

Edition Two – May 2003
 (English)

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Introduction

Satscape is one of several satellite tracking programs available today. I originally written it for myself, as other programs available at the time were very good, but had one or two little things I didn't like, or certain features weren't implemented, so I wanted a satellite-tracking program that did what I wanted it to do. Another thing was that there was a lot of programming technology available that wasn't being taken advantage of, such as synthesised speech and advanced graphics, user interfacing and internet integration.

Satscape uses pure maths to work out where each satellite is now, and at any point in time by using "Keplerian elements", these are numbers that describe mathematically where a satellite is at a certain point in time, its heading and speed, and uses that as a reference point to calculate where it will be some time after that point. However, using this reference point can become gradually inaccurate, due to 'variables' that aren't taken into account such as firing of thrusters onboard the satellite, so these elements need to be updated from time to time to ensure accuracy, this is done in Satscape by a simple 'internet update' feature that only needs to be done every 2 to 8 weeks at the most, or you can load them into your PC using a floppy disk if no internet connection is possible. One other thing that needs to be done is that your PC's clock needs to be accurate to ensure the prediction of the satellite in real-time is accurate, this also, is done by a simple internet update, that will synchronise your PC's clock with a military atomic clock.

I can't take full credit for Satscape, as its made up of several parts, the main one being the "calculation library", this is a kind of plug-in program written by David J Taylor, based on Dr. T.S. Kelso's original code, that does all the raw maths involved in finding out a satellite's position, Satscape sends the satellite's name and the current or future time to this calculation library, and it gives out the raw numbers about that satellite back to Satscape, which can then display them in a nice formatted manner, or use them to position the graphical elements on the screen, so no, I'm not a mathematical wizard! The "Skinning" effect seen in all satscape's windows is another plug-in program that does all the hard work for me. On the 3D view, Microsoft's DirectX system does all the hard work of sending the correct graphical information to your PC's graphics card, that way, Satscape simply needs to send it information about what object to place where in the 3D world. So as you see, my workload has been dramatically reduced thanks to other software author's work, and I'm very grateful to these people for providing these plug-ins for freeware authors like myself.

One other thing I've tried to do since deciding to put this program of mine on the internet is to cut-down on the astronomical jargon, to make Satscape easy to understand and use, so phases like "orthographic projection" have been replaced by simpler terms such as "3D View", also listening to and acting upon suggestions I've had over the years from people using the program, so they can get the most out of it, with the least amount of effort.
Enjoy...

Scott Hather

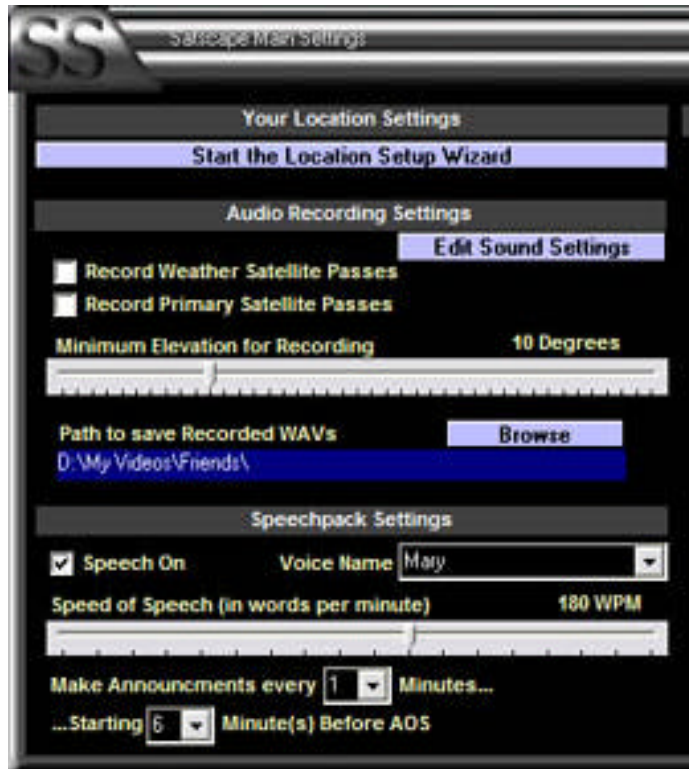
i

Chapter 1 : Satscape Main Settings

The Satscape main settings contain the most important settings to control how Satscape works.

After Installing Satscape, the first place you'll need to go is the main settings, If you've never ran Satscape before, then this setting window will pop up automatically. All settings in Satscape have a default, or "factory setting" and most of the time, this will do fine. The main exception is the Location settings, such as Latitude and Longitude. These settings describe your location on earth, so that Satscape can let you know of Satellites in range of your location, and also Azimuth (heading) and Elevation (degrees above horizon).

To enter these important settings, click the "Start the location setup wizard" button on the top-left of the window. It will step through each setting in turn to make it a painless process. Also, if you're not sure of your Latitude and Longitude, there's a button on the first step that will take you to an internet web page to find out, but you can of course use a map or GPS positioning device.



Both the Latitude and Longitude can be entered in 'decimal degrees' and the more traditional degrees/minutes/seconds format. Satscape internally uses the decimal degrees format, as it's easier to work with, so some rounding up/down is done in the conversion, but by a negligible amount. The height above sea level is sometimes tricky to find out, so you can take a guess at it, if you're not sure. For instance, if you live near the coast, then choose a low value (0 to 100), but if you live on the side of a mountain, you'll need a much higher value.(200 to 3000+) It doesn't make a big difference if you are off by 10s of metres, only Satellite Elevation figures will be off by a couple of degrees if you're wrong.

Also, the Latitude and Longitude don't have to be too accurate, the satellite's positions will still be accurate, just the Azimuth and elevation reading may drift off if your latitude and longitude are not set correctly.

Audio Recording Settings

Satscape can be used as an automatic audio recorder, all you need to do is plug the audio output from your scanner or radio into your PC's Line input socket, and audio will be recorded automatically from specific satellite passes, a WAV file will be recorded just for the time the satellite is passing over, so when you return to your PC you can use a program to process them, or just listen to what you've missed.

There's two option boxes you can tick to turn this feature on, the first being "record weather satellite passes", as the name suggests whenever a NOAA, Meteor or other weather satellite comes into range, the recording will start. The other option box will allow you to record the

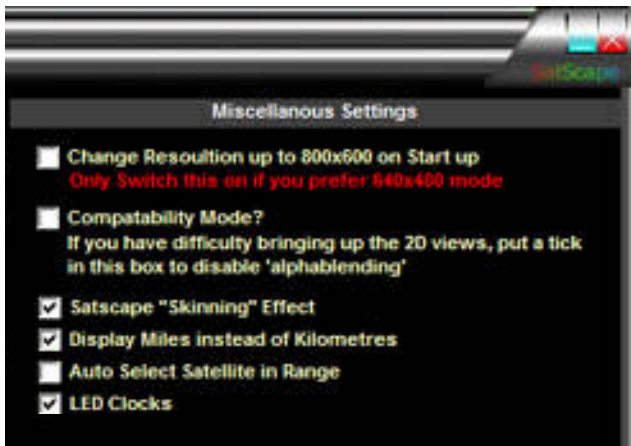
“primary” satellite, this is totally up to you which one you choose, and is discussed in the “groups and Keplerian elements” chapter. Below that you’ll see a slider control, this allows you to select a threshold for the recorder, so for instance if you have building in the way blocking the satellites signal, which renders the signal too noisy below 10 degrees elevation, you can set this slider to 10 degrees, and recordings will start when the satellite goes above 10 degrees, and stop as it drops below that, which will reduce the length of the WAV files, and save you from going through a lot of static noise to get to the actual signal.

Finally in that section, you can choose where the WAV files are saved to, by default, they are saved to the Satscape folder, but you may want to make a separate folder, or place them where your weather satellite decoder program is located. The filenames are made up of the satellite name and date of recording for easy reference.

Speech pack Settings

The Speech pack is an optional add-on for Satscape provided by Microsoft, which you can download from the Satscape web site. To install it properly, you need the “engine”, which is called “SPCHAPI” and the one or more of the voice packs. Both downloads need to be run one after the other, and it will unpack and install itself onto your PC. Once this is done, you can then go into the main settings in Satscape, and put a tick in “speech on”, then next to that a drop-down list of available voices appears, so choose a voice you like. The slider control under that allows the speed to be altered to make the speech clearer don’t set it too high.

Finally, you can set the speech up to activate how often you choose, when the 2D or 3D views are running, announcements are made when satellites are about to come into range of your location, you can set it just for one announcement, five minutes before the AOS (acquisition of signal) or once a minute up to an hour before the AOS, and any setting you choose in-between these values, so play around with what feels right for you.



Miscellaneous Settings

Finally on this window are various tick boxes that you can choose how Satscape looks and works, first of all the change resolution option is for those people who prefer to run in 640x480 mode, as Satscape requires 800x600, settings this option ON, will temporarily switch up resolutions when Satscape starts, and then back down to 640x480 when Satscape ends, so if you normally run in 800x600 mode or higher, then make sure this setting is OFF. When Compatibility mode is on, the sunlight effect on

the 2D views will not display, as its been known to cause problems on older PCs, so if you do find the 2D views do not work, e.g. you get a blank window, try switching this on to see if it helps.

The Satscape Skinning effect is the dark metallic look to each window, and the menu system. If you prefer the regular windows grey, or if you have Windows XP and would like to use that effect instead, then turn this feature off, and Satscape will look like your other windows applications. This can also help, if you have trouble clicking on any of the menu items.

Some of the altitude and distance readouts will display in kilometres, as that’s what Satscape uses to calculate the distances, if however you’re more familiar with Miles, then tick this box.

Auto Select is a fairly new feature, which works in both the 2D and 3D Views, rather than selecting a satellite yourself, Satscape will take an educated guess as to which satellite you’re interested in, and select it for you, you can turn this feature on and off here, but also in the menu of both the 2D and 3D views for convenience.

Finally, LED clocks sure look nice to most people, You can switch them on or off, should you wish to, you can also set it so that they always read GMT/UTC Time. Normally in Satscape, every time shown is you local time to keep it simple.

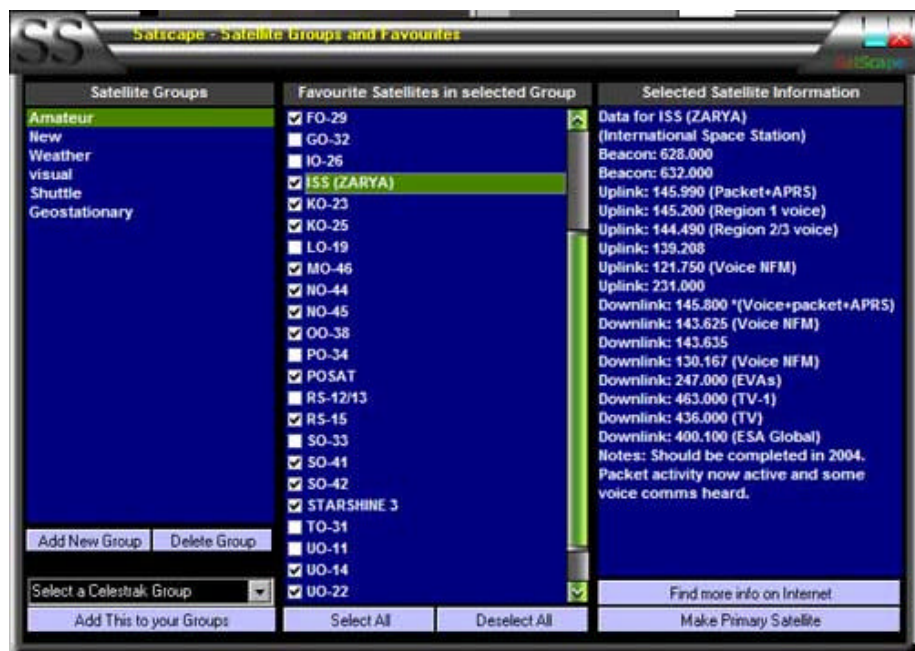
Chapter 2 : Satellite Groups and Favourites

Satellites are divided into groups, making it easy to find your favourite satellite.

There are some 8000+ Objects in orbit around the earth, some objects are just debris left over from satellite launches, old broken down satellites that weren't de-orbited, or even astronaut's spanners that were carelessly 'dropped' and consequentially put into orbit for a few years! But several hundred are fully working satellites, each one doing a specific job, weather satellites, TV satellites, Amateur radio satellites. So, in Satscape the satellites are grouped together depending on what they do, so you can find the one you're looking for. Satscape comes with several groups set up for you, containing the most popular ones, but you can add more groups (up to 30 in total) should you want to, so long as you don't exceed about 2000 satellites in total. Personally, I find 500 satellites more than enough!

What are Groups?

Each Group that is set up, appears in the list of the left side, you can click it, and the list of satellites it contains appears in the middle column. The group itself is really just a text file containing Keplerian elements for multiple satellites, E.g. "Amateur" is linked to the "amateur.txt" file in the Satscape folder, which as you'll see contains elements for all the amateur radio satellites. The group also contains data for where the satellite is on the Internet using a web address, so it knows where it can get a fresh copy if needed.



What are favourites?

You probably don't want to track all the satellites in a particular group, so a favourite is a satellite that you have selected (using a tick box) as one of the satellites in that group that you are interested in, there are a selection of favourites from different groups that are ticked already, when you install Satscape, you can of course de-select them and select ones for yourself, or even add a new group such as Military satellites or GPS satellites.

Adding new groups

There's a couple of ways to add a group, the first one is using the 'add new group' button, it will ask you a series of questions about this new group. You would use this option if there is a web site somewhere that contains Keplerian elements of satellites that aren't already in one of the groups, or if you have some elements sent to you via email, packet radio or some other means other than via the internet. So, click the button, and the first question asked, Is the group updated via the internet, so if you have a web address, click YES. Next it will ask for a name for this group, this can be anything you like, as its just for display purposes only, it will be the name that appears in the list of groups on the left. Next, it wants to know the web address of the actual file containing the elements, make sure this is spot on, it won't work if you just type the name of the web site, but don't include the usual http:// so in the example www.celestrak.com/NORAD/elements/amateur.txt

is the address given, if you view that page on a web browser, you'll see all the element data. And that's it, the new group appears, so the first thing you'll now need to do is do an internet update, see the chapter on that should you need help doing this.

So, that's all very well if the Keplerian data is on a web site, but what if you've got it on a floppy or via email etc. First, you need to get the data into the Satscape folder, otherwise, Satscape will not 'see' it, so either save or copy the element file into the Satscape folder, which is normally C:\Program Files\Satscape\ It can have any file extension you want, normally its .txt but another one used is .tle It doesn't matter what you use. Now that its ready and waiting, you need to tell Satscape its there, you only need to do this once, as it will remember it just like your other groups, so on the series of questions when you click 'add a group' click NO for the internet update question, and as before, it wants to know what to call it, any name will do. The next question is what the filename is, remember you saved it to the Satscape folder with a filename, such as "my keps.txt" or "some keps.tle", so type this in...EXACTLY and you'll then see your new group appear in the list, but no update is required, as they should already be there, ready to be used, and you can go ahead and select some favourites. Using this method, all you need do now is update that file with a new file (overwriting the old one) each time you get one, and Satscape will start using them right away, you don't need to go through the process of adding the group again.

Deleting a group

Very easy this one, if you find you don't use a particular group, then remove it, each group in the list may slow down Satscape slightly, particularly when starting up, as it checks the file and scans in the data, so the less groups you have, the quicker things will go. All you do is select it on the list, so that it's highlighted, and click the delete group button.

Adding a Celestrak Group

This is a very easy way to add more satellite groups, the main source of Keplerian data on the internet is the Celestrak Web server (www.celestrak.com) They hold over 30 or so groups of satellites, about 6 of them are already set up for you, but you can easily add more using this option without having to know the web address of the group, just click the drop-down list, choose what group interests you, and click the "Add this group" button below that, and you're done...just need to do an internet update to grab those keps.

Selecting Favourites

As you click on the group names on the left, you'll see the satellites contained in that group displayed in the middle column, each one has a box next to it, putting a tick in the box makes it one of your favourites, and will show up on all the different views within Satscape, one other thing is, if you click the name, rather than the tickbox, data about that satellite will appear to the right of that, usually telling you a little about that satellite. This is the database mentioned throughout this manual, some satellites won't show any data, this is ok, you can still track the position and do all the other things, its just that no info was found for that satellite, so it will give you the option of requesting information to be added. This is not an automatic process, what happens is, an email will be sent with a subject containing the name of the satellite to a special mailbox I've set up, and every so often, I'll do a little research and find out about the satellite, and then add it to the database, which is then uploaded to the web site, so updating this file is easily done on the Internet update menu option (see that section of the manual for more help)

Selecting a Primary Satellite

The Primary Satellite is which satellite is selected whenever you start up the 2D or 3D views, so you'll want to pick a satellite that you use the most, or have the most interest in, to do this simply select the satellite as a favourite (so it has a tick next to it), then click the "Make primary satellite" button on the bottom right of the window. The primary satellite feature is also used for audio recording, so you can record audio from your radio from a non-weather satellite.

Other Features

One last thing to mention on this window is the “Find more info on internet” button. Whether information is in the database or not, you can click this button, and Satscape will find web pages that could have information about the selected satellite.

Chapter 3 : Internet Updates

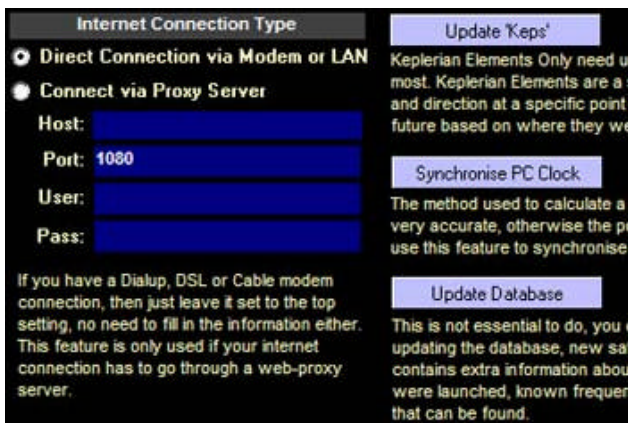
Satellite positions are only as accurate as the Keplerian data and your PC's Clock, so keep them up to date.

Satscape calculates the satellite's positions using Keplerian elements, the current time, and a whole load of maths, and as satellites sometimes fire on-board thrusters, or get pushed out of alignment by solar wind, atmospheric drag etc, the elements need to be updated from time to time, and your PC's clock needs to be re-synchronised to an atomic clock to ensure further accuracy. So, this is where the Internet update window comes in handy.

Updating "Keps"

As mentioned previously, Keplerian elements or "keps" are what tells Satscape where a satellite was at a point somewhere in the past, so it can use that information to work out where it will be in the future/present. The best source of up-to-date keps are on the internet, and I've found that Celestrak's to be the most reliable, so the default groups are set up to update the keps from their site, but you can use any other site, so long as it's a regular Web site (HTTP), Satscape no longer works using FTP sites.

To do this, you simply click the update button, an internet connection is required for this, and depending on how your internet settings are set up on your PC, it will either update right away, or bring up the regular 'dialup connection' box, if it fails right away, chances are something is wrong with your internet settings, please check your internet providers help files to ensure everything is ok, one other thing you can try is to dial up first, then click the update button. But if all goes well, and it usually does! The large blue box at the bottom of the window should tell you that it's updating each group one by one.



One thing to bear in mind, is that on the main Satscape window, it displays the 'age' of the Keplerian elements, this is not worked out from when you last updated them, but is worked out on how old the elements themselves are, remember the elements are a reference point of where the satellite was some time in the past, so if the brand new keps you downloaded show up as 2 days old, that means the reference point is from 2 days ago.

In my experience keps can be a month or so old before they start to become inaccurate, so there's no need to keep updating them every day, celestrak provide the service of free Keplerian elements, it would be a shame if they had to close down due to their server being overloaded with 100s of people updating their keps.

Synchronising your PC's Clock

The realtime predictions (2D and 3D views) are also dependant on your PC's clock being accurate too, if its 10 seconds fast, then the satellite's positions will be 10 seconds out, not such a big deal, but just for completeness, there's a button you can press that will synchronise your PC to a government atomic clock. Although the atomic clocks are synchronised with GMT/UTC, the time will be adjusted to your time zone, again, this feature requires an Internet connection.

Updating the Database

That's all that needs to be updated for Satscape to produce realtime accurate positions of satellites, but one feature I thought I'd add is some extra information about the satellite, their launch date, purpose, and any known frequencies that they receive and transmit on. So, it's not necessary to update the database, but once every few months, click it to get the latest database file containing more information on satellites that have been launched recently.

Internet Connection Type

This part of the window is quite advanced, normally if you have a regular dial up connection to the internet, or maybe a DSL or cable modem, you can leave it set to direct connection, this will also work if you have one high-speed connection on one PC and other PC's linked up via a network connection. The only time you need to choose the "proxy" setting, and fill in the details is if you are running a proxy server, or if your Internet provider insists you use theirs. If you don't know what a proxy server is, chances are you don't have one!

So, if you do have a proxy, you will also need to fill in the boxes. "Host" is the name of your proxy server; this can be the host name e.g. "myproxy" or the IP address e.g. 123.1.23.45 the next box is the port number, this can be anything, but usually 1080 or 8080, you'll need to check this yourself. Finally the username and password, 99% of the time you can leave these blank, they are not used on most proxy servers, they allow access based on your IP address, rather than using a username or password.

Chapter 4 : Locations

Satscape needs to know where you are so it can work out where the satellites are relative to you?

All Locations can be set up in this window, there's a Primary location, and this is the one that Satscape uses to work out where satellites are relative to you, so that Azimuth and Elevations are correctly calculated. The Secondary locations listed on this window are displayed on the 2D view, but also, can be used as alternate locations that you may go to. This way you can quickly switch locations with a few clicks, and start tracking the satellites right away from your new location.

How to Set your Current Location

First, you can use the tick box on the top-right of the window to choose how you enter your co-ordinates, in the traditional Degrees, Minutes, Seconds, or Decimal Degrees, neither way is better, but it must match the way you're entering the co-ordinates.

Fill in the entries on the right, including the Height above sea level, and the name of the location, then click Add Location to add it to the list.

Another way to do it, is click the current Primary location, edit the settings shown on the right, and then click Save Setting button.



If your chosen location is not shown at the top of the list, with the words "Primary Location" after it, then you can easily choose it to be, make sure your location is highlighted (by clicking it) and then click the "Set as Primary"

Each of the locations can have a tick next to them, this means they are shown on the 2D Views, taking the tick out of the box will hide it, should you wish to permanently remove a location, first select it, then click "Delete Selected Location"

Chapter 5 : 2D Settings

To get the most out of the 2D views, you need to get the right 2D settings.

For most people the 2D views are the heart of Satscape, so if you want to get it to work just how you like it, you can alter various settings to tweak most features of the 2D view, in the 2D Settings window. You can get to this window either from the main menu, or you can also get to it from any of the 2D views, also on the menu.

Ground track length

The Ground track is the curved white/red line that mostly looks like a sine wave; it shows the selected satellite's future path around the earth. Altering this slider you can make it shorter or longer, so for instance you may only want it to be one orbit long, so for regular polar orbiters you'd set it to around 90 minutes, for slower orbiters, set it to a few hours to see where its heading.

Map update speed

Because the satellites don't seem to move much when looking at the full worldview, you don't really need to update the window so often, so this slider will let you do it less often. The advantage being that your PC will have to work less.



Changing the 2D Map Image

The map of the earth you see on all 2D views can be altered to another style, what you're looking at on the 2D view's background is simply a JPEG image of the world, there's a wide selection on the Satscape web site to choose from, you simply drop the JPEG image you downloaded into the Satscape folder, which is normally C:\Program files\Satscape\ now when you go into the 2D Settings, and choose the drop-down list for the Map image setting, you'll see the new image file you just downloaded. Select it, and it will now be used.

If you plan on making your own image, or modifying one, some requirements need to be met. The image must be a JPEG image (.JPG) and be quite high definition, about 1000 pixels wide is a nice size to work with, and also, it MUST be a Mercator projection map. If you're not familiar with that term, it really means, the longitude and latitude lines (whether visible or not) should be spaced equally, for example, some map projections are more natural and have the poles squeezed up, and the equator spread out. If you're not sure, just go ahead and try it out, you can't break it by doing so, it's just that the cities and your own location won't match up with the map.

Changing the Horizon view Backdrop

Just as you can change the image used for the 2D views, you can also change the horizon view image, the default image is one I took from my back garden, so you may want to take a digital photo of your garden, and use that. One thing you may want to bear in mind is that the photo should be fairly dark, so as to make the satellites easy to spot, and more than likely you'll be using the horizon view during dusk/dawn to view the position of visible satellites.

So, once you have your image, the only requirement is that it should be saved as a JPEG image and saved to your Satscape folder, and it must have the file extension of .jpg

Once, its there, you can go into the 2D Settings, and drop down the list, and your jpeg image will be on the list, so select it, and the next time you go into the horizon view, your new backdrop will show up instead of the default.

Other options

You will also notice a series of tick boxes to further change the 2D views, most are straightforward enough and simply turn certain graphical options on or off. The Alternate world view will display the 2D map rotated around 180 degrees to show a map that is more biased towards Asia, Australia and surrounding areas, so if you live in this region of the world, you may prefer that setting.

Chapter 6 : 3D Settings

Making adjustments to the 3D View Settings.

The default settings for the 3D view are set to quite basic settings to cater for older graphics cards, also, as all computer monitors are different, the display may look too dark or too bright. You may have a 22-inch monitor; another Satscape user may have a 14-inch monitor. So, to cater for all possibilities, have a look at the 3D settings window, which you can get to from the main menu, but may be better to access it from the 3D view itself, so that you can make changes and see what effect it has instantly.

Sun's Brightness

Now its time to play god, this slider control will alter the brightness of the simulated sun to suit your particular monitor.

Ambient Light

This light shines in all directions on all objects such as the earth, satellites and the moon, in real life, the dark side of the earth lacks any light from the sun, so would appear completely black, but as this is a simulation, ambient light shines on the dark side of the earth, moon and satellites. Try not to set this too high; otherwise you won't be able to determine what side of the earth the sun lights up.



Label Font Size

Each of the satellites has a 3D label next to it with the satellite's name, if you find its too small and hard to read, you can increase the size, and likewise if you have a huge computer monitor, you may want to make these labels smaller, setting it to 0 will turn off the labels completely.

Orbit/Groundtrack length

The selected satellite will have its future path though space drawn using a red line, normally the default setting is about right for most satellites, but if you're tracking a slower moving satellite, the orbit track may be quite short, so you lengthen it using this slider.

Star Brightness

The star background isn't accurate at all, its there simply for display effect to add a feeling of depth; after all, it is a 3D view! So, this slider control allows you to alter the brightness of the stars to suit your own particular taste.

Texture Quality

When you look at the earth, its really just a sphere with a map of the earth wrapped around it, the original image is quite good quality, but by default is downgraded a little, so that the 3D view works well on slow PCs/Graphics adapters, so if your PC can handle the strain, crank this one up and the quality of the image will increase. One thing to note is that on this slider, any changes made are not instant, so you will need to alter it, close down Satscape, and then restart the 3D view to see how your changes affected the display. Remember, the higher the quality, the slower the 3D view will run, this is most notable when you start spinning around the earth rather than staying stationary.

Other Settings

The “Graphical Render Quality” is similar to texture quality, but as you can see, instead of a slider, it has a high/medium/low setting. It tells Satscape how much effort to put into making it look as realistic as possible, particularly the lighting. The Low setting will make relatively few calculations on how the light hits objects and is seen by you, whereas the High settings will trace the rays of light as they come from the sun, and bounce off the earth and hit you in the eye! This is often referred to as “ray tracing” and can produce the most realistic looking 3D images. Again, play around with these options to see how far you can push your PC to the limit without overworking it too much.

The “Use hardware vertex Processing” option is quite simple despite it sounding complex, sorry I couldn’t think of an easier phrase to describe this option. When its off (default) it uses a mode of DirectX where windows will do most of the hard work of producing the display, which is great, as it means it will work on most graphics cards, but isn’t the fastest way to get things done. However, when you switch this option ON, your graphics card will now do the hard work, and its much better at graphics than windows is, so you’ll see a huge increase in speed, but naturally, there’s a downside to this, only the new high-spec graphics cards can work in this mode, so that’s why the default setting is OFF. Feel free to try out this option ON. If it doesn’t work on your graphics card, it simply won’t display anything, or the display will look very strange, there may be lines all over the window etc, so if it doesn’t work, just go back in there and turn it off to get back to normality.

One other option I’ve not mentioned is the drop-down box at the top. You can usually leave this alone, but if for some reason, you have two graphics cards, or you have one that has two outputs, Satscape may choose the wrong one, so you can choose the correct one you want to use on this setting.

Chapter 7 : Other Launch pad menu Items

Even more menu items to choose from.

Several other options are present on the Launch Pad menu, the first one not mentioned so far, is “Copy Keplerian elements to floppy”. Should you have a PC without an Internet connection, you’ll be stuck when you want to update the Keplerian elements, so you’ll need some other way to do it. So, place a blank floppy disk in you’re A: Drive, or one that has enough space on it (as the floppy will NOT be formatted), and click this option. All the Groups of Keplerian element data will be copied to the floppy disk. You can then take this disk, and copy the content to the Satscape Folder on the Non-internet PC, and that’s it, your other PC will be updated with the latest tracking data.

The Help menu has several items, each links to other ways to get help and assistance when using Satscape, some of them require an Internet connection.

The FAQ help page is available offline, this page gives you help in some of the most common questioned asked, but there is also a link to view the online version of the FAQ page, this will contain any new things that may not have been asked at the time Satscape was compiled into a program and set-up. There are also “Flash” Movies, which can be played even over a regular dialup connection. Each one demonstrates me using Satscape, and showing how a particular feature works.

Chapter 8 : Using the 3D View

Take Satscape into the third dimension

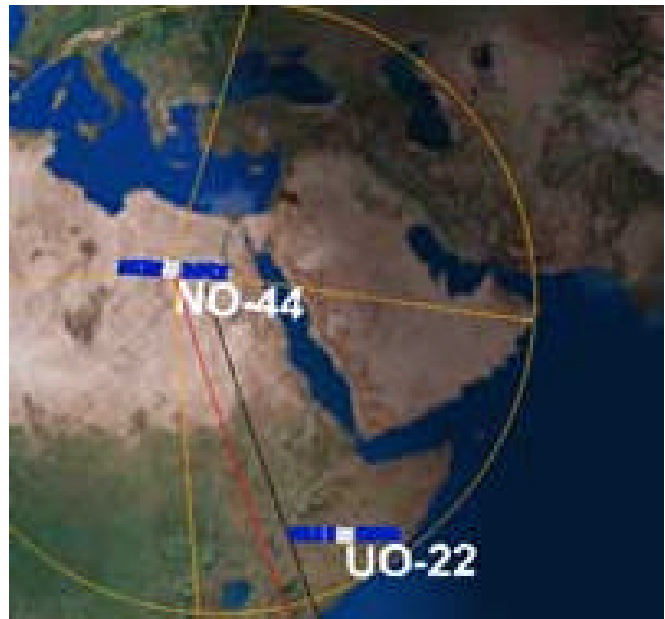
This is one of the most impressive features of Satscape...well, I think so!

Most satellite tracking programs use a 2D type of view to represent the Satellites, but using a 3D view makes things more real, as you get to see a simulated view of what its actually like up there right now, although it should be stated here that some objects are not to scale, such as the satellites, they aren't really that big, and no, they're not about to collide even though it may look like it in Satscape!

Main Features

The main part of this window is taken up by the 3D view itself, showing the earth. When you first enter the screen, you will notice a lot of technical information appear. This is mainly for diagnostic purposes, and to let you know it's starting up the display, as it can take a few seconds to set everything up. You will then get a view of the earth with your viewpoint hovering several hundred miles above your own location, looking down towards the earth.

Each Satellite is represented by a generic looking satellite, except the ISS and the Space shuttle, these have their own 3D object, next to each satellite will appear its name. Whatever satellite is currently selected will show some extra display items, first a red curved line going around the earth, is the satellites orbit track, or where its about to go over the next few hours, it also has a shadow on the earth's surface so you can see more accurately where its going to pass over. You will also see a circular/cone shaped line drawing in orange, this is the satellite's footprint. The easiest way to explain that, is if you were onboard the satellite and looked out the window, the area of the earth within the circle, is the area of earth you would see. In most cases, it's also the area of radio coverage too, so if your location is within the circle, you're in range of the satellite.



Navigation and display panel



On the right side of the window you'll see navigation controls, and other information about what you are seeing, and information about the selected satellites, as well as upcoming Satellite passes, Navigation is done by using the sliders on the top-right of the window, clicking on the 3D view itself will bring up the "position" menu and right-clicking will bring up the "look at" menu, both of which are explained below. So, first of all, you may want to move around...

Moving around

On the top-right, you can see the navigation panel, made up of 3 sliders, with data showing your current position. The Slider on the left alters your Latitude, so sliding this up and down moves you from pole to pole, along the bottom, this slider moves your Longitude, so you can move along the imaginary lines of longitude, and finally the right hand slider, moves your

position up or down in altitude, so you can view from a few hundred miles up, to several thousand miles out.

When you move around like this, Satscape is in “orbital mode”, there are 10 modes in all, each one gives a different perspective, and you can easily switch between each one using the POSITION menu item, or you can right-click anywhere on the window. I won't go into detail here on each position mode, its much easier for you to see what each one does, remember, each mode is simply moving your position, your attention stays focused on the earth, unless you change the “Look At” mode...

Look At Modes

There are 4 “look at” modes, each one changes what object you focus on when moving around the 3D world, normally, its focussed on the earth, so wherever you move to you're always looking at the earth. Again, these are pretty obvious, and its much better to just try each one out to see what affect it has, For instance, “look at : moon” will still allow you to move around, but you will be looking at the moon all the time, regardless of your position. Each one can be used in combination with any of the 10 Position modes, so you have a total of 40 different ways to look at this view. One extra item on the Look At menu is, Roll the Camera, this is simply for special effects, your view from this virtual camera will roll around and can be quite disorientating!

Options Menu

Under the options menu you can change what satellites are being viewed, the first two options allow just your favourite satellites to be displayed, or you can display all satellites, in this mode all satellites in all groups are displayed. You'll notice the satellite names are not displayed when viewing all, as it would make a mess and slow your PC right down, its just for display purposes only.

Next down the menu, you can switch between realtime, and “warp time”, when you switch to warp time, a slider will appear on the right side of the screen, just under the clock, you can use this like a video “jog” control, where you can rewind and fast forward at different rates of speed, meanwhile all the display items such as the time and satellite positions will update accordingly. Moving it to the centre position will freeze time.

Finally on the menu, is the “Auto Select Satellite” feature, when switched on, Satscape will make an educated guess as to what satellite you may be interested in tracking, and then automatically select it for you. You can of course switch this off and select a satellite manually, there are a couple of ways to do this on the 3D view, on the navigation section of the right-side of the window, there's a drop-down box where all your favourites are listed, you can select it from there, alternatively, further down the window are the upcoming passes each satellite is about to make, you can click any one of them, and the satellite will be selected.

ETA Panel a.k.a. AOS

On the Right side, upcoming satellite passes are displayed, they are in chronological order, so satellites already in range, or about to come into range soon, will be at the top of the list, the AOS stands for Acquisition Of Signal, this is the point in time when the satellite first comes up over the horizon, then LOS is Loss Of Signal, which is straightforward. You can click on any of the satellites in the list, and it will select that satellite as the current one.

Chapter 9 : Using the 2D Views

See the whole world from your armchair.

You'll probably find this window (or series of windows) most familiar if you've used other

satellite tracking programs. You can display the whole world on one screen or just a region of it that you're interested in. The satellites are overlaid on top of this, along with the sun and moon's positions. You will also see the sunlit/shaded sides of the earth too, along with various cities dotted around the world.

Using the Map

As with the 3D view, only one satellite can be selected at a time, although all satellites will continue to track across the screen. When you first open this window, a Satellite will be selected for you, this is known as the 'primary satellite' and can be chosen by you on the "groups and Keplerian elements" window from the main menu. You can then left click on or near a satellite and it will select it, or you may use the "Upcoming satellite passes" section of the window on the bottom-right of the screen. Once selected you'll notice more information about that satellite. Firstly, the orange circle known as the 'footprint' around the satellite, shows its potential coverage area, or from another perspective, if you were onboard the satellite and looked down at the earth, the area of the earth you would see is shown by the footprint circle, most cover a relatively small part of the earth at any one time, while others such as the geostationary satellites cover one third of the earth's surface.



You will notice the footprint seems to distort around the north and south poles, this is really because the map is distorted around the poles (mercator projection), so that they look bigger than they really are, and so the footprint looks bigger.

There's a red/white dotted line, this shows the satellite's future ground track of the satellite, where its going next, its mostly red, but when the dotted line changes to white, it means at that point, it will be in range of your location.

One last thing to mention about using the map, is that you can right-click anywhere on it, and it will bring up a list of your favourite satellites, this is useful if you're looking for a particular satellite, and can't see it on the map, just right-click anywhere, and left-click a satellite on the list to select it.

Expand Window

On the far right is a panel full of information, mostly regarding whatever satellite is selected, if you find this gets in the way, you can click the "expand window" bar going from top to bottom, and it will slide out the way, you can also bring it back using the same long button.

So, looking down this section of the window, first there's information about the selected satellite, a few things that may not be familiar to you, are MA, short for Mean Anomaly, this is the point of the



orbit that the satellite is currently at, measured from 0 to 360 degrees. Not sure if that's any use to anyone, but its there if you need it, further down is Phase(MA), this is very similar, but of more use to radio amateurs, it's the same MA number, but converted into a number in the range of 0 to 255. This number is often used on board amateur satellites' computer systems (0 to 255 is 8 binary digits or 8bit). When the satellite reaches a particular point in the orbit, it may switch modes and/or uplink/downlink frequencies, so its handy to know when its about to switch modes.

Also, in this blue section is NORAD Time, this is the day number, followed by a decimal place, and then the fraction of the day E.g. 0.5 is mid-day (UTC)

Below that in yellow and white text is the sun and moon's position, this is updated about once a minute, as they move relatively slow compared to the satellites.

The Time Tracking mode by default is Real-time, this can be changed to "time warp", when this is activated time will jump forward in certain increments, you can alter this using the slider

below these two buttons to jump ahead a few seconds to a several minutes.

Finally you can choose the info mode, to display information about the selected satellite, this is stored in the Satscape database, which is updated from time to time using the Internet update feature from the main menu, the ETA mode is the same as what you see on the 3D view, a list of upcoming satellite passes, each one is 'clickable' to select any of the satellites in your favourites.

Menu commands

The Satellite menu option simply allows you yet another way to select a satellite, its identical to right clicking anywhere on the map and shows all your favourite satellites.

As mentioned in the main settings window, you can record the audio output of a scanner or radio from a satellite, you can switch the recording options on and off from the OPTIONS menu, to choose to record all Weather satellites, and/or your selected Primary satellite.

Under the CONTROLS menu you can switch to other views, both 2D and 3D (if installed) as well as some other windows not yet mentioned, such as the Horizon view discussed in the next chapter.

Chapter 10 : Using the Horizon view

A virtual view of your part of the sky

This type of view seems to be left out of most satellite tracking programs, although its not essential, it can be quite useful, particularly for visual observations of satellites passing over. What you're looking at is a 360-degree view of the whole sky from your location. The bottom of the window is the horizon, and top edge of the window is directly overhead, so it's kind of distorted to fit the full 360-degree, horizon to zenith view on a flat window.

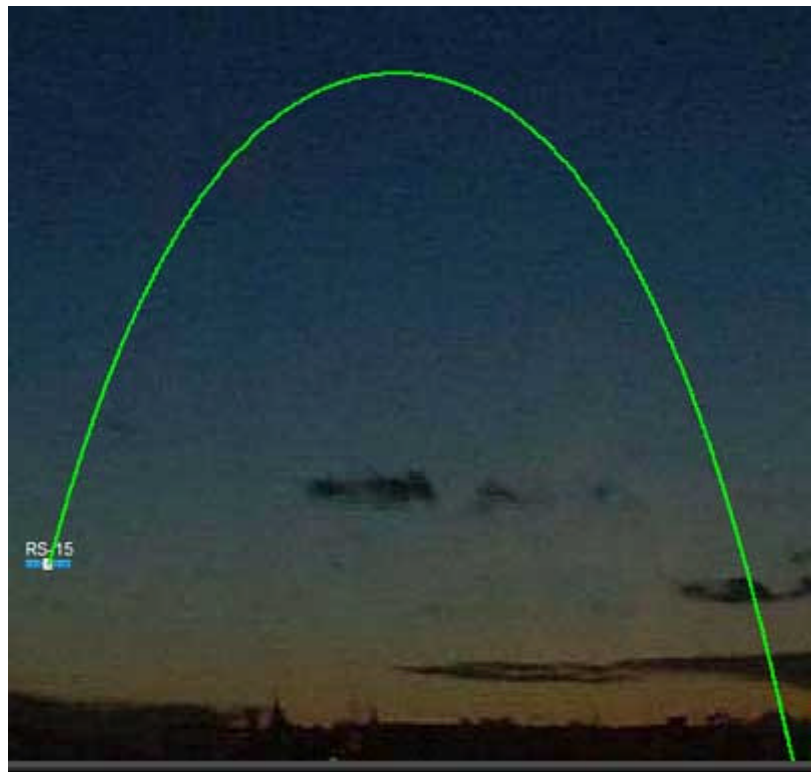
Interpreting the view

If any satellites are currently in view, you'll see them appear on the window along with a "sky track", just like the ground track you see on the 2D and 3D views, the Sky track is the path the satellite will take across the sky. A Satellite will be automatically selected for you, but you can select another one just by clicking on the satellite. The Sun and Moon will also appear on this view too, there position information displays at the top-left of the window, along with a hint as to whether satellites are currently visible.

Menu Items

Under the Options menu is an item you can switch on if you have the speech switched on, when its selected it will periodically announce the position of the selected satellite, this is quite useful if you're outside looking up at the sky, you can keep you're eyes on the sky and listen to the audio cues coming from your PC.

Under the Controls Menu, you can choose to centre the view on the north or south, normally if you live in the northern hemisphere, you'd choose south to be in the centre of the window, and north if you are in the southern hemisphere. It's not absolutely essential, its just there as an option.



Chapter 11 : Tabular Satellite data

Raw information about Satellite's positions.

This was the first part of Satscape I made. Its just the raw data about each satellite, no fancy graphics, just the numbers you need. As you can see from the image, each satellite in your favourites is listed down the left side along with the position information in each column.

This would be a good point to explain some of the terms used in most satellite tracking programs, which may be a bit off-putting for newcomers.



The screenshot shows the Satscape software interface with a window titled "SatScape - Tabular Satellite Position Data". The window displays a table of satellite data for the location "Scott". The table has columns for "Satellite", "Azimuth", "Elevation", "Range (km)", "Height (km)", "Lat", "Long", and "Direction". The data rows are as follows:

LOCATION	LATITUDE	LONGITUDE	HEIGHT	LOCAL TIME	GMT/UTC	SATELLITE STATUS	
Scott	52.94916666	1.180555556	100 mtrs	14:26:40	14:26:40	3 out of 28 Satellites in range	
Satellite	Azimuth	Elevation	Range (km)	Height (km)	Lat	Long	Direction
ISS (ZARYA)	263.01	-46.48	9762.18	385.21	-9.20	89.13	Descending
FO-29	234.50	-76.50	13724.66	1323.96	-60.87	137.23	Accending
OO-38	164.51	-74.95	13102.52	801.67	-78.22	219.36	Accending
KO-23	104.88	-15.44	6328.90	1317.47	21.28	305.90	Accending

"Azimuth" is the compass heading, 0 being North, 90 is East, 180 is south and 270 is west.

"Elevation" is the height above the horizon in degrees, 0 is right on the horizon, 90 degrees is right overhead.

"Range" is the distance between you and the satellite; just imagine a straight line from you to the satellite, that is the range.

"Height" is similar to range, but it's the distance from the satellite to the point on the earth directly below it, sometimes called the "satellite sub-point".

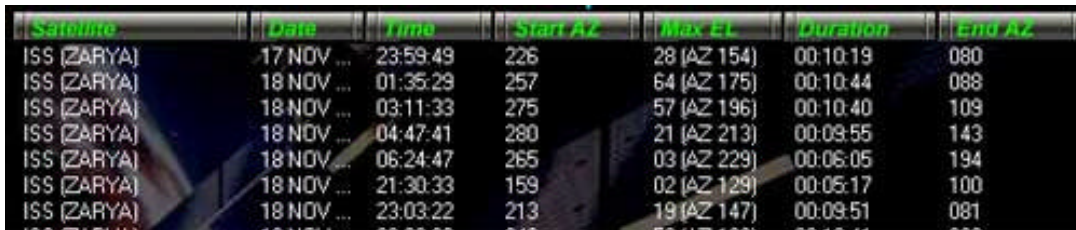
Latitude and Longitude was invented as a way to cut the earth's surface up into segments, so any point on the earth can be referred to by two numbers. The Latitude is cut up into 180 degrees, starting at -90 (south pole) to 0 (equator), then to +90 (north pole). Longitude is made up of 360 degrees, starting at 180 East, around New Zealand/Japan/west Pacific Ocean, going around to 0 degrees, often referred to as the Greenwich meridian, then around again to 180 West, which is actually 180 East as well ! On the tabular data view, the longitude is actually displayed as a number from 0 to 360, this is just another way it can be written, again zero is Greenwich, 180 IS 180 degrees, but then the numbers carry on up to 359 heading west.

One final thing to mentioned on the tabular view is the "direction", this is the satellite's "node", the satellite's orbit is a full 360 degree circle, starting at the top of the circle, it descends down to the bottom, this is known as the descending node, and then it comes back up the other side of the circle to reach the top again for the ascending node, simple really isn't it? All the satellite is really doing is going around in circles all day, its just the earth that is rotating around that moves its path along throughout the day.

Chapter 12 : Pass Predictions

Predict Satellite passes weeks in advance.

As well as Real-time predictions, you may need to know in advance when a particular satellite is due to pass over, this is where the pass prediction window comes in, you can predict several years in advance, although you do lose accuracy the further into the future you go. So, I'd recommend only going ahead a few months at the most. There's many uses for this, you may want to get a list of passes of all amateur satellites for the following day, so you can plan your activities in advance, or maybe you're going away from a PC for several days, and want to print out a list of passes to take with you. You can also save the predictions as a text file, so you can then send it as an email to a friend.



Satellite	Date	Time	Start AZ	Max EL	Duration	End AZ
ISS (ZARYA)	17 NOV ...	23:59:49	226	28 (AZ 154)	00:10:19	080
ISS (ZARYA)	18 NOV ...	01:35:29	257	64 (AZ 175)	00:10:44	088
ISS (ZARYA)	18 NOV ...	03:11:33	275	57 (AZ 196)	00:10:40	109
ISS (ZARYA)	18 NOV ...	04:47:41	280	21 (AZ 213)	00:09:55	143
ISS (ZARYA)	18 NOV ...	06:24:47	265	03 (AZ 229)	00:06:05	194
ISS (ZARYA)	18 NOV ...	21:30:33	159	02 (AZ 129)	00:05:17	100
ISS (ZARYA)	18 NOV ...	23:03:22	213	19 (AZ 147)	00:09:51	081

Types of Predictions

The top section of the window is divided into “preset” predictions and “instant” predictions, and the results for both will appear in the larger bottom section of the window. Both types can be run for a particular date or in the case of preset predictions, a series of dates.

Instant Prediction

There's two ways you can do this, the first one is to select a “satellite group” using the top box, then select a satellite from that group. Now you can either select a date from the calendar on the right, or just leave it on today's date, which is automatically chosen for you. Finally just click the Calculate button to make the results appear. Once you have some results, you can choose the Print button to send it to the default printer, or you can send the results to a text file.

The results show the time and date of the Start of the pass, the Azimuth of the satellite at the start of the pass, the maximum Elevation the satellite will reach (along with its Azimuth at that point). The total duration of the pass in Hours:minutes:seconds. The end AZ is the Azimuth as the satellite sets. Finally for visual observations, “Sunlit” will say yes or no as to whether the satellite is in sunlight at the moment, and visible is yes, if it is sunlit, and its dark enough at your location to be visible. Visible passes take place just before sunrise, and just after sunset.

Preset Predictions

There are several preset jobs that come set up in Satscape, these are listed on the left, but you can add more with jobs specifically to what you want, for instance you can find out the passes for all the NOAA satellites using the instant prediction, but you'd have to select each NOAA satellite, and click the calculate but for each one, so to save time, you could set up a job to do all that with just two clicks of the mouse.

First, to just run a job to see how it works, click one of the jobs listed, then click the “run Selected job” button, it will run through each satellite for how many days are selected in that job and produce the results below. If there is more than one satellite in that job, you may want to now press the “Sort Results Chronologically”. This will sort them, so that the first passes are at the top of the list, and the last passes are at the bottom, making it much easier to plan your activity.

Adding a new “Job”

So, if you'd like to know when several satellites pass over, over a period of several days, to save yourself a lot of clicking, just set up a new job. For an example, if you want a list of passes for NOAA 16 and 17 for 7 days, click on “Add new Job”. A window will pop up to allow you to fill in the details of what you want to do.

Firstly, type in a name for the job, this can be anything you like, and will be the name that appears in the list, so make it something to remind you what the job will do, in the example, lets call it “NOAA 16-17 7days”, next on the list is number of days, so type in 7. The next two options are up to you; you can save the predictions right away, or print them just by putting a tick in those boxes.

Now you need to build up a list of satellite, so choose “Weather” on the group name, and NOAA 16 on the satellite name, then click “add satellite to list”, and it will appear in the list. Do the same for NOAA 17. Now that you've got the job set up, click the “save this job” button, and you'll be returned to the pass prediction window, and your new job will be in the list, so go ahead and try it out.

The screenshot shows a software window titled "SS Pass Prediction Job Wizard". The window has a dark background with yellow text. It contains the following fields and controls:

- Name of Job:** A text box containing "My New Job".
- Number of Days:** A text box containing "12".
- Save Predictions to File:** A checkbox that is currently unchecked.
- Print Predictions:** A checkbox that is currently unchecked.
- List of Satellites:** A list box containing three entries: "AO-16", "AO-27", and "FO-20".
- Group Name:** A dropdown menu showing "Amateur".
- Satellite Name:** A dropdown menu showing "FO-20".
- Buttons:** Four buttons are located at the bottom of the window: "Add Satellite to List", "Remove Satellite", "Save this Job", and "Cancel + Close".

For either the instant predictions or the preset predictions you can use the calendar to select a start date, this is normally set to today's date, but you can go forward or backwards to select any date. In the example above you can make it start the 7 day prediction, 3 weeks from now if you want, just by selecting the future date, before you click the “calculate” or “Run selected job” buttons.

Finally, all times mentioned on the passes are in your local time, not GMT (unless you live in the GMT timezone!). This is true for everywhere in Satscape, unless stated that it is a GMT/UTC time, such as the UTC clock on the main Satscape window.

Chapter 13 : Iridium Satellite Flares

A free fireworks display in your Sky

So, just what are Iridium Satellite flares, and why would you want to know when they occur?

There are a “constellation” of about 60+ satellites known as Iridium, they are special mobile phone communications satellite, not for regular mobile phones, but for expensive phones that you can hire, the advantage over regular phones is that they give 100% global coverage, so they work in the middle of the Sahara desert, on the north pole, or in the middle of the ocean, as well as in your home town! The satellites themselves have a huge shiny plate antenna that reflects sunlight very well, this is not a feature of the satellite, just simply a side-effect. When the satellite is at a particular angle to the sun and your location, the sunlight is reflected down at your location, and can be extremely bright, a maximum of -8 Magnitude, e.g. Brighter than Venus or the Sirius star. It only stays that bright for a few seconds, and to the observer, it looks like someone has shot a flare into the sky, hence, the name given to this effect. Probably many “UFO” sightings are actually these satellites “flaring”.

Satscape doesn't currently make these predictions itself, so it uses a service provided by “heavens-above”, a server on the Internet. All you need to do is press the “update now” button, and Satscape will send you location details to the server, and send back the results, these will then be displayed and saved to memory so you can look back at them a few days later without having to update again. The predictions are for seven days, so you only need to update a maximum of every seven days.

The results show the start time (as usual in your local time, not GMT) along with where in the sky to look for it using the familiar AZ and EL. Intensity and Max Intensity show how bright it will be on the magnitude scale, so -8 is the brightest and 0 being the dimmest. So, if the intensity reads 0 and the max intensity is -8 , it will gradually get bright as it goes over. The best ones to look for is -8 on both readings, this is where you'll see a faint dot gliding across the sky, then very rapidly, it will become very bright, and stay bright for several seconds.

Many thanks to the people at heavens-above for providing this service, and I'd like to recommend you visit their web site for more interesting satellite pass information, you can do so by clicking the heavens-above logo on the window.

Chapter 14 : Satellite Database

A Built in Encyclopaedia on most satellites.

One added feature is the satellite database, this can be updated from the “internet update” option in the main menu, its updated manually by myself from time to time as new satellites are launched, so if there’s a new satellite you’d like to know something about, first make sure you’ve updated the database, but if no information is showing, it will give you the option to send a request to have information added. This is sent in the form of an email that goes to a special box I’ve set up, and periodically, I’ll go through it and find information on the satellites to put into the database file. You’ll also see a button to search the internet yourself, clicking it will connect to the internet and do a search for that satellite and display pages that may or may not be related to that satellite.

The contents of the database entries for each satellite are displayed on the 2D, 3D and horizon views each time you select a satellite, the details include the launch date and possibly launch vehicle, and if known, the uplink and downlink frequencies used by the satellite, and occasionally extra info as to whether the satellite is fully or partially operational, or if its just a pile of junk floating around up there.

Some “objects” are not catalogued; these include debris such as spent rockets, stage separation junk, or even astronaut’s spanners! NORAD currently track 8000+ objects like this, Satscape can track up to 500 simultaneously.

One thing to note here is if there is no information on a satellite, it doesn’t mean you can’t track it in Satscape, if it appears in the list, then it means Satscape has the Keplerian data for it, so you can go ahead and add it to your favourites for tracking and pass prediction. The information in the database, is simply extra data for your convenience.

Chapter 15 : Rotor and Radio Control

Get Satscape to control your antenna and radio

To make tracking satellites even easier for radio amateurs you can have Satscape move your antenna rotor and/or tune in your radio. This is not always needed, I've heard many times that a regular non-directional antenna is all that is needed such as a di-pole, where the "null-point" is directly above the antenna, and if the satellite is directly above you, chances are this null-point doesn't cause a problem, likewise with the radio, you can manually tune in the radio without too much hard work. But should you want Satscape with "bells and whistles" several control units are available to buy ready built or in kit form. I've not looked into this myself, so probably the best people to ask are the people using it themselves, radio amateurs or try contacting someone at AMSAT for further information, and/or take a look at their web site.

As for the software side of the control, this is handled by 3rd party software writers, Satscape simply generates the numbers, such as AZ and EL and Doppler corrected frequencies, these numbers are then sent out to windows' DDE system, which is a way for programs to communicate with each other, so Satscape will communicate this data to any program that wants it. Wisp-DDE is included with Satscape as it is freeware too, it takes the information from Satscape and does the actual controlling of your hardware. Any questions regarding these 3rd party programs such as Wisp-DDE please direct them at the relevant author, you're more likely to get a solution to any problems encountered.

Information about how 3rd party program works, and how to operate it will be included with the program itself, but here's some information on how to use the Satscape side of the software. The Rotor and radio control window can be brought up on the screen from the 2D or 3D views under the "control" menu, its pretty easy to use, just put a tick in the "enable DDE link" to switch on the data, there's a link to start up Wisp-DDE too, if you're using another program you'll need to start that up manually. The details of the satellite you're tracking will then appear in the tracking window, and if you've set up the 3rd party program correctly, the numbers will appear in there also, which means your rotor/radio will then be under control of Satscape. AZ and EL are sent to an accuracy of 100th of a degree, which should be very accurate and is updated once a second.

As many satellites have more than one frequency, you can use the drop down boxes for uplink and downlink frequencies to select which one you want to use, then to the right of that, the Doppler corrected frequency is used to tune your radio. Doppler is an effect of the satellite moving towards or away from the observer, so the radio waves appear to get compressed or expanded, which changes the frequency slightly, or quite considerably at higher frequencies.

There is also a tick box to enable Satscape to track the position of the moon as well, this may be useful for EME radio activity, although the moon moves relatively slower than satellites, this is just one less task you need to concern yourself with.

Finally if you encounter any errors when using the control system, check the title of the error message window, if it says "Satscape", then email me if you require assistance, otherwise contact the author of the program that generates the error.

As mentioned above, there are already several programs to do the controlling, as there are hardware devices you can use, one that I know of that seems to work well is the FODtrack system, you can find out more information about this at <http://www.gsl.net/ve2dx/projects/fod.htm>

Should you want to write your own control program, or get the information provided by Satscape into another windows program that has DDE capabilities, you'll need the "conversation"

parameters, if you have Microsoft Excel, you can get that to pick up the data and place it in a cell, by setting the cell =**Satscape|Tracking!Tracking**

What you'll see is one line of text containing the parameters separated by a space, which will look something like this:

SNSTARSHINE_3 **AZ**75.04 **EL**-36.03 **UP**0 **DN**145822300 **DO**-1823.44583212907 **LA**19.814686
LO267.745787 **AL**377.506904 **RR**5.46655308043831

Here's what each one represents:

SN = Satellite name

AZ = Azimuth

EL = Elevation

UP = Doppler corrected Uplink Frequency

DN = Doppler corrected Downlink Frequency

DO = Doppler Offset (used in TRX Manager)

LA = Latitude

LO = Longitude

AL = Altitude

RR = Range Rate (speed at which the satellite is moving to or from you)

Chapter 16 : Behind the Scenes

Just how does Satscape do what it does?

I can't take full credit for Satscape, I've had several helpers, and some of them don't even know it. Also, its been gradually built up over the years based on comments and suggestions by users of Satscape. So here is a basic guide to how it works using as few technical words as possible! The reason I'm including this information is for the technically curious, but also, a better understanding of how the program works will help you get the most of you it, and even fix problems should they arise.

Satscape has been working fine on my PCs for a long time, but how come that's not true for some other people who have emailed me in the past with problems using it or getting it running, it's the same program running on a similar PC, so it should work just the same shouldn't it? The main reason I think is, that Satscape is made up of several components each one doing a specific task, if just one of these components is missing or mis-behaving, the program will work most of the time, or completely fail. As you can see from the set up, there's a Satscape.exe file, this is the main part of Satscape that I write using a programming language called "Microsoft Visual Basic", this is known as a high-level programming language, which means it doesn't have to explain to the computer how to do every little thing that happens, for the most part, windows does the hard work of displaying each character of text, and each piece of the graphics, even down to what "pixels" on your screen to light up.

As calculating the position of a satellite at a particular time is quite a complex mathematical problem, I've taken advantage of another programmer's work to accomplish this task, David J Taylor has written a "library" of mini-programs based on Dr. T.S. Kelso's original program code that produces the raw numbers, taking in the Keplerian data, and the date and time of the prediction, these numbers are then passed over to Satscape, which can then make use of them, simply displaying them as with the tabular data window, or using them to position 3D objects in the 3D view. So, that's a whole load of programming taken off my hands.

Likewise, the 3D view is generated using Microsoft's DirectX system, this system 'talks' directly to your graphics hardware to produce a 3D view, so all I have to do is describe the scene, eg. Where each object is, there's still a lot of trigonometry to calculate within Satscape, but the graphics are produced on your screen entirely by DirectX.

The "skinning effect" used on Satscape's windows is yet another example of a freeware programmer producing a mini-program (OCX or DLL) to achieve a particular task, Satscape does not produce the skinning effect itself, the OCX does it, all that is required is that Satscape instructs it on what graphics to use.

There are many more of these OCXs and DLLs used within Satscape to make producing such a program, a lot easier for me. So, as you can see there are many parts to the program, if just one goes wrong or is not present on the PC, things go bad! Similar to a car, Satscape is the engine, the OCXs and DLL files are the wheels, doors and windows™ ☺ and without wheels your car isn't going to go very far.

So, the best and easiest way to fix a problem in Satscape is to reinstall it, to ensure all these components are installed and ready to go.

So, in closing, Satscape is a Multitude of components written by myself and other programmers around the world to produce an easy to use and graphically appealing Satellite tracking program, where possible, all technical and astronomical phrases have been replaced by common language that everyone can understand, it has many uses, the main one being for amateur radio use, but I'm

hoping it will be used by amateur astronomers to see satellites pass over in the night's sky, by Educational institutes such as schools and universities as a tool to show how satellites orbit the earth, as well as providing opportunities to communicate with people in space, having the equipment to communicate is one thing, but knowing when to communicate is just as important.

I hope by using this program, it enhances your enjoyment of participating in space technology for many years to come.

Scott Hather

Author of Satscape – The Freeware Satellite tracking program.

www.satscape.co.uk

For further help and assistance see the Help page/FAQ by pressing F1 within Satscape, or go to www.satscape.co.uk/fag.html for frequently asked questions and a series of on screen video tutorials. As mentioned at the end of the FAQ, I don't really have time to answer emails regarding problems or just general help in how to accomplish a particular thing in Satscape

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If you wish to do a translation of this manual, feel free to do so, add your name to the beginning and/or end of the document, and please send it to me, so I can include it on the web site.
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