off points for Foch's surprise attack. Also useful was the misty weather, which kept enemy planes on the ground, and moonless nights that acted as cover. At 0420 hours on August 8, the Allies began their sweeping attack.

The Germans were unable to check the flood of enemies that rolled them slowly back. The onslaught was highly successful. Sometimes the attacking troops, eager for engagement with the enemy, would advance too rapidly. That was never good, because the artillery gunners couldn't see into the haze, and had to rely on a rigid timetable. They could not adjust their fire as they normally would, because the planes were grounded at the beginning of the battle. The airplanes soon joined the fight, however, and provided the support necessary for victory. The battle progressed rapidly. Within two days, the French reoccupied Montdidier. Over the next month they dealt with the many expected counter-attacks, reorganized and improved their positions, and then started forward once more. Although the German lines remained unbroken, their troops were confused and demoralized. For the Allies, it was the first step toward ending the war.

St. Mihiel**(September 13, 1918)**

The St. Mihiel salient was an area of German-held land that jutted into the French holdings. It was easily defensible, and prevented the French from advancing. Thirty-two miles long, it kept the French from using an important stretch of railway, and foiled any attempt to attack into Lorraine. For years it remained strong — then the Americans came.

General Pershing, the American Commander-in-Chief, was eager to use his fresh troops in the most effective way. Destroying the salient was a worthwhile objective. His First Army staff studied and planned the offensive. The idea was that six divisions would attack from the southeast. Three more divisions would break through and advance from the northwest and head southeast. Meanwhile, three other divisions would attack the tip of the salient and keep them too busy to notice that they had nowhere to retreat. Before the attack, however, there would first be bombing.

At exactly 0100 hours the barrage began. It was as if the German side had exploded. Some guns concentrated on the trenches and the barbed wire. Other bombs lofted farther, seeking enemy artillery, strongholds and rest zones. The infantry waited for the bombs to weaken the German defenses to the point that an advance would be possible. They called it the "Stroll at St. Mihiel" because it seemed so easy to take. Demoralized Germans surrendered in waves. The Allied generals, seeing their success, shortened their timeline for conquest of the salient. The Allies pushed forward, facing stronger resistance and cutting off escape routes. Many did not even notice the planes in the air. Some never learned of the airmen's serious casualties.

The air force had a large role in this battle. Bombing missions against a heavily armed enemy were costly. Planes, which had a much better chance at strategic destruction, proved their value. They could pinpoint where their bombs would do the most damage. Also, they could signal where the distant artillery guns should aim. However, they were also easier targets than distant gunners somewhere hidden in the forest. They felt the brunt of the Germans' frustration. During the four days of the offensive, thirty-six airmen died. Far over enemy lines, and targeting the Germans' strongest areas, the pilots never considered St. Mihiel an easy offensive. For them, it was anything but a "stroll."

Argonne

(September 26, 1918)

The Germans prepared their defense of the Argonne area for over four years. It was an area naturally easy to defend. There were no landmarks to distinguish one ridge from another. The thick undergrowth made a wonderful cover for wire and netting, neither of which could be pushed aside or destroyed by shelling. The forest's ravines were too deep for the Americans to bring in their tanks. Under the best of circumstances, it would be difficult to penetrate.

The Germans' defense was thorough. The most effective means the Germans had for slowing down enemy advances was their "scorched earth" policy. They set towns and buildings ablaze, destroyed roads, booby-trapped train lines by placing mines underneath the tracks, placed explosives in ravines and rigged even the most innocent places to explode. When the Allied forces came, the Germans were ready to meet them.

What they were not prepared for was the energy of the troops that attacked. America, incensed by the Germans sinking passenger ships transporting Americans, and influenced by political pressures, had just entered the war — and the fresh American soldiers were eager to fight. They had not yet been worn down by nightmarish sieges that never seemed to end. Less trained than their European counterparts, they tended to take their orders as given. The French and British, encouraged by the fact that they had halted all the recent German counter-offensives, were also more optimistic than before. It certainly looked as though the war might be ending, and men were finding the will to throw themselves into battle once more.

The initial barrage began. In the first two days, the First Army advanced seven miles. Then progress slowed. German resistance was fierce and determined; they were fighting for their lives, and the lives of their homeland. The lack of Allied supplies also slowed things down. With no roads and steep terrain, it was sometimes a challenge to get information to commanders, more so to keep the troops fed.

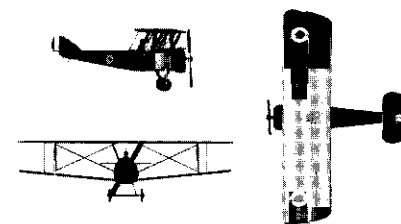
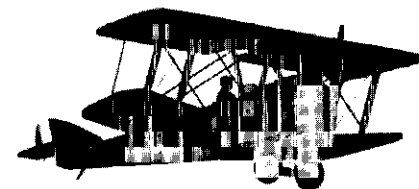
Planes were at Argonne, trying to survey enemy position and gather information, but they remained grounded most of the time. During the forty-seven days between the onset of the battle and the end of the war, only seven had clear skies. During the search for the Lost Battalion — a battalion surrounded by Germans with no food, supplies or orders to surrender when necessary — two bold pilots lost their lives by flying at tree-level. They could not pinpoint the battalion, but the Germans had no trouble finding the planes.

Constantly fighting flanking and sniper fire from the woods, the Allies made steady progress. On November 1, they launched the final assault. Within six days it was only a matter of mopping up, and celebrating the long-awaited armistice.

PLANES

Sopwith Scout (Pup)

Wingspan	26 feet 6 inches
Length	19 feet 4 inches
Height	9 feet 5 inches
Max. Weight	1250 lbs.
Manufacturer	Sopwith Aircraft Co.
Powerplant	80-hp Le Rhône 9C 9-cylinder rotary engine
Armament	One Vickers .303 machine gun
Speed Max.	95 mph
Ceiling	18,000 feet
Endurance	3 hours



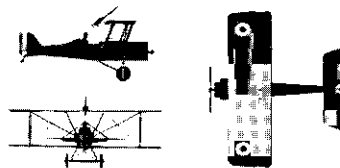
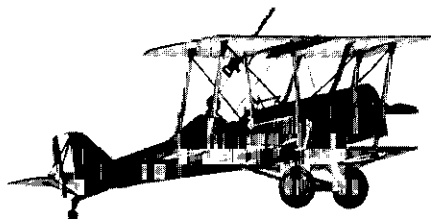
Because the *Scout* was basically a redesigned 1 1/2 Strutter, the creators saw the *Scout* as the Strutter's "pup," and hence the popular (but officially incorrect) nickname was born. Its lines are simple and graceful, and it is generally considered a beautiful piece of aviation design.

The first of the Sopwiths designed as a single-seat fighter, its two equal-span wings and responsive controls made it a simple pleasure to fly — a characteristic missing in the other, more cantankerous machines of the age. It could maintain altitude with the ease of a bird of prey, and maneuvered just as smoothly, but it was seriously underpowered in comparison to other aerial fighters. The *Pup's* 80-horsepower engine had trouble climbing, and being too slow to outrun enemies, it had to rely on offensive strategies. Although the *Pup* could outmaneuver its common opposition when it came to high-altitude turning combat, the Albatros was faster and more powerful, and could usually break away and renew combat under conditions more favorable to itself.

First introduced to combat in September 1916, its superior abilities easily overcame the German opposition, but so swift was the speed of aircraft evolution in those years that the *Pup* was retired from front line service after a relatively short period of time. Later called for Home Defense duties, *Pups* were outfitted with 100-hp Gnome Monosoupape engines which gave a better rate of climb and a slightly increased speed at maximum altitude.

R.A.F. S.E.5a

Wingspan	26 feet 7 3/8 inches
Length	20 feet 11 inches
Height	9 feet 6 inches
Max. Weight	1950 lbs.
Manufacturer	Royal Aircraft Factory
Powerplant	200-hp Wolseley Viper W.4a V-8
Armament	One Vickers .303, one Lewis .303
Speed Max.	130 mph
Ceiling	19,500 feet
Endurance	2 1/2 hours



The S.E.5a was arguably the best fighter aircraft to come out of the Royal Aircraft Factory — but its introduction to the skies was turbulent, at best. The engines that came out of England for installation in these single-seat fighters were grossly defective, sometimes needing complete overhaul upon delivery. A few hours in the air and overhaul was inevitable. Due to a faulty hydraulic gear, it was even possible to shoot off your own propeller. However, the demand for the S.E.5a was so high that the manufacturer could send such engines, noting that poor quality engines were better than no engines at all. It was not a good time for pilots.

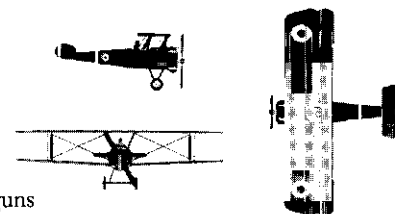
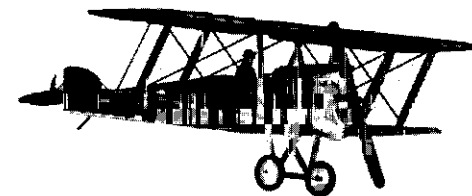
Still, when fitted with a reliable engine, the S.E.5a was a dependable plane. The cockpit was comfortable, and the cut-down windscreen and narrow fuselage meant heightened visibility for pilots. Its superior diving speed, combined with its stability as a platform for the Lewis machine gun, made for an excellent fighter. The S.E.5a had an in-line engine and didn't turn as quickly as the planes with rotary-powered engines, but it nevertheless enjoyed a three-to-one kill ratio over the enemy.

The design continued to be adjusted throughout the time it was in use. The manufacturers developed a stronger undercarriage that became standard. Introduced were better oil tanks, stronger trailing edges and a revised fin structure. Gone were the days of "any engine will do," and introduced was the high performance favorite of many pilots

The Home Defense squadrons used the S.E.5a, just as they used many retired front-line fighter planes, in the struggle to keep the skies over England clear. Unfortunately, the S.E.5a did not do so well on the home front as it did in regular battle. The swift and dependable plane's engine, being water-cooled, took longer to warm up before take-off, thus it was slower to respond to an immediate attack. Back on the front lines, however, the sturdy plane remained a favorite right up until the Armistice.

Sopwith F.1 Camel

Wingspan	28 feet
Length	18 feet 9 inches
Height	8 feet 6 inches
Max. Weight	1460 lbs.
Manufacturer	Sopwith Aviation Co.
Powerplant	110-hp Clerget 9B; 110-hp Clerget 9Z; 130- hp Clerget 9Bf; 140-hp Gnome Monosoupape; 100-hp Bentley BR1; 150- hp Gnome Monosoupape; 150-hp Le Rhône 9R, 9- cylinder rotary engines.
Armament	Two Vickers .303 machine guns
Speed Max.	110 mph
Ceiling	19,000 feet
Endurance	2 1/2 hours



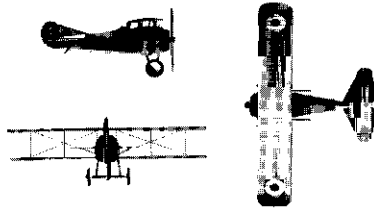
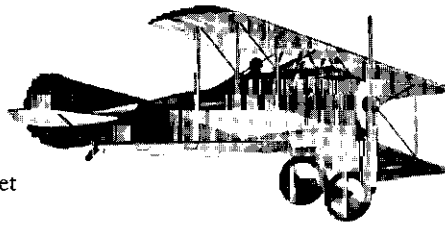
Vicious and cantankerous, or responsive and daring? Pilots' opinions about the Sopwith F.1 *Camel* varied, but always tended toward extremes. They either considered it a godsend or a plane that would send you straight to God. In fact, the *Camel* could easily be both.

The *Camel* was a compact flying machine with a comparatively spacious cockpit. It created a fairly stable center of gravity by massing the fuel tank, engine, pilot and machine guns in one small area. Both wings sported ailerons sensitive to pilot commands, and the powerful rotating engine created a strong pull to the right. The overall effect was impressive — the agile plane made extremely tight right turns, a tendency so strong that *Camel* pilots often made left turns by turning right 270°. In the hands of a master pilot, it was as nimble as a dancer. It could also be a moody and hyper-sensitive beast to fly unless you fully understood both aviation and your own individual plane. A lax hand snapped it into a spin.

Perhaps because they were wisely avoided by novices and preferred by experienced pilots, *Camels* achieved quite a kill record. With 1294 enemy aircraft downed in a single year, the *Camels* with their dual synchronized machine guns held the dogfighting record. More than a fighter, they were used with excellent results for close support of ground forces. They made much better strafers than offensive fighters, since other planes were capable of higher altitude and speed. Entering the war as a fighter in July of 1917, the *Camel* roared its way into both a firm reputation and history.

SPAD SXIII

Wingspan	26 feet 11 inches
Length	20 feet 8 inches
Height	7 feet 11 inches
Max. Weight	1805 lbs.
Manufacturer	Société Pour Aviation et ses Derivées
Powerplant	200-hp, Hispano-Suiza 8BEa V-12
Armament	Two Vickers .303 machine guns, up to two bombs
Speed Max.	135 mph
Ceiling	21,800
Endurance	2 hours



Some pilots were a little nervous at having the engine of the SPAD SXIII effectively in their laps — they had to fly from a reclining position, with their legs straight out. Others were uncomfortable with the fact that it had the gliding ability of a dropped rock, so it had to be landed with the engine on — a daunting prospect in a plane with no brakes. However, pilots who flew the SPAD in combat came away favorably impressed with its sturdy dependability.

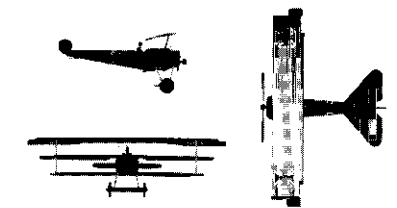
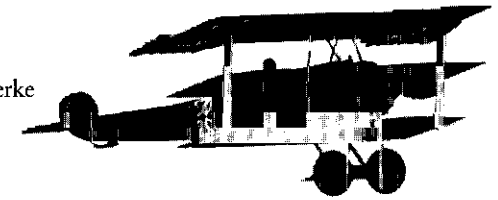
The powerful Hispano-Suiza engine, in combination with two machine guns, made the SPAD SXIII a favorite pursuit craft. As for climbing, there was nothing in its time that could match it. Moreover, SPAD pilots could make multiple sudden and deep dives without concern for doing structural damage. It became the mainstay of the French airfighters, and later became popular with the Americans, as well, especially since the Americans had the pleasure of acquiring SXIIIs after the few flaws in its design had been recognized and resolved.

The SPAD was a sturdy fighter in an age of frighteningly fragile aircraft. Most of its features, in fact, seemed designed for dependability in combat. It had tie-struts at the midpoint of the wings to keep the brace wires from whipping in flight. Close-set ribs and a strong fuselage structure made the plane sturdier still. This created a rather heavy plane, even before armament was added. Once the twin machine guns were added the plane was even heavier, but provided a beautifully stable platform for firing its twin Vickers guns.

The SXIII was decidedly tricky at low speeds. It liked veer to the side instead of flying straight, and was apt to stall suddenly due to the thinness of its wings. Not to mention that it was nearly impossible to fix jams in the right-hand Vickers gun. Pilots were willing to forgive these faults, however, in a plane capable of receiving formidable damage, even artillery fire, without structural catastrophe or loss of control.

Fokker Dr.I

Wingspan	23 feet 8 inches
Length	18 feet 11 inches
Height	9 feet 8 inches
Max. Weight	1289 lbs.
Manufacturer	Fokker Flugzeug-Werke
Powerplant	110 hp Thulin-built Le Rhône built 9J 9-cylinder air-cooled rotary engine or Oberursel UR II 9-cylinder rotary
Armament	Two Spandau 7.92mm machine guns
Speed Max.	103 mph
Ceiling	20,000 feet
Endurance	1½ hours



Anthony Fokker designed the Eindecker, one of the first popular fighters of the war. He had then slipped into dark, though unofficial, disfavor when the German government asked him to design a plane similar to the Sopwith Triplane. Inspired by a captured enemy Sopwith, the first German triplane was created by Fokker's associate, Reinhold Platz. During its short lifetime, the Fokker Dr.I was modified and improved by both Fokker and Platz.

Like other Fokker airplanes, the Dr.I's fuselage was welded steel tubing braced with transverse cables, creating a rigid rib-like cage that was then covered with fabric. The 2.62m propeller gave a swift climb to low and medium altitudes, while the extra wing increased its rate of climb and gave a tighter turn. Upper-wing ailerons gave impressive maneuverability that often meant the difference between victory and a fiery descent. The interior was of Spartan design: a control stick, rudder pedals, an ignition lock switch and throttle. However, the control stick combined the trigger and throttle, allowing the pilot to control the engine, maneuver and fire twin Spandau machine guns all without taking his hands off the stick. With practice, such an arrangement was very advantageous. All in all, the Dr. I was considered an outstanding aircraft.

It did have some drawbacks, however, such as a distressing tendency to fall apart when diving too long or fast. This was primarily the fault of substandard workmanship, particularly of the third wing. The Dr. I's inability to gain speed, even with improved engines, also contributed to shortening its active operational life span to a handful of months.

FLYING PRIMER

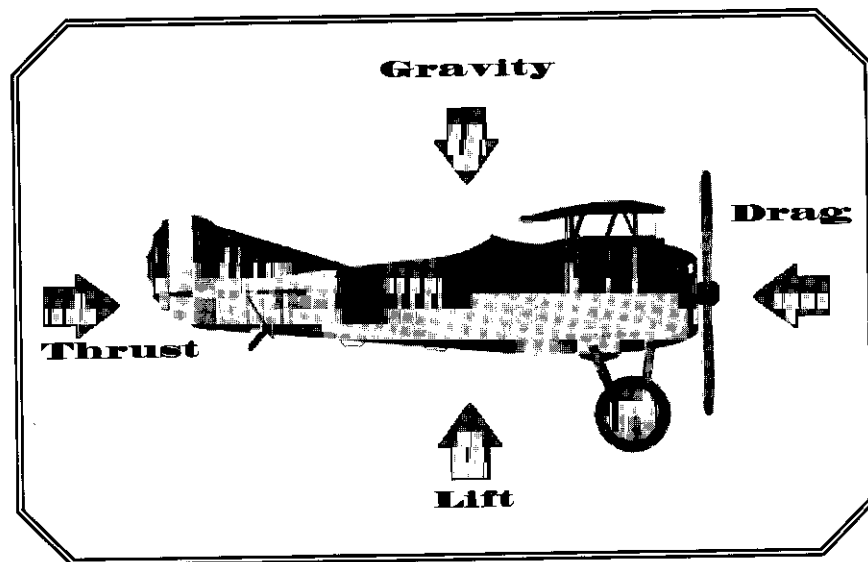
PRINCIPLES OF FLIGHT

As a pilot, you should understand how to use the air to your advantage. To help you prepare for your first flight, this section defines the aerodynamic principles that allow airplanes to take off and maneuver – lift, thrust, drag and gravity.

Lift

Lift is the force that pushes the plane upward. As air passes at different speeds across the top and bottom surfaces of the wings, it causes a difference in pressure. This variance in pressure results in a lifting force that “pushes” under the wings and lifts the plane into the air. As the speed of the airflow increases, so does the lift.

Lift also changes with the shape of the wing and the angle at which the wing meets the airflow. When you increase the angle of the wing by climbing too steeply, you disrupt the airflow over the wings. This often causes the aircraft to stall. If you do stall, diving should increase your speed (and lift), allowing you to regain control of the plane.



Thrust

Thrust is the forward force applied to your plane by its engines and propellers. During level flight, the rotation of the propellers causes air to move over the blades. This moves the plane forward, providing the wings with the airflow needed to create lift. Thrust is always applied in the same direction as the airflow over the propellers.

You can increase the amount of thrust by increasing your throttle setting. If you do not have enough thrust to keep your plane moving forward, you lose lift and your plane stalls. If your nose points downward, both thrust and gravity are pulling your plane downward as well.

Drag

Drag is the force that counteracts the forward motion of your plane. It is caused by the resistance of the air flowing around the airframe. Smooth plane surfaces result in less drag, and therefore, more efficient flight.

Gravity

The most fundamental force you encounter is *gravity*, the force that pulls your plane toward the ground. It is a constant force in that always applies in the same direction with virtually the same force. Your aircraft uses thrust and lift to counteract the effects of gravity and remain airborne.

G-Forces

One “G” is a measurement of force equal to the force exerted by the Earth’s gravity on a stationary object. If gravity suddenly became twice as strong, you would experience two Gs. Note that a measurement of G-force is *not* the same as gravity, which is a constant force toward the center of the Earth.

G-forces are caused by sudden changes in velocity, such as when you twist and turn the plane rapidly in the air. Positive Gs make you feel heavier because they pull you relatively downward. Negative Gs make you feel lighter and pull you relatively upward. Remember, when you are upside down, your relative “up” points toward the ground.

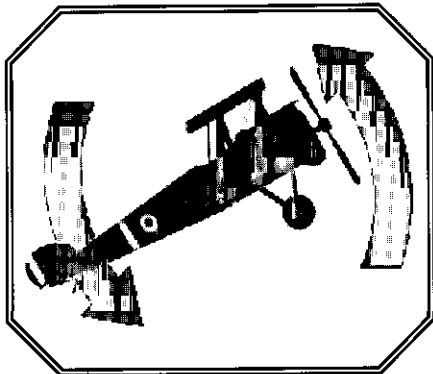
MANEUVERING VECTORS

Now that you know what forces interact with your airplane during flight, you are ready for the basic maneuvering vectors – pitch, yaw and roll. This section describes these basic vectors. As you gain flight experience, you learn what combinations of pitch, yaw and roll are most effective.

Pitch

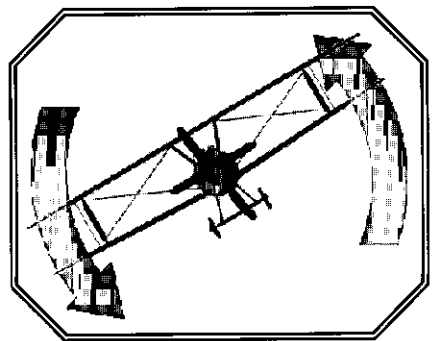
Pitch is rotation about an axis running through your plane from wingtip to wingtip. If you tilt the nose of the plane up or down, you change its pitch. As mentioned earlier, the elevators on the tail of the plane adjust your pitch. To pitch the plane upward, pull your control stick toward you. To descend, gradually push the control stick away from you. Beware of changing the pitch too drastically – this can disrupt the air flow around the wings and cause your plane to stall.

NOTE: Pitch remains relative to your plane's top and bottom – when you roll to one side, the change in pitch causes a banked turn.





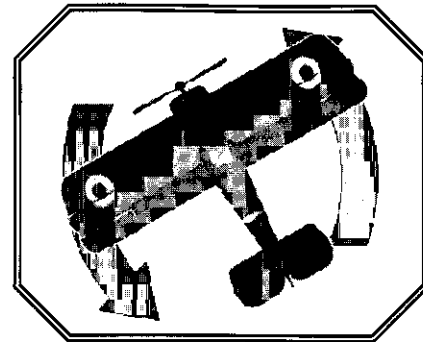
Roll

A *roll* is rotation about an axis running through your plane from nose to tail. During a roll, the plane's wings move up or down, but the aircraft continues to fly a straight course. If you push your control stick to either the right or left, you will spin about this axis. Rolling results from the complementary movement of the left and right ailerons – if the left aileron tilts up, the right will tilt down, and vice-versa.



Yaw

Yaw is rotation about an axis running vertically through your plane. These “flat turns” occur when you change the heading of your plane without changing its vertical orientation. If you turn the rudder to the left (using ) you can steer the plane to the left. Likewise, turning the rudder to the right (using ) causes the plane to veer to the right. Though you can turn purely through yaw, a much more effective way is to use a banked turn.





NOTE: Using the rudder to turn causes the plane to go into a slightly banked turn. For example, a yaw to the left would cause a pilot's left wing to dip slightly — and the pilot would have to compensate by moving the stick slightly to the right. Similarly a bank would cause the ship to yaw slightly in the opposite direction as the turn — causing the plane to straighten.



Bank



You can combine a roll and pitch to bank the plane to the left (nose up, roll counterclockwise) or right (nose up, roll clockwise). However, pitching and rolling the plane reduces the amount of lift and increases drag. To offset the resulting loss in speed, you may need to increase your throttle before you perform a bank.

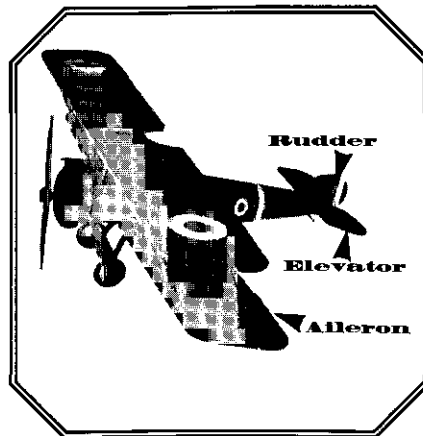
Control Surfaces

An airplane uses several different components to control the flow of air. Each part interacts with the air to create forces and movement:

Rudder. Yaws the plane left or right ( or ).

Aileron. Rolls the plane clockwise or counterclockwise (joystick or  .

Elevator. Pitches the nose of the plane up or down ( .



FLIGHT TACTICS

Although you could simply try to learn like any rookie flier, it would be to your advantage to study the flight tactics outlined in this manual. Just as in the real world, learning to fly combat engagements involves much more than jumping into the cockpit and manning the machine gun. First, you must familiarize yourself with the principles of flight. Then, you must practice the basic maneuvers that will carry you to your future dogfight and bombing missions. Finally, you need to learn the standard offensive and defensive moves to help you survive and succeed in *Wings of Glory*.

Taking Off

Most of your missions begin at the aerodrome. To start your takeoff, increase your throttle to 100 percent (throttle is controlled by **[1-0]**, in 10% increments, with **[0]** being full throttle). As your plane gains speed and lift, you should notice that your tail rises. When this happens, slightly raise the nose of the plane by pulling the joystick toward you or by pressing **[↓]**.

NOTE: The game has an "autopilot" feature that automatically performs your takeoff for you. If you wish to use this function, press **[A]** when you are ready for takeoff.

Climbing

After you complete your takeoff, your next objective is to reach your cruising altitude. As you learned in *Principles of Flight*, higher speeds generate greater lift. To climb, make sure your throttle is at full speed (**[0]**) and then raise the nose of the plane. Be careful not to climb too quickly or your aircraft may stall. (In a rotary plane, you gain altitude better if you turn slightly to the right as you climb.) If you begin to stall, dip the nose of the plane. Once you descend and gain speed, you will be able to level out and begin climbing again, this time more gradually.

To climb most efficiently, use maximum throttle and pitch up to a 15-degree angle. Once you reach the desired altitude, lower the nose to level the plane. Then, throttle back (again using **[1-0]**) to conserve fuel; cruising at full throttle guzzles gas you may need later.

Descending

You can decrease your altitude in two ways: reducing your throttle (using **[1-0]**) or lowering the nose of the plane (pushing the joystick away from you or pressing **[↑]**). Slowing down reduces lift, allowing you to lose altitude gradually without gaining speed. Diving lets you descend rapidly while increasing your speed.

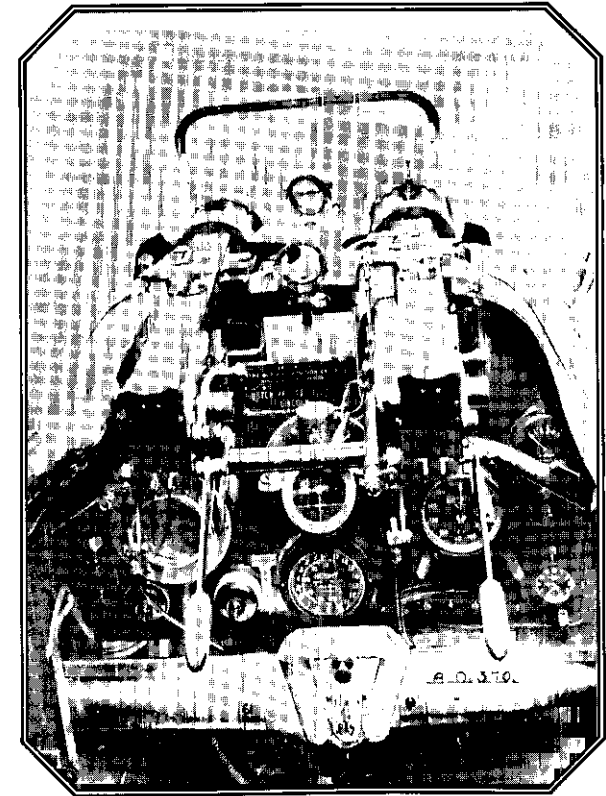
Recovering from a Stall

You experience a stall whenever your airspeed drops below the minimum threshold for a particular plane to maintain its lift (usually close to 45 kilometers per hour). Stalling usually occurs during tight turns, loops, takeoffs and landings at slow speeds. As airspeed drops, less air flows over the control surfaces and lift also decreases. A loss of lift causes the control surfaces to become inoperable. The only way to recover from a stall is to gain airspeed. If you have sufficient altitude, let the plane fall until the speed picks up enough to generate lift. Otherwise, try increasing your throttle.

Landing

When playing *Wings of Glory*, you can choose to land manually or you can let the autopilot perform the landing for you. If you are a new pilot, you may prefer to leave the landings up to the computer. As you become a seasoned flier, you will probably want to attempt landing. If you want to execute an autopilot landing, press **[A]** and the computer will take over.

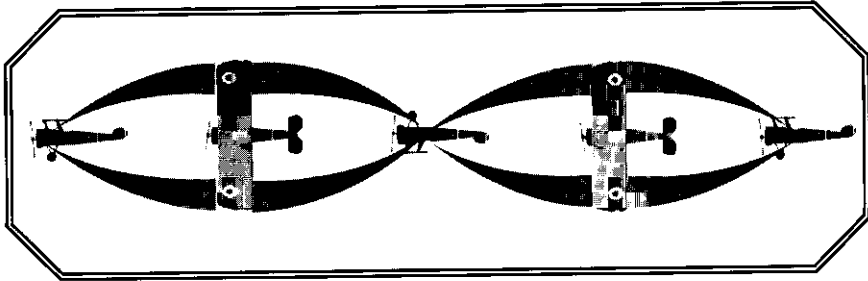
When landing, start your approach from several hundred yards away and adjust your altitude to 150 feet. Your best chance for a successful landing is to land near an aerodrome, but you can land anywhere reasonably flat. Make sure you are lined up with the "runway" and reduce your throttle until you have almost reached stalling speed (around 45 kilometers per hour). When you reach the beginning of the "runway," your altitude should be about 25 feet. Gently raise the nose of the plane (by pulling the joystick toward you) and drop down onto the ground.



FLIGHT MANEUVERS

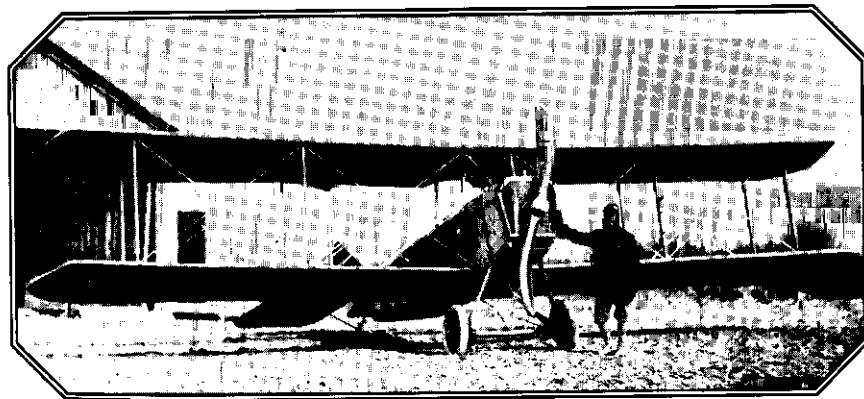
Roll

A *roll* does just what its name implies – you roll the plane around an imaginary axis extending horizontally from the nose through the tail of the aircraft. Rolls do not change your direction, but they may allow you to dodge fire until you are able to move away. To perform a roll, push the joystick to the left or right and release it when you wish to stop rolling.



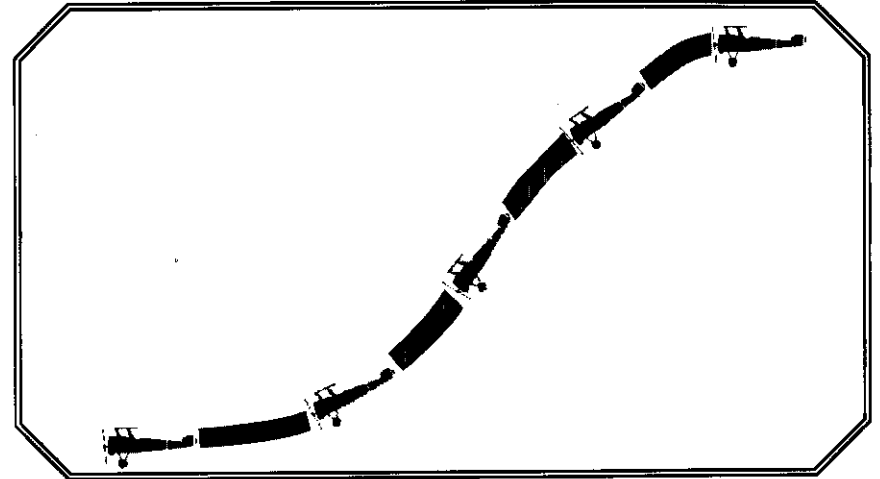
Barrel Roll

A *barrel roll* combines a normal roll with an increase in pitch. This produces a screw-like effect in which your plane spirals around an imaginary horizontal axis. To carry out a barrel roll successfully, push the joystick sharply to the left or right to roll the plane. At the same time, gently pull the nose of the plane up by moving the joystick toward you. This change in pitch keeps your plane oriented about the horizontal axis. This maneuver mimics the spiral of a corkscrew and is a useful evasive method if you are being tracked by enemy fire.



Dive

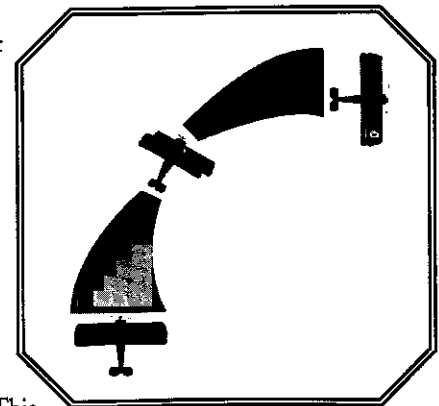
The *dive* is a maneuver primarily used to attack an enemy plane. It involves pitching down and descending at an angle. (A steep or prolonged dive causes the wings to rip off many of the planes flown in the first World War.) Before you go into a dive, make sure that you have enough altitude to do so safely. You should allow at least 1,000 feet between you and the ground at the end of your dive. Next, push the joystick forward. This causes the nose of the plane to dip down. When you finish your dive, pull straight back on the joystick to raise the nose of the plane.



Break Turn

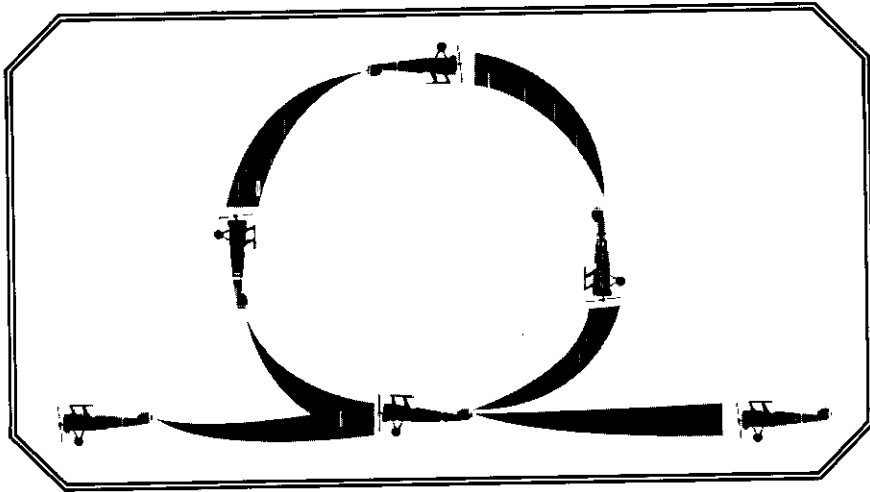
A *break turn* is an offensive or defensive turn used to change direction quickly. To conduct a break, make a hard roll (45 degrees or so) to one side by sharply pushing the joystick left or right. At the same time, pull the control stick straight back to raise the nose of your plane. This maneuver results in a sharp turn. Break turns are especially useful in dogfighting, which requires numerous changes in direction.

NOTE: If you and an enemy plane are moving toward a common point, you should always break *toward* your attacker. This prevents the opposing plane from following your turn. It also reduces the time that the attacker has you in his gunsight. If you break *away* from the other plane, the attacker will be able to form on your tail and shoot you at will.



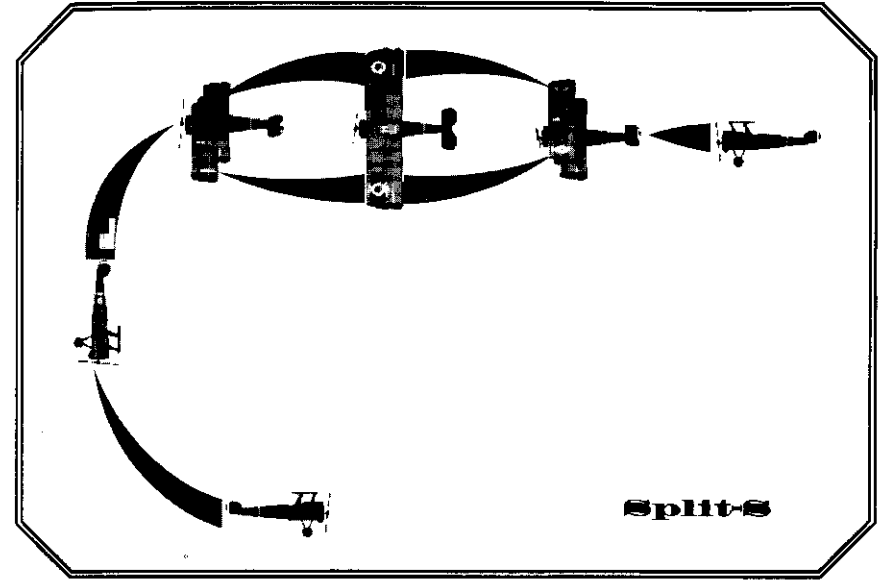
Loop

A *loop* is an offensive or defensive maneuver used mostly by maneuverable fighters. You perform a loop when you complete a full 360-degree vertical turn. To execute this maneuver, make sure you have enough momentum to compensate for the speed you lose during the loop — diving before the loop helps you gain enough speed. (You will learn the correct speed for each plane with practice.) Then, sharply pull back on the joystick so that you begin climbing. By keeping the joystick pulled toward you, you continue to turn. The loop is complete when your plane is once again flying level and facing the same direction as when you started. When you finish the loop, release the pressure on the joystick. Remember, loops cause you to lose both speed and sometimes altitude, so you need to accelerate before attempting this maneuver.



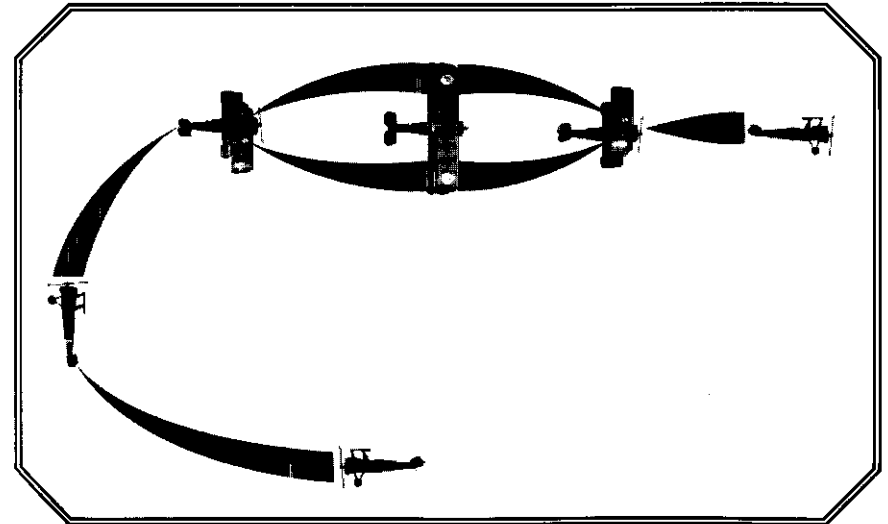
Split-S

You use *split-S* maneuvers to lose altitude and reverse direction. Additionally, your final speed increases as a result of a split-S turn. To perform this maneuver, make sure you are flying level and have ample altitude (several thousand feet). Then, roll the plane 180 degrees so that you are upside down. Pull back on the joystick to go into a half loop toward the ground. Diving for too long at this point can be very dangerous. After you complete the half loop, release the joystick and straighten your course. You should now be flying level, but in the opposite direction and at a lower altitude.



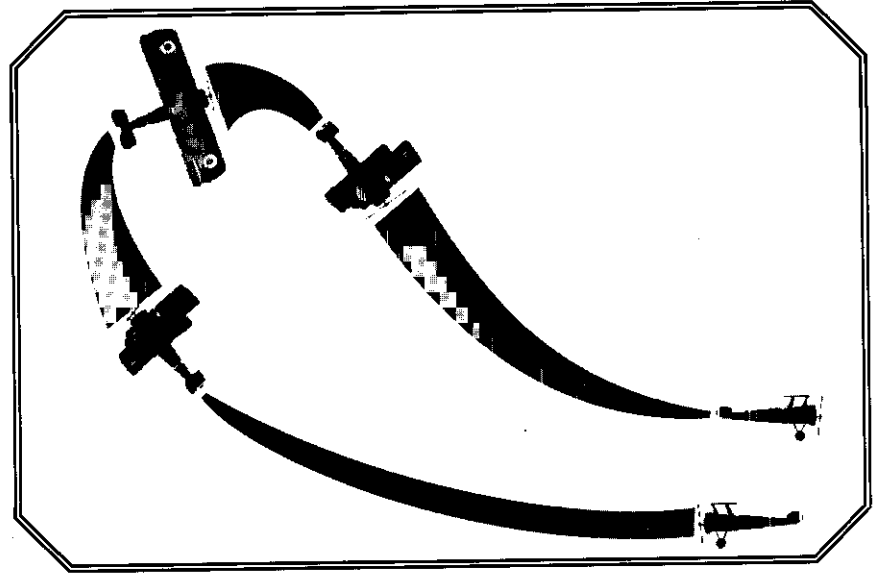
Immelmann

You use *Immelmanns* to gain altitude and reverse direction. This maneuver was named after a World War I German flying ace who used it when he passed under enemy aircraft flying in the opposite direction. To carry out this maneuver, level out your plane and increase your speed. Then, pull straight back on the joystick and go into a loop. At the top of the loop, perform a 180-degree roll and level out the plane so that you are again flying horizontally, but in the opposite direction.



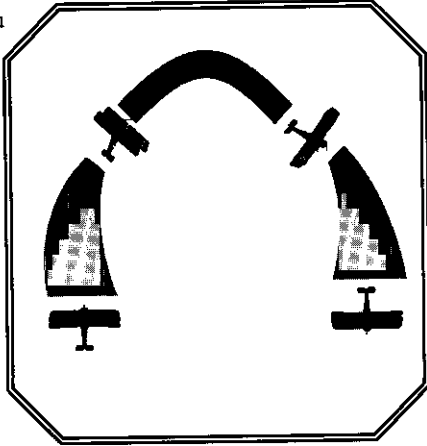
Wing Over

A wing over is similar to riding a skateboard up a ramp, turning, and then rolling back down the ramp. Your end position is the same as your start position, but you are facing the opposite direction. To carry out a wing over, pull the joystick toward you and begin a steep climb. When your plane begins to stall, turn your rudder. (In the game, you use or to turn the rudder to one side.) This causes the plane to turn as if it were pivoting on one wing. When the plane turns a full 180 degrees, straighten out the rudder and dive back into your original position.



Chandelle

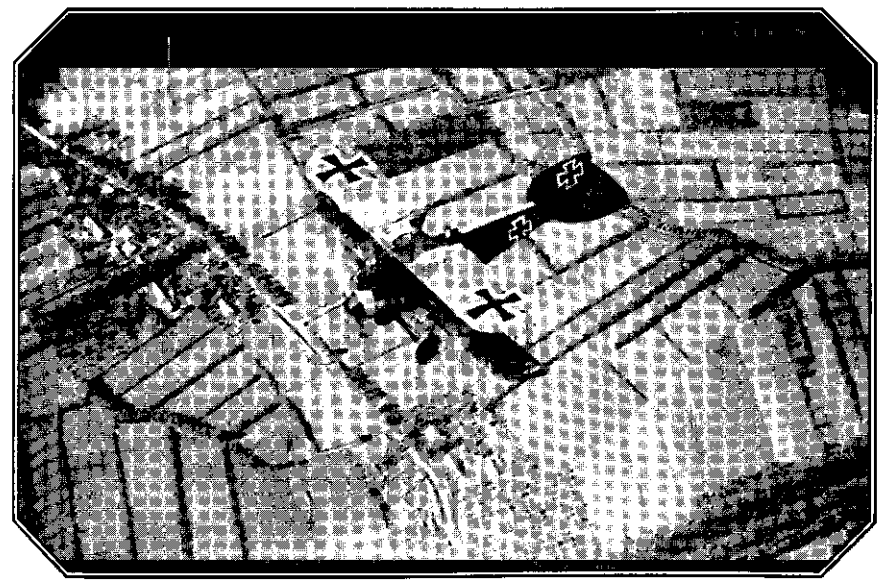
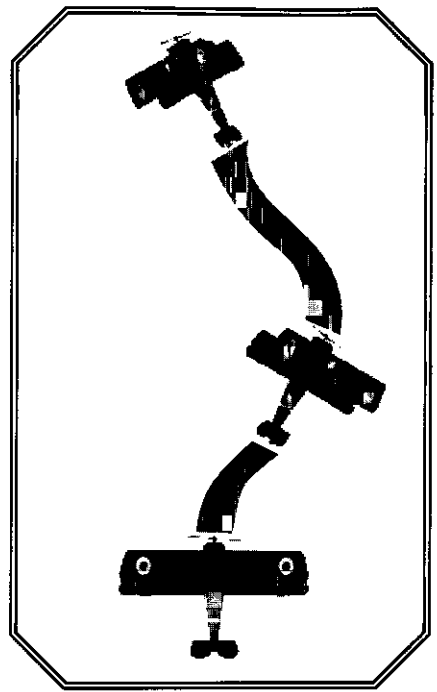
Chandelles are wide half-turns that allow you to gain altitude and change direction. Planes flying at the front of a squadron often used this maneuver to engage enemies that were attacking from the rear. To conduct such a turn, roll your plane by gently pushing the joystick to the left or right. At the same time, pull back on the stick to increase the pitch of the nose and climb up. Sustain your bank until you have completed a 180-degree turn and then resume level flight. After completing a chandelle, you are facing the opposite direction and flying at a higher altitude.



Scissors

The *scissors* maneuver is nothing more than a series of banks back and forth, from left to right. You can scissor your aircraft by alternately pushing the joystick to either side. If you want to increase the tightness of your turns, use the rudder (, or) or the elevators (joystick). Scissoring is useful when you are trying to shake an opponent off your tail. If you are piloting the more maneuverable plane, your enemy may even pass you and allow you to train your guns on his tail.

Many pilots utilized the scissors move, also called *jinking*, to keep an eye out for other aircraft. When escorting a group of bombers, the faster fighters could scissor alongside the other planes. This accomplished two things – it increased the pilot's field of vision, and it killed some of the fighter's speed and allowed it to stay with the slower bombers.



COMBAT

To combat your enemy successfully, you must identify your plane's strengths and weaknesses, while also taking your enemy's into consideration. You must be able to size up the situation and act accordingly. Two fundamental elements can tilt the balance in your favor – the element of surprise and a height advantage. Regardless of your advantage, victory or defeat depends on how well you can perform certain offensive and defensive maneuvers.

This section describes special attack and defense techniques you can apply during your missions. After studying these tactics, try applying them in flight. You may want to review *Principles of Flight* (pp. 42-43) and *Flight Maneuvers* (pp. 48-53) before you read this section.

DETECTING THE ENEMY

During flight, you must remain alert and constantly scan in all directions for enemy aircraft. Surprise is the greatest advantage you can have as a pilot – if your approach remains unnoticed, you will be able to go on the offensive.

To avoid detection, you should try to fly above your enemy. Sometimes you can conceal your approach by flying directly between the sun and your opponent. The sun will blind your enemy. Remember, though, that you can be on the receiving end of one of these surreptitious attacks.

HOMING IN FOR THE KILL

Once you spot your enemy (and if he hasn't seen you), your next goal is to remain undetected. First, try to locate the sun by using the multiple camera views (see *Playguide*). Then, position your plane so that you will eventually come between the sun and the enemy aircraft.

Begin your approach toward the opponent directly "out of the sun" so that he will be blind to your attack. A perfect attack of this type places the sun directly behind your back.

If you cannot use the sun to your advantage, gain altitude so that you are flying higher than your opponent. This does two things: it allows you to dive (trading height for speed), and it helps you avoid detection. You should practice "checking your six," or constantly turning to look up and behind for enemy aircraft.

Another good offensive tactic is to take advantage of your enemy's blind spots. In most planes, pilots find it difficult to see directly behind the plane. The wings and fuselage also serve as natural shields against the pilot's field of vision. Unless the pilot is constantly weaving to check the sky in all directions, he may not see you until your attack is underway.

TAKING THE FIRST SHOT

The greatest mistake many fighter pilots make is firing prematurely while out of range and wasting precious ammunition. Before shooting, make sure that your target is within the range of your weapon. Follow the rule prescribed by seasoned dogfighters – hold your fire until the plane is within 50 yards.

Once you stalk your opponent and move within range, you are ready to attack. Unless you attack head-on or directly from the rear, your enemy will never remain in your gunsight for more than a few seconds. To increase your chances of an accurate hit, you should exercise *deflection shooting*. Deflection shooting means firing leading shots just ahead of your opponent's current position. With practice, the enemy plane will fly directly into the path of your bullets.

When firing leading bullets, you must take into account the speed of your target, the angle of attack, and the distance of your target. You must allow for more lead if the enemy is flying faster, flying perpendicular to you, or breaking away from you.

You will not always have to fire deflection shots. If you are tailing a plane or flying straight toward the enemy, you will make *zero deflection* shots. This means that you aim directly at your target without compensating for the forward movement of your plane or your enemy's plane. Zero deflection shots eliminate the need to shoot ahead of the target and do not affect your aim. You should be able to make zero deflection shots if you are making a head-on pass. (Note, however, that this undesirable position places you directly in the enemy's line of fire.) Also, if you are closing in behind an enemy aircraft at a slight angle, you should be able to make zero deflection shots for at least a few seconds.

Deflection shooting was first practiced in World War I by the great British ace Albert Ball and became standard practice for all fighter pilots after the 1920s. Many fighters, in fact, scratched "Christmas Tree" marks on the gunsight in order to compensate for target movement. Incrementing in length, the tick marks allowed fighters to aim their guns ahead of a target.

ATTACK PASSES

Once you initiate combat, you must outfight your enemy using a series of delicate maneuvers. When you are engaging a fighter plane, you use different tactics than if you are attacking a bomber. Depending on what plane you are in and what plane your enemy is flying, you may choose different tactics in the same situation.

Engaging a Fighter

Dogfight. This combat technique is a twisting series of actions and responses on the part of both pilots. Usually, one pilot tries to shake the tailing pilot and assume his firing position. If you are flying a maneuverable plane capable of making quick turns, you are more likely to emerge the victor from a dogfight. Dogfighting consumes a terrific amount of fuel, so you should make sure your plane is able to weather air-to-air combat.

Stern Attack. This tactic originated during World War I, when attacking pilots would sweep down onto the enemy's tail and open fire as they crossed the other plane's flight path. Easier to carry out than other attacks, inexperienced pilots or poor marksmen tended to use the stern method in fighter-fighter and fighter-bomber engagements.

Stern attacks are most effective when you approach directly from the sun and less potent when you attack speedier aircraft (they can accelerate away from you during your dive). It is a poor attack method against bombers because of the risk of being shot down by a tailgunner.

Engaging a Bomber

You must adopt different tactics to engage a bomber because of the size and speed differences. The lumbering bomber is larger and less maneuverable than its sleek fighter counterpart and less able to evade your attack. Because of these disadvantages, most aircraft of this type were also manned by gunners. When engaging a bomber, you should adhere to several main tactics.

Stern (Rear) Attack. As mentioned in the fighter section, the stern attack is a sweeping attack made from the rear. Requiring little skill, this tactic can be used with caution against bombers without rear gunners.

Side Attacks (High and Low). Side attacks allow you to move into position to make a deflection shot at your enemy. You can make a side attack either high or low, depending on your current position. The most effective attack, the high side pass, is a dive made from 1,500 feet above your enemy.

To make a high side pass, climb to the appropriate altitude. Then, push down on the control stick to begin diving. At the same time, bank in toward your enemy's plane at a 45-degree angle. Open fire when you are within range (remember to fire leading shots). Once you pass under the enemy plane, pull back on the joystick and use your diving speed to climb up. This places you in position to repeat the attack from the opposite side.

If you have a minimal altitude advantage (400-600 feet), you may opt for the low side pass. You execute this attack the same way you would a high pass, except that you do not need to dive steeply. Attacking low does not allow you to reposition yourself easily for a second attack.

Opposite Attack (High, Level or Low).

This attack method involves facing the enemy from above, below or head-on for a one-time firing spree. Although this tactic does not require deflection shots, it is difficult to turn around for a second approach. To make a high opposite attack, fly toward the enemy plane at a slightly higher altitude. As you move closer, push the joystick away from you to descend. When you spot the enemy in your gunsight, begin shooting. Be sure to continue your downward flight path so that you do not hit your target. You can make a low opposite attack using the same method – the only difference is that you are climbing instead of diving.

Level opposite attacks involve flying directly toward your enemy. This method is the most dangerous because you fly directly into your opponent's spray of bullets. With practice, you will be able to jink slightly while firing, and in doing so, reduce your enemy's chances of hitting you.

Overhead Pass. This complex move is equivalent to performing back-to-back split-S and half-loop maneuvers. Many pilots crashed trying to make an overhead pass, but it is a potent weapon if used successfully. You can approach your enemy from the same direction or from the opposite direction of his flight path. You must have several thousand feet of clearance both above and below your target to execute an overhead pass.

To make an overhead pass in the opposite direction, position yourself above, ahead and to the right (or left) of your opponent. Then, go into a banking descent toward the enemy. Once you turn around 180 degrees and position yourself above the enemy, perform a 180-degree roll. Now that you are upside down, pull the joystick toward you and go into a half loop. Toward the end of your loop, begin firing at the enemy. To avoid tailgunner fire after your pass, bank hard to the left (or right) and use your dive speed to set up a second approach.

To make an overhead pass from the same direction, line up vertically with your enemy, but at a slightly higher altitude. Perform a 180-degree roll so that you are looking down at your opponent. Before you reach the other plane, pull the joystick toward you and go into a half loop. Toward the end of your loop, begin firing at the enemy. To avoid tailgunner fire after your pass, bank hard to the left or right and use your dive speed to set up another approach from the same direction.

ATTACKING GROUND TARGETS

One of your most essential objectives is to destroy ground targets. If you succeed in destroying an airfield, you are grounding an entire squadron of aircraft. You can use two methods to attack ground targets – glide bombing or strafing.

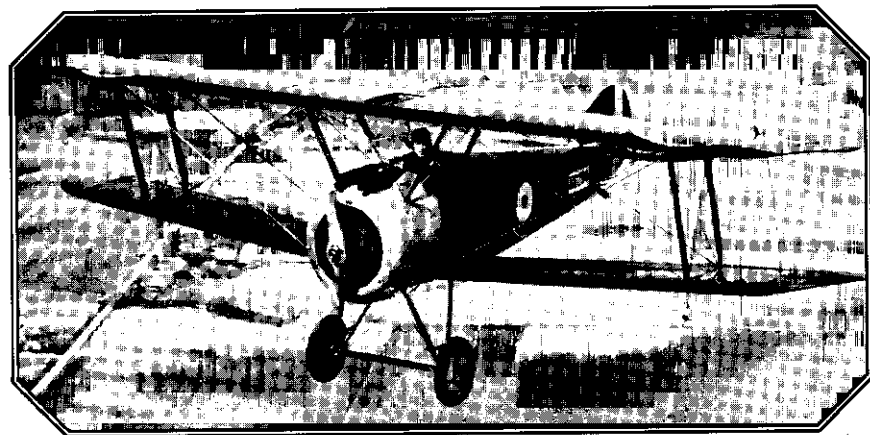
Glide Bombing. You perform glide-bombing maneuvers by beginning your dive further away and approaching the target at a 20-degree angle. Release your bomb just ahead of the target when your altitude drops to several hundred feet. Finally, pull up and increase your throttle to avoid enemy flak.

Strafing. Strafing refers to firing a volley of bullets on a ground target. When flying in early-century planes, it is best to strafe from a low approach.

To make a low strafing attack, drop to a very low altitude (several hundred feet at the absolute highest) and position yourself either in front of or behind the target. Increase your throttle speed and begin firing when the enemy is in range. To spread your ammunition into an arc, alternately turn the rudder left (⤵) and right (⤴) while firing.

WINGMAN DEFENSE

When flying in pairs or in formation, one pilot is the *wingleader* and gives the other plane (the wingman) orders. The wingleader was responsible for scanning the skies straight ahead and directing attacks against targets. The wingman, on the other hand, followed orders and kept a sharp lookout to the rear. Together, they composed a mutual defense.



AWARDS OF WORLD WAR I

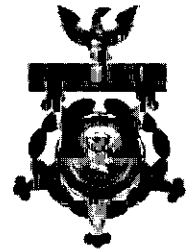
United States' aviators were richly decorated for their participation in World War I. Each Allied country awarded medals to their countrymen and foreign servicemen alike. Neutral or smaller allied countries also had medals of their own, and famous Yank aces found themselves with decorations from such countries as Romania, Serbia, Montenegro and China.

UNITED STATES

Medal of Honor

The United States Medal of Honor is awarded for gallantry in the face of the enemy, and for service above and beyond the call of duty. In World War I, only one was awarded, posthumously.

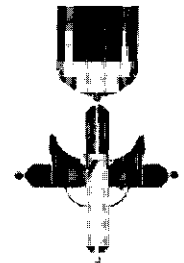
In *Wings of Glory*, it is awarded to the player for 60 kills.



Distinguished Service Cross

The Distinguished Service Cross is awarded to any member of the army, regardless of rank, who distinguishes himself or herself by extraordinary heroism. In World War I, 235 were awarded, including 41 awards with Oakleaf cluster — indicating a second award of the Distinguished Service Cross.

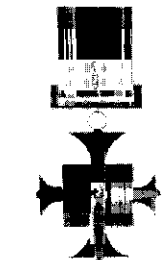
In *Wings of Glory*, it is awarded to the player for bombing a bridge in support of the Battle of Lys.



Distinguished Flying Cross

The Distinguished Flying Cross is awarded to aviators who had been recommended for, but not awarded, other high medals.

In *Wings of Glory*, it is awarded to the player for participation in the Battle of St. Mihiel.

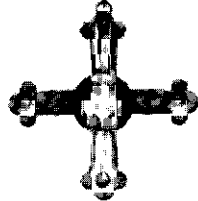
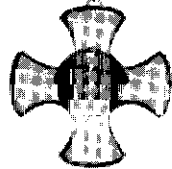
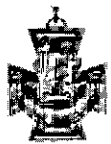
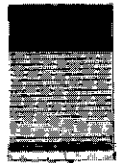


BRITAIN

Victoria Cross

The Victoria Cross was established in 1856 by Queen Victoria. It has precedence over other orders of Knighthood such as the Order of the Garter, the Order of the Thistle, and the Order of St. Patrick. It is awarded for a single act of bravery or devotion to the country performed in the presence of the enemy.

In *Wings of Glory*, it is awarded after single-handedly bombing a munitions factory.



Distinguished Service Order

Founded in 1886, the Distinguished Service Order is awarded only to commissioned officers, generally for valor or merit which does not warrant the Victoria Cross. Bars are awarded to represent subsequent awards of the same decoration. In World War I, two DSOs were awarded to Americans. Albert Ball, the British pilot eventually credited with forty-four kills, is believed to be the first officer to receive the DSO with two bars.

In *Wings of Glory*, it is awarded to the player for 10 kills.

Distinguished Flying Cross

The British Distinguished Flying Cross was created on April 1, 1918, to replace the Military Cross when the Royal Flying Corps and the Royal Naval Air Service were combined. It is awarded to officers and warrant officers for an act, or acts, of valor, courage or devotion to duty performed while flying against the enemy. The DFC is only given for service in the air. In World War I, twenty were awarded to Americans.

In *Wings of Glory*, it is awarded to the player for 5 kills.

FRANCE

Legion d' Honneur

The Legion d' Honneur was founded by Napoleon Bonaparte on May 19, 1802, for gallantry in action. There are five grades of the award. The two lowest (Officer's Cross and Knight's Cross) went to younger combat officers. The Knight's Cross could also be awarded to non-commissioned officers and foreigners for outstanding military service. There is no distinction between award during war and award for civil service. In World War I, 39 were awarded to Americans.

In *Wings of Glory*, it is awarded to the player after the attack on the Douai aerodrome.



Croix de Guerre

Established on April 8, 1915, the Croix de Guerre is given to any individual mentioned in dispatches by a general or commanding officer. For mention in an Army dispatch one receives a bronze laurel wreath (called a palm) affixed to the ribbon. For mention in an Army Corps dispatch, a gilt star is awarded. Mention in a Divisional dispatch earns a silver star, and mention in a Brigade, Regimental or Unit dispatch is rewarded with a bronze star. In World War I, 158 were awarded to Americans, eight of whom twice received this honor.

In *Wings of Glory*, it is awarded to the player for 15 kills.



Medaille Militaire

The Medaille Militaire is awarded to NCOs in the army or navy. In World War I, five were awarded to Americans.

In *Wings of Glory*, it is awarded to the player for 30 kills.

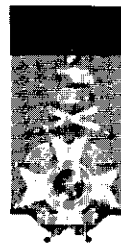


BELGIUM

Order of Leopold

The Order of Leopold is awarded to officers for gallantry and long service. In World War I, 13 were awarded to Americans.

In *Wings of Glory*, it is awarded to the player for 20 kills.



GLOSSARY

A.E.F. Abbreviation for the American Expeditionary Force.
 Ace A pilot with five kills to his credit. (p. 24)
 Adrift To be absent without leave.
 Aerodrome Air field.
 Allies The American, British, French, Italian and Russian coalition allied against the Central Powers.
 Archie Slang for anti-aircraft fire.
 Bird Slang for airplane.
 Blip the motor Temporarily shut off power to the engine. This was the only method of controlling speed on earlier planes (such as the Bleriot XI), but stopping the motor for more than a few seconds significantly increased the chances that the engine would catch fire.
 Bosche French slang for German forces.
 Bounce A slang term meaning to surprise an enemy aircraft.
 Brass Hats Slang for American commanding officers, referring to the braid worn on their hat brims.
 Bullseye The central mark of a target.
 Buckshee Items that a soldier got for free, either found or stolen; corruption of the Indian word Baksheesh.
 Bus Slang for airplane.
 Cad A man whose behavior is ungentlemanly.
 Central Powers Germany and Austro-Hungary.
 Charon Mythical figure; pilots the boat carrying the souls over the river Styx in hell.
 Chucked her about To handle a plane wildly or badly.
 Chipper Sprightly, in good spirits.
 Coil A belt of machine gun ammunition stored in a coiled form.
 Cook's Tour To shepherd inexperienced soldiers on the battle front.
 Crowing Bragging.
 Dawn patrol Early morning air patrol of the assigned sector, often to determine enemy location and intent.
 Doughboys Slang for American forces.
 Durance Vile imprisonment.
 Editors Officers assigned to screen letters to and from soldiers to prevent disclosure of classified information; any questionable material was cut from the letter.
 Flight A smaller portion of a squadron's strength.
 Flux Diarrhea.
 Forward Ops Slang for Forward Operations, which sent orders from the battle front to units stationed behind the lines.
 Greenhorn An inexperienced person.
 Hindenburg Line German battle line.
 Home Office The British government office charged with, among other things, civil defense.
 Horn Slang for telephone or field radio.

HQ Slang for headquarters.
 Huns Slang for German forces.
 Jerrys Slang for German forces.
 Kill A downed aircraft credited to a pilot.
 Kit Pack containing a soldier's belongings.
 Landowner Soldier's term for dying; he would "own" the land he was buried in.
 Lit up like a new saloon Drunk.
 Major-domo A man in charge of the housekeeping staff of a large hotel.
 Mustard gas An oily substance that blistered and disabled anyone exposed to it; used in artillery shells.
 Pitch Rotation about an axis running through your plane from wingtip to wingtip. (p.44)
 Poilus Name for the French forces.
 Puttees Fabric wrappings worn around a soldier's lower legs.
 R.F.C. Abbreviation for the British Royal Flying Corps. Became the Royal Air Force on April 1, 1918.
 Roll Rotation about an axis running through your plane from nose to tail. (p. 44)
 Roving commission Having no set patrol to fly; having orders to fly at will and freely engage any enemy encountered.
 Rudder The fin on the tail of an aircraft that controls its yaw. (p. 45)
 Sanitary fatigue duty Digging trenches for new latrines and covering over old trenches.
 Sans fairy ann Corruption of the French phrase "sans ne fait rein," it doesn't matter.
 Sausage Observation balloon or dirigible.
 Snipes Imaginary creatures.
 Sortie A mission flown by an airplane.
 SPAD Acronym for the French Societe Pour l'Aviation et ses Derives which was responsible for building such aircraft as the SPAD VII and XIII.
 Squadron A tactical aircraft unit, usually composed of between 12 and 18 planes.
 Stick The control column in an aircraft's cockpit used to operate the ailerons and elevators.
 Stunts Aerial acrobatics in an aircraft for the purpose of showing the pilot's skill and daring.
 Sub pens German submarine bases.
 Swell Slang for someone who is strikingly stylish.
 Tommy Slang for a British soldier.
 Top Brass Slang for British commanding officers, referring to the brass insignia markings worn on their uniforms.
 Tram A British automobile that provided public transportation.
 Two-seater A plane that carried a crew of two, generally an observation aircraft.
 Wet behind the ears Inexperienced.
 Wind up To panic.
 Yank Slang term for American forces.
 Yaw Rotation about an axis running vertically through your plane. (p. 45)