

FS-ATC 2.0

Air Traffic Control software for Microsoft Flight Simulator Macintosh version 4.0

FS-ATC is an air traffic controller software that operates with Microsoft Flight Simulator. It runs on the background and it uses some undocumented apple events to find out position, direction, altitude and speed of aircraft. Using this information FS-ATC sends messages to the pilot using notification manager dialog box or playing sampled sounds.

This version has been completely revised. There are lots of new features like realistic pilot-controller communication, altitude control, more accurate position tracking, support for sampled sound resources, and support for the new Speech Manager. There is also a new instrument for long range navigation.

This version introduces a function key resource (FKEY) that is installed into Flight Simulator application. Command-Shift-8 key combination is used as a communication button to simulate pilot's discussion with tower, center and approach controllers.

There are more flight routes and the old ones have been completely rewritten. A couple of them are written for SD-series scenery files by Mallard software. FS-ATC will automatically change sceneries needed on the route during the flight.

For each route there is a map that opens with TeachText. You can use the maps to study what the controllers will require you to do.

Installation

Double click on the **fs-atc-20.sea** self-extracting archive. It will create FS-ATC folder on the disk you select.

Before doing anything else, read possible README text files carefully.

Next you should install the FKEY into Flight Simulator. The installer application is contained in "Flight Simulator FKEY" folder. The application simply copies the FKEY resource id 8 into Flight Simulator resources.

Getting started

The very first time you start FS-ATC 2.0 you are prompted to select FS World Scenery, which you should do. Actually FS-ATC 2.0 records the directory and volume reference numbers into FS-ATC preferences file in preferences folder in system folder. This information is used to switch scenery files automatically during the flight.

To fly with FS-ATC open a controller file, and open corresponding Flight Simulator situation. Then request takeoff clearance by pressing COMMAND-SHIFT-8...

A controlled flight

The FS-ATC 2.0 controller files are now as realistic as possible. You will fly with instrument flight rules, that means your flight plan has been filed and a controller will know who you are and where you are going when you tell you are with him.

The pilot first requests takeoff clearance. Controller responds telling the pilot to taxi to expected runway and to hold short. When the aircraft has stopped near the beginning of the specified runway the pilot is cleared for takeoff.

Once on the air, aircraft is transferred to air traffic control center telling pilot to contact center, which gives further instructions. Depending of the flight, there may be more center transfers.

Depending on the destination airport, pilot is told to contact approach controller at 30-40 miles from airport. Controller assigns a runway and gives pilot instructions to perform ILS or VOR approach. Finally, the pilot is told to contact tower for landing clearance.

What you should know to fly with FS-ATC?

All FS-ATC routes that come with this release are designed for the Gates Learjet 25G. Controllers will call it Lear 25G in the simulation. FS-ATC can also be used with other planes, but I find Lear most interesting.

You're required to fly with instruments all the time. Use must use VORs for navigation and ILS for landing approach. They are explained in Flight Simulator manual. For long flights over areas that don't have any VORs you must use the new navigation instrument (described below) that directs you along a six-mile-wide path. It is turned on and off automatically.

The altitudes above 17999 feet are called flight levels. 18000 is flight level 180, 21000 is 210, 33000 is 330 and so on. (This is partly true... in real life air pressure is hardly ever 29.95 as Flight Simulator always has. But we only refer to altimeter readings here, not the actual distance between sea level and the aircraft.)

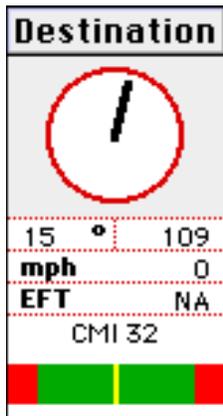
When you fly below 10.000 feet you must not exceed 250 knots.

Altitude control

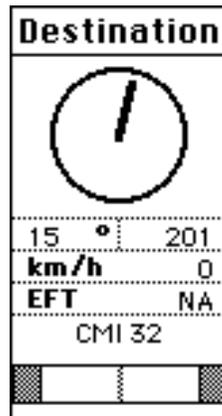
I finally found out the way to get altitude information out – unfortunately it is altitude above ground level. However the controller files have a mechanism to set elevation to fix the values whenever necessary.

Everytime you have reached an altitude that you are told to climb or descend to, FS-ATC starts to track your altitude. If you are more than +-1000 feet away, you are told to maintain specified altitude. I'm sorry for the large tolerance, but it is impossible to catch all elevation changes and it would be frustrating to get false messages.

The Destination window



Color



Black&White

The ADF-like gauge at top shows direction of destination airport.

The number at top left shows the offset in degrees between your heading and destination.

The number at top right shows distance to destination in nautical miles or in kilometers.

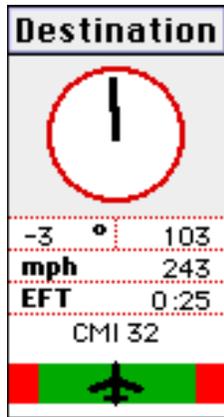
Second line shows speed in nautical miles per hour (=knots!) or in kilometers per hour.

EFT is estimated flight time calculated from current speed directly to destination airport.

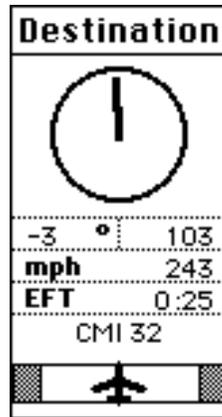
The last line tells the destination.

At the bottom is the new navigation instrument that shows a six-mile wide flight path. It is turned on and off automatically. An aircraft symbol is displayed on it when it is in use.

The new navigation instrument



Color



Black&White

The new navigation instrument is in use when the aircraft symbol is displayed. It shows aircraft location on the six-mile-wide flight path. The ADF-like gauge points to end of the given flight path.

The green (white on B&W systems) area is six miles wide. The red (grey on B&W) area is two miles wide, but the aircraft symbol will remain visible even if you are more than five miles away from the center of the path.

When the aircraft symbol is in the middle you are on the center of the path. When it is on the red (or gray in B&W systems) you are out of the path and you should correct heading to opposite direction.

The example display tells that you are on the middle of the path but to maintain there you should turn three degrees left.

This instrument is turned on and off automatically, usually the controller will say "radar contact" meaning that this instrument is turned on. It goes off without notification when it is no longer needed, ie. when you have been given new instructions.

Ten pixels correspond one nautical mile and that means one pixel is 0.1 NM. In meters 10 pixels is 1852 meters and one pixel is 182.5 meters. The accuracy is slightly worse than NAVSTAR has, but I hope you don't mind...(more accurate readings would require much wider display!)

Sounds

FS-ATC 2.0 can play 'snd' resources stored in the controller file. Unfortunately they take enormous amount of disk space, so only one of the controller files (distributed in a separate file!) has sounds. I have used 22 kHz sample rate with 6:1 compression to use the minimum disk space possible, but still the size of "CGX-CMI with sound" is almost 500 kB. I apologize my terrible pronunciation.

FS-ATC 2.0 has numbers 0-18 and a couple of general commands as built-in sampled sounds. There is also a mechanism to construct messages like "Lear 25G, maintain flight level 2-1-0" from different sound resources.

You may set from preferences if you want controller messages as dialogs, as sounds or (this is a last minute addendum!) as Speech Manager speech (described below).

Only sounds option tries to play sounds in the controller file. If no sound resource is found, a dialog box with text is shown instead. The sounds are played asynchronously, in other words Flight Simulator and FS-ATC continue running when the sound is being played with only minor speed decrease. You can even have Flight Simulator playing all sounds...and it's still fluent (Colour Classic: 16MHz/68030/System 7.1).

The way FS-ATC 2.0 allocates a sound channel is against the rules Inside Macintosh VI gives. A channel should be created just before playing the sound and it should be disposed right after it is played. Unfortunately, this works only when an application is on foreground. Applications shouldn't play sounds from background. FS-ATC 2.0 creates the sound channel in the beginning of program and it is disposed when it quits. Anyway, this mechanism seems to work fine.

Speech

Apple has just released a new system extension, Speech Manager, and Macintosh Pro speech synthesizer. FS-ATC supports both Speech Manager and Macintosh Pro. However, I have no intention to license and redistribute those. I hope they will be on the market soon.

The new Speech Manager has lots of different voices to offer. You can select one voice for pilot and two alternating voices for controllers. This can be a lot of fun!

I have even made a dictionary resource to clarify pronunciation of some airman terms, but it's very time consuming work, so there are some mistakes and inconsistencies, and some of the messages are unclear.

Note that if you want to use Plaintalk™ Text-to-speech extension and synthesizers, you must increase FS-ATC memory setting to about 1500K.

I have tested FS-ATC with Speech Manager voices only.

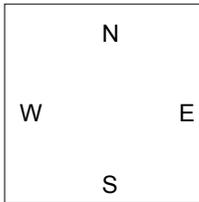
Microsoft Flight Simulator 4.0 coordinate system

The information describing coordinate system on page 79 of Microsoft Flight Simulator User's guide is incorrect.

The coordinates are of format (North,East)

The boundaries of Flight Simulator world map are:

65536,0 65536,65536



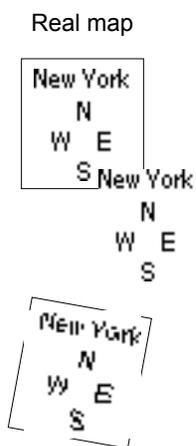
7.5 units correspond one nautical mile. The distance between W and E is 8738 nautical miles, so the grid covers 261,889,489 nautical square miles.

One statute mile is 6.5175 units. Distance between W and E is 10055 miles and the total area is 289,571,208 square miles.

One kilometer is 4.05 units. Distance between W and E is 16183 kilometers and the grid covers 485,019,334 square kilometers.

Conclusion: Flight Simulator grid does not cover whole world.

Flight Simulator manual tells that on some areas the coordinates are canted some degrees to compensate for orthogonal grid overlaid on Lambert conformal conic projection.



And after canting it is placed on the Flight Simulator grid and the coordinates are digitized.

In addition on some areas North has variation of few degrees.

I have studied carefully the FS World Scenery by Microsoft and SD-7, SD-9 and SD-11 World Sceneries by Mallard Software. These scenery files are digitized so that the cities are on correct locations on the Flight Simulator world map grid – you can fly cross-continent by changing sceneries.

Unfortunately I don't have other scenery files, but according to what I have been told, I understand that Europe has been digitized to wrong place on Flight Simulator map grid. It is at the same place as Midwestern US. This means that you can not fly overseas realistically. – This is also confirmed by the dimensions of Flight Simulator grid!

There might also be similar problems with Japan and Hawaii.

But, I don't know yet if there is a workaround - I need all available sceneries, but they are not available in computer stores here in Finland.

I hope bad inconsistencies between different scenery files are corrected in future.

The “FS Aircraft location” window

This window shows the information that FS-ATC 2.0 uses to control the pilot. Coordinates are the same as in the Flight Simulator. Altitude is measured from ground level, but the controller files may sometimes correct the elevation.

Heading tells the direction on the Flight Simulator grid and the value is different the one displayed in compass of Flight simulator. However, you can convert the values with following formulas:

FS Compass = FS-ATC heading + degrees coords are canted + Variation
FS-ATC heading = FS Compass - (degrees coords are canted + Variation)

Example 1:

FS-ATC says you are flying heading 90 at San Fransisco. Flight simulator will display:

Coordinates are canted at -20 degrees
Variation -16 degrees

$$90 + (-20) + (-16) = 90 - 36 = 54$$

Example 2:

Flight Simulator heading 90 in New York. FS-ATC will display

Coordinates are canted +10 degrees
Variation +12 degrees

$$90 - (10 + 12) = 68$$

Bank and Pitch are ignored by FS-ATC.

How the controllers work?

There are different ways to detect position of aircraft. The basic way is to compare distance from destination. When the aircraft is at specified distance or nearer, a message is displayed.

Second way is to set up a circle with center coordinates and radius in miles. When the aircraft comes into the circle, message is displayed. It doesn't allow any drifting, that means if pilot gets lost, there would be no more messages. In earlier versions of FS-ATC, this was used most often.

Third way is to use coordinates of a VOR, and check when the aircraft intercepts a specified radial counted from a circle that has the VOR coordinates as center. This is very accurate and useful when giving landing approach instructions.

There may also be additional checkings, for example a message sent when an aircraft is holding short before takeoff. The message is displayed when speed equals to zero knots and the aircraft is in specified circle.

After a message is displayed, FS-ATC starts to track the next controller.

Flight plan maps

There is a map for each route. They open with TeachText, which is on one of your system software disks. The maps show the flight path and which VORs are used and some brief comments describing what the controllers require you to do. The location and notation of VOR stations are not accurate – you should always refer to maps in Flight Simulator manual and those that come with additional scenery files.

More controller files?

If you pay the share fee, I will mail you the sources for the files included, plus documentation on writing controllers.

After that – if you want – mail your controller file to me (I prefer email!), and I will include it with the next version.

Sources

Registered users will receive THINK C source examples for extracting data from Flight Simulator using Apple Events and for converting that data to understandable format.

Bugs, performance problems?

This software has been written and tested with Macintosh Colour Classic (16MHz 68030,4MB, System 7.1). I have also tried it briefly with a Macintosh Plus (4MB, System 7.0.1) and found out that it works, although the screen of MacPlus is a little bit small for displaying the "Destination" window.

I'm sure there are bugs that I haven't found. If you find any, please report them to me. Address is below.

Thanks to

Greg Ford for giving lots of help with the phraseology and vocabulary plus giving many new ideas. Without him this version would never have come out.

Shareware policy

If you like this software, send **10\$ US funds in Cash**, to

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The shareware fee includes documentation for FS-ATC controller source file format, THINK C source examples for extracting data from Flight Simulator, And the next version of software, if there is one. I would like to distribute the package via email, so let me know your address. But snailmail works, too.

Suggestions and comments are welcome, you can email them to Miika.Asunta@csc.fi

You may redistribute this program freely. Please include all files.

The technicalities are discussed with registered users only.
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