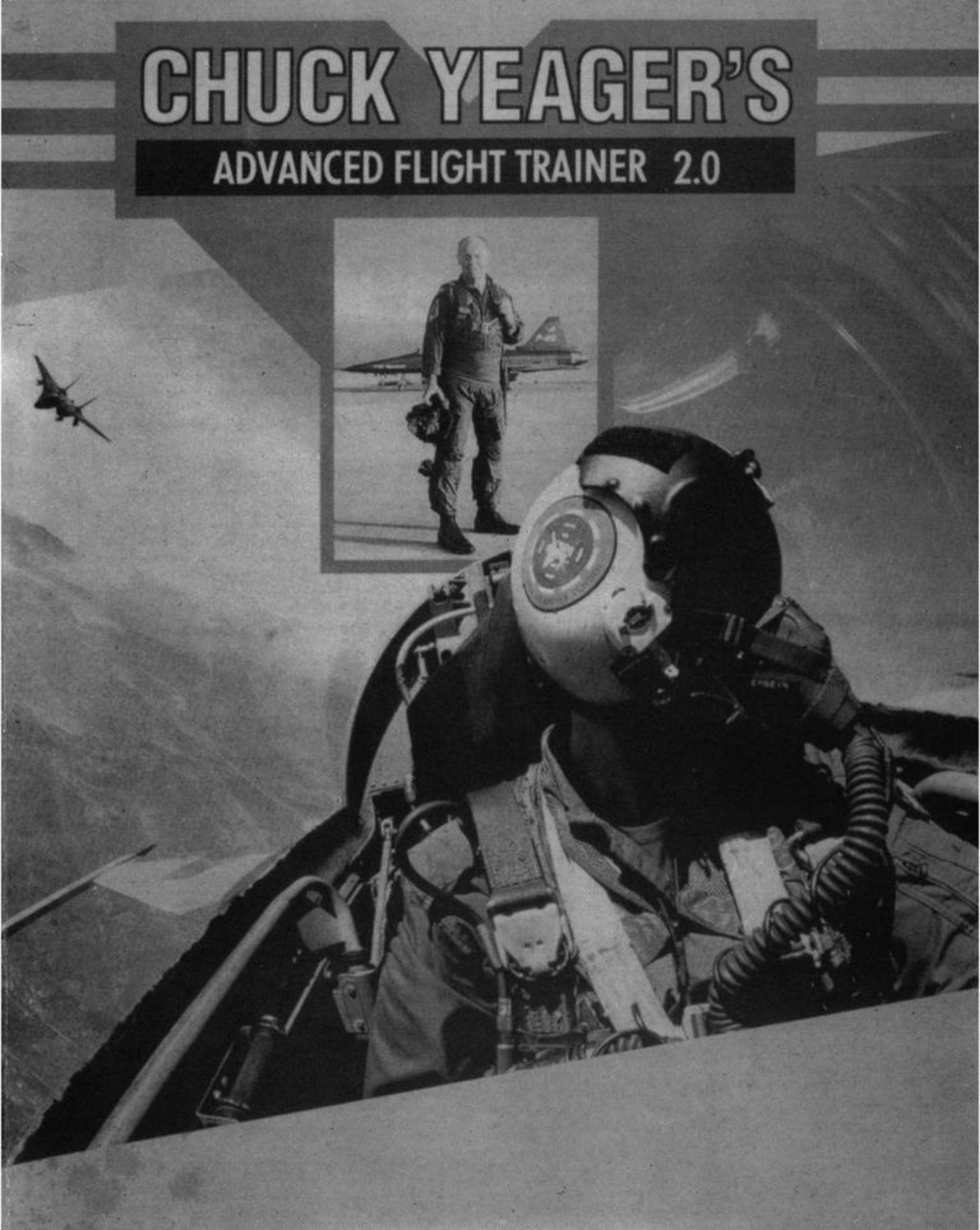
CHUCK YEAGER'S

ADVANCED FLIGHT TRAINER 2.0



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PART I: WELCOME TO AFT 2.0

General Yeager, before he became a general:
If they would've decided to make me a general, my first question would've been: Do generals get to fly?

USING THIS MANUAL

This manual was written for IBM or IBM-compatible computers. If you're using another type of computer, some commands and features described in this manual may be different or unavailable on your computer system. If you're using any computer *other than* an IBM or IBM-compatible computer, please read the Command Summary Card for information specific to your computer.

This manual is divided into three parts:

- Part I, *Welcome to AFT 2.0*, contains everything you need to play AFT. You'll learn how to load your game, read the instrument panel, and control an airplane.
- Part II, *Missions*, describes flight training, races, formation flights, and test piloting.
- Part III, *Technical Reference*, explains the basic concepts of flying. This section also contains details on the flight simulator.

Flying Insights™ tape Let Chuck Yeager tell you about AFT's many features with the Flying Insights tape included in the package. Load the game and play the tape. Chuck Yeager will fill you in on AFT and personally instruct you on your first flight.

GETTING STARTED

This section tells you how to properly load AFT on your computer.

➤ Check AFT's Requirements

To play AFT 2.0, you must have a computer with at least one floppy drive and 512K of free memory. Your system must be running on DOS 2.0 or higher and have a graphics adapter — either EGA, CGA, MCGA, VGA or Hercules.

AFT has an unusually large number of files, all of which had to be compressed to fit onto the floppies included in the package. The result is YOU CAN'T PLAY FROM THE ORIGINAL AFT DISK(S). Instead, an install program on your original AFT disk creates a copy of the game from which you'll play. The install program configures the game to your current system. If you upgrade your system, you should create a new copy of the game.

5.25" users You'll find two disks in the package: Disk #1 and Disk #2. During installation, you'll have to swap these disks.

3.5" users The entire game has been packed onto one disk. Whenever you're asked to insert an *original* Disk (#1 or #2), insert the single disk included in the package.

➤ Install AFT

Installing AFT on a Hard Disk To copy all the files from the original AFT disks to your hard disk, do the following:

1. Turn on your computer and wait for the DOS prompt.
2. Insert the original Disk #1 in drive A or B.

3. Type **A:** or **B:** (whichever drive the original disk is in) and press **<Enter>**.
4. Type **INSTALL** and press **<Enter>**.
5. You'll be asked what kind of disks you want to install the game on. Use the up/down (↑ ↓) arrow keys to move the highlighted bar to "Hard or Ram Disk". Press **<Enter>** to install the game on your hard disk.
6. The machine will want to know which drive on your hard disk you're going to install AFT on. The default drive is C. Press **<Enter>** to install the game on drive C, or type the letter of the drive you want to install it on, then press **<Enter>**.
7. Finally, you'll need to name the directory that the game will be stored under. "YEAGER" is the default name. Press **<Enter>** to name the directory "YEAGER", or type in a new name and then press **<Enter>**.
8. The install program will tell you when to take out Disk #1 and insert Disk #2. When the installation is complete, put away the original disks for safekeeping.

To start AFT from your hard drive:

1. Plug in any IBM-compatible mouse or joysticks. In addition to the keyboard, you can use one or two joysticks; a mouse; a joystick and a mouse; or a flight stick such as the Maxx™ Yoke.
2. Turn on the computer. (You *must* plug in your input device before you turn on the computer.)
3. Type in the letter of the drive you installed AFT on (if you chose the default drive, you'd type **C:**). Press **<Enter>**.
4. At the prompt, type the name of the directory the game is stored under (for instance, if you chose the default name, "YEAGER", you'd type **CD\YEAGER**). Press **<Enter>**.
5. At the prompt, type **YEAGER** and press **<Enter>**.

Installing AFT on Floppy Disks You can't play from the original AFT disks, so you'll have to install the game on floppy disks from which you can play. Please format *one* of the following configurations of disks before you do anything else:

A) One 5.25" 1.2MB floppy disk

B) One 3.5" 1.44MB floppy disk

C) Two 5.25" 360K floppy disks

D) Two 3.5" 720K floppy disks

See your DOS manual if you don't know how to format disks.

To install AFT on your blank disks, do the following:

1. Boot your system with DOS (2.0 or higher).
2. Insert the original AFT Disk #1 in drive A or B. Type **A:** or **B:** (whichever contains the original disk) and press **<Enter>**.
3. Type **INSTALL** and press **<Enter>**.
4. Use the up/down (↑ ↓) arrow keys to move the highlighted bar to the kinds of disks you want to install the game on (whatever kind you formatted above). Press **<Enter>** to choose the disk configuration.
5. The machine will ask if you have these disks ready at this time. Press **<Enter>** if you have the blank disks ready. If not, return to DOS by typing **NO** and pressing **<Enter>**.
6. Follow the onscreen instructions. You'll have to swap disks from time to time. When the installation is complete, make another set of copies to act as backups, then put away the original disks for safekeeping.

To start AFT from a floppy disk:

1. Plug in any IBM-compatible mouse or joysticks. In addition to the keyboard, you can use one or two joysticks; a mouse; a joystick and a mouse; or a flight stick such as the Maxx Yoke.
2. Turn on the computer. (You *must* plug in your input device before you turn on the computer.)
3. Insert your copy of Disk #1 into drive A or B. If you have two identical drives, insert your *copy* of Disk #1 into drive A and your *copy* of Disk #2 into Drive B. If you have two drives that are not identical, the entire program can only be run from one drive.
4. Type **A:** or **B:** (whichever contains the *copy* of Disk #1), then press **<Enter>**.
5. Type **YEAGER** and press **<Enter>**.

➤ Enter the Password

Before you can begin flying, you must enter the correct password. After you load AFT, you are asked to look through this manual and find a word in a particular paragraph. The question will look something like this:

> Please enter the 1st word in the paragraph marked AILERONS in the manual.

Find the paragraph in this manual marked by the flight term you see on the screen. Next, find the word in the paragraph (first, second, third, etc.). Type the word and press **<Enter>**. For example, the word you are asked to enter in the example above is "When" (page 22). AFT will tell you if you've entered the wrong security code. You only get one try to enter the right code before AFT returns you to DOS.

Once you've entered the correct code, a title screen briefly appears. You're then dropped into the cockpit of an airplane on the runway of the main airport. Before you take her up, please configure AFT to your computer as explained below.

➤ Configure AFT

AFT 2.0 automatically configures itself to your graphics adapter and ports, but there are a number of options you can set yourself. When you quit the game, AFT copies your current configuration into a file. The next time you start AFT, your configuration will be the same as it was when you quit your last game.

To set the configuration, press <Esc> to call up the main menu. Move the highlight bar to ? by using the cursor keys (← →); press <Enter>. Then use the down cursor key (↓) to highlight **CONFIG**; press <Enter>. Use the cursor keys to highlight options, then press <Enter> to set your selections. Set the following items:

EGA If you have an EGA board, you can choose your monitor resolution: **320 X 200**, **640 X 200**, or **640 X 350**. Higher resolution is visually spectacular, but also causes the game to run slightly slower than in a lower resolution. This may or may not be noticeable depending upon the speed of your machine. Also, no cockpits are displayed in 640 X 350 mode.

SOUND With **OFF** selected, AFT produces no sound effects. On **QUIET** you hear crashes, stall warnings and touch down effects. **FULL** adds the sound of your engine.

MOUSE If you're using a mouse, you can set its sensitivity. Mouse sensitivity is measured in dots per inch (DPI). The lower the number, the higher the sensitivity.

JOYSTICK Select **OFF** if you aren't using a joystick. If you're using a single joystick, set this on 1. If you have a joystick with a throttle setting on it (such as the Maxx Yoke), select 1+. Select **2** if you have two joysticks. To use a mouse and joystick combination, set your joystick on 1 and turn your mouse on (see MOUSE above). To find out how the combinations actually control the planes, see page 17.

TIME Choose **DAY** or **NIGHT** flying.

STARS Choose whether you want to have stars showing or not. Select **OFF** if you don't want any stars showing. Choose **ON** and the stars will shine (during the day, you

have to be pretty high up to see the stars). The major constellations of the northern hemisphere are also mapped in the sky. Choose **CONSTELLATIONS** if you want the major constellations displayed.

MAP The AFT world is one huge map with several locations or "landmarks." You can choose to have all of the landmarks showing (**FULL**) or just a partial showing. With **PARTIAL**, AFT displays only a few landmarks at a time. The advantage to a partial showing is that the frame rate will speed up and AFT will run faster. (For more on AFT landmarks, see *Locations*, page 48.)

SEE SELF When you're in PILOT view, you can *rotate* your view from the canopy to look around you. The problem? The airplane's nose and fuselage limit your view. Select OFF to hide the airplane when viewing in this mode; select **ON** to see the airplane. Note that this only affects PILOT view. (For more on Views, see page 63.)

WINGMEN In formation flying, you have wingmen that fly along side of you. Select **ON** to see the wingmen or **OFF** to hide them from your view.

Getting Maximum Performance From AFT

The more objects there are on the screen, the slower the simulation runs. If you want the simulation to run at maximum speed, set MAP on **PARTIAL** and SOUND, STARS, SEE SELF and WINGMEN on **OFF**. Set EGA on **320 X 200**. While you are flying, you can turn off the instrument panel by pressing <**Enter**> (you can fly just fine using the information on the Heads-Up-Display). Practice your takeoffs and landing at the airstrip, not the main airport (select AIRSTRIP from the LOCATIONS menu). If you're not flying with a joystick already, you might consider buying yourself a joystick and a game port adapter.

Needless to say, the faster your machine, the better. Slow machines may encounter some problems: onscreen messages may appear too early in certain circumstances. If you find this is true for your machine, ignore the onscreen messages completely — you can fly easily without them.

➤ Selecting Menu Options

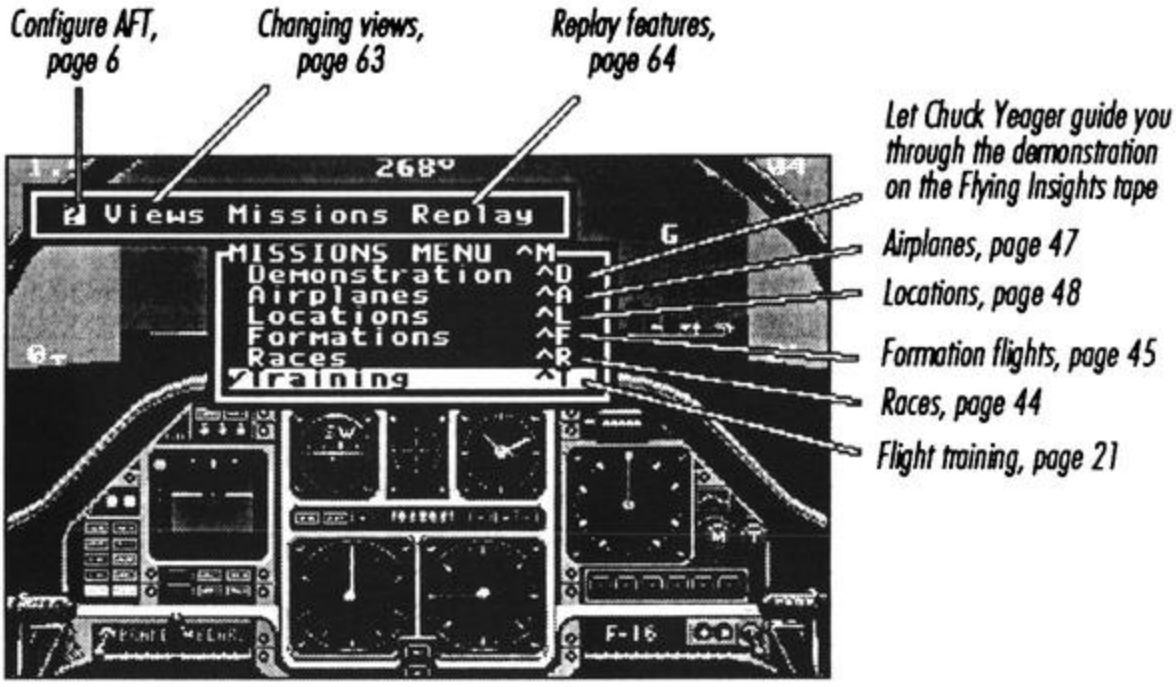
To select an option from a menu bar or a menu, highlight the option you want and press <Enter>. Use your cursor keys (← → ↑↓) to move the highlight bar. Use the <Esc> key to exit a menu. If only the main menu is showing, <Esc> will return you to your flight. If you're flying, <Esc> will pause the flight and call up the main menu.

There are also a number of Quick Keys you can use to go directly to a menu:

<Ctrl>V	Views	<Ctrl>T	Flight Training
<Ctrl>M	Missions	<Ctrl>1	Day 1, Flight Training
<Ctrl>D	Demonstration	<Ctrl>2	Day 2, Flight Training
<Ctrl>A	Airplanes	<Ctrl>3	Day 3, Flight Training
<Ctrl>L	Locations	<Ctrl>4	Day 4, Flight Training
<Ctrl>F	Formations	<Ctrl>5	Day 5, Flight Training
<Ctrl>R	Races	<Ctrl>6	Day 6, Flight Training
<Ctrl>Q	Quit	<Ctrl>C	Quit

In AFT, <Alt> functions the same as <Ctrl> in all situations.

➤ Take Off!



You're now free to explore AFT 2.0's exciting features.

Can't tell an elevator from a rudder? If you don't know a thing about airplanes, go to "The Basics of Flying" in Part III, *Technical Reference*. Knowing the fundamentals goes a long way when it comes to controlling your airplane. Once you've read that section and understand the fundamentals of flight, continue with "AFT Instrument Panel," the next section.

➤ Problems Getting Started?

AFT automatically configures itself to your system and saves the configuration as a file on your disk. If you have one of the following monitors or graphics cards, you may encounter problems getting started:

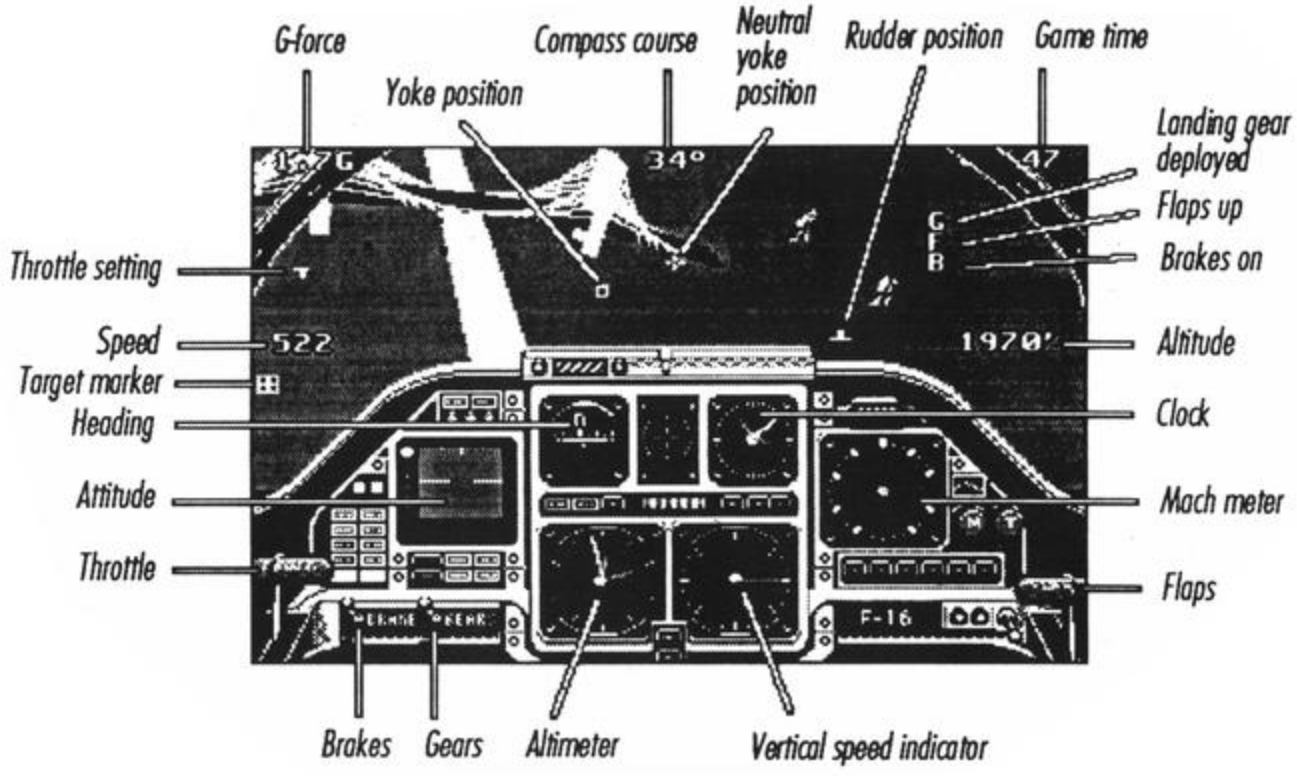
Hercules You've just typed **YEAGER** to start the game and all you're getting is a dark screen. Reboot your system with DOS and follow the starting instructions above, only when you get to step 4., type **YEAGER H**. This configures your *copy* of AFT to your Hercules graphics card.

EGA If you have an EGA card and a RGB monitor, you must leave the resolution setting on 320 X 200. If you changed the resolution setting under the CONFIG menu, the screen will show unrecognizable graphics. Since AFT saves this as a new configuration, you'll have to do the following in order to change the setting back to 320 X 200:

1. Press **<Ctrl>-Q** to quit the game.
2. Follow the start procedures above, only when you get to step 4., type **YEAGER C**.
3. Go to the CONFIG menu and change the resolution settings back to 320 X 200.
4. Press **<Ctrl>-Q** to quit the game, then restart as you normally would by just typing YEAGER.

AFT INSTRUMENT PANEL

The AFT instrument panel contains all the instruments you'll need for the flight missions. Below is a typical instrument panel. Exactly what you see onscreen depends on the airplane you're flying. Each time you load AFT, you automatically get the last plane you were flying. Below is the instrument panel of the F-16.



Heading Indicator Like a compass, this shows which direction the plane is flying — north, south, west, east, or points between.

Airspeed Indicator or Mach Meter Registers the speed of the airplane through the air in miles per hours (mph), or registers the ratio of airspeed to the speed of sound (1 Mach is 760 mph at sea level).

Attitude Indicator Portrays the airplane's position relative to the horizon. It shows the degree of bank and the amount of pitch.

Altimeter Measures the height in feet of the airplane above sea level. AFT airports and open terrain are at sea level.

Vertical Speed Indicator (VSI) Indicates whether the airplane is climbing, descending, or in level flight. The rate of climb is measured in feet per minute (fpm), in rates up to 2000, 4000, or 8000 fpm, depending on the plane you're flying.

Brake Control Shows whether your brakes are on or off.

Landing Gear Control Shows whether the gear is up or down.

Throttle Control Tells you how far you've advanced the throttle. It measures power output as a percentage of full engine capacity.

Slip Indicator (Inclinometer) Registers how coordinated your use of ailerons and rudder is. In a coordinated turn, the ball rests between the two reference marks. If the ball goes to the far right, feed right rudder. If the ball goes to the far left, feed left rudder.

Flaps Control Shows whether the wing flaps are up or down.

Clock Displays computer clock time.

Instruments are useful but not absolutely necessary for flying. Sometimes the instrument panel gets in the way of the HUD. Though the information is usually repeated on the instrument panel, it's often easier to refer just to the HUD. You can choose to see the panel or not by pressing <Enter>.

HUD Instruments

AFT has a secondary monitoring system called the *Heads-Up-Display (HUD)*. The HUD is a transparent sheet spread across the glareshield upon which critical information is electronically projected. HUDs reduce the need to look down at your instruments. There are two parts to AFT's HUD: control markers and instrument markers.

Control Markers

Control markers tell you the status of critical controls. Turn the control markers on and off by pressing **H**.

+ Marks the center of your screen and the neutral position of your ailerons and elevators. This is the only marker that won't disappear when you turn off the HUD markers.

□ Reports aileron and elevator positions (your ailerons and elevators are always coupled in AFT.) The box follows the movement of the joystick, mouse, or keypad keys.

⊥ Tracks rudder position. When the marker is to the left of the center of the screen, the rudder is pointed to the left. Likewise, when the marker's to the right, the rudder is pointed to the right.

T Throttle position. The higher the T appears on the screen, the higher your throttle is set.

F Your flaps are down. When your flaps are up, the letter disappears.

G Your landing gear is down. The letter disappears when your landing gear is up.

B Your brakes have been set. The letter disappears when the brakes are off.

Instrument Markers

Instrument markers give you critical flight information: your altitude, speed, etc. Turn the instrument markers on and off by pressing **<Shift>-H**.

+ The target marker represents your next "target" or goal. The target in a flight differs depending on which mission you're flying. In a race, the target is the next gate you must pass through. If you're flying in a formation, the target is your position in the formation. If you're just out for a joyride, the target is the main airport. When you're flying in

formation or racing, the idea is to try to head for the target marker. This means keeping the marker in the center of the screen. As long as your target is in view from the cockpit, the target marker remains on the screen. If you can no longer see the target from the cockpit view, the + turns into a ⊞. The ⊞ marker will move along the perimeter of the screen. To stay on target, move the nose of your plane toward the ⊞ until it turns into a +.

Gs	The number of Gs your airplane is experiencing. A G is the basic unit measuring load factors on your airplane.
Compass	The direction you're heading. 0° is north; 90° is east; 180° is south; and 270° is west.
Game Time	The time that has elapsed since you started your mission.
Speed	Your speed in miles per hour.
Altitude	Your altitude in feet.

The figures on the HUD may seem distracting at first. When real HUDs first appeared in airplanes, many pilots complained that the movement on the periphery of their vision was distracting. However, once they got used to the floating numbers, they realized they could gain critical information about their machine without so much as moving the eye.

CONTROLLING AFT PLANES

You can control AFT planes with the keyboard or you can use different combinations of keyboard, joystick, mouse and/or Maxx Yoke. What you use depends on your preference and the equipment you own. Whatever instrument you use to control your planes, you'll still need to use the keyboard to enter certain commands.

You can't watch yourself fly. But you know when you're in sync with the machine, so plugged into its instruments and controls that your mind and your hand become the heart of its operating system. You can make that airplane talk, and like a good horse, the machine knows when it's in competent hands.

Using a Joystick

A joystick works the same as a yoke in a real airplane. Pulling back on the joystick will cause the plane to climb; pushing forward will cause the plane to dive; pulling to the side will cause the plane to roll.

The two joystick buttons act as rudder control: one button moves your rudder to the left, the other to the right. Before you begin your first flight, check which button feeds left rudder and which one feeds right rudder. Pressing both buttons at once centers the rudder. With one joystick, the throttle must be set using the keyboard.

➨ From the CONFIG menu, select 1 from JOYSTICK.

Recalibrating Joysticks When you start, AFT electronically sets the yoke to correspond with your joysticks current position. This should be the center. If it isn't, reconnect the springs so the joystick is exactly in the center. Now press J to recalibrate.

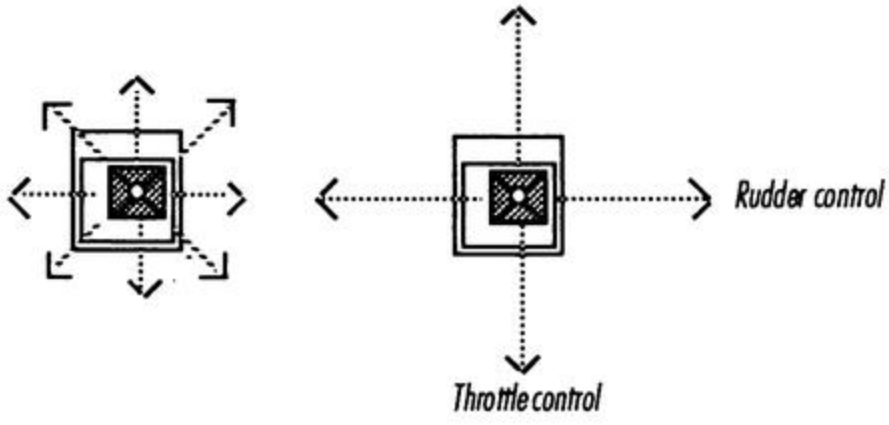
Using a Flight Stick

A flight stick is a joystick with a throttle control added, usually in the form of a lever or dial. Two of the flight stick buttons function as rudder controls. Pressing them both centers the rudder. When you begin AFT, set the throttle control in the middle (50%).

➨ From the CONFIG menu, select 1+ from JOYSTICK.

Using Two Joysticks

If you're using two joysticks, one joystick is your aileron/elevator control and the other is a combination of throttle and rudder control. When you begin AFT, set the throttle control in the middle (50%).



Joystick #1
Aileron/Elevator Control

Joystick #2
Rudder/Throttle Control

You'll have to test which of your joysticks controls the aileron/elevator stick and which controls the rudder and throttle. Do this by selecting HANGAR from the LOCATIONS and testing which joystick moves the appropriate markers on the Heads-Up-Display (see page 12 for information on HUD markers).

Disconnect the up/down spring (the throttle) so it won't auto-center. Most joysticks have a switch on the bottom that you can set on "free." This releases the spring so your throttle setting can remain constant. You should leave the spring controlling the left/right action (rudder) on auto-center. The joystick buttons have no effect when you're using two joysticks.

➨ From the CONFIG menu, select **2** from JOYSTICK.

Using a Mouse

To be able to use a mouse, you must have a Microsoft®-compatible mouse driver already installed and running. The aileron/elevator marker follows the mouse cursor. The mouse buttons act as rudder controls. Pressing both mouse buttons center the rudders *and* the aileron/elevator controls. Use the keyboard to set the throttle.

➨ From the CONFIG menu, select **OFF** from JOYSTICK. Set the MOUSE on **200.**

Using a Mouse and a Joystick

You can use a mouse and joystick combination. The joystick acts as aileron/elevator control while the mouse acts as throttle/rudder control. (Move the mouse up and down to set the throttle, right and left to set the rudder.) The joystick buttons also set the rudder; press both buttons to center the rudder. Mouse buttons have no effect when you're using a mouse and a joystick.

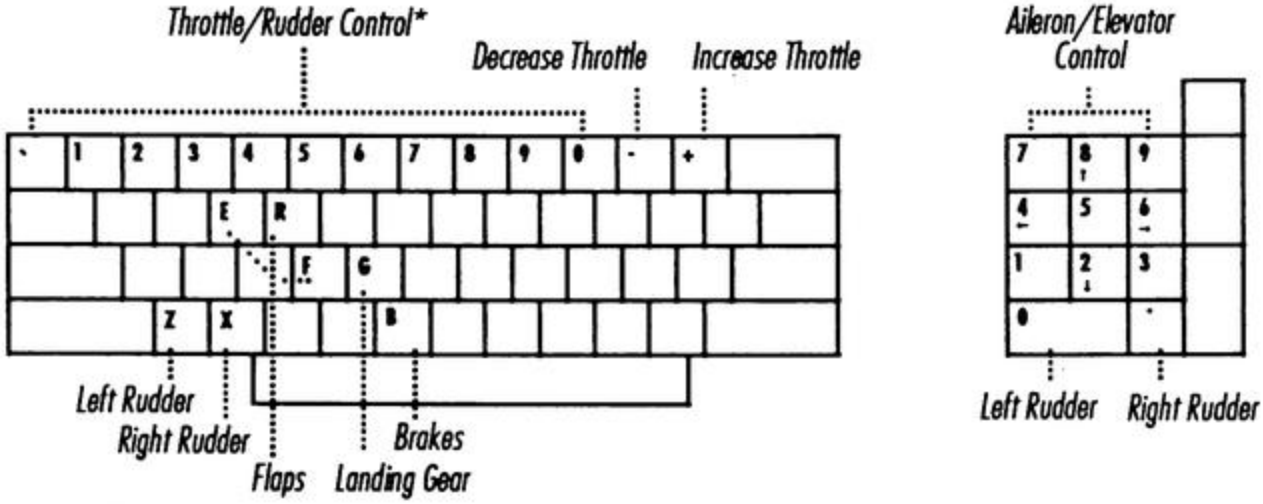
➨ From the CONFIG menu, select 1 from JOYSTICK. Set the MOUSE on **200.**

Using the Maxx Yoke

AFT is compatible with the Maxx Yoke, which simulates a modern airplane control wheel. Turning the wheel left and right controls the ailerons. Pushing or pulling the wheel controls the elevators. The firing buttons on the handles control the rudder. The Maxx Yoke has its own throttle setting. When you begin, set the throttle slider in the middle (50%). If you accidentally start AFT with the Maxx throttle on a different setting, center the wheel, slide the throttle to the middle, and press J to recalibrate.

➨ From the CONFIG menu, select 1+ from JOYSTICK.

Using the Keyboard



Ctrl + *Any throttle, rudder, and aileron/elevator key* = *Macro-movement*

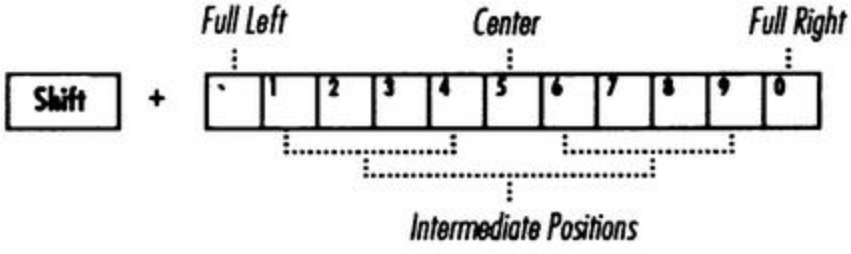
Shift + *Any throttle, rudder, and aileron/elevator key* = *Micro-movement*

} *Does not apply to throttle/rudder number keys*

** Keys have dual functions. See descriptions below.*

Throttle Control Keys You can set the throttle in 10% increments by pressing keys 1-0. For instance, 0 is 100% power, 5 is 50%, 7 is 70%, etc. [`] is 0% power (engine cut). You can also use + to increase your throttle and - to decrease it (1/50th). For precision flying, press <Shift>-+ or <Shift>- - to increase or decrease your throttle in very small increments (1/150th). Press <Ctrl> with + or - to increase or decrease your throttle in large increments (1/10th).

Rudder Controls Pressing <Shift> with the 1-0 keys will change your rudder setting:



If it's confusing to use the number keys for both rudder and throttle control, press **Z** to move the rudder to the left (1/50th) and **X** to move the rudder to the right (1/50th). **0** and . on the numeric keypad (**INS** and **DEL** on some keypads) function the same as **Z** and **X**. For precision flying, press any of these keys with <**Shift**> to move the rudder in very small increments (1/150th). <**Ctrl**> with any of these keys moves the rudder in large increments (1/10th).

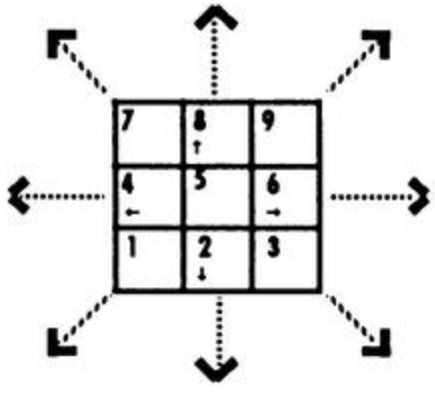
Flaps Press **F** to lower your flaps 100%. Press **F** again to raise your flaps all the way. Use **E** and **R** for *intermediate* flap settings; **E** lowers (extends) your flaps 25%. **R** raises (retracts) your flaps 25%. When your flaps are down, the letter "F" appears on your Heads-Up-Display.

Brakes Press **B** to put on and take off your brakes. When your brakes are set, the letter "B" appears on your Heads-Up-Display and the brake switch on the instrument panel is up (the brake switch will be down on some planes such as the Cessna and Piper).

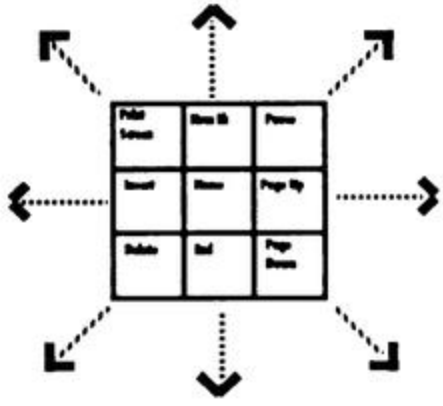
Gear Press **G** to raise and lower your landing gear. When your landing gear is down, the letter "G" appears on your Heads-Up-Display and the switch on your instrument panel is up (the gear switch will be down on certain planes such as the Cessna and Piper).

Yoke Controls If you're not using a joystick or mouse, you can control the airplane's yoke with the numeric keypad. Press one of the keys in the figure below and the aileron/elevator marker on the Heads-Up-Display will move in the arrow's direction. The plane will respond accordingly. For instance, pressing the **8** key is the same as pushing forward on the airplane's joystick (which would cause the plane to dive in normal flight). Pressing **5** returns the ailerons (and rudder) to their neutral positions. If you press **5** repeatedly, the elevators will slowly return to their neutral postions.

With a numeric keypad:



PS/2 models 25 and 30 don't have numeric keypads, so use these keys:



Pressing any of the above keys with the <Ctrl> key moves the aileron/elevator cursor in bigger increments, thus changing the plane's course faster. The <Shift> key moves the cursor in smaller increments, thus the plane will change course more gradually.

Trimming the Yoke Pressing the **spacebar** works the same as a trim adjustment on a real plane. At the beginning of a flight, your joystick's neutral position is equal to the yoke's neutral position in the center of the screen (elevators/ailerons neutral). To trim the yoke, move the yoke to a new position on the screen and press the **spacebar**. Release the joystick and the yoke will stay in the new position. You can trim the yoke so that a neutral joystick maintains straight and level flight, a steady climb, or any other flight attitude. To untrim the yoke, press **<Shift>-spacebar**. The neutral joystick now corresponds to the yoke in the center of the screen.

WHAT NOW?

At this point, you know how to select from menus, you understand your instruments, and you know how to control an AFT plane. What now? We recommend you continue with Part II, *Missions*. There you'll find instructions for the flight training class where Chuck Yeager teaches basic moves to advanced stunts. If you'd rather skip school and take your plane up, go ahead. You can find takeoff instructions on page 26. Be sure to check out the rest of the manual for complete details on AFT.

PART II: MISSIONS

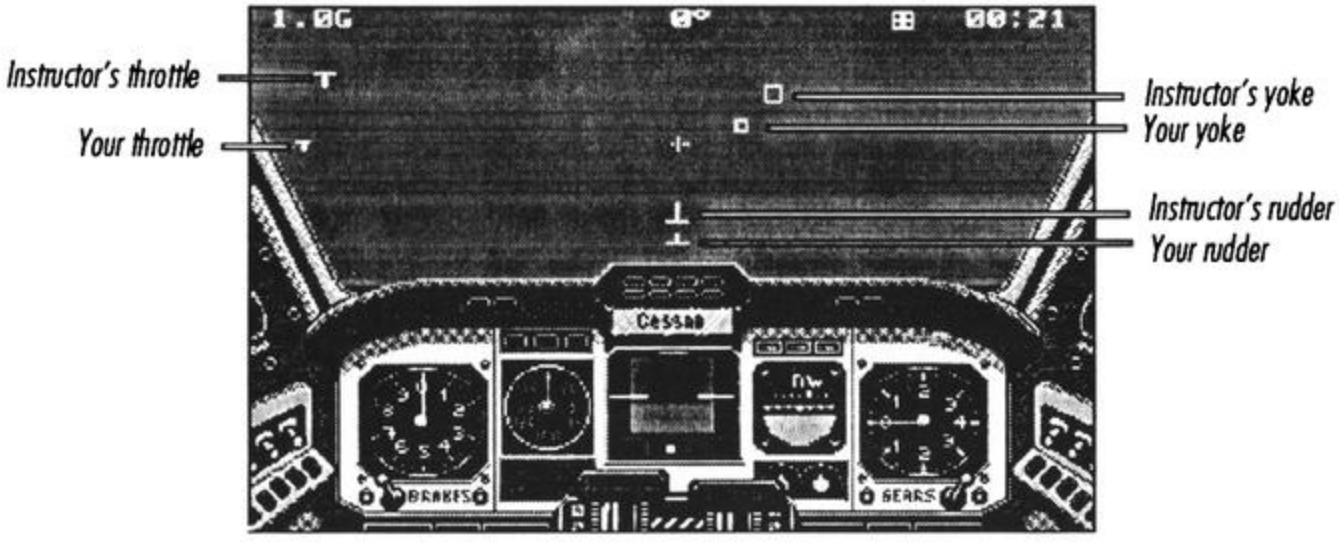
FLIGHT TRAINING

We flew from dawn to dusk, six flights a day, six days a week, dogfighting, buzzing and practicing gunnery. We crawled exhausted into the sack at ten and straggled to breakfast at 4:30 a.m., taking off on our first flight of the day just as dawn broke. I logged 100 hours of flying that first month. Hog Heaven...

AFT 2.0 Flight Training is divided into six "days" of instruction. On Day 1, Chuck Yeager teaches you the fundamental maneuvers: straight and level flight; climb and descend; bank; takeoff and landing. All other stunts build on these basic maneuvers — learn them well and you're off to a flying start. On Day 2, you'll begin making smooth transitions between the basic maneuvers: climb to straight and level flight, etc. You'll learn aerobatic stunts on Days 3 & 4: everything from aileron rolls to hammerhead turns. On Days 5 & 6, you'll practice all of AFT's races and formation flights with skill and accuracy.

ACCELERATION

In flight training, Chuck Yeager shows you how to perform each maneuver by showing you where to set your yoke, rudder and throttle. There are two sets of control markers on the screen: one set for Chuck Yeager (the larger markers), the other for you (the smaller markers). The idea is to keep your airplane controls at the same settings; your throttle and rudder markers should be parallel to Yeager's, and you should try to keep your yoke marker on top of Yeager's yoke marker.



➨ The control markers on your Heads-Up-Display must be activated for flight training. See page 12 for more details on HUD.

AILERONS

When you first select a maneuver, Yeager is actually in control of the airplane. Match his moves to learn the maneuver. You can take control of the plane by pressing I. The only things you can't control during flight training are which airplanes you're flying and your location.

Begin flight training by selecting MISSIONS from the main menu. Select FLIGHT TRAINING from the MISSIONS menu, then select the appropriate Day. Select the maneuver you want to learn.

Day 1 ☼

Things have changed some since the days when I was learning to fly. As I recall, the instructor just slapped your butt in the front seat and demonstrated the airplane, then moved you back, and then you had to learn all this stuff as it happened: how to take off, level off, turn, and everything else associated with flying the damned thing. That was the way you learned to fly because that was the way they taught you. And that was fine by me, because the way I look at it, flying's flying.

Introduction

AIRFLOW

Your first task in an unfamiliar cockpit is to get checked out in the plane's controls and instruments. In this introduction you'll learn the instrument panel and the Heads-Up-Display (HUD) of AFT's Cessna, the first plane Chuck Yeager will teach you to fly. The Cessna's instruments and controls are similar to those of most of the other planes in AFT.

Straight

This is straight and level flight. You begin at 3,000 feet, headed north over the main airport. You can fly level at a variety of power and pitch settings. The airspeed is different for each combination, but remains steady if you are flying level. When you apply more power, you need to lower the nose to maintain level flight as the airspeed increases. The reverse is also true. Straight and level cruise speed at 100 mph requires 75% power and about one-third up elevators.

AIRSPEED

Achieving straight and level flight is a matter of maintaining constant heading and altitude. Adjust pitch with the elevators and power with the throttle until the distance between the glareshield and horizon stays the same. Use the ailerons to keep the wings level so the glareshield remains parallel to the horizon. The glareshield and horizon are your inside and outside visual reference points.

ALTIMITER

Check your instrument panel. The plane on the attitude indicator should split the artificial horizon, the altimeter should be constant, the vertical speed indicator should hover around 0 fpm, and the heading indicator should be steady.

Climb

This is a straight climb. You'll start at 3,000 feet, 1 mile north of the airport heading north. You climb at 100 mph for about a minute, gaining 800 to 1000 feet per minute (fpm).

ANGLE OF ATTACK

In a straight climb, the pitch attitude and power settings will cause a gain of altitude while the bank attitude remains level as for straight-ahead flight. Adding power while holding the pitch attitude required for straight and level flight results in a climb. Best climb performance occurs with 100% power and with the nose higher than in straight and level flight. Holding the stick back about half-way raises the nose and reduces airspeed to about 100 mph.

ATTITUDE

The visual references for a climb resemble the visual references for straight and level flight. The glareshield should remain parallel to and a constant distance from the horizon. However, the nose is higher when climbing, so distance from glareshield to horizon changes. In a steep climb, the glareshield may even be above the horizon.

Check your instrument panel. The plane in the attitude indicator should be above the horizon. The altimeter should be moving in a clockwise direction and the vertical speed indicator should be above the 0 point. Provided you keep the wings level, the heading indicator will remain constant.

Descent

AVIATION

This is a straight descent. You start at around 3000 feet, 5 miles south of the airport heading north. You descend 1000 fpm while traveling about 100 mph on a 50% power setting.

In a descent (or glide), you reduce power from cruise (75%) to cruise descent (50%) and adjust the pitch attitude so that gravity pulls the airplane forward and down along an inclined path. Reducing power to 50% and holding the stick about 1/8 forward lowers the nose and results in a 1000 fpm descent at about 100 mph.

BACK PRESSURE

The visual references for a descent look much like those for a straight and level flight. In both cases, the glareshield should remain parallel to and a constant distance from the horizon, but the glareshield is slightly lower on the horizon during a descent.

BANK

The plane in the attitude indicator should be below the horizon, the altimeter should be moving counter-clockwise, and the vertical speed indicator should register close to 1000. The heading will remain constant as long as you keep the wings level.

Left Turn

This is a left turn with a 30° bank angle. You circle at 3000 feet, 3 miles south of the airport in a 30° bank.

A turn involves close coordination of all three flight controls — ailerons, rudder, and elevators. You turn the airplane by banking the wings: left bank for a left turn and right bank for a right turn. The banked wings lift both up and sideways. This sideways lift of the wings turns the plane. The total amount of lift is the same; consequently, there's less upward lift. You must compensate by raising the nose or the plane will descend. For example, with power set at 75% and the stick held slightly less than halfway left or right, you must hold the stick back almost halfway to maintain constant altitude.

CENTER OF GRAVITY

The glareshield should be at an angle to the horizon. Hold the pitch attitude constant and you'll get a level turn. The plane on the attitude indicator should be at an angle to the artificial horizon. If you hold the pitch attitude constant during the turn, the altimeter will be constant and the vertical speed indicator will be steady on 0 fpm. On the instrument panel, only the heading indicator moves, confirming the turn.

Right Turn

This is a right turn with a 30° bank angle. You circle at 3000 feet, 3 miles south of the airport in a 30° bank.

The only difference between a Right Turn and a Left Turn is the direction of bank. See Left Turn (above).

Takeoff

In this lesson you learn how to take off. You begin lined up on the runway of the main airport.

To take off, the airplane must accelerate from a standstill to an airspeed that moves enough air over its wings to create the lifting force needed to overcome gravity. The takeoff also includes the initial climb away from the takeoff area to a safe maneuvering altitude. The entire procedure involves a high degree of control on the ground as well as in the air.

COMPASS

Begin by lining up the airplane with the runway and applying 100% power. Use the rudder to maintain directional control on the ground. When you reach takeoff speed, rotate the airplane to the climb attitude by pulling back on the stick to raise the nose. After liftoff, you may need to lower the nose slightly until airspeed builds up to normal climb speed (100 mph). At that point, you can establish the airplane in the familiar climb attitude that you have already practiced.

CONTROL SURFACE

As you taxi down the runway, use the runway markings as a visual reference. After you lift off, the balls on the ground grow smaller, which should help you judge your altitude by eye. Because of your nose-high pitch angle, you quickly lose sight of them unless you change to an alternate view.

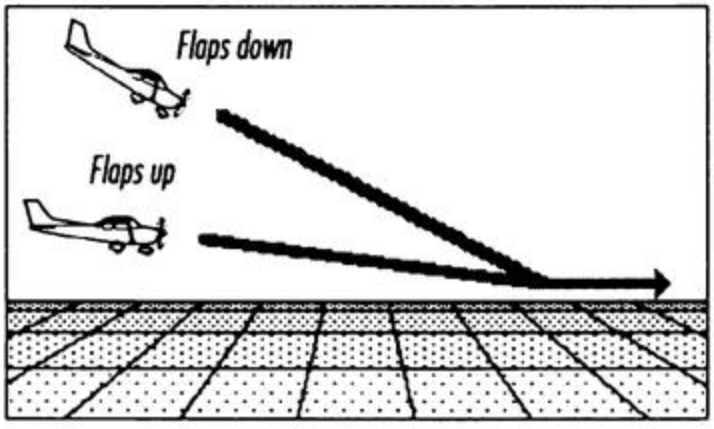
Landing

You'll learn a beginner landing. You are on a one-mile final for the runway at an altitude of 500 feet. Landing teaches you how to *approach* the runway; Flare (below) tells you how to touch the plane down on the runway.

To land the airplane, you must carefully control the power and pitch attitude to achieve a descent at the proper approach speed. You also need to maintain directional control so you land on the runway.

DRAG

Plan your approach to the airport so that you are lined up with the runway at an altitude of about 500 feet when you're about 2 or 3 miles out. Before reaching that point, move the elevators about one-third up and set power at 40% for a descent rate of about 500 fpm and an approach speed of 75 mph. You are now on final approach.



Flaps steepen the descent angle

As you line up on final, lower the flaps slowly and adjust the pitch attitude to maintain your descent rate. With the flaps down, the pitch attitude is lower for the same descent rate, giving you a better view of the runway. The airplane can also fly at a slower speed with the flaps extended, so there's less danger of stalling.

ELEVATOR

On short final, about one-half mile out, locate a touchdown spot on the runway. This touchdown spot should remain at a constant distance above your glareshield when approaching the runway. If the touchdown point appears to rise in your windshield it means your angle of descent is too steep. In that case, add power as necessary to make the descent angle shallower. If you were to continue the approach without adding power, you would land short of your touchdown point, if not short of the entire runway.

You control the glideslope (angle of descent) with power, not with pitch attitude. Think of the throttle as your altitude control.

If you see the touchdown point descend in your glareshield, then your angle of descent is too shallow and you are going to overshoot your desired touchdown point or the entire runway. To avoid this, you must decrease power to increase the angle of descent.

Watch for the balls on the ground as you descend and use their size to gauge your height above the ground. At 200 feet, you are low enough to see the balls through the glareshield. Looking out a side window, you can see them below you at about 1000 feet.

EMPENNAGE

While on final approach, watch your airspeed closely. As mentioned earlier, your target airspeed for a smooth and safe landing in the Cessna 172 is 75 mph. If you need to adjust your airspeed while on the final approach, adjust the pitch attitude. For example, if you notice the airspeed has crept up to 80 mph, raise the nose slightly to slow down. If you've inadvertently slowed to 70 or lower, lower the nose slightly to speed up.

You control airspeed with pitch attitude, not power. Think of the elevators as your speed control.

Flare

You'll learn how to touch the plane down on the runway. You are lined up on final approach for the runway at an altitude of 300 feet.

The landing flare is a slow, smooth transition from a normal approach attitude to a landing attitude. When the airplane is 10 to 20 feet above the runway, you gradually apply back pressure on the stick, raising the elevators to slowly increase the pitch attitude. At the same time, you reduce power to idle so you can land on the main gear while the nose gear is still up in the air. Increasing the pitch attitude increases lift, thereby decreasing the downward velocity of the airplane, so you gently settle onto the runway. This increase in lift also increases drag which helps to slow the aircraft before touchdown. After touchdown, brake to taxi speed, raise the flaps, and taxi off the runway.

FINAL

Day 2 ☼ ☼

"Crash" isn't a word pilots ever use. I don't really know why, but the word is avoided in describing what happens when several tons of metal plows itself and its pilot into the ground. Instead, we might say, "He augered in." Or, "He bought the farm."

On Day 2, you begin to put the pieces together: you learn to make smooth transitions between the fundamental maneuvers. Every aerobatic stunt you'll learn later requires that you make faultless transitions between maneuvers. Your plane is once again the Cessna 172.

Level to Climb

To climb from straight and level flight, you'll start at 3000 feet, 2 miles south of the airport heading north at about 125 mph. During the transition, you climb 250 feet.

FLAPS

Your goal is to make the transition from straight and level cruise flight into a straight climb. First, raise the pitch attitude from straight and level to climb by bringing the elevators back until the visual reference looks like what you expect for a straight climb.

Increase the power from cruise (75%) to climb (100%). The transition is complete when the airspeed is constant, about 75 mph for a Cessna 172. The glareshield remains parallel to and a constant distance from the horizon. In a steep climb, the glareshield may be above the horizon.

The plane on the attitude indicator should be above the horizon in a climb position, the altimeter moving clockwise, the vertical speed indicator above the 0 point, and the airspeed indicator moving counter-clockwise.

Climb to Level

You start at 3000 feet, 9 miles south of the airport. During the maneuver, you climb 300 feet before leveling off.

FUEL STARVATION

The transition from Climb to Level is exactly opposite to that from Level to Climb (above). After climbing to the altitude you want, lower the pitch altitude from climb to straight and level flight. Continue operating at full power to let the airspeed increase to the approximate cruise airspeed. Then decrease the power to 75%. If you reduce power early, the acceleration to cruise speed will take longer.

The transition is complete when the pitch attitude is appropriate for straight and level flight, the power is set at 75%, and the airspeed indicator is approximately 100 mph.

Level to Descent

You start at 3000 feet over the airport heading north at about 100 mph. During the transition, you descend 800 feet.

Reduce power gradually to about 50% (remember, power controls altitude). The more you reduce power, the greater the descent angle and rate of descent. To avoid ear discomfort in a real airplane, the descent rate should not exceed 1000 fpm.

The transition is complete when the power is reduced to 50% and the pitch attitude is set at the normal descent attitude. The airspeed should be constant, the altimeter moving counter clockwise, and the vertical speed indicator below the 0 point.

Descent to Level

You start at 3000 feet, 2 miles south of the airport, descending at 100 mph.

G-FORCE

The transition from Descent to Level is opposite to Level to Descent (above). Gradually increase power. As you do this, the glareshield moves up closer to the horizon. Increasing power to 75% should bring the airplane to a straight and level attitude.

Steep Left Turn

You circle at 3000 feet 1 mile north of the airport.

The key to performing steep turns (45° to 60°) is understanding what happens to lift in a turn. Banking for a turn creates sideways lift at the expense of upward lift. In a steep turn, the amount of vertical lift lost to the horizontal is substantial and the result will be a serious loss of altitude unless you increase pitch attitude and set the power to 100%. The increased power and pitch attitude will increase the upward lift to offset the loss due to sideways lift.

Start the maneuver by setting the power to 100%. Roll the airplane about 60° of bank. When passing 30° of bank, increase the pitch attitude slightly.

GLARESHIELD

If you start to lose altitude during the turn, make the bank shallower to increase the vertical lift. When you reach your desired altitude again, resume the steep bank but with more back pressure on the stick.

You must roll out of a steep turn before you reach your desired heading. As a rule of thumb, start to roll out about half the bank angle ahead of your desired heading. If, for example, the bank angle is 60°, start the roll out 30° early.

As you roll the airplane to level flight, reduce the pitch attitude to that of straight and level flight. Reduce power to cruise (75%) and the maneuver is complete.

Steep Right Turn

You circle at 3000 feet 2 miles south of the airport.

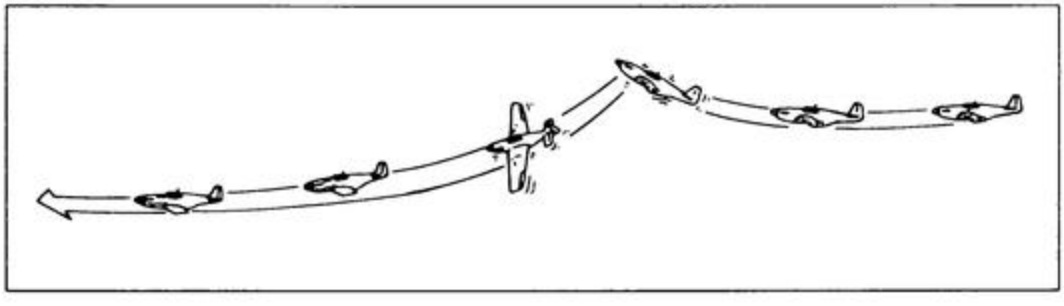
The only difference between a Steep Right Turn and the Steep Left Turn (above) is the direction of bank.

Power Off Stall

You start at 3000 feet 3 miles northwest of the airport.

GLIDESLOPE

A stall occurs because you've over-controlled the pitch attitude of the airplane by applying too much back pressure too fast. When the smooth airflow over the airplane's wing is disrupted, lift rapidly degenerates — the result is that you descend rapidly.



Recovering from a stall is simple: release back pressure on the stick. The plane's nose will drop back down and smooth airflow over the wing will return.

The power-off stall generally occurs when an airplane is approaching an airport for a landing. If you let the airspeed get too low or pitch attitude too high, a stall may occur.

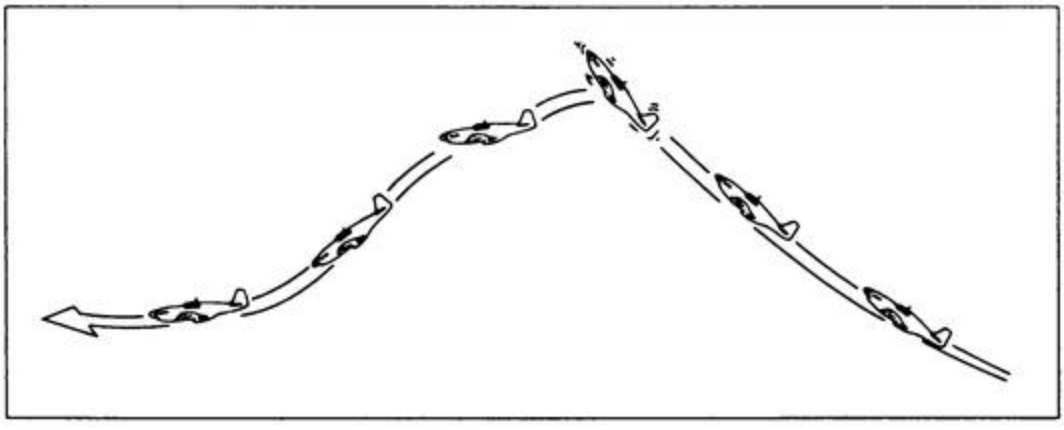
The first indication of an approaching stall may be the stall warning horn (provided the sound configuration is on QUIET or FULL). If the stall progresses unchecked, you will see visually and on the instruments a descending pitch attitude. You should release back pressure on the control stick and add full power (100%) to begin a climb to a safe altitude.

HEADING

Practice stalls at a safe altitude — at least 3000 feet above ground level. The maneuver is complete when you've re-established the airplane in straight and level flight.

Power On Stall

Power on stalls normally occur during takeoff or in normal climbs. To practice a power on stall, climb to a safe altitude at 100% throttle. Slowly bring the nose upward into a steep climb which the airplane cannot maintain for very long.



To recover from the stall, release back elevator pressure and lower the nose. Return the airplane to straight and level flight when possible and cut the throttle to 70%.

Day 3 ☼ ☼ ☼

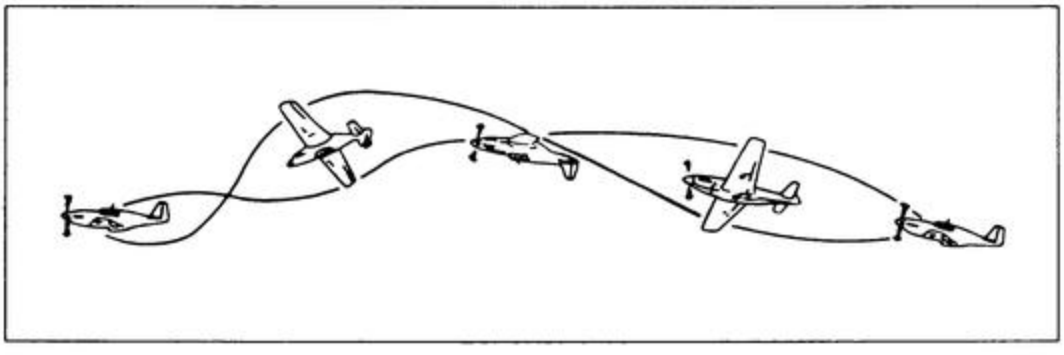
Flying became fun. I knew what I was doing in the cockpit and understood the airplane. In only a month, I graduated from being air-sick even while flying level to actually enjoying spins and dives.

LATERAL AXIS LIFT

No sooner was the airplane invented than the earliest fliers were trying to see just what they could make their new machines do. Many of these stunts, now referred to as aerobatic maneuvers, were invented or discovered purely by accident. When some stunt didn't go exactly as planned, the result was often a newly-discovered maneuver. Others were invented as evasive maneuvers for the dogfighting pilot and many are still used today in air combat. Since a Cessna isn't a high-performance airplane, you're now going to switch to a P-51 Mustang.

Aileron Roll

The aileron roll was one of the early stunts invented by barnstorming pilots. Today, there are many variations of this maneuver: slow, fast, four-point, eight-point, barrel, etc.



LONGITUDINAL AXIS

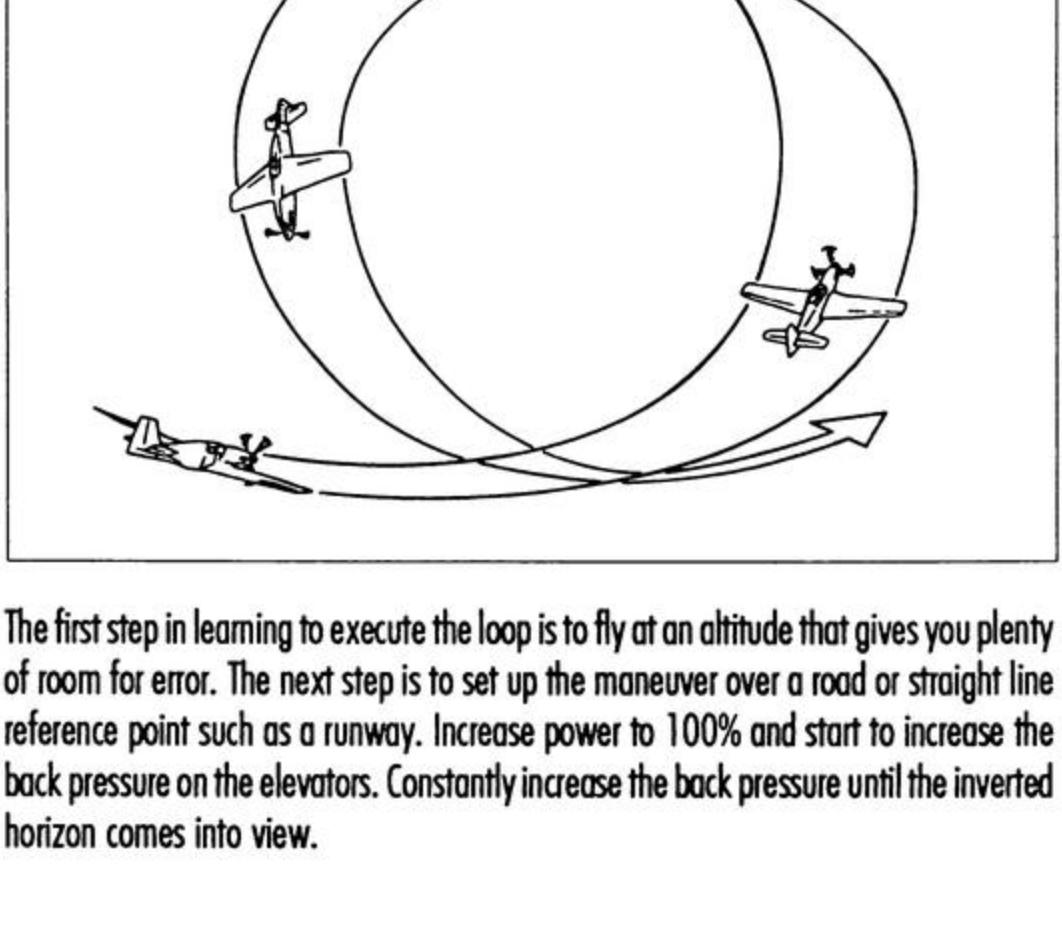
Begin by increasing the power to 100% and increasing the pitch attitude to approximately 20° above straight and level attitude. Next, initiate a coordinated roll while maintaining slight back pressure on the elevators. The slight back pressure maintains a constant positive G-force throughout the roll.

When the upright horizon appears, center the ailerons to initiate the roll out and resume straight and level flight. This completes the maneuver.

Loop

MACH

Lincoln Beachey, an early daredevil barnstorming pilot, is credit with inventing the loop, or "loop-the-loop" as it was originally known. It was used extensively by World War I pilots as an evasive action maneuver while dogfighting in the skies over Europe.



The first step in learning to execute the loop is to fly at an altitude that gives you plenty of room for error. The next step is to set up the maneuver over a road or straight line reference point such as a runway. Increase power to 100% and start to increase the back pressure on the elevators. Constantly increase the back pressure until the inverted horizon comes into view.

You might need to select a left or right view in order to keep the wings of the airplane parallel to the horizon. If the wings are not parallel to the horizon, use aileron control to level them.

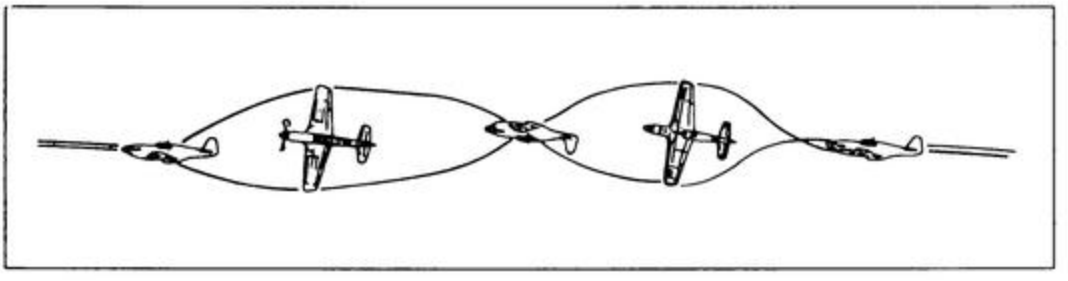
PITCH

As the inverted horizon comes into view, you must relax some of the back pressure in order to make the circle symmetrical. You may also need to reduce power on the back side of the loop to keep the airspeed from becoming excessive and to keep the loop symmetrical.

As the upright horizon comes into view, set the pitch attitude for straight and level flight attitude. If you haven't already reduced the power to cruise, do it now. You should start and finish the loop on the same heading.

Slow Roll

The slow roll is essentially the same as the aileron roll in that the movement is around the longitudinal axis of the airplane. The major difference is that the pitch attitude is held on the horizon throughout the roll.



PROPELLER

Begin the slow roll by increasing power to 100%. Then initiate a coordinated roll, left or right, with ailerons and rudder. As the bank angle passes 90°, you will have to hold the stick forward to keep the nose of the aircraft on the horizon.

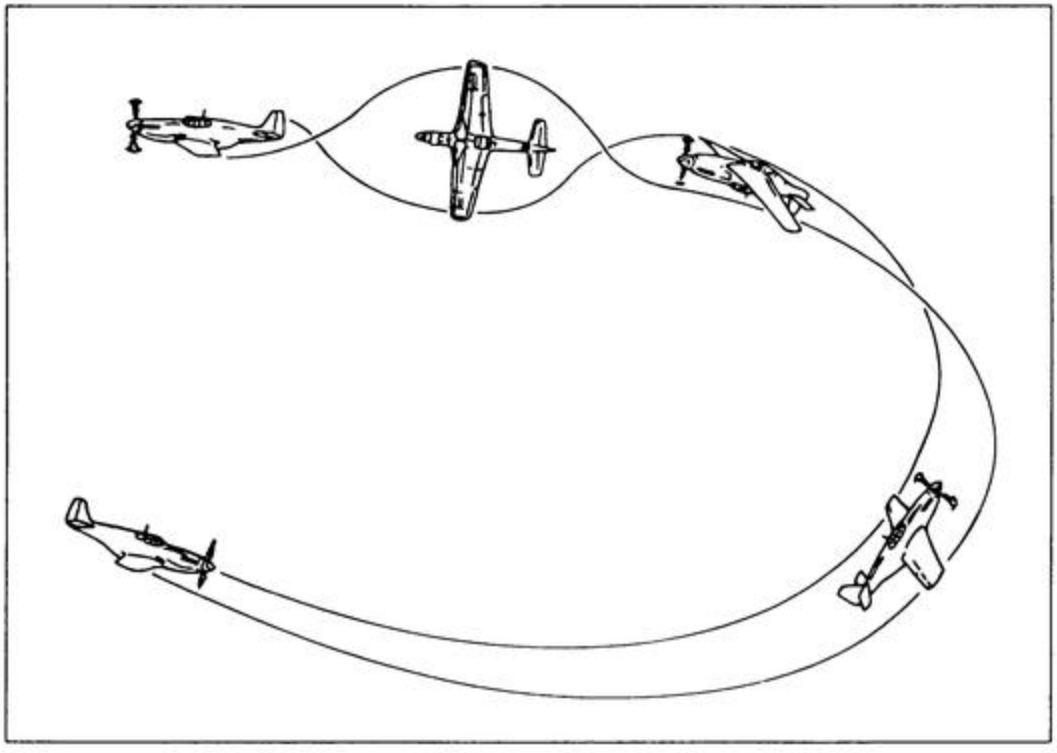
As you complete 270° of roll, neutralize the elevators. When the upright horizon returns to view, increase the back pressure to maintain straight and level attitude and

reduce power to cruise (75%). The maneuver is now complete. The final heading should be the same as the entry heading.

Immelmann

The Immelmann was invented by Max Immelmann, a WWI German pilot, as a maneuver to reverse direction while gaining altitude. It is half a loop followed by a half roll. Lt. Immelmann was credited with 17 kills as a German fighter pilot, but his career was brief. He entered combat August 1915 and died June 1916 when his aircraft broke up in flight due to structural failure.

ROLL



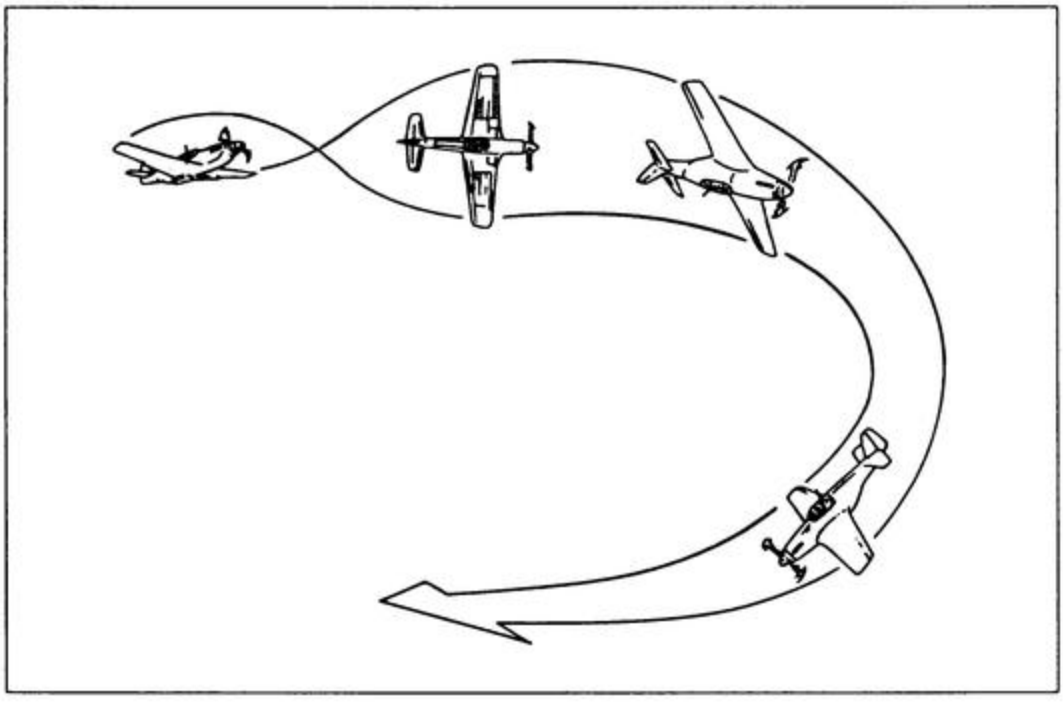
To begin an Immelmann, increase power to 100% and increase back elevators as if you were performing a loop. But when the inverted horizon comes into view, initiate forward elevators. Hold this attitude until the airplane is stabilized in inverted flight.

RUDDER

The heading of the airplane should be 180° opposite that of the entry. Next, half roll the airplane left or right to the upright straight and level flight attitude. Finally, reduce the power to cruise (75%) and the maneuver is now complete.

Split S

The Split S consists of half a roll and the last half of a loop. A reference line on the ground (such as a runway) helps when executing this maneuver.



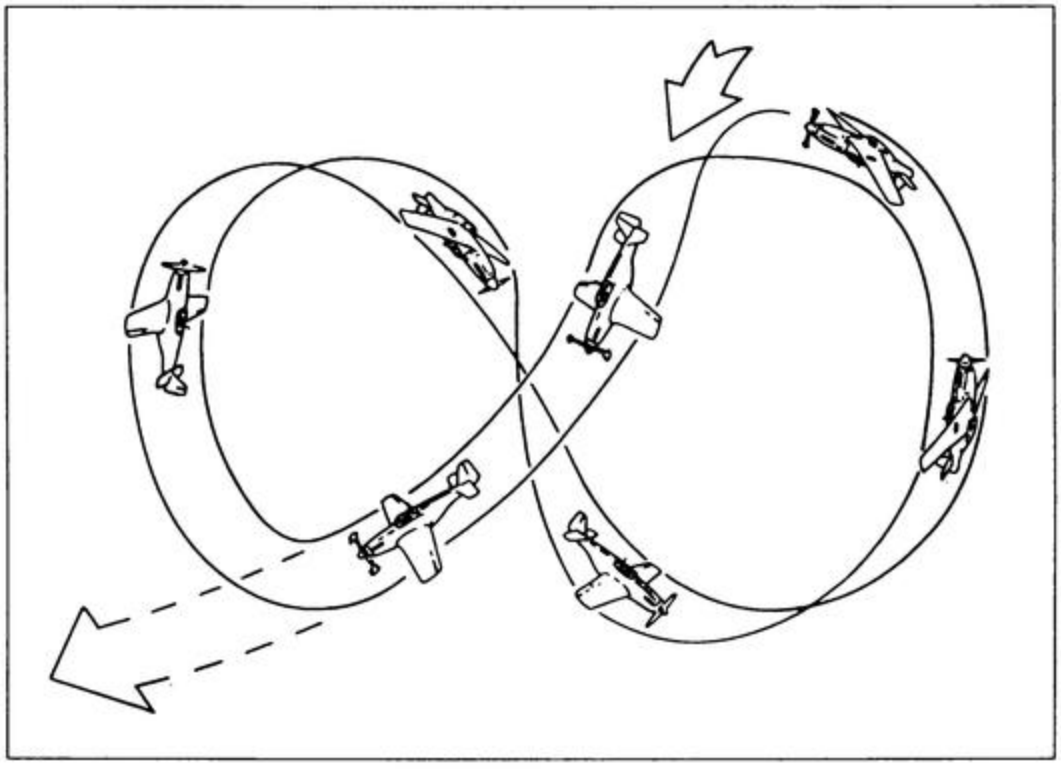
Reduce power to approximately 50%. The airspeed will decrease if the altitude is maintained; this is important because the second part of the maneuver generates excessive airspeed.

RUNWAY

Execute a roll, stopping in the inverted position. As the airplane reaches inverted flight, apply back pressure on elevators. Steadily increase back pressure until the upright horizon comes into view. When you reach the straight and level attitude, increase power to normal cruise. The heading should be 180° opposite the entry heading.

Cuban 8

The Cuban 8 was invented by an American pilot named Len Povey, who flew for the Cuban Government during the 1930s. The Cuban 8 consists of a 3/4 loop with a half roll on the 45° descending angle followed by another 3/4 loop and another half roll on the second descending angle at which time the figure 8 is complete.



SERVICE CEILING

Increase power to 100% and reduce the pitch attitude to increase the airspeed. Then apply continuous back pressure just as in a loop. You must neutralize the elevators as the glareshield of the aircraft reaches a point of 45° below the inverted horizon. At this time, the aircraft is half-rolled to the upright still in a 45° descent attitude.

You increase back pressure again, just as in a loop. And again, when the glareshield of the aircraft reaches a point 45° below the inverted horizon, you release back pressure. The airplane is now upright in a 45° descent attitude. Apply more back

pressure to regain a straight and level flight attitude, and reduce power to normal cruise. The exit heading should be the same as the entry.

Day 4 ☼ ☼ ☼ ☼

On Day 4 you master advanced stunts in a P-51 Mustang (except in DEMO, where you take up an XPG-12).

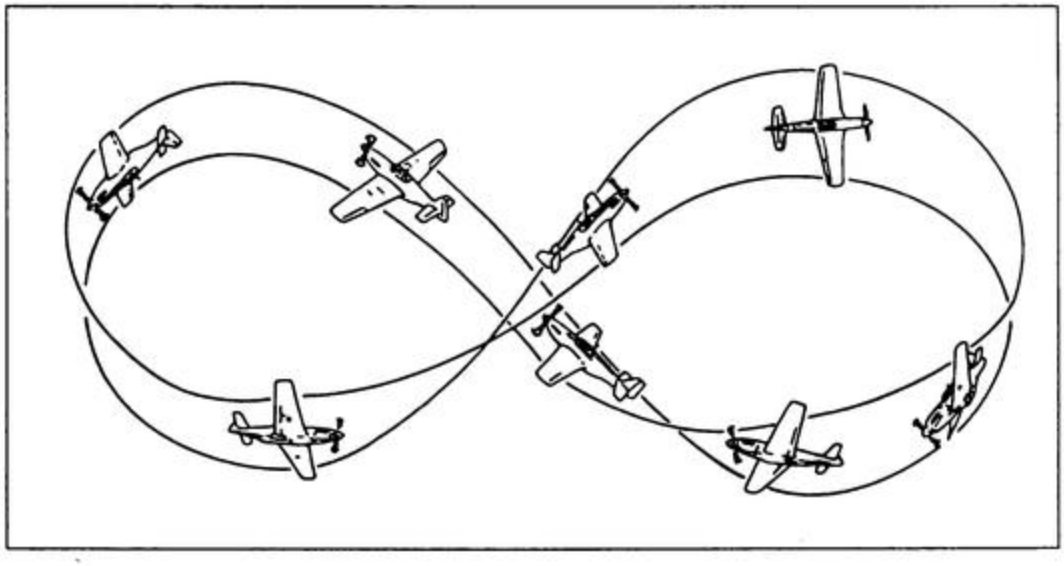
Demo

SKID

This is the same introduction flight that you can select and watch from the Main menu. When you select it from the FLIGHT TRAINING menu, you get the chance to try and match the instructor's moves. Good luck!

Figure 8

The Figure 8 maneuver consists of a steep right turn followed by a steep left turn. A reference line on the ground (such as a runway) helps when executing this maneuver.



SLIP

Increase power to 100% while maintaining a straight and level attitude. Flying along the reference line, go into a steep right turn without losing altitude. When your heading is approximately 270° away from the reference line (your original course), roll out of the turn. Execute a steep left turn until your heading is once again parallel with the reference line.

Four Point Roll

SPIN

Begin the roll by increasing the power to 100% and increasing the pitch attitude to approximately 20° above straight and level attitude. Next, initiate a coordinated roll — aileron and rudder — to the right or left while maintaining slight back pressure on the elevators. The back pressure maintains a constant positive G-force throughout the roll. When the horizon has rotated 90° on the glareshield, neutralize the ailerons and rudder to stop the roll. After you've held the position for a few seconds, continue the roll. As you approach inverted flight, apply opposite rudder and forward elevator to coordinate the roll. When your wings are level with the horizon, neutralize the rudder and ailerons to stop the roll, but maintain forward pressure on the stick so that your altitude stays constant. Again, hold the position for a second.

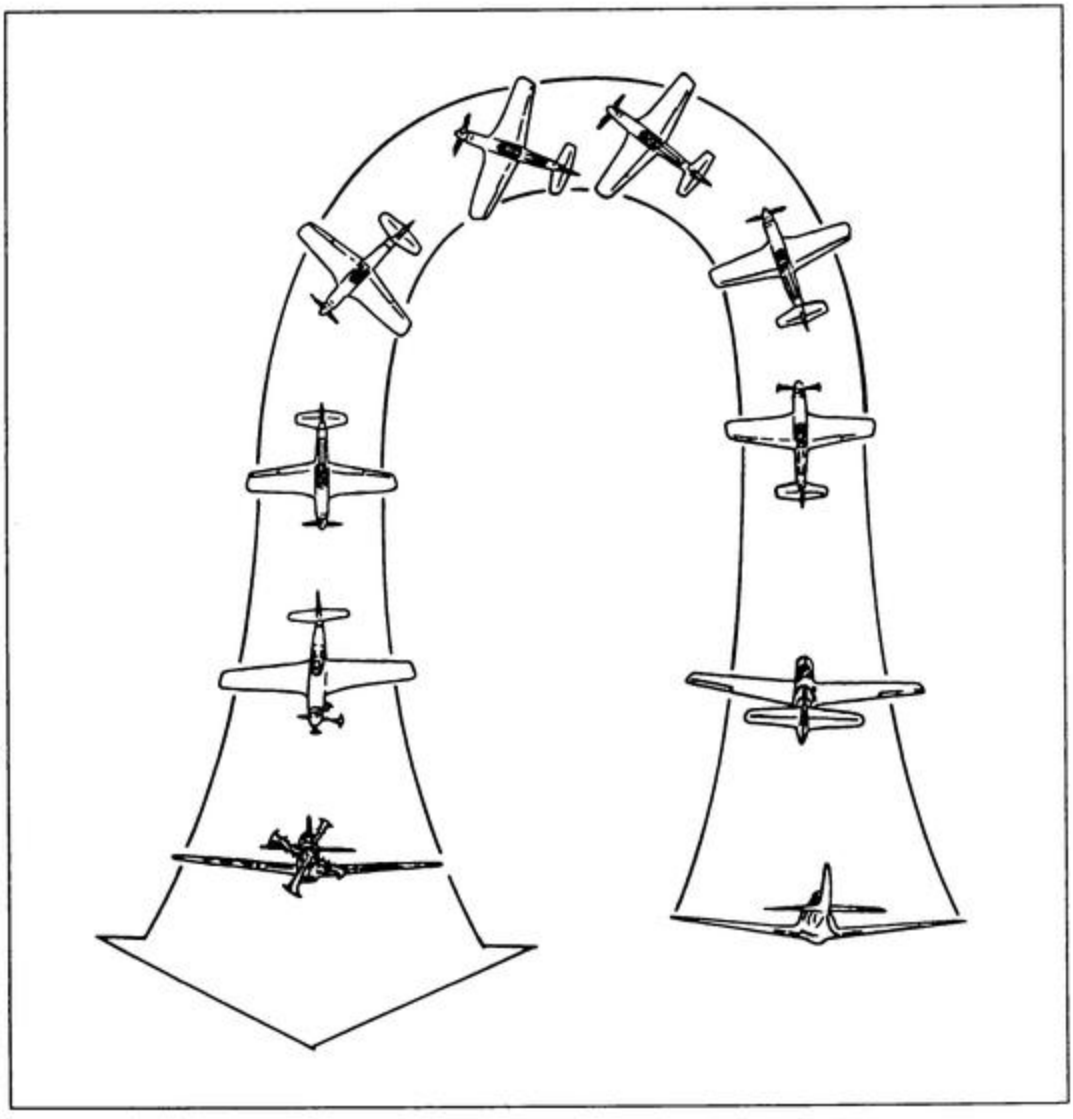
To come out of the roll, apply aileron and rudder while reducing forward pressure. When your wings are in a vertical attitude, neutralize the ailerons and rudder and hold the position for a few seconds. Then repeat the same actions until you are once again in level flight.

Hammerhead Turn

STALL

Increase power 100% and attain full speed, then start a full-power vertical climb. Note your exact altitude as you enter the climb. Gravity will begin to work against your upward motion, and your airspeed will drop rapidly. Just as the airplane slows to a stop, apply full rudder. Timing is the essence of the hammerhead turn. If you rotate too late, you'll slide backwards before you make your turn; too early and you'll fly over the top.

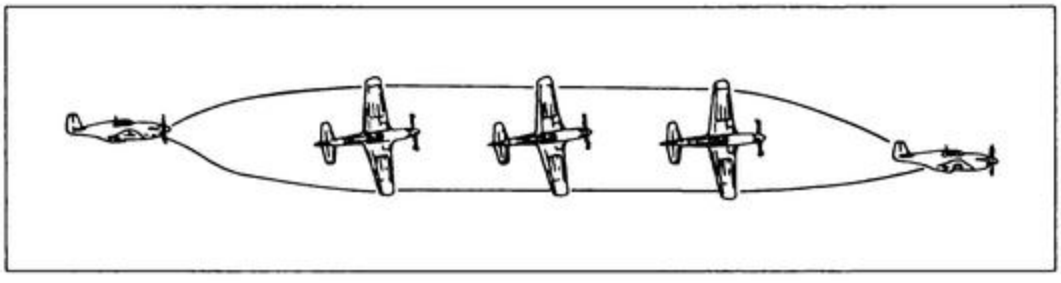
The idea is to rotate on a single point at the crest of your climb. You should level out at the same altitude that you began the maneuver.



Knife Edge

THROTTLE

Roll the airplane in the same manner as in the aileron roll. When you reach a 90° angle in relation to your horizon, neutralize the ailerons. Use left rudder if your left wingtip is up, or right rudder if your right wingtip is up. Slight forward pressure on the yoke will help keep you flying even.



Replay

At some point in your flying career, you may stun the crowds with some awesome daredevil maneuver and then wonder how in the world you did it. When this happens, choose REPLAY from the Day 4 menu to fly the maneuver over again with onscreen control markers that you can follow. Note that there's no need to use REPLAY to review other FLIGHT TRAINING maneuvers.

Days 5 & 6 ☼ ☼ ☼ ☼ ☼ . . . ☼

Mastering the races and formation flights is far from easy, so the last two days of instruction are devoted to guiding you through them. First read the descriptions and tips under Races (page 44) and Formations (page 45), then select the event you want to learn from Day 5 or Day 6.

Do NOT select any races under Day 5 or #1-#5 under Day 6 unless you have saved recorded flights. If you do, a message will appear telling you that you haven't recorded this particular race or formation. See Races and Formations for more information on recording.

RACES

Each of the races has its own gate layouts and class of planes. You CANNOT change planes or you're no longer in the race. Once you've chosen a race, AFT lines you up behind the first gate. As you approach the first gate, you will see the arrows leading between the poles. Follow the course arrows to the next gate. When you pass a gate, AFT flashes an on-screen message confirming your passage. The message only appears when you've gone through all the previous gates in the proper sequence. A small + marker points the way to the next gate. Keep the marker toward the center of the screen and you're on the right course. AFT keeps track of your time through the course. If you make it through all the gates in the correct order without crashing, your time appears on the screen.

TRACK

Your success as a race pilot depends on knowing where the next gate is and the best angle at which you should go through it. When you start, you want full power, so open your throttle up all the way. If you're flying a prop-plane, you'll probably fly most of the race at full throttle. However, if you're flying a modern jet, you'll probably have to cut back on the power quite a bit in order to finish the race.

VERTICAL AXIS

In any race, the challenge is to trade speed for a higher rate of turn. The first key is not to lose speed as you exit the turn. The second is to spend as little time as possible with a turning load (pulling Gs in a turn) — this is energy that isn't being used to pull (or push) the aircraft through the air. Make your turns as precise and direct as you can. Even small midcourse corrections cost you time. The winner will be the one who makes the most efficient use of the plane's throttle and air brakes. And while you're maximizing your speed, cornering as tightly as you can, don't forget to keep your altitude around 50 feet....

Your Competition

You're racing against the clock as well as against other airplanes. The first time you complete the course, you are the only plane in the race — you only need to successfully complete the course in order to win. AFT then records your flight as one of the competitors the next time that race is flown. That means that the next time you choose that race, you'll be racing against yourself! You'll have to do better in order to beat your best time. If you want to remove your opponents, select the race you want cleared, then press <Esc>. Now select **CLEAR CHECKED RACE** from the RACES menu.

Floppy Users If you're using 360K floppies, you may not have enough disk space to record all races and opponents. There are two things you can do to gain more disk space:

- You can delete old races by selecting **CLEAR CHECKED RACE.**
- You can re-install the game onto another pair of disks and record your races on the new play disks.

FORMATIONS

We weren't trained for aerobatics. Aerobatics you see being done today are merely refined air combat tactics. That's what we learned after we learned to fly. Sure, we learned to do rolls, and loops, Cuban 8s, and Immelmanns — but that's all part of dogfighting.

VERTICLE STABILIZER

It isn't by accident that the most well-trained air forces in the world also have some of the best aerobatic teams: the US has the Thunderbirds and Blue Angels, the British have the Red Arrows, and the French have the Putrouille de France. All these groups demonstrate a commitment to accuracy and consistency — the things that create a stable gun platform. Although an Immelmann may be a satisfying maneuver, it was

invented by a German fighter pilot to overcome the air combat problem of reversing direction while gaining altitude. Most of what you will practice here has its origin in combat.

In formation flying, you test your flying precision by following a lead plane as it performs a series of stunts. At the end, AFT grades the difficulty of the maneuver and the accuracy of your performance against the leader's. You'll follow the leader in a P-51 through more and more difficult maneuvers until you're ready to fly with the master himself, Chuck Yeager. Then fly wingtip to wingtip in jet fighters with the world-famous Thunderbirds and Blue Angels. If you slip up on a maneuver and find yourself trailing behind, press **C** to instantly "catch up" to the others.

YAW

You can also record five formation flights of your own. Each formation flight can have up to five airplanes in it. You choreograph each plane's stunt.

1. Select the aircraft you want to fly from the AIRPLANES menu.
2. Select the location from the LOCATIONS menu.
3. Get the initial speed and altitude you need to begin your maneuver, then press <Esc>.
4. Select one of the flights (#1-#5) from the FORMATION menu.
5. If you've previously recorded a flight in this space, AFT will ask you if you want to clear the old formation. Select **Yes** to erase the previous formation flight, or **No** to add a new plane to the formation.
6. If you've already recorded more than one plane for this formation flight, you'll be asked which plane you want to follow. Select the number of the plane (they're in the order that you recorded them).
7. Perform your maneuver. Each recording uses a limited amount of memory, so the time limit of your maneuver depends upon how fast it uses up the allotted memory.

If your maneuver is too long, AFT will tell you when it has stopped recording. If you haven't used up all the time, press <Esc> to stop the recording.

8. Now you can view the flight you just made. Select DAY 6 from FLIGHT TRAINING, then select the same flight (#1-#5). AFT will ask you if you want to record the flight. Select **Yes** if you're sure you flew as well as you wanted. You can change your view to see how the manuever looks from different perspectives (see Changing Views, page 63).

9. You can also add planes to a flight by repeating steps 4-8. AFT will ask you if you want to add the flight to the formation. Select **Yes** to *add* your new plane to the formation. Select **No** to *replace* another plane's flight with the one you just recorded. If you select **No**, you will have to specify which plane you want to replace.

Floppy Users If you're using 360K floppies, you may not have enough disk space to record all five formation flights. There are two things you can do to record new flights:

- You can delete old formation flights to gain more disk space. Select the flight you want to delete (#1-#5). AFT will ask you if you want to clear the old formation. Select **Yes**. Now select something different from the AIRPLANE or LOCATION menu. AFT will ask you if you want to record the flight. Select **No**.
- If your old flights are too hot to give up even one of them, you can re-install the game onto another pair of disks and record your flights on the new play disks.

AIRPLANES

AFT comes with 18 airplanes, ranging from single-engine prop planes to rocket jets. Knowing the capabilities and limitations of your airplane is one of the most important aspects of being an ace pilot. If Yeager didn't know his P-51 like the back of his hand in World War II, it's doubtful that he would have the outstanding record and reputation he holds today. You can study each airplane's specs by selecting **AIRPLANES** from the

MISSIONS menu. Take up each plane and compare it with the others you've flown. Each plane has its own unique characteristics, for better and for worse. For instance, the X-15 — designed to test the problems of high-altitude flight — is one of the fastest and highest flying planes ever built. Its sleek profile, however, allows it much less fuel than other AFT planes: you have maybe a minute's worth of fuel to fly as high as you can before gravity begins to pull you back down. Likewise, the Space Shuttle, though capable of penetrating space, can only be landed by the pilot — it takes something other than a runway to get this thing off the ground.

I was always eager to acquire practical knowledge about the things that interested me. That was a big reason for my success as a pilot. I flew more than anybody else and there wasn't a thing about an airplane that didn't fascinate me, down to the smallest bolt.

LOCATIONS

The AFT world is 65,000 square kilometers (about 160 square miles). Because you fly in real time, you can spend hours flying around in a prop plane and still have new territory to explore. In a supersonic jet, you could circle the world in under an hour, but it will still take you a while to visit and explore all the locations. AFT has three airports, including a main airport. You could fly between AFT's airports and discover all the landscape features on your own, but most of the time you'll want to go directly to a particular location. Select **LOCATION** from the **MISSION** menu to go directly to the following places:

- **RUNWAY** — On the runway of the main airport, ready for takeoff.
- **HANGAR** — In the hangar of the main airport.
- **FINAL** — 190 feet up, ready for final approach for landing at the main airport.
- **LINED UP** — 1010 feet in the air and lined up for landing.

- **10,000** — 10,000 feet in the air: a good starting point for practicing new maneuvers.
- **OBSTACLES** — 190 feet up, approaching several miles of obstacle courses made of gates and shapes.
- **SLALOM** — 190 feet off the ground, lined up with a killer slalom course.
- **CANYON** — 640 feet up, flying toward a hair-raising canyon. We *dare* you to fly anything faster than a Sopwith through this.
- **BRIDGE** — 190 feet up, approaching a bridge.
- **AIRSTRIP** — On a solitary airstrip. With no hangars or towers on the screen, this is a great place to practice takeoffs and landings if you have a slower computer.

TEST FLIGHTS

The real hero in the flight test business is a pilot who manages to survive.

The ultimate challenge of your piloting skills is in testing airplanes. As a test pilot, your goal is to take up a plane and test its capabilities to the max. Every maneuver must be carefully performed with the aircraft to see if it is as good in the air as it looks on paper. You have to be an excellent pilot to fly with the utmost precision and keep your data accurate. You also have to be good enough to keep yourself from getting hammered by the unexpected. Flying a plane to its limits — pushing the edge of the envelope — is risky business. Only the best pilots have the combination of skill, experience and coolness under pressure to save themselves and their planes when something goes wrong.

The procedures that follow are the maneuvers you should put your plane through. Remember, the only way to obtain accurate results is to fly your plane very carefully, relying heavily on instruments. Attempt to stabilize all the flight parameters: throttle,

heading, altitude, attitude, airspeed, vertical climb, and slip. If you are unable to stabilize the aircraft, then it has reached its minimum or maximum limit.

After you complete a procedure, write down your results on a copy of the Test Flight Checklist (at the end of this section) to compare against other aircraft or against other pilots' findings.

Minimum Take-Off Speed (Flaps Up)

The Minimum take-off speed is the slowest speed you can take off at with your flaps up.

This may sound simple, but if the engines don't cut it, you can run out of runway...fast.

1. Make sure your flaps are up.
2. Start on the runway.
3. Increase the throttle to 100%.
4. Pull back on the stick about 75% and hold it there.
5. Watch the altimeter and VSI. When they leave 0, check and record airspeed.

Minimum Take-Off Speed (Flaps Down)

This minimum take-off speed test is the slowest speed you can take off at with your flaps down.

Commercial airliners rely heavily on flaps because they reduce the speed and distances required for take-off.

1. Put flaps down.
2. Start on the runway.
3. Increase throttle to 100%.
4. Pull back on the stick about 75% and hold it there.
5. Watch the altimeter and VSI. When they leave 0, check and record airspeed.

Maximum Level Speed

The maximum level speed is the fastest speed you can fly level at 10,000 feet.

Going faster is one of the things I always found myself doing. I guess it's just one of the things I enjoy the most.

1. Make sure the flaps are up.
2. Start at 10,000 feet.
3. Increase throttle to 100%.
4. Hold VSI at zero.
5. When airspeed and altitude stabilize, read and record the altitude, Mach and indicated airspeed (on the HUD). Climb in increments of 5000 ft and repeat 4-6 times.

Maximum Level Speed (10,000 Feet, Flaps Down)

This maximum level speed is the fastest speed you can fly level at 10,000 feet with the flaps down.

This type of destructive testing isn't something that's pleasant to put an airplane through, but it's crucial information we have to know.

1. Start at 10,000 feet.
2. Put flaps down and increase throttle to 100%.
3. Hold VSI at zero.
4. Watch carefully for the "flaps jammed open" message on the screen. This message occurs *very* quickly on the fast jets, so be alert.
5. When you see the "flaps jammed open" message, read and record the airspeed.

Cruise Speed (10,000 Feet)

The cruise speed is the constant speed you can maintain at 10,000 feet and 75% throttle.

Knowing your aircraft's cruise speed is useful because it also gives you some insight into the airplane's limitations.

1. Start at 10,000 feet.
2. Set throttle to 75%.
3. Hold VSI at zero.
4. When airspeed and altitude stabilize, read and record the airspeed.

Stall Speed — Clean (Gear & Flaps Up)

The stall speed is the slowest speed you can fly with the gears and flaps up before you stall.

This is one of the most important numbers to know about your plane because the closer you can get to a stall during the landing the less runway you'll need. Maybe then you can land the SR-71 at the main airport...

1. Start at 3,000 feet.
2. Increase airspeed to about 125% of take-off.
3. Hold VSI at zero (it's hard).
4. *Slowly* — one notch every 15 seconds or so — reduce the throttle while continuing to keep the VSI as close to zero as possible. When you can no longer keep the VSI at zero, check and record the airspeed.

Stall Speed (Gears & Flaps Down)

This stall speed test is the slowest speed you can fly with the gears and flaps down.

Basically, anything that protrudes from the airplane's body is going to affect airspeed and lift — something as "unaerodynamic" as the landing gear will have a negative effect.

1. Start at 3,000 feet.
2. Increase airspeed to about 125% of clean stall and lower flaps and landing gear.
3. Hold VSI at zero.
4. *Slowly* — one notch every 15 seconds or so — reduce the throttle while continuing to keep the VSI as close to zero as possible. When you can no longer keep the VSI at zero, check and record the airspeed.

Maximum Sustained Rate of Climb

The maximum sustained rate of climb is the highest rate at which an airplane can gain altitude. You might think that a vertical climb is the fastest way up, but most airplanes lose speed and stall in a vertical climb.

This is one of the harder tests and requires the most time and skill. The maximum rate of climb for aircraft like the F-16 and F-18 is found in a ballistic vertical climb. That's because these aircraft often generate thrust greater than their weight. As you approach their ceiling and reduce engine power, they lose their ability to climb this way. At that point they work like other airplanes and you can measure maximum rate of climb. That's why these planes are so easy to fly — there are few problems the go-stick can't correct. Try measuring the P-51 if you want more of a challenge.

1. Start at 3,000 feet with throttle at 100%.
2. At the aircraft's clean stall speed (first try only), pull the nose of the plane into a steady climb, maintaining a constant speed.
3. When airspeed has stabilized, note the altitude and the time in the upper right corner of the HUD as you cross a 1,000 foot boundary.
4. After you have climbed an additional 10,000 feet maintaining a constant airspeed, note the time again. Plot the time on a copy of the Test Pilot's Checklist at the end of this section. Plot the time at the convergence of the airspeed and seconds on the grid. (For aircraft with poor climb performance, try climbing 3,000 feet instead of 10,000.)
5. Repeat Steps 3 to 5, increasing airspeed in increments that match the flight checklist grid. Continue this process until the airspeed matches, and you can maintain, the aircraft's maximum level speed.

6. When you have recorded all the data points on the checklist grid, connect the plots to form a curve. Find the lowest point on the curve; that is your best constant climb rate.

Service Ceiling

The service ceiling is the altitude you can reach without exceeding the normal parameters of the aircraft's limits.

It sounds easy, but it's another test that requires discipline and skill.

1. Start at 10,000 feet with the throttle set at 100%.
2. Climb at the aircraft's maximum sustained rate of climb.
3. Adjust attitude to maintain airspeed.
4. Fly as high as you can and don't let the VSI go to negative.
5. Record the altitude at which you can no longer climb.

Maximum Attainable Speed

The maximum attainable speed is the fastest you can take your plane.

Be careful when you're pushing the envelope. Experience makes the best test pilots, and in most cases, experience and auger jobs don't mix. Some aircraft like the X-3 exhibit a phenomenon known as "inertial roll coupling." This can cause the nose of the plane to pitch away from the flight vector. It can be mild and controllable, or it can be destructive...

1. Climb almost to the service ceiling.

2. Push the nose down and hold in a steep, steady dive.
3. Watch the altimeter and airspeed indicator.
4. Don't let the altitude get too low to pull out of the dive before the airspeed stabilizes.
5. When the airspeed indicator stabilizes (doesn't continue to climb) or when the wings start to foul, record the airspeed and altitude.

Maximum Attainable Altitude

The maximum attainable altitude is the highest you can take your plane. As far as we know, this test is reserved for AFT pilots — it's just too dangerous to do in a real plane.

It's simple — take the plane as high as you can. Of course you may encounter problems with speed instabilities, structural damage from G forces, or loss of control in the thin, high altitude atmosphere, but that's all part of being a test pilot.

1. Set the throttle at 100% and climb to 50% of the aircraft's service ceiling.
2. Level off and let airspeed increase to maximum level speed (try not to lose altitude).
3. Pull the nose into a climb, thus transferring the built-up airspeed into climb energy. When you are almost vertical (pointed at the star straight up), you should be gaining altitude at a great rate. You are trading airspeed for altitude in a ballistic climb.
4. As airspeed starts to bleed off, reduce your angle of attack to sustain climb.
5. The sky blackens as you enter the edge of space.
6. Experiment. The object is to set the altitude record for the plane. Here's something to shoot for: at the time this manual is written, the SR-71's record AFT altitude was 164,900 feet. Good luck!

TEST FLIGHT CHECKLIST

Aircraft _____ Test Pilot _____

Record the data for the following categories:

In Mach

_____ Minimum takeoff speed
_____ Minimum takeoff speed, flaps down
_____ Maximum speed at level flight (100% throttle)
_____ Maximum speed with flaps down
_____ Cruise speed (75% throttle)
_____ Stall speed, gears and flaps up (clean)
_____ Stall speed, flaps down
_____ Stall speed, gear down and flaps up
_____ Stall speed, gear and flaps down
_____ Maximum attainable speed in dive
_____ Speed for maximum sustained rate of climb

In Feet

_____ Service ceilings
_____ Maximum attainable speed in a dive

Mach Speed (MPH for lower performance airplanes)

.2	(60)	+	+	+	+	+	+	+	+	+	+
.3	(90)	+	+	+	+	+	+	+	+	+	+
.4	(120)	+	+	+	+	+	+	+	+	+	+
.5	(150)	+	+	+	+	+	+	+	+	+	+
.6	(180)	+	+	+	+	+	+	+	+	+	+
.7	(210)	+	+	+	+	+	+	+	+	+	+
.8	(240)	+	+	+	+	+	+	+	+	+	+
.9	(270)	+	+	+	+	+	+	+	+	+	+
1.0	(300)	+	+	+	+	+	+	+	+	+	+
1.1	(330)	+	+	+	+	+	+	+	+	+	+
1.2	(360)	+	+	+	+	+	+	+	+	+	+
1.3	(390)	+	+	+	+	+	+	+	+	+	+
1.4	(420)	+	+	+	+	+	+	+	+	+	+
1.5	(450)	+	+	+	+	+	+	+	+	+	+
1.6	(480)	+	+	+	+	+	+	+	+	+	+
1.7	(510)	+	+	+	+	+	+	+	+	+	+
1.8	(540)	+	+	+	+	+	+	+	+	+	+
1.9	(570)	+	+	+	+	+	+	+	+	+	+
2.0	(600)	+	+	+	+	+	+	+	+	+	+

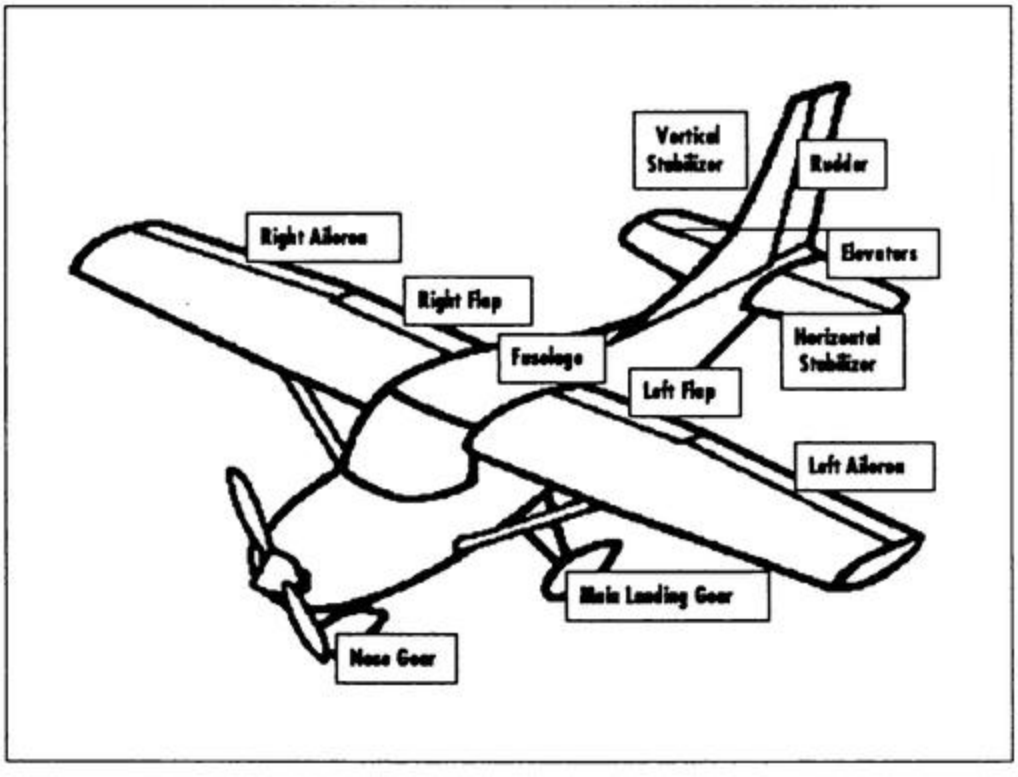
Time to 10,000 feet (or 3,000 feet for lower performance planes)

PART III: TECHNICAL REFERENCE

THE BASICS OF FLYING

All airplanes — no matter how new, old, basic, or advanced — have similar components. Wings generate lift, the tail assembly provides stability, landing gear furnishes ground maneuverability, the engine supplies motive force. The fuselage (or body) holds everything together and gives the pilot and passengers somewhere to sit.

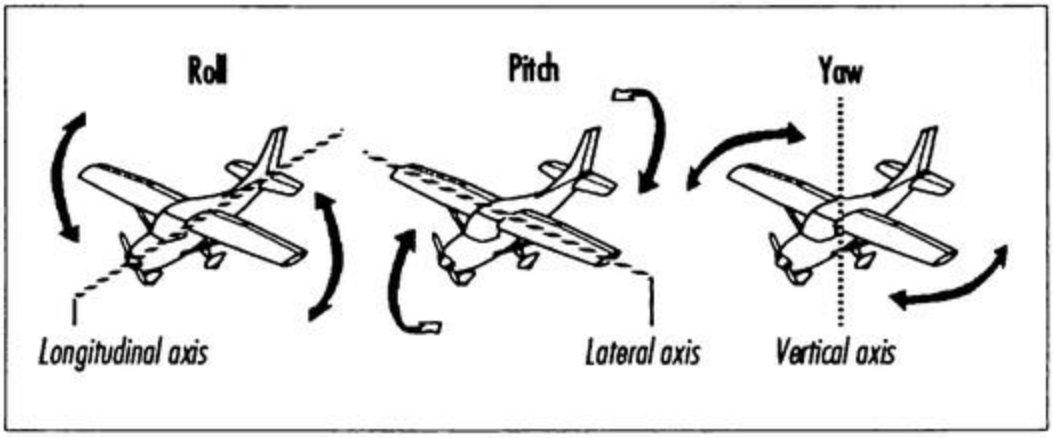
Parts of an Airplane



Movable control surfaces on the wings and tail allow the airplane to maneuver in three dimensions while airborne. The pilot controls the plane by moving pedals and a control wheel or stick in the cockpit. The ailerons and elevators are connected to the control

wheel or stick. The rudder is connected to rudder pedals.

In addition to the primary controls, most airplanes also have wheel brakes, wing flaps, and retractable landing gear.



Ailerons Roll, Elevators Pitch, and Rudder Yaws

Ailerons — Bank control

To turn an airplane in flight, you must *bank*, or roll, the wings. To bank the wings, you move the ailerons, which are located on the outer trailing edges of the wings. To bank left, move the stick to the left; this raises the left aileron and lowers the right, causing the right wing to come up. To bank right, move the stick to the right; the right aileron will go up and the left will drop, causing the left wing to rise.

Elevators — Pitch control

Elevators keep the airplane vertically stable. Moving the elevators up or down makes the nose of the airplane *pitch* in the opposite direction. To pull the nose up, raise the elevators by pulling the stick back. Pushing the stick forward will make the elevators go down, which in turn will force the nose down.

The elevators don't directly make the plane gain or lose altitude. They only change the angle at which the wings move forward along the flight path; that angle is called the angle of attack. For example, if you hold the stick full back on a low-powered airplane, you won't start gaining altitude. Instead, you'll stall (i.e., your wings will quit generating lift) and you'll begin to descend rapidly. Use your throttle *with* your elevators to control altitude.

Rudder — Yaw Control

The rudder, located at the trailing edge of the fin, controls *yaw*, or swings the tail right or left. On the ground, the rudder steers the airplane like the rudder of a boat. While airborne, the rudder works in conjunction with the ailerons to coordinate turns. When the rudder and aileron aren't coordinated in a turn, the tail of the airplane *slips* to the inside of the turn, or *skids* to the outside of the turn.

Swing the tail left by applying the right rudder pedal; swing the tail right by applying the left rudder pedal.

Engine — Power Control

To oversimplify, an airplane flies because you cause it to accelerate down the runway until its wings develop a lifting force that's greater than its weight. In contrast, you land because you cause the lifting force to be less than its weight. An airplane needs power to get off the ground and sustain flight; the engine supplies this power. In AFT, the *throttle* controls the engine's energy output and is measured in percentages of its *total* output potential.

Wing Flaps — Lift and Drag

Flaps are a movable part of the wing, normally hinged to the inboard trailing edge of each wing. When down, they increase *lift* and *drag*. As a result, you can make a steeper approach for landing without increasing airspeed. Lower the flaps by pushing the

handle forward. Raise them by pulling the handle back. Be careful using your flaps when your plane is experiencing excessive aerodynamic loads (such as those caused by excessive speeds): your flaps can jam or even get torn off.

Brakes — Stopping

Coast to a stop on the ground by cutting the throttle and using the brakes. Flip the brake switch to apply the brakes (whether you flip the switch up or down depends on the airplane you're flying).

Landing Gear — Landing and Ground Maneuvering

Two main landing wheels are designed to withstand landing loads and support the airplane on the ground. A third, smaller wheel is used to control ground steering. Most airplanes have a "tricycle" wheel formation, where the smaller wheel sits forward of or behind the two main wheels, thus forming a triangle.

Landing gear creates wind resistance, so the more modern aircraft have retractable landing gear — once you've taken off, you can pull the gear up. In AFT, landing gear is pulled in by a switch on the instrument panel (whether you flip the switch up or down depends on the plane you're flying).

Flight References

There are three basic components of airplane control: pitch control using the elevators, bank control using the ailerons, and power control using the throttle. Performing any maneuver is a matter of coordinating these three components to achieve the "flight attitude" you want. Flight attitude is the relationship of your airframe to outside visual references.

Visual Reference (VR)

You fly by visual reference when you note the relationship of a specific reference point on your airplane — like the glareshield (window) above your instrument panel — to the horizon. As you become skilled, you become continuously aware of these relationships without thinking about them.

Instrument Reference (IR)

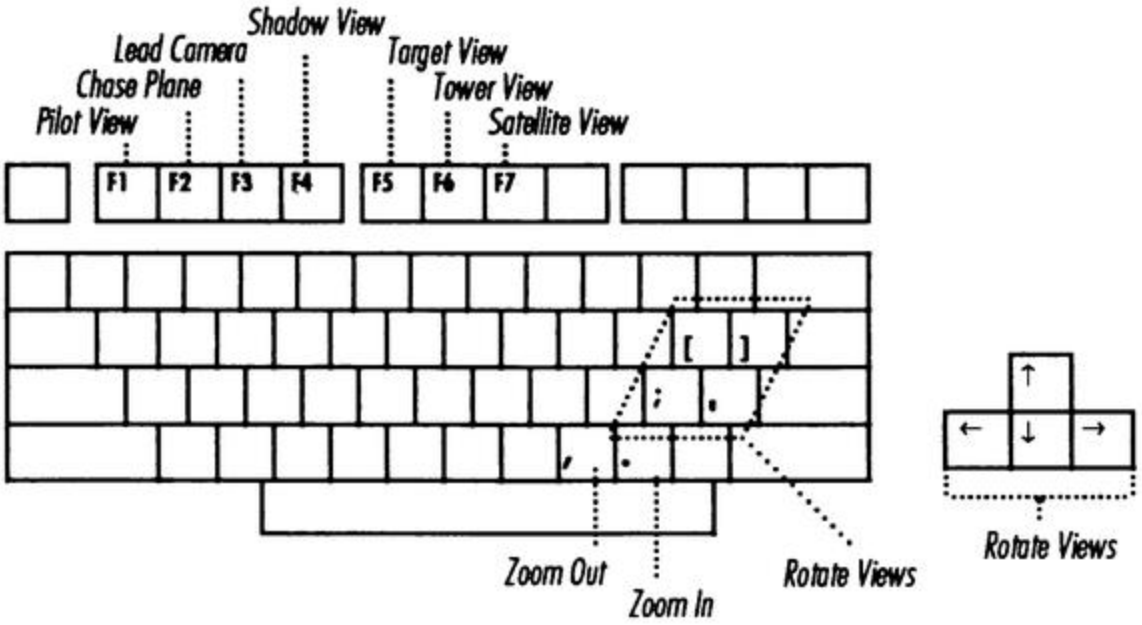
You can fly by visual reference alone, but you get better control and become a more proficient pilot if you also confirm your attitude by scanning the instruments.

CONTROLLING THE SIMULATOR

This section tells you about features in AFT that you can control. You'll learn how to change views, replay flights, switch airplanes, change locations, and a number of other tasks.

Calling Up Menus <Esc>

Press <Esc> to call up the menu bar. If you abort a flight by mistake, you can press <Esc> again. You'll pick up right where you left off.



Ctrl	+	*Rotate View Keys*	=	*Macro-movement*
Shift	+	*Rotate View Keys*	=	*Micro-movement*

Changing Views

Normally you'll want to look straight ahead through the windshield (the PILOT view) so you can monitor your instruments. Once controlling the plane becomes easier, you'll probably want to take time to view your flights from outside the cockpit. To change a view in flight, press one of the function keys shown in the figure above. AFT will "pan" to the new view like a Hollywood movie-camera. If you want to *cut* right to your new view, press <Ctrl> plus one of the view keys.

Zooms

In each view, you can "zoom" in by pressing the period (.) key or "zoom" out by pressing the comma (,) key. Pressing the zoom key repeatedly increases the zoom speed. To freeze the zoom at a particular setting, hit the opposite zoom key the same

number of times. Each of AFT's views has a different magnification *range*. Some views let you move right up to the plane; others let you move really far away. When you first switch to a view outside of the cockpit, you immediately set a magnification range. All other views that you switch to from then on will have the range of that view. You can reset the magnification range of a view to its default setting by pressing <Ctrl> plus its function key.

Rotating Views

You can rotate views while flying by pressing the arrow cursor keys (*not the arrow keys on your numeric keypad!*) or the equivalent keys displayed in the diagram on page 63. This has a different effect depending on whether you're viewing from the inside or outside of the cockpit. Press <Ctrl> plus a function key (<F1> through <F7>) to cancel the rotation.

Replay Menu

AFT has a built in flight recorder that lets you replay your last flight. To watch your flight in its entirety, select REPLAY from the main menu. If you only want to watch certain parts of your flight, use the keys below to "forward" or "rewind" your replay.

- **+1 MINUTE <F8>** — Forwards to the next minute from wherever you are in the recording.
- **LAST MINUTE <Shift> + <F8>** — Skips to the last minute of the replay.
- **FAST FORWARD/NORMAL FORWARD <F9>** — Press <F9> to fast forward the recording to the end of the flight. Press <F9> again to return to normal speed.
- **-1 MINUTE <F10>** — "Rewinds" approximately one minute from wherever you are in the recording.

The replay feature only records your last flight. It "forgets" the recording as soon as you start a new mission. If you want to save flights, see *Formations*, page 45.

Changing Airplanes <Ctrl>-A

Change airplanes any time by pressing <Ctrl>-A or by selecting AIRPLANES from the MISSIONS menu. You can change airplanes in mid-flight; once you select a new plane, you'll pick up where you left off in your new plane. **Be careful!** Make sure you're not exceeding the limitations of the new plane — if you were flying at Mach 2 in the SR-71 and then change to a Sopwith Camel, you'll rip your wings off and plummet to the earth faster than you can say, "Curse you Red Baron!"

Changing Locations <Ctrl>-L

Change locations by pressing <Ctrl>-L or by selecting LOCATIONS from the MISSIONS menu. See *Locations*, page 48, for more on locations.

Other Flight Controls

Pausing Flight P Press **P** any time to suspend flight; press any key to resume. Calling up the menu bar by pressing <Esc> also pauses flight. Press <Esc> again to pick up where you left off.

"Catch Up" C When flying in formation, it only takes one mistake to find yourself lagging behind. Press **C** to instantly "catch up" to the others.

Wind W Wind adds one more level of challenge to top AFT pilots. Press **W** to toggle the wind on and off.

GLOSSARY

Ailerons	Hinged surfaces at the trailing edge of each wing near the wingtips. Ailerons control the plane's roll; lowering an aileron increases lift and raises the wing. The ailerons are linked; deflecting one down moves the other up.
Altimeter	Instrument used to measure the height (in feet) of the airplane above sea level.
Angle of attack	The angle at which the wing meets oncoming air. The greater the angle of attack, the more lift occurs as air striking the bottom of the wing is deflected downward. If the angle of attack is too great, the airplane stalls.
Attitude	The direction the nose of the airplane is facing. This is not necessarily the direction the airplane is heading. *See* Track.
Auger in	Crash.
Back pressure	Pulling back on the flight stick.
Buy the farm	Crash.
Center of gravity	The part of the airplane where the longitudinal, lateral, and vertical axes cross.
Control surface	Parts of the airplane that can be moved to affect a plane's flight.
Crab	To fly at an angle to the track over the ground in order to compensate for a crosswind.
Drag	The resistance created by air striking the surface of the aircraft as it moves through the air. Some drag also occurs as the wing deflects air downward to produce lift.
Elevators	Hinged surfaces on the trailing edge of the horizontal stabilizer that cause the aircraft to move about its lateral axis, controlling pitch. Pushing the stick forward moves the elevators down; the resulting airflow pushes the tail up and the nose down.
Empennage	The unit consisting of the horizontal and vertical stabilizers. Also known as the tail section.
Final	Final approach to landing.
Flaps	Hinged surfaces on the trailing edges of the wings, usually near the fuselage. Flaps can be lowered to increase lift and drag, allowing a slower airspeed and a steeper angle of descent while landing.
Fuel starvation	A condition that arises in gravity-fed engines in which fuel cannot reach the carburetor, resulting in an engine stall.
G-force	Gravitational force.
Glareshield	An airplane's windshield.
Glideslope	The angle of descent.

Go-stick	Throttle.
Heading	The direction in which the aircraft is pointing, as indicated by the heading indicator.
HUD	Heads-Up-Display. AFT's secondary control monitoring system.
IR	Instrument reference.
Lateral axis	The axis of the aircraft that extends from wingtip to wingtip.
Lift	The upward force generated by air flowing over wings. Air moves faster over the curved top of the wing, creating a low pressure that pulls the plane up. At the same time, air striking the bottom of the wing is deflected downward, creating more upward force.
Longitudinal axis	The axis of the aircraft that extends through the fuselage from nose to tail.
Mach	One Mach is 760 miles per hour at sea level. The Mach number is the ratio of true airspeed to the speed of sound.
Pitch	Rotation about the aircraft's lateral axis, pointing the aircraft's nose up or down.
Roll	Rotation about the aircraft's longitudinal axis. Also an aerobatic maneuver.
Rudder	The hinged surface on the vertical stabilizer that controls the airplane's yaw.
Service ceiling	The altitude above which the engine no longer has enough power to maintain a climb rate of 100 feet per minute.
Skid	The aircraft's undesirable sideways and upward movement toward the outside of a turn.
Slip	The aircraft's undesirable sideways and downward movement toward the inside of a turn during a sharp bank.
Stall	When the angle of attack is too great, the air no longer flows smoothly across the upper surface of the wing and no longer contributes to lift. Instead, the air passing the wing becomes turbulent and rapidly degenerates lift.
Throttle	The control that the pilot uses to control the engine's power output.
Track	The direction the airplane is actually heading.
Vertical axis	The axis of the aircraft that passes vertically through the fuselage, intersecting with the longitudinal and lateral axes at the center of gravity.
Vertical stabilizer	The vertical section of the tail. Also called the fin.
VR	Visual reference.
VSI	Vertical speed indicator.
Yaw	Rotation about the aircraft's vertical axis.

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KEY COMMAND SUMMARY

Menu Keys

<Esc>	Call up main menu (in flight); escape menu (in menu)
↑	Move highlighted bar up
→	Move highlighted bar right
↓	Move highlighted bar down
←	Move highlighted bar left
<Enter>	Select menu or option

<Ctrl>V	Views	<Ctrl>T	Training
<Ctrl>M	Missions	<Ctrl>1	Day 1, Flight Training
<Ctrl>D	Demonstration	<Ctrl>2	Day 2, Flight Training
<Ctrl>A	Airplanes	<Ctrl>3	Day 3, Flight Training
<Ctrl>L	Locations	<Ctrl>4	Day 4, Flight Training
<Ctrl>F	Formations	<Ctrl>5	Day 5, Flight Training
<Ctrl>R	Races	<Ctrl>6	Day 6, Flight Training
<Ctrl>C or Q	Quit		

<Alt> *may be used in place of* <Ctrl>.

Flight Keys

Yoke Control (on the numeric keypad)

5	Center ailerons (and rudder)*	7	Yoke forward and to left
2	Yoke back	9	Yoke forward and to right
8	Yoke forward	1	Yoke back and to left
4	Yoke left	3	Yoke back and to right
6	Yoke right		

<Shift>2, 8, 4, 6, 7, 9, 1, or 3	Move yoke, micro-movement
<Ctrl>2, 8, 4, 6, 7, 9, 1, or 3	Move yoke, macro-movement

<Alt> *may be used in place of* <Ctrl>.

For PS/2 models 25 and 30

Home	Center ailerons (and rudder)*	Print Screen	Yoke forward and to left
End	Yoke back	Pause	Yoke forward and to right
Num Lock	Yoke forward	Delete	Yoke back and to left
Insert	Yoke left	Page Down	Yoke back and to right
Page Up	Yoke right		

** Repeatedly press the key to center the elevators.*

Throttle Control

' or <Tab>	Throttle off	9	Throttle 90%
1	Throttle 10%	0	Throttle 100%
2	Throttle 20%	-	Decrease throttle by 1/50th
3	Throttle 30%	+	Increase throttle by 1/50th
4	Throttle 40%	<Shift> -	Decrease throttle by 1/150th
5	Throttle 50%	<Shift> +	Increase throttle by 1/150th
6	Throttle 60%	<Ctrl> -	Decrease throttle by 1/10th
7	Throttle 70%	<Ctrl> +	Increase throttle by 1/10th
8	Throttle 80%		

<Alt> *may be used in place of* <Ctrl>.

Rudder Control

Z or <Ins>	Rudder left by 1/50th
X or <Del>	Rudder right by 1/50th
<Shift>-Z or <Shift>-<Ins>	Rudder left by 1/150th
<Shift>-X or <Shift>-<Del>	Rudder right by 1/150th
<Ctrl>-Z or <Ctrl>-<Ins>	Rudder left by 1/10th
<Ctrl>-X or <Ctrl>-<Del>	Rudder right by 1/10th
<Shift>-' or <Shift>-<Tab>	Full left rudder
<Shift>-5	Center rudder
<Shift>-0	Full right rudder
<Shift>-2, 3, or 4	Intermediate left rudder positions
<Shift>-6, 7, or 8	Intermediate right rudder positions

<Alt> *may be used in place of* <Ctrl>.

Miscellaneous Flight Keys

B	Brakes	G	Landing gear
E	Flaps down by 25%	F	Flaps up or down 100%
R	Flaps up 25%	spacebar	Zero trim

Simulator Keys

View Keys

<F1>	Pan to pilot view
<F2>	Pan to chase plane view
<F3>	Pan to lead camera view
<F4>	Shadow view
<F5>	Target view
<F6>	Tower view
<F7>	Satellite view

Press <Ctrl> + key to "snap" to new location/set magnification range

.	Zoom in
,	Zoom out
[ ] ; '	Rotate views
↑ ↓ → ←	Rotate views

<Ctrl>[ ] ; '	Rotate views, macro-movement
<Ctrl>↑ ↓ → ←	Rotate views, macro-movement
<Shift>[ ] ; '	Rotate views, micro-movement
<Shift>↑ ↓ → ←	Rotate views, micro-movement

<Alt> *may be used in place of* <Ctrl>.

Replay Keys

<F8>	Forward to next minute
<F9>	Fast forward/Normal forward
<F10>	Rewind one minute
<Shift><F8>	Skip to last minute of replay

Miscellaneous Simulator Keys

<Enter>	Instrument view (during flight only)
C	Catch up
H	Heads-Up-Display — control markers
<Shift>H	Heads-Up-Display — instrument markers
I	Take control of plane (FLIGHT TRAINING only)
J	Recenter joystick
P	Pause flight
W	Wind

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