

FINAL FLIGHT!
by Mark Chasin

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FINAL FLIGHT! is a flight and landing simulator, which allows you to experience the thrill and tension of piloting a small plane, not intended to be similar to any commercially available plane. Your view is out of the cockpit of this plane, looking out toward the runway in the distance. The simulation accurately calculates relative and absolute positions of the planes and runway, and then depicts them on the screen. Since it is written entirely in machine language, the speed allows many screen updates each second, for a real-time view. As you approach the runway, you will actually see the perspective change and the runway grow larger, in proportion to your speed and altitude. Your instruments are accurate, and the plane can be landed using only the instruments, but this should not be attempted by novice pilots. PLEASE read the remainder of these instructions BEFORE attempting to land, since a thorough understanding of the controls and options will avoid frustration. At any time during flight, the simulation may be halted by simultaneously hitting the CTRL and I keys; to restart, hit them again.

STARTING THE SIMULATION

For the disk version, turn on your disk drive, and when the busy light goes out, insert the FINAL FLIGHT! disk, and close the drive door. Check to be sure that you have removed all cartridges from your computer, and that the top door is securely fastened. Turn on your television set or monitor, and then turn on your computer. The program will

automatically boot, and, after a few seconds, the faceplate of FINAL FLIGHT! will appear. At this point, the program waits for you to hit any key. As soon as you do, the program itself will load, and begin by asking you at which level you would like to try your first attempt.

For the tape version, place the tape in your recorder, and close the cover. As above for the disk version, be sure no cartridges are in your computer, turn on your television or monitor, and then hold down the START button on your computer while turning it on. The computer will beep, signalling you to depress the PLAY button on the recorder. After you have done so, hit the RETURN key to load the program. The first screen will not be the faceplate, but rather the simulation itself. Make your selection of options, and begin.

THE CONTROLS

Your primary control is a joystick, plugged into the left slot on the front of your ATARI (slot 1). It gives control over 3 different functions:

- 1) Pushing the joystick forward (12 o'clock position) causes the plane to nose down, producing a negative pitch, and increases the rate of descent. Pulling back on the stick (6 o'clock position) will cause the plane to rise, producing a positive pitch, and increasing your rate of climb. Pitch is the degrees of deviation from level flight. A negative pitch indicates that the plane is losing altitude; a positive pitch indicates that the plane is rising. A pitch of 0 indicates level flight.

- 2) Pushing the joystick to the left (the 9 o'clock position) will move the plane left, but only in levels of difficulty 2-4 (see below for a discussion of the various options provided). At these levels of difficulty, pushing the joystick to the right (the 3 o'clock position) will move the plane right. Note that the view you see is out of the cockpit windows, and moving left will cause everything on the screen to appear to move right, as the nose of your plane slowly turns left.
- 3) Holding down the fire button while you push the joystick from side to side will change the fuel fed to the engines, raising or lowering the power produced. Holding the button down while moving the joystick left (the 9 o'clock position) will decrease power, whereas pushing left (the 3 o'clock position) will increase power.

Other functions of flight are controlled from the keyboard, as follows:

- 1) The F key toggles the landing Flaps up and down. If they are up, depressing the F key once will put them down. Depressing the F key a second time will retract them up again. When down, the stall speed of the plane is decreased; i.e., it remains aloft at slower speeds.
- 2) The B key toggles the Brakes on and off. Depressing the B key will set the brakes, and a second time will release them.

- 3) The E key controls the pitch of the propeller of the Engine. A feature not found on most small planes, this allows the pilot to change the pitch to slow the plane down after landing. THIS SHOULD NEVER BE DEPRESSED WHILE IN FLIGHT!!! IT WILL IMMEDIATELY CAUSE A CRASH!!!
- 4) The R key (immediate Retry) is more completely described below, under CRASHING.

THE OPTIONS

The first screen of the simulation asks for what level of difficulty you would like to attempt, on a scale of 1-4. A difficulty of 1 is the easiest to land, whereas a difficulty of 4 should be reserved for more experienced pilots. The differences between the various levels are as follows:

- 1) As the difficulty increases, the runway becomes smaller. The runway becomes shorter and narrower, a harder target to hit.
- 2) The higher the difficulty, the lower must be your vertical speed when you touch down. That is, at level 1, little penalty is given for slamming down into the runway, but as you increase the difficulty, you must set the plane down more and more gently. In addition, the plane's stall speed increases with higher difficulties. Therefore, you must maintain higher minimum speeds at higher difficulties. Stalls are more completely described under FLYING THE PLANE below.

The maximum vertical speeds allowed at touchdown, and the stall speeds for each level of difficulty are:

Level of Difficulty	Maximum Vertical landing speed	Stall speed	
		Flaps up	Flaps down
1	-128	40	30
2	-112	50	30
3	- 96	60	40
4	- 80	65	45

- 3) At level 1, no side-to-side movement is enabled, allowing novice pilots to concentrate on landing following a straight-in approach. At the three higher levels, the plane will move from side to side. At level 2, such movement is permitted, but is only required to avoid obstacles, described below. At levels 3 and 4, at your first view of the runway, it will be off to one side or the other, and you will need to move to center it in your window. Furthermore, at level 4, treacherous cross winds can blow you continually off course, requiring constant attention to compensate.
- 4) The higher the level of difficulty, the more fuel you will use at each power setting. Obviously, the more power you need, the more fuel you use. It is barely possible to land the plane with no fuel remaining, by gliding in, but don't try it without a lot of practice!

- 5) Since the easier levels have fewer hazzards, your initial distance to the runway will be shorter. The highest levels demand skillful piloting over longer periods of time to successfully land.

After having made your selection of difficulty, the simulation goes on to ask which weather conditions you would like to choose, clear or foggy. The choice of fog should be made only after some experience, since it is more difficult than with a view of the runway to guide you.

Finally, you must select your cockpit parameters. The choices are to fly:

- 1) with both instruments and a view of the runway.
- 2) with no view of the runway at all.
- 3) with a view of the runway, but with no instruments to guide you.

Since the choice of fog prevents you from seeing the runway until you get very close to it, and option 2 of the cockpit parameters prevents you from seeing the runway at all, you may not choose both of these options together. If you select foggy weather, the simulation will not accept an answer of "2" for the final selection, forcing you to make another choice.

It is possible to land the plane under all conditions, even in foggy weather with no instruments, but such attempts are doomed to crashes unless the pilot is very, very familiar with the plane. Such situations are not recommended for the novice!

In attempting to land, many novice pilots will stay at low altitude, and when over the runway, set the plane down very gently. We do have one small problem here, however. When we built the MFG Executive Tower, no one told us they were going to put an airport in our backyard! We had a beautiful view of rolling countryside from our windows on the fortieth floor. Now what do we see? Planes coming at us from every direction, that's what! Takeoffs-landings-near misses-it's enough to give us ulcers. Please don't add to it. If you see us, please divert around or climb over us. At level 1, you'll have to climb, since you won't be able to move around us, but at the other three levels, you can do either. If you remain on the correct flight path, you'll never see us, and we'll have no problem. BUT ABOVE ALL, DON'T HIT US!!! PLEASE?

At levels 1 and 2, you will be the only plane using this airport. Although you may see other planes from time to time, they will not be using this airport. However, at levels 3 and 4, you will be sharing with others. You will be the only plane landing (except for the ones behind you), but others will be taking off, under the control of the air traffic controllers, until you are on your final approach. Some of these will be piloted by Sunday pilots, and you'd better avoid them, since mid-air collisions can be messy at best, and will bring in the FAA for years of questions. Since very few people fly in fog, you'll be the only plane in the air if you choose that option. Also, if you choose to fly with no view of the ground, the air traffic controllers will also keep the air free of other traffic. After all, one crazy person in the air at a time is enough!

Finally, once you are on the ground, you only need to concentrate on slowing the plane down at level 1, but at the higher levels, you will find that the plane pulls to the side somewhat, and if you don't correct this pull, you will run off the side of the runway, and crash.

INSTRUMENTATION

A typical view of the instrumentation in your plane is shown below. In the descriptions which follow, the letters of the instrumentation are capitalized and underlined to make the relationships more clear.

<u>ALTIM</u> 5483	<u>PCH</u> -1	<u>VSPEED</u> - 120	<u>MPH</u> 88	<u>DME</u> 12534	<u>RNR</u> 48	<u>FUEL</u> 87
<u>RAI</u> ^	<u>DI</u> <	<u>ETO</u> HOR	<u>BRKS</u> OFF	<u>FLAPS</u> UP		

The instruments on the top line are, in order from left to right:

- ALTIMeter-measures your altitude from the ground, in feet. EXAMPLE: your altitude is 5483 feet.
- Pitch-measures the angle of your plane from the horizontal. A pitch of zero would be level flight. EXAMPLE: your pitch is -1, a slightly downward angle.
- Vertical SPEED-the number of feet per minute that your plane is gaining or losing altitude. EXAMPLE: vertical speed is -120, so you are losing altitude at 120 feet per minute.

- Miles Per Hour-your horizontal speed. EXAMPLE: you are approaching the runway at a speed of 88 miles per hour. Note: this may normally be in knots, but is given here in MPH for familiarity.
- Distance Measuring Equipment-measures the distance between your current position and the near end of the runway, in feet. As you pass over that end of the runway, the numbers will begin to increase again, but will be followed by an asterisk, so that you can tell when you are safely over the runway. EXAMPLE: you are 12534 feet from the closest end of the runway.
- Power-the percent of maximum power you have applied to the engine. EXAMPLE: you have 48 percent of maximum power applied.
- FUEL remaining-the percent of your total fuel capacity you have still remaining. EXAMPLE: you have 87% of your fuel left.

The second bank of instruments will now be described, also from left to right:

- Flight Path Indicator-signals whether you are above, below, or directly on the correct flight path for landing. Move the plane up or down to the point at which this indicator is a horizontal line, and maintain this until you get to an altitude of less than 600 feet. From this point on, don't trust the indicator, but rather, use your view of the runway and your altimeter to land safely. EXAMPLE: the arrow is pointing up, so you should ascend to regain the correct flight path.

- Directional Indicator-signals whether you are right or left of the correct flight path for landing. Move the plane from side to side to the point at which this indicator is a horizontal line, and maintain this at all times, EVEN AFTER LANDING! EXAMPLE: the arrow is pointing left, so move the plane that way to regain the correct flight path.
- Engine Thrust Direction-in flight, this should always read NOR. To assist in slowing the plane after landing, this can be altered to REV with the E key. EXAMPLE: the plane is functioning normally.
- BraKeS-indicates whether the brakes are OFF or SET. Don't ever try to land with the brakes already set! EXAMPLE: the brakes are OFF, the normal condition for flight.
- FLAPS-indicates whether the landing flaps are UP or DOWN. For normal flight, they should be UP. EXAMPLE: flaps are up, as is normal.
- Stall warning-if your speed decreases to within 5 MPH of your stall speed, a yellow stall warning will light immediately below your speed, and a high-pitched bell will sound to warn you of an impending stall. If you stall, the warning will turn red, and an alarm klaxon will sound, to warn you. EXAMPLE: neither condition has occurred, so no warning is visible on the instrumentation.

FLYING THE PLANE

When you first enter the simulation, you will be in level flight, with both pitch and vertical speed of zero. You will see the runway, either as a dot in the distance; or a line of lights at the edge of the runway, or as two lines of lights, depending on your distance to the runway and your altitude. In general, small movements are better than rapid control swings, and if you slowly change controls, you'll find it much easier to keep in control.

Check the FPI and DI. Are you too high or too low, or off to one side? If so, GRADUALLY correct until you are on course and flight path. Remain on the flight path until your altitude is about 600 feet. From this point on, trust your eyes and your view of the runway to land correctly. As you approach the runway, you'll need to decrease your speed, so as to lower your rate of descent. To do this, lower PWR until your speed is below 75 MPH, and lower your landing flaps. Then decrease power further, until your VSPEED is below the maximum allowable for the level you have chosen. Keep yourself lined up with the center of the runway, wait for the asterisk to appear in the DME, signalling that you are over the landing threshold, and drop lightly down on the runway. Remain in the center of the runway, and reverse engine thrust and apply brakes to slow to a stop before the end of the runway rolls by. Easy, wasn't it?

Your PWR must be adjusted to take into account climbing or descending. As you climb at constant PWR, your speed will decrease. DON'T LET IT GET CLOSE TO STALL SPEED!! Increase PWR as needed to

maintain speed. However, the more PWR applied, the faster you will use up your fuel, so find a balance between them. Fuel is used faster with your flaps down, so try to keep them up until you're about to land. Don't let your speed increase to over 200 MPH, since severe turbulence will occur. If you exceed 220 MPH, your plane will probably shake itself apart. Turbulence can also occur if you lower your landing flaps at speeds in excess of 75 MPH. To eliminate this turbulence, decrease your speed, or raise your flaps.

There are several obstacles to worry about. If you come in substantially below the flight path indicated on the FPI, you may come close to the MMG Executive Tower. Please try to avoid this. At levels 3 and 4, you must also avoid the Sunday pilots taking off from below. Fly around, over or under them.

If you don't believe you can safely land after your approach, you may pull up before touching down. When you have completely passed over the far end of the runway, a message will appear on the screen telling you that you have overflowed the runway, and that you have circled around to try again. However, remember that the circling takes fuel, so you will begin your second approach with substantially less than 100% fuel remaining. If you run out of fuel, it may still be possible to land, by quickly getting your landing flaps down, and decreasing your pitch to the point where the speed remains above the stall point. If you get to this point-lots of luck-you'll need it!!

Lift, which keeps the plane in the air, is generated by the flow of air over the control surfaces. If your horizontal speed drops below a

certain point, the stall speed of the plane, the flow of air cannot any longer generate enough lift to hold the plane in the air, and a stall occurs. THE ONLY WAY to pull out of a stall is to get the nose of the plane down VERY QUICKLY, to increase speed and generate lift. Since you fall very fast if you stall, pointing the nose down is contrary to normal instincts, but you'll have to learn this to pull out of a stall. After regaining enough speed to pull out of the stall, level off quickly, and get back onto the flight path and glide slope.

CRASHING

An important part of the simulation, and the aspect of the simulation from which its name is derived, FINAL FLIGHT! Fortunately, this is only a simulation, although you may get so involved that you tend to forget that. Occasionally, while in the early stages of the novice pilot, you may be unable to avoid a crash, in which case a sympathy telex will be sent to your next of kin. The telex will detail the reasons for the crash. If you don't want to read the entire text, pressing the R key at any time during the typing of the telegram will return you for a Retry at another landing, allowing you to choose a new level of difficulty.

All of us at MMG Micro Software hope you enjoy this simulation. If you have any suggestions, comments or recommendations, please write and tell us. We can't promise to answer every letter, but you have our promise that we will read and carefully consider each one.