

EchoMap 3.0 User's Guide



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This Manual is for users of EchoMap, on an Echo Flight **Flight Cheetah** Multi-Function-Display or a Windows® laptop. An electronic version of this manual will be installed to
/Echomap/Docs/EchoMapGuide.pdf

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Please read the following information

- Echo Flight provides weather and messaging only in the Continental U.S. and surrounding offshore areas
- Echo Flight continues to develop new technologies to provide pilots with new and exciting ways to gather information in the cockpit. For a full understanding of how the system should be used, please refer to the Echo Flight, Inc. Services and Systems Agreement.
- This product is meant to augment, **not replace** pilot voice communication with Flight Service Stations (FSSs), other Air Traffic Control (ATC) facilities or Airlines Operations Control Centers (AOCCs). It does not replace pilot and controller/FSS/aircraft dispatcher voice communication for critical weather or operational information interpretation. Please verify all information including navigational and weather information from independent sources before considering it valid.
- Before using Echo Flight products during flight, you should become completely familiar with the operation of the system and equipment as well as modes of operation and indications of various system failures.
- Although governmental Selective Availability for GPS has been removed, altitude information should not be used for vertical navigation.
- This system is for portable use. Please observe all FAA regulations including 91.21 regarding the use of portable equipment in the cockpit. This product is not IFR certified. It is for advisory use only and is designed to supplement other sources of flight data while enroute. For additional information please refer to the Airman's Information Manual concerning weather avoidance.
- Take care positioning and securing equipment so it is free and clear of all controls, instruments, doors and windows. As with any transceiver, contact with an antenna while transmitting may cause electrical shock.
- Always make sure NOS approach plates are current. Approach plate information should be printed before flight in case of electrical failure. Always make sure you have the most current updated information.
- All aircraft are certified with a maximum allowable weight to be placed on the control yoke. Assume that the computer exceeds this amount and should not be mounted on the yoke unless your aircraft manufacturer approves. Please remember that any object on the control yoke may cause a potentially dangerous flywheel effect if poorly centered. If you have any mounting questions please contact your A&P mechanic.
- Information in this document is subject to change without notice.

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1. INTRODUCTION

This Manual is for users of the EchoMap software running on a either an Echo Flight **Flight Cheetah** Multi-Function-Display or a Windows laptop/tablet computer.

Reading this manual will introduce you to the powerful features and functions of EchoMap. You should install software on your home computer to practice in demo mode. See section **4.2.1**.

1.1 System Requirements

If you are not using the software on a Flight Cheetah flight computer, it is recommended that you use a Pentium class Windows® laptop or tablet computer. **WinCE is not supported.**

Requirements	Minimum	Recommended
Operating System	Windows 95, 98, ME, XP	Windows NT4, 2000
Processor	Pentium 75 MHz	Pentium III 500 MHz or more
RAM (megabytes)	16-32	64-128 or more
Hard Drive	500 megabytes	1 gigabyte or more
Ports	1 serial or USB port	2 serial or USB port

At least **one RS-232** serial port is required to communicate with the Satellite Transceiver and/or GPS Receiver (USB to Serial adapters are available). A faster processor or more RAM will improve system performance. A **CD-ROM drive** is required to install software and updates, but is not required for use in-flight.

Warning - When using a mobile computer in the cockpit, special care should be taken to place the screen out of direct sunlight, in an easily viewed area that does not interfere or block any controls or instruments.

1.2 Data-Link and GPS

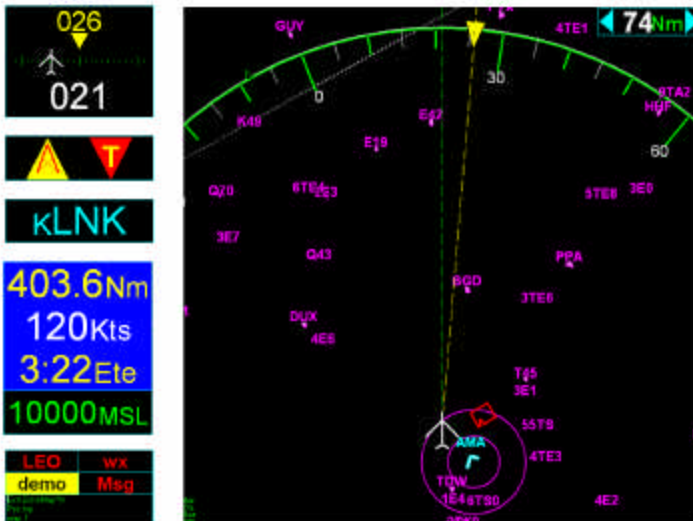
EchoMap is designed to work with the Quake and Panasonic brands of ORBCOMM satellite communicator (SC). These SCs provide integrated GPS functionality. EchoMap also supports the use of a separate NMEA GPS receiver on a serial/usb port to run without an SC or to replace the SC's integrated GPS. If you use both an SC and a NMEA GPS, you will need at least two serial or usb ports.

2. FLIGHT DISPLAY INDICATORS

EchoMap has been optimized for maximum flexibility, capability and ease of use in flight. Please take a few moments to review its functions to get the most of its capabilities.

The flight display screen consists of six separate sections:

1. Heading information, upper left panel.
2. Obstacle Alert, second down on left.
3. Direct to location, third down on left.
4. Position information, lower center left panel.
5. GPS and ORBCOMM Satellite Status, lower left panel.
6. Moving Map display, right hand panel.



EchoMap will scale to fit any display resolution. Layout will differ depending on whether it is displayed in portrait or landscape mode. Landscape mode is shown above. In portrait mode the indicators display on top of the map.

2.1 Heading Indicator

The first section of the flight display is the heading indicator in the upper left corner of the screen. The top yellow number is the magnetic heading to your waypoint. The lower white number is your actual current track. The visual aircraft indicator shows the number of degrees off course, in this case 6 degrees to the left of the correct heading represented by the yellow triangle below the magnetic heading. The tick marks show how many degrees your aircraft is off course in one-degree increments up to a maximum deflection of 11 degrees. Navigation is as simple as flying towards the triangle.



2.2 Obstacle Alert Indicator

The obstacle alert indicator panel will automatically display either a tower or terrain alert symbol when the aircraft comes within 8 minutes and 500 feet of an obstacle. If no GPS altitude is available, this alert indicator will show a red and white striped bar.



2.3 Direct to Indicator

The third panel displays the currently selected target waypoint, which may be an airport, VOR, NDB, intersection or custom waypoint. The color of the text matches the color of item on the map. When an airport is displayed in cyan it indicates a controlled airport in the destination while magenta would indicate an uncontrolled airport.



2.4 Position Indicators

Directly below the direct to indicator is the navigation box. This box displays current navigational information during flight. The first two lines are **Distance to the Waypoint** and **Ground Speed**. The third line displays the **Estimated Time Enroute (ETE)** to the target waypoint. ETE is computed on your actual track and closure rate, (not just distance divided by ground speed), to give you an extremely accurate time.

A rectangular display box with a blue background and a black bottom section. The text is as follows:
 403.6Nm (yellow)
 120Kts (white)
 3:22Ete (yellow)
 10000MSL (green, on black background)

For this reason, the ETE indicator will disappear when your track is 90 degrees or more off from the target heading.

The final line indicates your altitude in feet above mean sea level. This altitude will appear in yellow when your aircraft is 500-1000 feet above the terrain and red when within 500 feet or less. When GPS reception is less than 4 satellites no altitude is displayed and you will receive a No Alt warning in the Obstacle clearance panel.

Note: Although government Selective Availability has been removed, the system is not to be used for primary vertical navigation or IFR navigation.

2.5 Satellite Status Indicators

Directly below the navigation box are the satellite status indicators. There are four indicators, upper-left is the status of the ORBCOMM satellite connection, lower-left is the **GPS** lock status, upper right is the **WX** status which lets you know what weather product is being displayed, and lower right is the **Msg** status. The indicators will also display an arrow up or down to show that the system is transmitting or receiving data from the satellite.

A rectangular display box with a black background and green text. The text is as follows:
 B5 (large)
 GPS (large)
 CV (large)
 Msg (large)
 receive queue 0
 meter 16 received
 SC Msg Received
 WX Nexrad
 send queue empty

Below these indicators is a small text box that outputs status information that is written to status log. The text is small because it is not necessary to read this information during flight.

2.5.1 Satellite Indicator Colors

The ORBCOMM status indicator shows whether you have established a link with the satellites and whether you are transmitting or receiving.

Color	ORBCOMM Satellite Indications (upper left)
Red	No signal is being received on the serial port or the satellite transceiver has failed its initial check and verification. Remedy: Confirm that the satellite transceiver is receiving power and is connected securely to the computer's serial port using the provided serial cable.
Yellow	The satellite transceiver is operating correctly and is ready to receive or transmit data, but no ORBCOMM satellite is in view.
Green	You are currently in view of an ORBCOMM satellite. Dotted Green and Red bars indicate Signal Strength and Noise.
White arrow	Arrow pointed up means satellite transceiver is transmitting data to satellite. Arrow pointed down means satellite transceiver is receiving data from satellite.

The GPS indicator shows whether you have established reception of the GPS constellation.

Color	GPS Lock Indications (lower left)
Red	No signal is being received from the satellite transceiver or it has failed its initial check and verification. Remedy: Confirm that the satellite transceiver has power and is securely connected to the computer's serial port.
Yellow	GPS signal is being received, but the GPS receiver has not yet locked on to at least three satellites. Remedy: If the GPS indicator remains yellow, double-check the GPS antenna connection and placement. Note: The first time the system is used, the GPS may take some time to lock on.
Green	Locked on to at least three satellites with good geometry, providing real-time position for the moving map. If you are using a WAAS GPS, a WAAS lock is indicated by "WAAS" black text on green.

The Weather indicator shows the status of weather requests as well as the age of weather.

Color	WX Status Indications (upper right)
Red	Current weather is over an hour old, or Demo weather displayed.
Yellow	A request for weather has been made but not yet received.
Green	Weather under an hour old displayed. Shows the age.

The message indicator shows the status of message requests.

Color	Message Status Indications (lower right)
Red	No queue count available from satellite transceiver.
Yellow	Messages are queued to send.

Green	Send queue empty and waiting.
--------------	-------------------------------

2.5.2 Satellite Indicator Examples

LEO	wx
off	Msg

You have no connection with the Satellite transceiver. All indicators are red.

LEO	wx
GPS	Msg1

You have a connection with the satellite transceiver, but no lock with either GPS or ORBCOMM satellites. You have made one WX request, which is waiting for a connection to send. If this persists, check your antenna or verify antennas have a clear sky view.

A3	wx
GPS	Msg

Poor lock on with ORBCOMM Sat A3, all noise (red bar). WX not requested (red), no GPS lock (yellow), empty Msg queue.

B8	wx
GPS	Msg1

Locked on to Sat B8 (green) with 70% Signal Strength and no noise. Sending data (white arrow up), GPS locked (green), NexRAD request pending (yellow), and one message in queue waiting to be sent (yellow Msg1).

D8	wx
GPS	Msg

Locked onto ORBCOMM Sat D8 (green), with 100% Signal Strength, receiving data (white arrow down), GPS locked (green), weather request for NexRAD is pending (yellow), no messages are waiting to be sent (green Msg).

B5	C/V
GPS	Msg

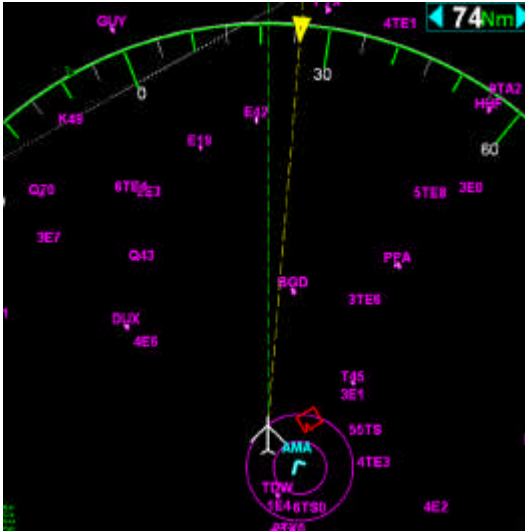
All green. Lock to Sat B5 with a little noise (dotted red bar). Metar (C/V) information received less than an hour ago, and no messages are waiting to be sent (green Msg).

D8	Nx5m
GPS	Msg

All green. Locked onto ORBCOMM Sat D8, GPS locked, NexRAD image displayed 5 minutes old, and no messages are waiting to be sent.

2.6 Moving Map Panel

The sixth and largest section of the EchoMap display is the moving map that shows your aircraft's current position in relation to airports, airspaces, Navaids, weather and a wide range of other data. To maximize situational awareness of presented data, colors are chosen for optimum legibility and menus are logically grouped for ease of use.



The map range is displayed in the upper-right corner of the moving map. It indicates the

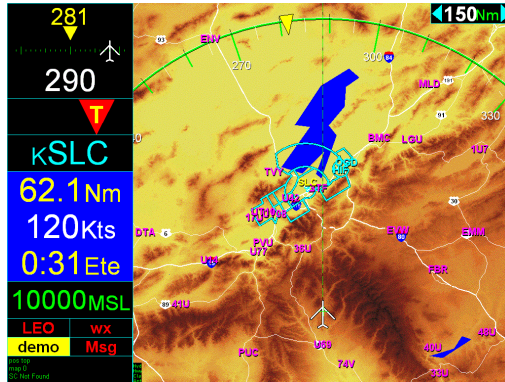
distance to the green compass ring or to top edge of the map if the compass ring is off. Use the **Left** arrow key to decrease the range (zoom in, down to 0.25Nm) and the **Right** arrow to increase the range (zoom out, up to 2500Nm).

Press **both left & right arrows** simultaneously to enable **auto-zoom** mode, which will automatically set the viewing range to show your target waypoint. A yellow label indicates if auto-zoom is enabled.

3. GPS MOVING MAP

Echomap has an extremely flexible GPS moving map. It has been optimized for maximum capability in flight with minimum heads down time. Please take a few moments to review its functions to get the most of its capabilities.

Most features in EchoMap are accessed through five top level menus that correspond to the **NAV, INFO, MSG, WX** and **D->** keys on a Flight Cheetah MFD, or the F1-F5 keys on a regular keyboard. If you have installed EchoMap on a touch screen computer, a menu bar is displayed to allow touch access to menus.



Use the **up** and **down** arrow keys to select items in the menus. The selected item is highlighted with a yellow bar. Press the **Enter** key to activate the selected item. You can close the menu by pressing the same key you used to open it. Users with a touch screen close the menu by clicking on white caption bar. You can go **up** from the top of the menu to return to the parent menu.

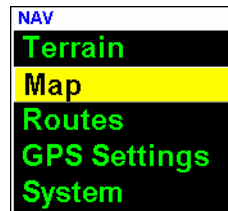
3.1 Navigation Menu

The Navigation menu contains all of the settings to customize the map display as well as create flight routes and access the system.



To access the Navigation menu press the **Nav** button (F1).

From this menu you can select from the **Terrain, Map, Routes, Mode** and **System** sub menus.



Terrain - The terrain menu lets you control how terrain is displayed on the moving map.

Map - The map menu lets you customize the display options for the moving map, including which layers of navaid data are displayed on the map as well as filtering options.

Routes - The routes menu lets you create user defined routes and waypoints.

GPS Settings - The mode menu lets you select whether the display is in demo mode, GPS mode or playback. The default normally selects GPS mode.

System - The System menu provides access to system configuration and diagnostics, the operating system, and the system shutdown/exit options.

3.2 Demo Mode



To most easily learn how to use Echomap before flight it is suggested you operate the display in demo mode. To operate in demo mode, First press the Nav key ,Then scroll down to **GPS Settings** and press Enter. Next scroll down to **Demo** and press **Enter**.

3.3 Map Range Controls



The Range keys change your viewing range, the **left** arrow decreases range and **right** arrow increases range. The range is displayed in nautical miles in the upper right hand corner box of the moving map indicating the distance of your aircraft to the edge of the green compass ring.

The viewing range will zoom down to .25 Nm and up to 2,500 Nm. Zooming closer than .25 Nm or Zooming farther than 2,500 Nm will cause the software to Enter into an auto-zoom function. In the auto-zoom mode, the software will automatically make the viewing range equal to the distance to your target waypoint.

3.4 Navaid Overlays

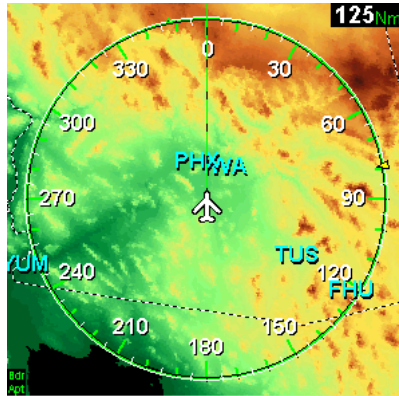


The **Up** arrow and **Down** arrow allows you to scroll through different customized layers of navigational data such as airspace, highways and airways. To read more on how to customize your own layers please refer to **3.10**



3.5 Terrain Contour

The terrain contour background map displays terrain in solid shades of color. The color mapping is based on the elevation coloring of standard sectional charts, but slightly adjusted for improved on-screen visibility. The image to the right shows the aircraft position in Arizona. Mexico is to the south.



3.5.1 Display the Terrain Contour Overlay



Press the Nav button, select **Terrain**. In the Terrain menu select **Map: ON** and **Mode: Map**. Next press **Enter** to remove the menu. You can toggle this function on and off your moving map display by pressing **Nav Enter Enter**.

3.5.2 Display Black Background



Press the Nav button, select **Terrain**. In the Terrain menu select **Map: OFF**. Next press **Enter** to remove the menu. You can toggle this function on and off your moving map display by pressing **Nav Enter Enter**.

3.6 Terrain & Tower Alerts

EchoMap automatically displays alerts if your current altitude is within 500ft of terrain or a tower in an 8 minute radius of your current position. You are alerted to the terrain or towers that would display red on the moving map. The alert indicators are

positioned below the heading indicator. If there is no GPS altitude available, this area will display as a red and white slashed bar that says **NO ALT** or **NO GPS**. Terrain and tower alert conditions are always calculated, even when terrain and towers are not being displayed on the map.



3.6.1 Terrain Alert Indicator

Echomap will display a terrain alert icon if there is terrain within **8 minutes** (based on your current GPS ground speed) and 500 ft of your current altitude. Although the terrain alert indicator is always enabled, you have the option of deciding whether or not you want to view the color coded areas of conflicting terrain on the moving map as shown on the next page.



EchoMap provides advisory worldwide terrain elevation data. The terrain database is derived from the USGS GTOPO30 global digital elevation model (DEM). Elevations are regularly spaced at 30-arc seconds (about 1 Km). Elevations are stored in 100ft increments to save disk space. The terrain data may contain some degree of error (especially outside of the United States). By rounding up to the nearest 100ft, we help to insure that the error is on the side of caution. It is possible that some terrain features will not be depicted in the data. Terrain data should never be used for primary surface navigation

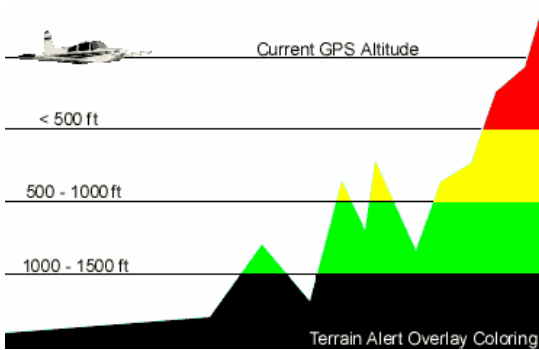
3.6.2 Tower Alert Indicator

Echomap will display a tower alert icon if there is a tower within **8 minutes** (based on the current GPS ground speed) and 500 ft of your current altitude. The tower alert function is always enabled, and if there is a conflict the obstacles are automatically displayed on the moving map with the same color coding shown for terrain.



3.6.3 Terrain Alert Display

The terrain alert overlay shows only terrain that is within 1500 feet of your current GPS altitude. The terrain alert overlay is color-coded so that areas within 500 feet of your altitude display **red**, 500-1000 feet are in **yellow** and 1000 feet-1500 feet **green**. Anything in excess of 1500 feet clearance is not displayed.

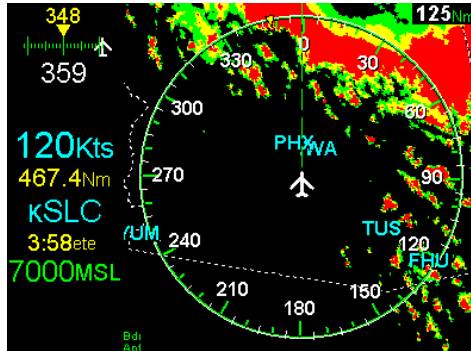


3.7 Display The Terrain Alert Overlay



Press the Nav button,

select **Terrain**. In the Terrain menu select **Map: ON** and **Mode: Alert**. Next press **Enter** to remove the menu. You can toggle this function on and off your moving map display by pressing **Nav Enter Enter**.



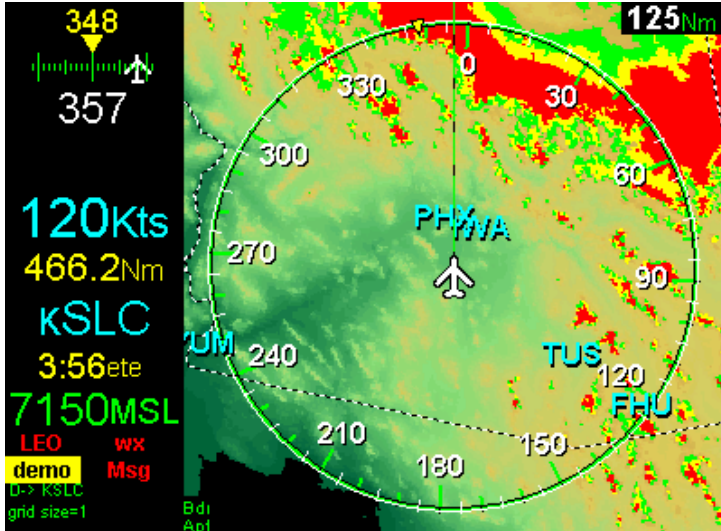
3.8 Display The Terrain Contour and Alert Overlay



Press the Nav button, select **Terrain**. In the Terrain menu select **Map: ON** and **Mode: Both**. Next press **Enter** to remove the menu. You can toggle this function on and off your moving map display by pressing **Nav**

Enter Enter.

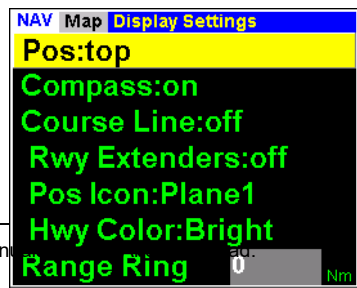
The image below shows **both** the terrain contour map and alert overlay at the same time. If NexRAD radar and terrain overlay are both set on, the map will alternate between the dotted radar images and the solid colors of the terrain alert.



Note - GPS altitude is used to compute tower and terrain alerts. The system including GPS hardware is **not IFR certified** and is strictly for **supplemental use only**. Even with increased accuracy since the termination of selective availability, GPS altitude still varies above and below the actual altitude by several hundred feet. This system is meant to supplement, but not replace, primary sources of information such as current charts and altimeter settings. All terrain and obstacle data provided by the US government. Although this data is believed to be correct, there is the possibility that certain terrain or obstacle data may be incomplete or inaccurate. If you find any inconsistencies between this US government data and your current charts or observations please notify Echo Flight support at 1-800-739-7161.

3.9 Moving Map - Display Settings

The display settings menu allows you to customize your



compass and aircraft position on the screen. In addition you have the option to display your course line for your route of flight as well as runway extensions and 45 degree lines of entry.

To open the Map Display Settings menu, press the **Nav** button, select **Map**, then select **Display Settings** and press **Enter**.

3.9.1 Change Your Map Compass Display

The **Pos** setting lets you use the **Left** and **Right** arrow keys to cycle through the moving map display modes of **Top**, **North**, **Center** and **Bottom**. The compass can also be toggled on and off in the display setting menu.

Center	Position and compass centered; track up
Bottom	Position on bottom; small compass; track up
Top	Position on bottom; big compass along top; track up
North	Position and compass centered; north up

The **Compass** setting lets you toggle the compass ring map display on and off. Changing the compass ring settings will change the value of the range indicator, since it displays distance to ring. If compass ring is turned off, map range indicator displays the distance from the current position to the top of the screen.

3.9.2 Display Course Lines

The **Course Line** setting lets you toggle the course line on and off. The course line is displayed as a yellow dashed line on the map between the current position and the target waypoint.

The **Runway Extenders** settings lets you toggle the display of runway extender lines between **Off**, **On** and **45 Degree Entry**. This allows you to toggle between an extended runway center line, 45 degree pattern entry or no extension for the last 10 miles to your destination airport.

3.9.3 Other Map Display Settings

The **Pos Icon** setting lets you cycle through a number of icons that can be used to depict your current position on the moving map. These include airplane shapes, a helicopter shape and arrow shapes.

The **Hwy Color** settings lets you choose from three different color schemes for displaying roads and highways on the moving map. **Bright** mode helps you see in high glare/light situations. **Medium** and **Dark** can improve visibility in medium or low light

situations. **Color** displays the roads using coloring similar to a standard road map.

The **Range Ring** setting lets you display a thin white ring a particular range around your aircraft. This can be using in addition to the standard green compass ring to help you determine your distance to objects on the map, including weather. You can set the range ring size from 5 to 100 nautical miles.

3.10 Map Menu - Layers

The **Layers** menu allows you to configure multiple pages of navigational data for your moving map. Each page can contain any combination of data. For example, you could have airports and airspace on one page, airways on another and roads and state borders on another.

Once you pages have been configured, you can quickly change between them by pressing the **Up** and **Down** arrow keys from the moving map. You can create as many separate data pages as you wish. The system comes with several layers preconfigured, you can add, change or delete these as you wish.

3.10.1 Add or Delete a Map Layer

From the **Layers** menu, you can turn on and off individual data layers by using the **Up** and **Down** keys to select it in the list and press **Enter**. The green dots indicate which layers are currently displayed.

Add a Layer

Once a desired group of data layers is active, select **Insert** in the **Layers** menu (or press **Insert** on keyboard) to add as a preset map data page. You can create as many preset data pages as you want, containing any combination of data layers. You can then cycle through your preset pages of data from the moving map using **Up + Down** arrows. The list of layers for the active page is displayed on the lower left of the map.



Delete a Layer

While viewing an unwanted preset map page, select **Delete** in the **Layers** menu to delete that preset page (or press **Delete** on keyboard).

3.10.2 Keyboard Shortcuts for Layers

You can insert or delete layers directly from a keyboard...

Layer Names	Keyboard shortcut	Layer Data Description
APT	A	Airports
CLA	C	Class Airspaces
SUA	S	Special Use Airspaces
NDB	N	Non Directional Beacons
INT	I	Intersections
VOR	V	VHF Omni-directional Radio-range
AWY	W	Low Altitude Airways
JWY	J	Jet Airways
ARR	R	Arrivals
DEP	D	Departures
PJA	P	Parachute Jump Areas
OBS	O	Obstructions / Towers
HWY	H	Highways/Roads
HYD	Y	Hydro graphics, Bodies of Water
BDR	B	State Borders
Trip Path	T	Traces Flight Path on Map with a Red Line

3.11 Map Menu - Filter Settings

EchoMap's database contains more navigational data than can be displayed all at once without cluttering the map. To reduce clutter you have two options to control what you view on your moving map so you can easily see

NAV	Map	Filters	NavAid
VOR Zoom	500		Nm
VOR Distance	100		Nm
NDB Zoom	200		Nm
NDB Distance	350		Nm
INT Zoom	350		Nm
INT Distance	350		Nm

important information with minimum heads down time.

The **Filters** menu allows you to change the cut off range distance, and the **Layers** menu allows you to set up multiple pages of navigational information to overlay on the moving map.

3.11.1 Change Filter Settings



Press the **Nav** button, select **Map**. In the Map menu select **Filter**. In the filter menu you can scroll to the desired navaid with the **Up** and **Down** arrows and change the settings with the **Left** and **Right** arrows. When your selections are complete you can back out of each section of menus by pressing the **Nav** button.

The **Range** setting in the menu allows you to set the distance ahead of your aircraft that you want this type of navaid to be displayed. The **Zoom** setting is the range, in miles, as shown in the upper right hand corner of the moving map at which all of the Navaids will disappear.

You can set the **Distance** filter for public and private airports. Airports do not have a zoom setting, but automatically determine if they should be displayed at a given zoom range based on the size of the facility.

The **Minimum Runway** filter sets the minimum runway length needed for an airport to display on the map or in airport lists.

Example - Setting **VOR Distance** to 200 miles and **VOR Zoom** to 500 miles would mean that you can see VOR's up 200 miles ahead of you, but if you increased the range of the compass ring out to 500 miles all the VOR's would disappear.

4. DATABASE INFORMATION



The Information menu (F2) allows you to access information about various map features. Select the type of object you want information for: Airports, VORs or NDBs. Then either enter an identifier or select one from the list to see information about an object. Objects are listed in order from closest to furthest from your current location. Only loaded objects are listed.

Note : Pressing the **Direct To** key (F5) while in an info page will set the current object as your target waypoint.

4.1 Airport Information

There are five pages of airport information. To view, select or enter an airport identifier. Once an airport is selected, press **Enter** to view it full screen. When the airport info display is full screen, you can change pages with the **left** and **right** arrows, or return to the partial screen view with airport list by pressing **Enter**.

4.1.1 Airport Facility Page

The **Facility** page shows the runways of the airport (or a circle if unsurveyed), the name, location, elevation, phone number, lighting, ATC, runways sizes and services of the airport. The runway sizes, on the lower left, are color-coded: red an unsurveyed airport, yellow is shorter than minimum runway filter and green is longer than minimum runway filter.

KDEN Facility Comm Map Metar Plates INFO

Denver Intl
Denver, CO
Elev 5431ft Ph:303-342-2200
Lights DUSK-DAWN
ATC DENVER

17R/35L = 12000 x 150
17L/35R = 12000 x 150
16/34 = 12000 x 150
08/26 = 12000 x 150
07/25 = 12000 x 150

Landing fee charged
Notam 0
Major Airframe, Major Engine repair
Automotive Gasoline
Grade 100LL Gasoline (LOW LEAD BLUE)
Grade 100 Gasoline (BLUE)

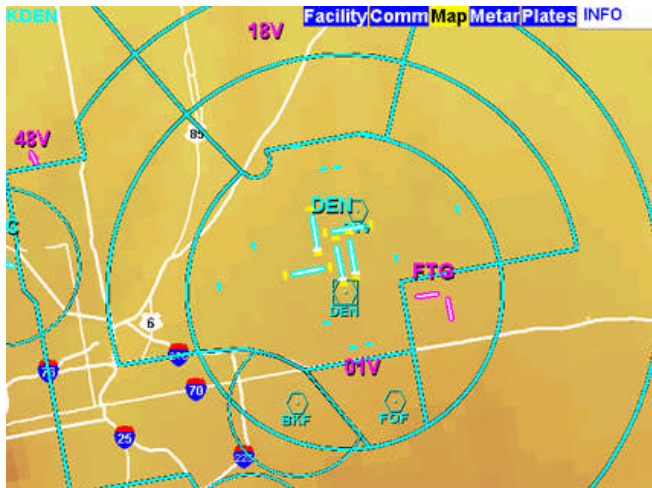
4.1.2 Airport Frequency Page

The frequency page lists the communications frequencies used at the airport, including Tower, Approach, Departure, ATIS, GND, Unicom and others.

KDEN	Facility	Comm	Map	Metar	Plates	INFO
ATIS	125.6(ARRI)(303-342-0819)	GND	121.85(RYS 08/26; 17L/35R)			127.5(RYS 07/25 _16/34)
	134.025(DEP)(303-342-0820)					
	Hrs: 24					
Tower						
DENVER						
	124.3(RYS 08/26 _17L/35R)					
	133.3(RY 17R/35L)					
	135.3(RYS 07/25 _16/34)					
	Hrs: 24					
APCH						
DENVER	119.3(NORTH)	120.35(SOUTH)				
	Hrs: 24					
DEP						
DENVER	126.1(WEST)	127.05(NORTH)				
	128.25(EAST)	128.45(SOUTH)				Hrs: 24
FSS						
DENVER	123.65					
	Cirnc Divry 118.75					
Ucom	122.95					

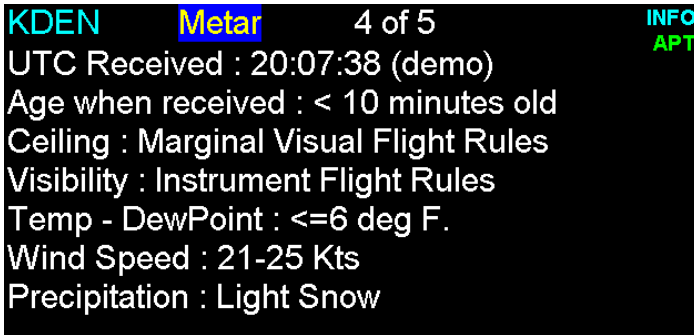
4.1.3 Airport Map Page

The map page displays a map of the airport and landmarks around the facility. The map shows terrain, runways, markers, airspaces, nav aids, and surrounding highways. Use **Up** and **Down** arrow keys to zoom in and out of the map.



4.1.4 Airport Metar Weather Page

The Metar page will show whether the selected airport is a Metar site. If a textual Metar is available for this airport, it will display both in raw and decoded format. If a graphical Metar is available for this airport, a textual interpretation will be displayed. See the Metar Weather section for more information.



KDEN Metar 4 of 5 INFO
APT
UTC Received : 20:07:38 (demo)
Age when received : < 10 minutes old
Ceiling : Marginal Visual Flight Rules
Visibility : Instrument Flight Rules
Temp - DewPoint : <=6 deg F.
Wind Speed : 21-25 Kts
Precipitation : Light Snow

4.1.5 Airport Plates Page

The plates page lists and displays any installed approach plate images that are available for the airport. Only users with a plates subscription (Echo Flight Plan3 or Plan4) will have these NOS plates.

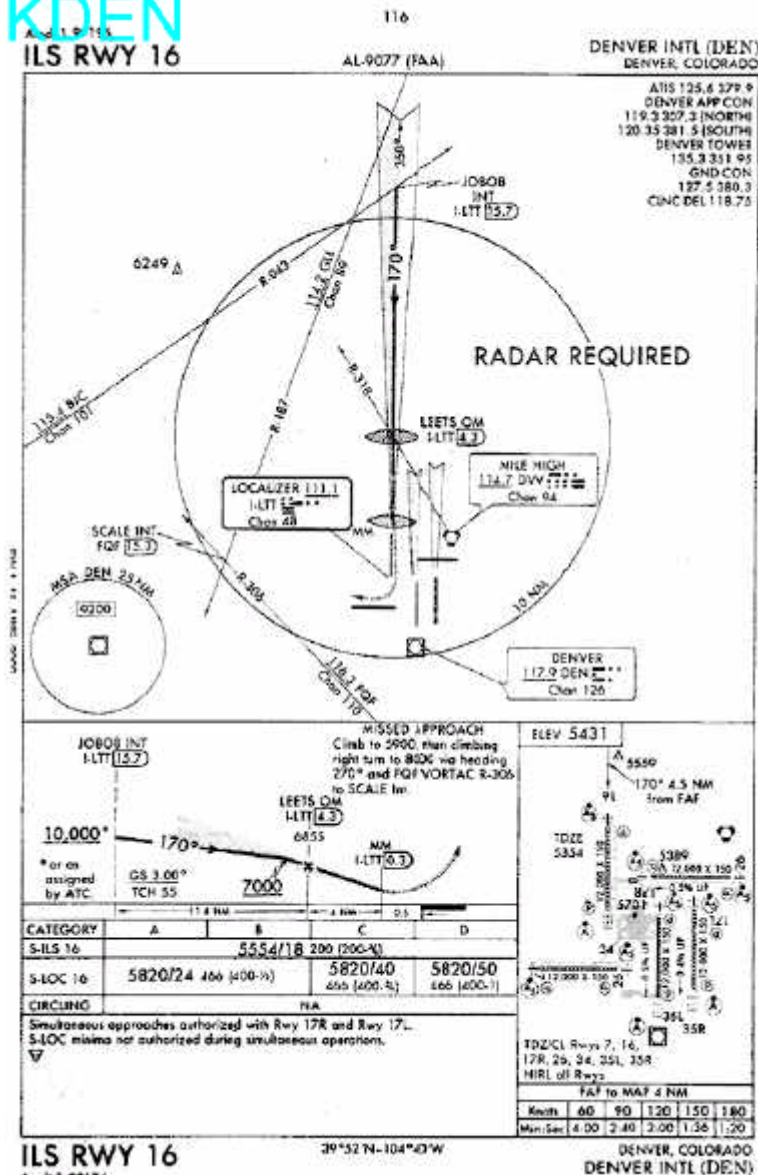
If you aren't already in full screen mode, press **Enter**. Use the **Up** and **Down** arrows to select the chart and press **Enter** to display it. When a chart is displayed, you can scroll it with the **Up** and **Down** arrows and zoom and scroll with the **Left** and **Right** arrows. To return to the chart list, press **Enter**.

If you have a printer connected, you can print a plate you are viewing by pressing **F6**. If you need to print more plates, you can use the provided EchoChart software to more easily view and print plates outside of Echomap.

Warning: Never try reading electronic plates in flight!
Always print paper copies before flight. Please check for any chart updates.

KDEN

AL-9077 (FAA)
ILS RWY 16



SW-1, 15 JUN 2000

4.2 VOR Info Page

VOR information pages display the Name, Frequency, and Elevation of each VOR. Arrow down to highlight the VOR.

VOR ID	Frequency (MHz)	Elevation (ft)
LAA	90	3950
LBL	46	
DHT	54	
BGD	67	
TBE	85	
GCK	86	
AMA	94	
PNH	97	
BFV	162	

LAA
LAMAR VORTAC
Freq : 116.90
Elev : 3950 ft

4.3 NDB Info Page

NDB information pages display the Name, Frequency, and Elevation of each NDB. Arrow down to highlight the NDB or enter an identifier.

NDB ID	Frequency (kHz)	Elevation (ft)
JHN	48	3324
EHA	9	
GUY	21	
BCY	31	
HQG	32	
ULS	52	
DUX	59	
PYX	62	
LHX	109	
TQK	109	

JHN
BEAR CREEK NDB
Freq : 341
Elev : 3324 ft

5. ROUTES & APPROACH OVERLAY

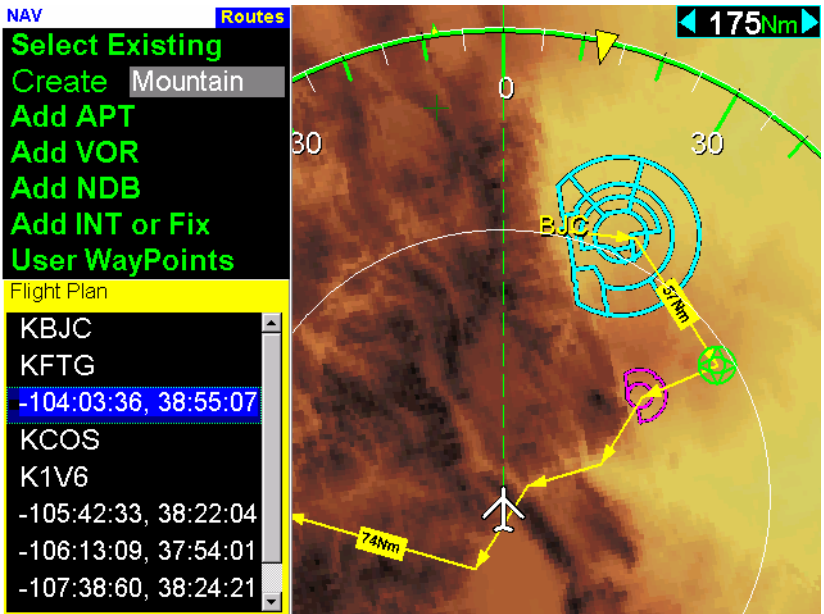
5.1 Create a New Route

From the **Nav** menu, select **Route** and then use the **Down** arrow to select **Create** and press **Enter**. In the **Create** box, enter a name for your route and then press **Enter**.



After a route name is created, you will need to add waypoints. Select the type of waypoint you want to add with the **Down** arrow and then press **Enter**.

To add Airport, VOR, NDB or Intersection waypoints, either select a point by scrolling through the list on the left hand side of the screen with the **Down** arrow or manually enter its name with the **Up** and **Down** arrows similar to the way you would scroll in an identifier in the **Direct To** menu. Pressing the **Enter** button adds the waypoint. When you add a waypoint, it will be added to the Flight Plan list of waypoints and you can then add another point.



The route is displayed on the map as yellow arrow segments. The currently selected waypoint is highlighted with a green icon. The waypoints of the currently selected route are displayed on the bottom of the routes menu in the Flight Plan list. All changes to

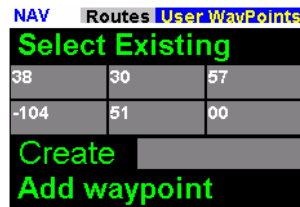
the route will automatically be stored for later use from the **Direct To** menu.

5.2 Select an Existing Route

Existing routes can be accessed through the **Routes** menu under **Select Existing**. Select the route and press **Enter**. Or, to delete a stored Route, select the route and press the **Direct To** button or **Delete** key on keyboard.

5.3 Add User Waypoint

You can add arbitrary user defined waypoints, which can be added to a user route. Select the **User Waypoints** option to bring up the Menu.



You can manually enter the Longitude and Latitude values using the **arrow** keys. You can also use a mouse click on the moving map to fill in the Longitude and Latitude values automatically. The waypoint will be displayed as a thin green cross on your map. Once you have the desired position entered, you must select **Add Waypoint** for the point to be added to your route. You can also use the **Create** setting to create a named waypoint, which can be accessed by itself or used in a route.

5.4 Insert or Delete a Waypoint in an Existing Route

You can insert or delete waypoints from the selected route using the Flight Plan list at the bottom of the routes menu. Scroll down to select a waypoint in the list. You can insert a point after the currently selected line by pressing **Enter** and then adding one of the different types of waypoints.

You can delete a point from the Flight Plan list by selecting it in the Flight Plan list, and pressing the **Delete** key (use **D->** key on FL240/270).

5.5 Direct To Menu



To go directly to any waypoint, airport or user route, press the **Direct To** button (F5), and then select the desired type of destination with the **Enter** button. Once the waypoint type is selected, a box will appear on the left hand side of the screen displaying waypoints closest to furthest. Simply scroll with the **Up** and **Down** arrows to the desired identifier and press **Enter**.

Users without a keyboard can still input identifiers. Press the **Right** arrow to activate the edit box, then use the **Up** and **Down** arrow keys to cycle through the alphabet. When the desired letter is reached, use **Right** arrow again to go to next position. When the identifier is complete press **Enter**.

Id	LIC	
LIC		1
5V4		33
A50		43
00V		47
FTG		51
01V		54
COS		56
AKO		57
APA		58
DEN		58
7V5		59
3V4		64
ITR		64
2V6		66
18V		69

5.5.1 Select Next Waypoint

To select the next waypoint on your route press the **Direct To** key. In the menu select **Next Waypoint** with the **Enter** button. This menu option is only displayed if you have a user route or approach overlay set as the target.

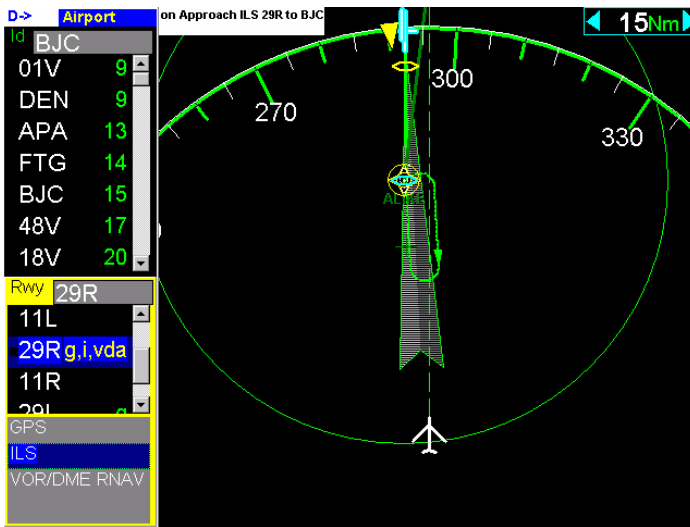
D->
Next WayPoint
Reverse Route
APT
VOR
NDB
INT
WayPoint
Route

5.5.2 Reverse Route

To reverse direction on your route press the **Direct To** key. In the menu select **Reverse Route** with the **Enter** button. This menu option is only displayed if you have a user route set as the target.

5.5.3 Approach Overlay

EchoMap has a growing database of airport approach routes, based on our NOS Approach Plate scans. The approach route data includes the path(s) of the approach, the missed approach and any holding patterns associated with the approach. The approach routes can overlay as vector data on the GPS moving map, allowing pilots to see the paths of the approaches in relation to their aircraft.



5.5.4 Selecting an Approach

When you set the **Direct To** target destination to an airport, you will be given a list of the available runways at the airport. Next to the runway identifier are characters to indicate the type of approach overlays available in the database for that runway. You can select a runway from the list, or you can skip the runway selection, by pressing **Enter** at the empty runway id prompt. If there are any approaches in the database for this runway, you will then be given a list to select the type of approach. Once an approach is selected, it will put EchoMap into Approach Mode and the approach route will overlay on the GPS moving map. Approach Mode is indicated by a white bar with the name of the approach.

The approach route will automatically target the closest Initial Approach FIX (IAF). As you fly past the target point, the next point in the approach will automatically be targeted by the navigation system. The current target waypoint is displayed in the

target indicator and the point is highlighted in yellow on the map. You can manually select the next waypoint in the approach, or change the selected runway or approach from the **Direct To** menu.

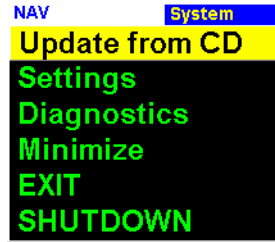
5.5.5 Viewing the Approach (requires Plates subscription)

When in approach mode, pressing the **Info** (F2) button will directly display the associated approach plate scan instead of the normal Info Menu. Pilots should always verify the accuracy of the approach displayed on the GPS map against the plate scan. Any discrepancies should be reported to support@echoflight.com.

The Approach Overlay functionality in EchoMap can only be used as secondary information to enhance situational awareness and should never be used without primary systems certified for flying approaches as well as current paper approach plates.

6. SYSTEM MENU

The **System** menu is used for shutting down the computer, accessing system settings and diagnostics, updating database or software, minimizing the window display and providing some diagnostic information.



To access the system menu, press **Nav** (F1), scroll down to **System** and then press **Enter**.

6.1.1 Shut Down the Computer

To shutdown your computer, open the System menu, select **Shutdown** and then press **Enter**. You will be asked to confirm the shut down; press **Enter** again to complete the process.

FL240 and FL270 users should always use the Shutdown menu option before turning off power to insure all settings are saved.

6.1.2 Exit to Windows (laptop computers only)

Laptop computer users are given the option to Exit the EchoMap software to Windows, without turning off the computer.

If FL240 or 270c users need to exit to Windows, they must have started the computer with a keyboard connected (a mouse is also recommended). With the keyboard, press ctrl-c to exit to Windows.

6.1.3 Update from CD

Echo Flight subscribers will be mailed database and software update CD-ROMs on a 56-day cycle. To install the update, insert the CD into your drive, then select the **Update from CD** option and press **Enter**. If the update is found, EchoMap will automatically close to allow the files to be updated. If the installation cannot be run, a warning will be displayed and you will need to check the CD drive to insure it was plugged in and turned on when the computer booted.

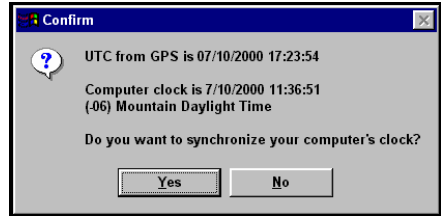
If you receive a damaged or corrupt CD, please contact Echo Flight Customer Support at 1(888)739-7161 to arrange a replacement.

Note - You can also download the latest database update on the internet using your customer support login to the www.echoflight.com website. The database update file is called updatedb.exe and is 15-20 megabytes.

6.1.4 System Settings Menu

Synchronize the Computer's Clock

EchoMap records, logs and time stamps many events during flight, this can be helpful if trouble shooting becomes necessary. By synchronizing your computer's clock with satellite time this information becomes more accurate.



To synchronize your computer's clock with the GPS clock, press the **Nav** button and select the **System** menu and then the **Settings** menu. Simply press the Enter button to synchronize.

Rotate Display (FL240, FL270 only)

Echo Flight's Flight Cheetah MFDs have the ability to run in landscape or portrait mode. Use Rotate Display from the System Settings menu to toggle between landscape and portrait mode.

6.1.5 System Diagnostics Menu

This menu is only necessary when Echo Flight Support Personnel have asked you to access this information for review.

Show Echomap.ini - displays the Echomap.ini file contents in a read-only text window

Show Efi.ini – displays the Efi.ini file contents in a read-only text window.

SysInfo – displays computer system info in a text window, including computer specifications, software versions and data-link serial numbers.

6.1.6 Minimize (laptop computers only)

The Minimize menu option is found in the **System** menu when running on laptop computers and minimizes the EchoMap software window and allows you to use other software on the computer simultaneously. You will be asked to confirm the full minimization of EchoMap, as you will need a keyboard and/or a mouse to be able to use Windows outside of EchoMap.

You can also toggle between windowed and full screen modes by pressing F10 on a keyboard.

7. DATA-LINK WEATHER

One of the most powerful features of EchoMap is Data Link Weather using the ORBCOMM satellite constellation. The network operates similar to a paging system in that it transmits and receives relatively small compressed data packets in quick bursts.

How to use Data Link Weather

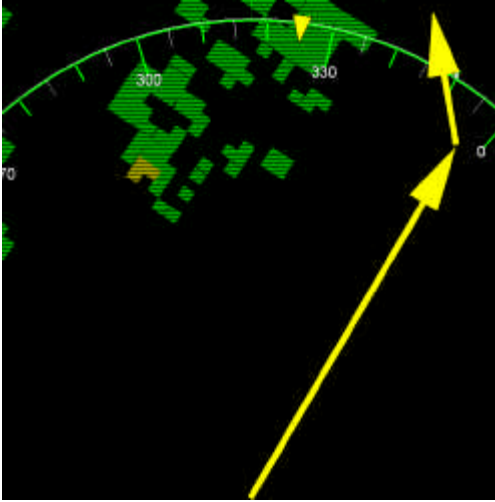
- Data Link Weather provides supplemental information only. It shows you the big weather picture for your route of flight.
- Data Link Weather is intended to augment, **not replace**, pilot voice communication with Flight Service Stations (FSSs), Air Traffic Control (ATC), or Airlines Operations Control Centers (AOCCs).
- Despite common industry references to “real time weather”, no data link weather is truly instantaneous. US government NexRAD images are updated on average every 5 minutes, and the average age of EchoMap Data Link Weather typically ranges between 5 to 10 minutes by the time it reaches the cockpit.
- Data Link Weather enables the user to efficiently circumnavigate entire areas of bad weather, without having to maneuver within close proximity of weather cells, reducing time and fuel consumption in route.
- Data Link Weather provides an additional layer of information, increasing the chance for breaking a link in the chain of events that could potentially lead to an accident.

DO NOT use Data Link Weather to:

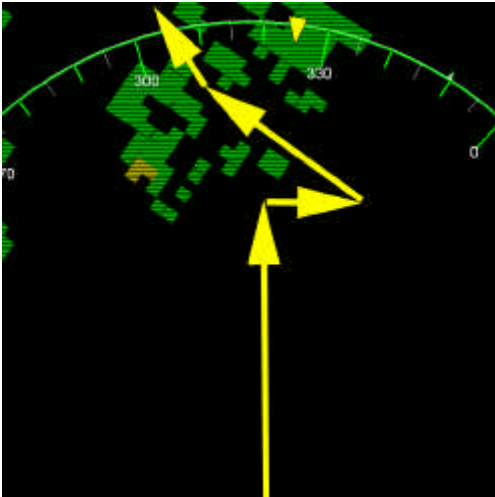
- Replace your pre-flight weather briefing.
- Replace other in-flight sources of weather data such as Flight Service Stations, ASOS, ATIS, weather radar and lightning detection systems.
- Perform tactical flying in or close to storm activity.
- Chase storms!

Note : You must have either a Panasonic or Quake satellite transceiver and subscription to Echo Flight to use any Data Link functionality.

Correct way to Use Data Link Weather



Incorrect way to use Data Link Weather!



Note: The Airman's Information Manual recommends that pilots should circumnavigate inclement weather by at least 25 nautical miles!

7.1 Data Link Weather vs. Onboard Radar

Data Link Weather is different from onboard weather radar in several important ways.

Onboard Radar

Has the advantage of providing instantaneous information on echo returns in front of the aircraft, making it ideal for tactical decision making while in close vicinity of thunderstorms.

Has the disadvantage of not being able to detect storms at a distance. Additionally, it has problems seeing through a cell to let you know what is beyond that echo due to attenuation.

Data Link Weather

Has the advantage of providing the big picture of NexRAD Doppler radar activity for several hundred nautical miles ahead, making it ideal for strategic flying.

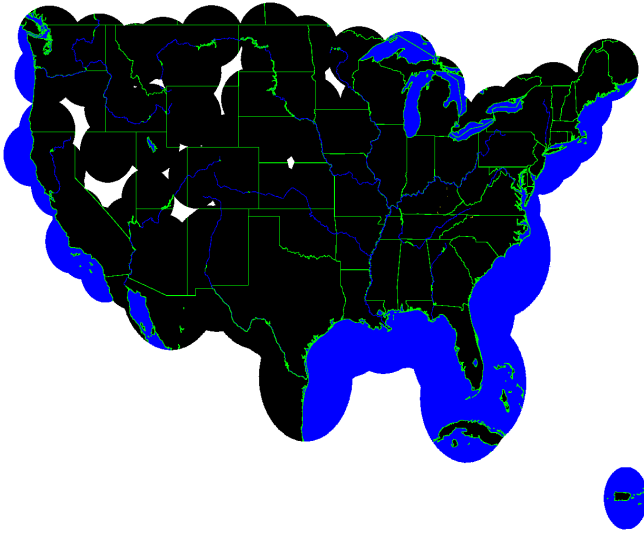
Has a slight time delay due the fact the NWS provides updates once every 5 minutes. Any data link information is near real-time (typically no more than 5-10 minutes old on average) but not instantaneous and should never be used for tactical weather avoidance. It should be used for strategic weather avoidance only.

The addition of Metar weather provides the pilot with a much greater awareness of various weather conditions at the airports with types of information not available via onboard radar.

7.2 NexRAD Weather Radar

NexRAD weather is collected from the National Weather Service and compiled into a composite image. This image contains colored cells that represent precipitation (snow, rain or hail) falling in a particular area. The color of the cell represents the highest level of precipitation registered at the time of the image.

There are approximately 120 NexRAD stations in the US that are combined to create the NexRad composite. The map below shows the approximate coverage of the Nexrad data. The map is subject to change as NexRAD stations are added or change. Areas without NexRAD coverage are shown as White.



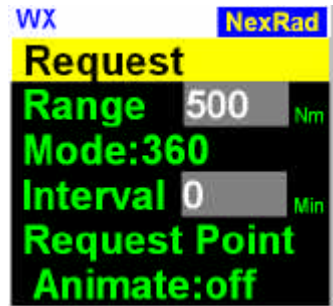
NexRAD radar composites incorporate extensive processing on the ground. Updates arrive at the Echo Flight Network Center every five minutes. The age of the weather update returned to you greatly depends on when your request arrives at the Echo Flight Network Center. For instance, your request might arrive 4 minutes after the update was posted. It takes roughly two minutes to send the update through the ORBCOMM system. Thus, this particular update would arrive to you and the **WX** indicator would display it as six minutes old.

7.2.1 Requesting a NexRad Image



To request a NexRAD weather picture, press the **WX** key and select **NexRad** in the menu. If the current request settings are correct, simply press the **Enter** key.

If you are connected to the satellite transceiver, the request will be sent to an ORBCOMM satellite and relayed to Echo Flight where a compressed data packet of weather will be sent back to you via satellite. The satellite status indicator shows the current state of this process. (See section 2.5). The NexRad layer will automatically display on the map when received. This layer can be toggled on and off by pressing **Enter** from the map.



Note: In Demo mode the NexRAD process is simulated.

7.2.2 Changing NexRad Request Range

Select the **Range** option to set the diameter of the weather request area. Use the **Left** and **Right** keys to decrease or increase the range from 75 and 500 Nm in 25 Nm increments. In order to optimize your request, select only the range you require. (i.e. the distance to the next Waypoint). Transaction times can increase with larger requests. The server may also be able to provide higher definition pictures if smaller request ranges are used.

7.2.3 Changing NexRad Request Direction

There are two NexRAD request modes, **360** and **Ahead**. The **360** mode is for those times when you may want a full 360-degree NexRAD picture centered on your current position. Remember that in **360** mode the request range is roughly half the forward distance. The **Ahead** mode extrapolates the request from your current GPS location toward your target Waypoint so that most of the picture will be situated ahead of you, with only a portion behind you. The Ahead mode does not require you to be flying toward the requested Waypoint.

7.2.4 Automatic NexRad Requests



The interval menu lets you program the system to automatically send weather requests on a regular time interval. The interval can be set from 0 to 60 minutes in 15-minute increments. Interval preset is 0 (off). To activate this function select **Interval** in the menu and use the **Left** and **Right** arrow keys to pick your setting.

7.2.5 Remote NexRad Request

The Request Point menu lets you request a NexRAD image centered on a remote airport, navaid or intersection instead of route of flight. This is useful when looking ahead over long distances.

Select **Request Point** in the menu and select the desired point as you would if you were flying direct to that target (see section 4.6) Once you select an item press **Enter** to send the request and return to the moving map. The result will replace any weather currently displayed on your map.

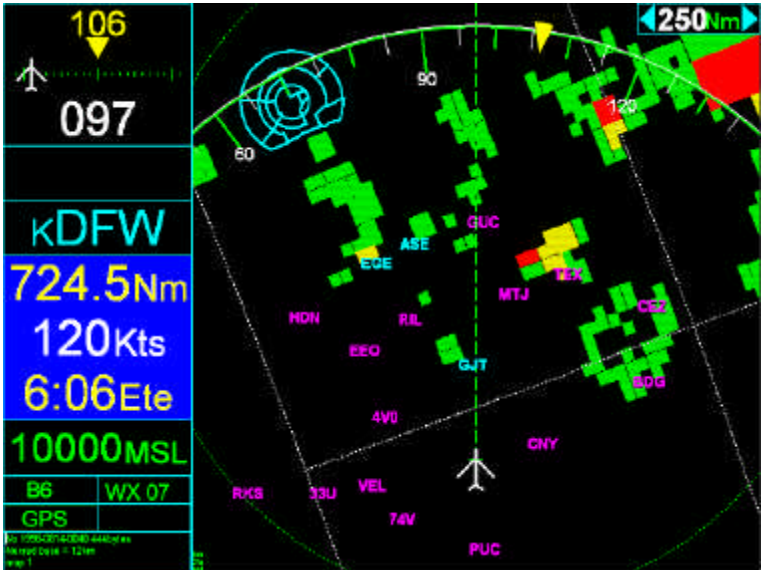


To view the weather from a remote location press the **INF** (F2) key, and select the correct airport in the menu and view its map page.

7.2.6 NexRad Radar Animation

Basic NexRAD animation is provided that, when enabled, cycles through all the received NexRAD pictures. This can provide some idea of how the weather is changing. Select the **Animate** option in the WX menu and press **Enter** to toggle animation mode on and off.

7.3 Interpreting NexRAD Radar Pictures



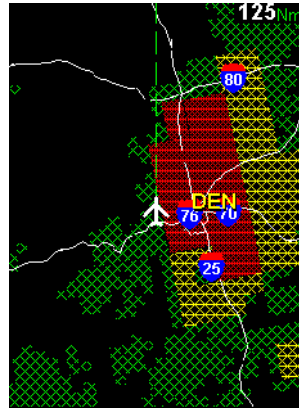
The figure above shows a NexRAD image with green, yellow and red cells being displayed, the **WX07 indicator shows that the image is 7 minutes old**. This will automatically count upwards as time increases so you always know the age of the data. You can spot significant storm activity between a 110 and 120 heading at slightly more than 100 and 200 nautical miles away.

The closer you are to the precipitation, the more detail the cell patterns will provide. The further the activity is from you the less detail is shown and the larger the grid areas are. Providing more detailed information at long range would not provide additional useful strategic information due to the change in weather as you travel towards it.

Please refer to the Airman's Information Manual concerning weather avoidance. Circumnavigate all storm cells by at least 25 nautical miles.

7.3.1 Storm Cells

Storm activity is displayed on the moving map with cells measuring from 2km to 12km in size. The detail levels vary depending on many factors, including size of requested area, amount of weather, and distance from center of picture. Although a higher level of detail can be displayed, due to the 5 to 10 minute age of the weather and storm movement it does not provide additional useful navigational information. Cells are displayed with three levels of intensity.



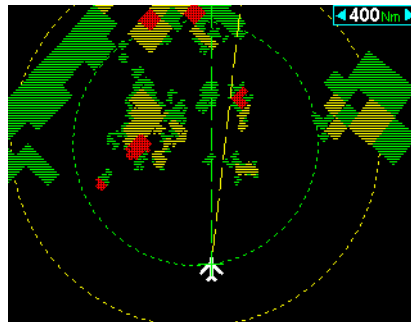
The three levels of intensity are:

Green	Light to moderate rain or snow	0 to 0.05" rain/hr or 0 to 0.5" snow/hr	5 – 29 dbz
Yellow	Moderate to heavy rain or heavy snow, possible lightning	0.06 to 1.5" rain/hr or 0.5 to +1" snow/hr	30 – 54 dbz
Red	Extreme rain/sleet/hail, lightning	+2.5" rain/hr or sleet/hail	55 + dbz

WARNING - You should always assume that weather intensity levels have increased since the image was received. You should not fly close to any activity, including the green cells!

7.3.2 NexRAD Picture Boundaries

Two concentric dashed circles denote the boundaries of the current weather picture on the moving map. The inner green circle indicates the area where weather is represented in the most detail. The outer yellow circle indicates where the weather is represented in less detail. **Any weather completely outside of the outer yellow circle will not be displayed.** Cells display when any part contacts the outer yellow circle, so large cells can extend beyond the circle.



7.4 Metar Reports

Metar weather data is collected by the Echo Flight Weather Server from individual airports as they report. While NexRAD shows precipitation over a large area, Metar displays many types of data supplied from the requested airports in a given range.

Metar reports can be requested and displayed textually for individual airports or graphically for groups of airports. Graphical Metar reports efficiently show a picture of the conditions within hundreds of miles with minimum heads down time.

7.4.1 Graphical Metar Reports

Graphical Metar reports contain three pages of information: Ceiling/Visibility, Wind Speed/Direction and Temperature/Dewpoint Spread. The current Metar page is displayed by the WX status indicator. You can cycle through these pages of Metar data by pressing **Enter** from the moving map.



To request a graphical Metar report for all the airports in your area, press the **WX** key and select **Metar** in the menu. Select **Area Request** and press **Enter** to send the request. When the report is received, the graphical icons will automatically be displayed at their associated airports. When Metar icons are displayed, the airport identifiers may change colors, and runways may not be displayed.

Note - In Demo mode the Area Metar process is simulated.

Select **Range** in the menu and use the **Left** and **Right** keys to set the diameter of the Metar request area anywhere from 10 to 200 nautical miles (Nm) in 10 Nm increments. The time required to transmit will increase with a larger range.

The graphical reports can be viewed on the map, or interpreted as text on an Airport's Metar Info Page.

7.4.2 Interpreting Graphical Ceiling / Visibility Reports

A graphical Metar report has three pages of information. The first page of information shows Ceiling, Visibility and Precipitation for each reporting airport. A vertical bar displays ceiling status and a horizontal bar visibility status, forming an L-shape. The color of the bar indicates the status.

Statu s	Ceiling	Visibility
VFR	Greater than 3,000 ft	Greater than 5 Nm
MVFR	1,000 to 3,000 ft	3 to 5 Nm
IFR	500 to 1,000 ft	Less than 3 NM
LIFR	Less than 500 ft	Less than 1 Nm

7.4.3 How to Read Precipitation Levels

Inside the L-shaped Ceiling/Visibility bars may be letters indicating precipitation. If there is no letter, then this data isn't reported.

Precipitation	Light	Moderate	Heavy
Rain	RA-	RA+	RA++
Snow	SN-	SN+	SN++
None	NP		

7.4.4 Interpreting Metar Age

It is important to remember that METAR information from multiple airports is not all from the same time period. The times of the individual Metar reports is shown by color-coding the associated airport identifier. Some airports don't supply Metar data and have normal coloring.

Identifier	0-30 minutes	30-60 minutes	60+ minutes
PDX	PDX	PDX	PDX

7.4.5 Metar Ceiling/Visibility Example



MCN has a low IFR ceiling and VFR visibility, with the age of the report less than 30 minutes.

ABY has an IFR ceiling and VFR visibility with moderate rain reported, with the age of the report 30-60 minutes.

AMG has a low IFR ceiling and low IFR visibility and heavy snow reported, with the age of the report 30-60 minutes.

VLD has a marginal VFR ceiling and VFR visibility with light rain reported, with the age of the report 30-60 minutes.

TLH has a VFR ceiling and VFR visibility, with the age of the report less than 30 minutes.

7.4.6 How to read Graphical Wind Speed and Direction

When you request an area Metar the second page of data you receive is the Wind Speeds and Directions. Use the **Enter** key to change which Metar page is displayed.

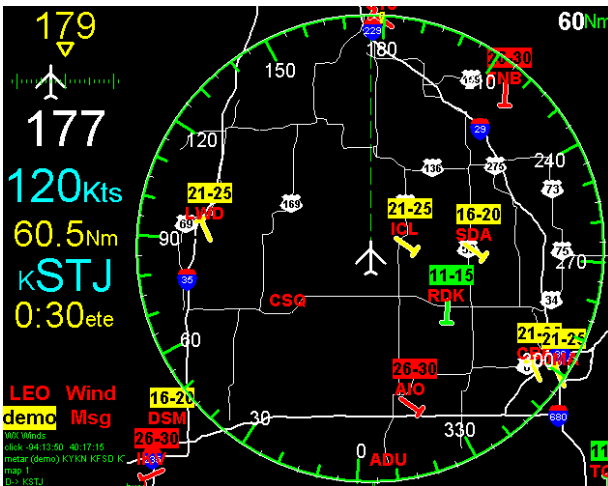
The Wind layer shows the wind speed and direction on the ground at the airport. The speed is shown as a range, with a possible gusting value. Wind direction is drawn using a **T** shaped bar. With the wind blowing from the bottom towards the perpendicular point of the **T** in 30 degree segments.

The text box indicates wind speed ranges. The color of the box also indicates the different ranges.

Green = 0–15Kts,

Yellow = 16–25Kts

Red = 26+Kts



7.4.7 How to read Graphical Temperature Dew-point Spreads

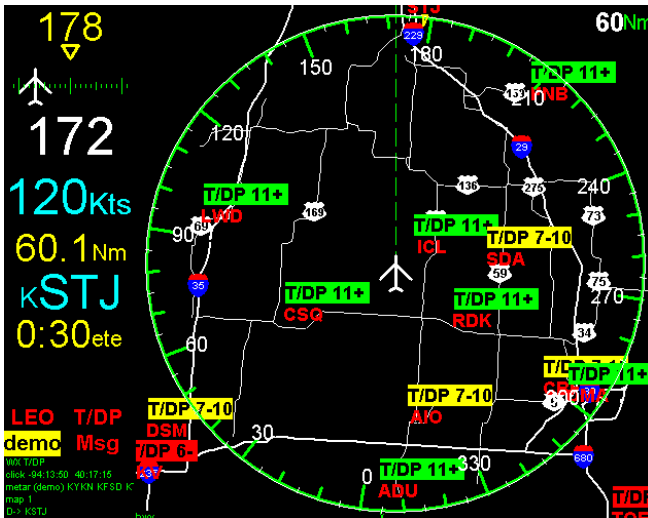
When you request an area Metar the third page layer you receive is the temperature/ dew point spread. This is particularly useful to find areas where fog is likely to exist.

The bars are color coded to show the likelihood of fog.

Green = 11 or more degree spread

Yellow = between 7-10 degrees

Red = 6 degrees or less



7.4.8 How to View Weather Overlays

There are five weather overlay options that you can scroll through in flight with the **Enter** key including one that removes all weather overlays entirely. Only available weather overlays will be accessible as you step through the cycle. The current overlay is depicted in the wx indicator (T/DP in above picture).

- **NexRad Radar**
- **Ceiling, Visibility and Precipitation**
- **Wind Speed & Direction**
- **Temperature Dewpoint Spreads**
- **No weather information**

7.5 Text Metar Reports



The **Text Request** option in the Metar menu lets you request a complete textual Metar report for a specific airport. To select the desired airport, enter the identifier or select from the list. Once you select an airport, press

Enter to send the request.

When the report is received a bar will appear above the moving map telling you a Metar report was received. Press the **INF** (F2) button to automatically display the text report on the Airport's Metar Information Page.

Note : currently Demo mode doesn't simulate text metars.

```
KDEN Facility Comm Map Metar Plates INFO
Curr UTC : 23:11
142253Z
31011G18KT
10SM
FEW080
SCT140
18/M03
A2999
RMK
AO2
SLP110
VIRGA
DSNT
N
AND
S
T01831028
```

8. IN FLIGHT EMAIL



Press the **MSG** button (F3) to activate the message menu where you can send and receive Email, or send position reports. Any messages you send through the Echo Flight Network will automatically log you in, allowing you to receive any Email sent to you.

8.1 How to Send Email

From the message menu select **Send Mail** to bring up the form with **To**, **Subject**, and **Message** fields. If you do not have a keyboard to enter text into these fields you must use the arrow keys to set the letters.

MSG

Send Mail
Received Mail
E-Mail Login
Pos Report

Enter a **TO** address or select a previously used one. Addresses you enter manually will be added to the list for later reuse.

Enter a **SUBJECT** or select a previously used one from the list. If a previous subject is used, the message body will be filled in with the same text sent the last time.

Send Mail

TO beta@echoflight.com
erik@edj.net
paul@echoflight.com

SUBJ running late
Again

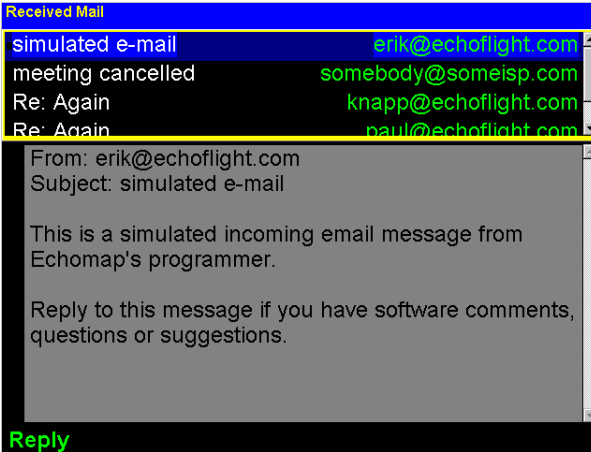
MSG I am running late.
I'll be there around 2:00.
E

SEND

When the message is complete select the **SEND** option and press **Enter**. The menu will close and if you have a live connection, the message will be queued to send. Otherwise it will be added to the lists for later use.

8.2 Receiving Email

When Email is received, a bar at the top of the map will tell you that Email has been received. To view newly received messages, press the **MSG** button (F3). You can view old messages with the **Received Mail** option in the message menu. All Email that has been received is listed. You can delete messages from the archive by pressing the **Direct To** button (or **Delete** on a keyboard). Use the **Reply** option to reply



to the selected Email.

Your satellite transceiver is provisioned at Echo Flight to have an Email address like "EFlight59@EchoFlight.net". Your Echo Flight number was provided with your system.

For someone to send you Email, you need to have previously sent them a message with the system. If you have not done this or you are not logged in, the mail will be returned to the sender. This ensures you receive in flight Emails only from people you know.

Note Email sent through the satellite cannot use html or deliver attachments

8.2.1 Email Login

You must be logged on to the Echo Flight Network to receive Email. Any message sent through the system (mail, position reports, or weather requests) will automatically log you on. To manually login, select **Email Login** and press **Enter**. You will be logged off two hours after the last message or login. Any Email sent while you are not logged on will bounce or forward to an alternate address.

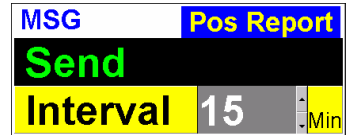
You can use your customer service login at www.echoflight.com to configure alternate Email addresses that messages sent to your in-flight address will forward to when you are not logged in.

8.3 Position Reporting

Position reports can be sent manually or automatically. The position reports can then be viewed on a sectional map using your login to the customer area of www.echoflight.com. You can also use the web interface to configure Email addresses that you want position reports to be forwarded to.

To manually send a position report, select **Send** and press **Enter**.

To automatically send position reports at regular intervals ranging from five minutes to an hour, select the **Interval** value using the arrow keys. An interval of **0** disables automatic reporting.



9. THE ORBCOMM DATA LINK NETWORK

The ORBCOMM system operates using a new generation of satellite technology called Low-Earth Orbit satellites ("LEOs"). The ORBCOMM constellation is the world's first commercial LEO data and messaging system, consisting of 35 satellites which send and receive data packets in quick bursts. The ORBCOMM constellation is a redundant and relatively simple relaying system. It operates as a "bent pipe," sending and receiving information to a network of ground earth stations where most of the system complexity resides. The system has been fully operational since November 1998.

The ORBCOMM system uses 137-138 MHz frequency for transmissions down to aircraft and 148-150 MHz frequencies for transmissions up to the satellites. The FCC allocated and approved these frequencies for LEO satellite system use at the World Administrative Radio Conference in February 1992. The FCC then applied approval to Little LEO mobile satellite services in January 1993. The FCC granted ORBCOMM a U.S. commercial license in October 1994.

9.1 Advantages of LEO Technology

1. **Low Cost** - ORBCOMM's LEO satellites occupy orbits approximately 500 to 600 miles above the Earth. The close proximity to earth means the Subscriber Communicators require less powerful transmitters (5 watts) and relatively simple whip antenna systems. Therefore, the transceiver equipment needed to communicate with an ORBCOMM satellite can be relatively small, lightweight and inexpensive.
2. **Any Altitude, Anywhere** - The ORBCOMM system allows you to receive weather images while flying at any altitude, anywhere. This allows you to receive weather information when the weather is bad, and when lowering ceilings keep you within a few thousand feet of the ground and you are out of reach of tower-based weather information. Additionally, by using a satellite data link you can fly the quickest and most efficient route of flight without the inefficiencies of having to fly out of your way to access tower based weather information.
3. **Multiple Applications** - The ORBCOMM system, much like the GPS constellation, is a satellite system developed for multiple mobile markets. Thus, the aviation industry can benefit from the scale of economies of this widely used technology at low cost today.
4. **Omni-Directional Antenna** - Unlike other satellite systems, LEO transceivers do not require a directional dish for two-way communication; rather they operate with an omni-directional whip antenna sending data in quick bursts. ORBCOMM operates on a VHF frequency range making it resistant to attenuation such as rain and foliage.

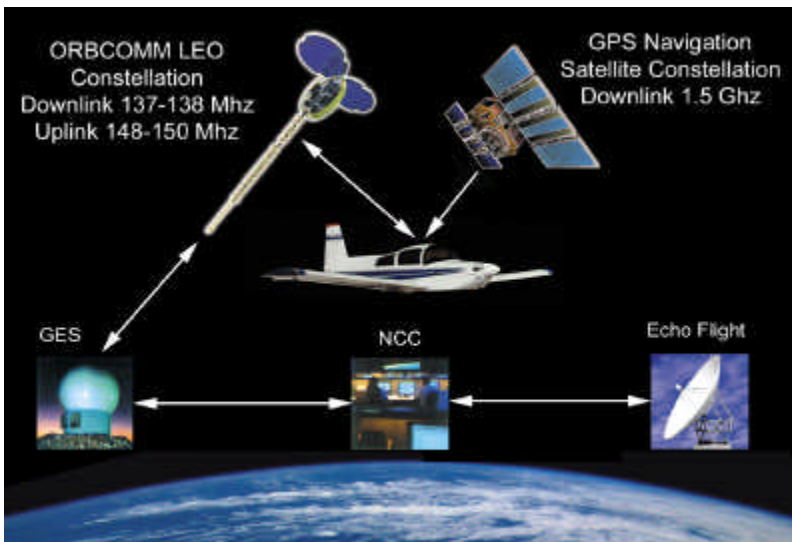
9.2 Network Operation

The three main components of the network are:

The Space Segment - the constellation of ORBCOMM satellites.

The Ground Segment - network gateways located around the world. This includes the Gateway Control Centers (**GCCs**), Gateway Earth Stations (**GESs**), the Network Control Center (**NCC**) and the Echo Flight Network (**EFN**).

Aircraft System – the on-aircraft items required to communicate with the ORBCOMM system. This includes the Subscriber Communicator (SC), VHF and GPS Antennas, EchoMap software, and a portable computer.



9.2.1 Space Segment

The main function of the ORBCOMM satellites is to complete the link between the Subscriber Communicator (SC) and the switching capability at the NCC in the U.S. The satellites are "orbiting packet routers" ideally suited to gather data packets from aircraft and other mobile vehicles and relay them through a tracking Earth station to the NCC. Transmissions in other parts of the world are routed to a GCC.

9.2.2 Ground Segment

The ground segment contains most of the intelligence of the ORBCOMM system. It consists of GCCs, GESs and ORBCOMM's NCC located at ORBCOMM's headquarters in Dulles, VA. Within the U.S., there are four additional GESs located in Arizona, Georgia, New York State and

Washington State. The fifth GES is located in Curacao, French Antilles in Central America.

Gateway Earth Station (GES)

ORBCOMM's GESs link the ground segment with the space segment from multiple locations worldwide. The GESs provide the following functions:

- Acquire and track satellites based on orbital ephemeris data
- Transmit and receive packets to/from the satellites
- Provide connectivity between satellites and NCC (GCC)
- Monitor status of local GES hardware/software
- Monitor system level performance of satellites "connected" to the NCC (GCC)

The GES is redundant in that it has two steerable high-gain VHF antennas that track the satellites as they cross the sky. The GES transmits to each satellite at a frequency centered at 149.61 MHz at 57.6 KBPS with a nominal power of 200 watts.

The GES receives 3-watt transmissions from the satellite at 137-138 MHz range.

Network Control Center (NCC)

The NCC is responsible for managing the ORBCOMM network elements and the U.S. gateways through telemetry monitoring, system commanding and mission system analysis. It provides network management of ORBCOMM's satellite constellation and is staffed 24 hours a day, seven days a week by certified controllers. The NCC performs the following functions:

- Monitor real-time and back-orbit telemetry from ORBCOMM satellites
- Send real-time and stored commands to the satellites
- Provide the tools and information to assist engineering with resolution of satellite and ground anomalies
- Archive satellite and ground telemetry for analysis
- Monitor performance of the GESs
- Monitor status of the U.S. based ORBCOMM Message Switch (OMS) and related software
- Monitors connection to and status of the EFMS

Echo Flight Message Switch (EFMS)

The Echo Flight Message Switch receives a continuous, worldwide weather feed. The EFMS continually processes weather to reply to in-flight weather requests. All data is sent or received directly through the EFMS center via a dedicated high-speed frame relay line with an additional dial-up line as backup.

Gateway Control Center (GCC)

The Gateway Control Centers are located in South America, Europe, Asia and provides switching capabilities to link mobile transceivers with terrestrial-based customer systems via standard communication modes including X.400, X.25, leased line, dial-up modem, public or private data networks, and Email networks including the Internet.

9.2.3 Aircraft Segment



The aircraft segment consists of the Satellite Communicator, the flight computer and the antennas

Subscriber Communicator (SC)

The SC is a two-way transceiver that provides in-flight access to weather, messaging and position reporting. The SC also receives GPS positions with its eight-channel GPS receiver. All data is sent via an RS-232 serial port to either your computer.

Note: This system is for portable use only; it is not STC'd. If you need to permanently attach any items to the aircraft consult your avionics shop for a field approval. (Form 337) Contact Echo Flight if you require any assistance.

Two antennas are provided, a portable GPS antenna, which can be



placed upon the glareshield of the aircraft, and a special VHF antenna mounted on the top of the fuselage for two-way communications with the ORBCOMM satellites. The VHF antenna is the only permanent installation required. **Refer to the Antenna Installation Manual.**

10. TECHNICAL SUPPORT

If you have questions call **1 -888-739-7161** from 10am to 7pm EST Mon. through Fri. or Email **Support@EchoFlight.com**.

10.1 Log Files

There are several log files generated to help us track down any unforeseen issues you may have with EchoMap.

\echomap\echomap.log contains information about the operation of EchoMap, mostly the same information that appears in the output window on the lower left of your screen. You can graphically view this log using the logtool.exe utility. This is the most important file for debugging satellite connection problems.

\echomap\userdata\gps directory contains recordings of GPS information from past trips.

In the event EchoMap does not function within normal parameters contact support at Echo Flight. If you have Email, we may ask you to send these files to us for review.

10.2 Disk Space

It is recommended that you always have at least 10 megabytes of free disk space when running EchoMap. If you are running low on disk space you may delete the log files. It is suggested that you do this only if you don't have any issues that you may need assistance with. If you run out of disk space you will be prompted to reset or disable your GPS output file to recover space.

10.3 Echo Flight Online

Subscribers can login to the Echo Flight website at <http://www.echoflight.com>. If you don't have a login and password for your account, call Echo Flight support to arrange one. The website can provide you with performance statistics that can help you identify and troubleshoot data-link antenna installation problems, as well as provide access to position reports and various settings for your account.

APPENDIX A: KEYBOARD SHORTCUTS

There are many keyboard shortcuts that can be used to access EchoMap functionality without using the menus.

Key	Action	What it does
F1	Nav Menu	Navigation Menu.
F2	Info Menu	Information Menu.
F3	Msg Menu	Messaging Menu.
F4	WX Menu	Weather Menu.
F5	D Menu	Direct To Menu.
F8	Compass	Cycle through compass display modes on map.
F10	Windowed	Toggle between windowed and full screen for easy access to other software without leaving EchoMap .
F12	Exit	Exit the program, with confirmation.
Esc	Escape	Back up menus.
Ctrl-C	Exit	Exit the program, with confirmation.
Ctrl-D	Demo	Toggle demo movement. Won't work if GPS is on.
Ctrl-G	GPS	Toggle GPS movement, scanning for SC if necessary.
Ctrl-K	Keyboard Mode	Toggle keyboard mode.
Ctrl-Q	Clear queues	Clears the send and receive queues of the Data Communicator.
Ctrl-U	UTC Time	Show the computer and UTC time.
Ctrl-T	Clear Trip Path	Reset the trip path on your display screen.
Ctrl-V	Show Version	Show current EchoMap version in the output window.
Ctrl-X	Exit	Exit the program, with confirmation.
Ctrl <>	Rotate left/right	In demo or off mode rotate your heading left or right.
<	Slower	Decrease demo ground speed.
>	Faster	Increase demo ground speed.
A	Airports	Toggle airport display.
B	Borders	Toggle state border display.
C	Class Airspace	Toggle class airspace display.
D	Departure	Toggle departure path display.
H	Highways	Toggle highway display.
I	Intersections	Toggle Intersection display.

Key	Action	What it does
J	Jet Airways	Toggle jet airway display.
N	NDBs	Toggle NDB display.
O	Obstacles	Toggle obstacle / tower display.
P	PJAs	Toggle parachute jump area display.
R	Arrivals	Toggle arrival path display.
S	Special Use	Toggle special use airspace display.
T	Trip Path	Toggle user flight path line display.
V	VORs	Toggle VOR display.
W	Victor Airways	Toggle victor airway display.
Y	Hydro	Toggle hydro graphics display
? or ?	Zoom In	Reduce the scale of the map.
? or ?	Zoom Out	Increase the scale of the map.
? ?	Scroll	Scroll through preset map layers or select menu items.
?	Enter	Cycle weather overlay mode off/NexRAD / METAR/wind/TDP or activate menu items.
Insert	Add layer	Add current overlay to list controlled by the ? ? keys.
Delete	Delete layer	Remove current overlay from list controlled by the ? ? keys.

APPENDIX B: GLOSSARY

ALT (GPS Altitude): Altitude, calculated by the GPS receiver. A substantial difference between this altitude value and altitude referenced above sea level may exist due to accuracy degradation by the military; altitude information should not be used for vertical navigation.

Azimuth: Bearing, as measured clockwise from true or magnetic north.

Brg (Bearing): The direction to any point, usually measured in 360 degrees relative to true or magnetic north.

Course: The planned direction of travel in a horizontal plane.

Course Deviation: The amount of distance left or right from the desired course of travel.

CDI (Course Deviation Indicator): Is the graphic indicator of course deviation shown as a graduated bar indicating the distance left or right of course.

DTK (Desired Track): The desired course of navigation between a point of origin and a destination Waypoint.

GES (Ground Earth Station): The ground earth station links with the ORBCOMM satellite to provide a direct link to the ORBCOMM Network Control center.

GS (Ground Speed): Speed of travel across the ground measured in nautical miles per hour.

INT (Intersection): Intersections can be set to display, or not display in the moving map mode according to their distance from the aircraft.

Kts (Knots): All speeds are displayed as knots or nautical miles per hour. Every 1.15 statute miles per hour equals 1 knot.

Lat (Latitude): Lines that circle, and are parallel to, the equator. Latitude is in degrees, minutes and seconds north and south of the equator.

LEO (Low Earth Orbit): A new generation of satellite communication satellites orbiting at low altitude (approximately 500 miles above the earth), able to communicate with low power ground transceivers without the need for a directional antenna. All two-way data is transferred via ORBCOMM's Low Earth Orbit constellation.

Lon (Longitude): Any line from pole to pole measured in degrees, minutes and seconds that is perpendicular to the equator.

METAR: the international standard code for hourly and special surface weather observations. The METAR acronym roughly translates from the French as Aviation Routine Weather Report.

Magnetic North: The region, some distance from the geographic North Pole where the earth's magnetic lines concentrate. The angle between where the magnetic compass points to, magnetic north, and true north is the magnetic variation. Magnetic variation is measured in east or west. To get true course from magnetic course eastern variations are deducted and western variations are added. In **EchoMap**, magnetic deviation is calculated based on the nearest airport or Navaid. A light, thin green tick on the compass indicates true north.

Minute: 1/60th of a degree of a circle. One nautical mile.

Nautical Miles (Nm): 1.15 statute miles equals 1 nautical mile. All distances in EchoMap are in nautical miles.

NDB (Non-Directional Beacon): NDBs can be set to display, or not display in the moving map mode according to their distance from the aircraft; this is user configurable. NDBs, closest to furthest can also be accessed directly through the **D?** /**F5** and **INFO/F2** keys.

Rng (Range): The distance from the present position to the destination Waypoint measured in nautical miles.

Second: 1/60th of a minute of a circle.

Statute Mile: 0.87 of a nautical mile. Not currently used in EchoMap.

Subscriber Communicator (SC): The subscriber communicator is the unit that simultaneously handles all two-way ORBCOMM data transmissions as well as the receiving of GPS signals and sends all data via an RS-232 serial port to the computer.

Trk (Track): The line over the earth that the aircraft is actually traveling.

True North: Geographic north, located at the North Pole. True north is represented in EchoMap by light green compass tick.

UTC (Universal Coordinated Time): Zulu time, the time in Greenwich, England. This time, provided by the GPS is used to calculate weather age in EchoMap.

Waypoint: Any fix used for navigation and defined by latitude and longitude coordinates.

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