ICDS 2000
PILOT OPERATIONS HANDBOOK

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REVISIONS

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Limitations and Risks

CAUTION: *The ICDS 2000 positional information is only as accurate as the Long Range Navigation (LORAN or Global Positioning System (GPS) that sends the data. Any error in the LORAN or GPS is passed on to the ICDS 2000. Consult your LORAN or GPS manual for possible aircraft position or altitude errors.*

Data contained on the removable Data card is only as reliable as ARNAV's source of data. Reasonable care is taken to verify the data, but the data validity cannot be completely guaranteed even when current. The data on the Data card will become obsolete if not updated.

The Digital Obstacle File (DOF) is provided by the FAA NATIONAL AERONAUTICAL CHARTING OFFICE (NACO), and is a listing of verified and unverified obstacles in the U.S. with limited coverage of the Pacific, the Caribbean, Canada, Mexico, and Bahamas. The Digital Obstacle File contains only obstruction data for those man-made objects, which affect domestic aeronautical charting products, and does not purport to indicate the presence of all obstructions, which may be encountered

The U.S. Geological Survey EROS Data Center is the source for the global digital elevation model (DEM) used for rendering terrain base maps. The Elevations in the DEM are regularly spaced at 30-arc seconds (approximately 1 kilometer).

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Introduction

The ARNAV ICDS 2000 Multi-Function Display is a powerful tool designed to aid pilots in all phases of flight. The ICDS 2000 interfaces with other systems on the aircraft to provide a centralized display for integration, computation, and centralized control. The system displays information in text, numeric, and graphical formats. Benefits of the ICDS 2000 include enhanced spatial awareness, increased flight safety and efficiency, with a reduced pilot workload.

Important Facts
For safety reasons, the ICDS 2000 operations must be learned on the ground. During flight operations, the ICDS 2000 will aid and reinforce the pilot with menus and prompts.

The Terrain Obstruction Proximity System (**TOPS**) is based on a vertical clearance of 1,000 feet above the database terrain, MEF, and man-made obstacles when the aircraft altitude is less than 5,000 feet, and a vertical clearance of 2,000 feet above obstacles when the aircraft altitude is greater than 5,000 feet.

Power - The ICDS 2000 receives power directly through the aircraft's avionics power bus. The Power-On Light indicator, located above the Line-select-keys, remains on as long as the ICDS 2000 is receiving power. A power interruption switch may be installed to recycle the power to the ICDS 2000 without the need to recycle the avionics Master.

Card Access – The ICDS 2000 has two card slots located on the right side of the unit. The rearmost slot on the ICDS 2000 contains the Program card, and the front card slot holds the option engine data-recording card. The cards are inserted with the ARNAV label facing the front of the ICDS 2000. These cards may be replaced by sliding the unit forward until you have clear access to the card slot.

WARNING: Do not install or remove the Program / Data card while the ICDS 2000 is turned on. Removing the Program / Data card while the ICDS 2000 is reading data could destroy data on the card.

Hardware Organization

Overview

The ICDS 2000 consists of a 10.4 inch diagonal Active Matrix Liquid Crystal Display (AMLCD) built into a one-piece Control Display Unit (CDU). All electronics and interconnection hardware are included in one box. The CDU is mounted in the panel in a doublewide DZUS rail and contains the screen, brightness control, and 11 panel mounted line-select-keys. The CDU also contains the Program / Data Card.

Line-select-keys

Located on the right side of the display screen are the 11 line-select-keys. These keys are used to choose a menu item, choose functions within a menu, or enter information. Each key lines up with a menu option or graphical ICON. Choose a function by pressing the key corresponding to the menu option for that function.

Brightness

The ICDS 2000 automatically adjusts the brightness of the display and panel mounted line-select-keys to maintain easy legibility in any condition of ambient light.   The user may also manually adjust the brightness.

Procedure

- From the mapping window, press the line-select-keys adjacent to the Brightness ICON.
- Use the right arrow line-select-key to increase the brightness. Use the left arrow line-select-key to decrease the brightness.
- After approximately 5 seconds of no entry, the brightness window will disappear.
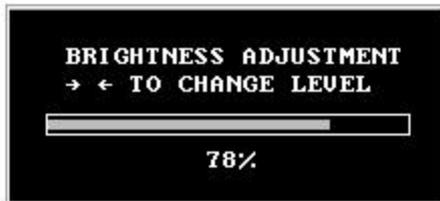
Software Organization

The ICDS 2000 uses a combination of pop-up windows and ICONs that allow the pilot to select desired attributes for display.
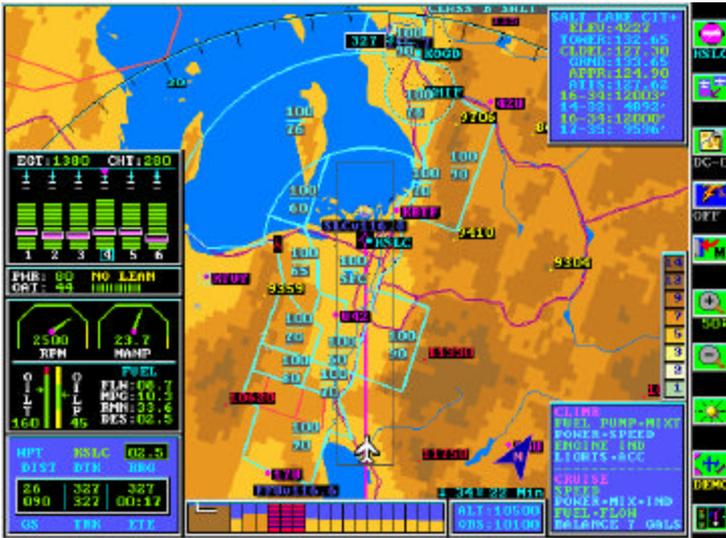
The mapping window is the main screen and largest window. It contains the graphical display of the aircraft's position in relation to items such as airports, navaids, special use airspace, and geographical information. It also contains the graphical ICONs that provide hot key access to the functions available to the pilot.

Pop-up data windows may be turned on to display certain information on the map window. For example, pressing LSK-9 will bring up the QuikRef guides for display in a window in bottom right section of the map window. Pop-up windows disappear when you turn off the corresponding function.

Three of the ICDS 2000 pop-up windows require optional equipment to be installed before the window will appear. These windows are:

Ryan TCAD or Goodrich Skywatch
Cockpit Display of Traffic Information

Goodrich Wx-500 Lightning detection

ARNAV EngineView Engine monitoring

Power-up Procedure

1. Turn on your GPS or LORAN navigation unit. - The ICDS 2000 needs your current latitude and longitude from your Global Positioning System (GPS) or Long Range Navigation (LORAN) unit to lock onto your position. Wait until the GPS/LORAN has acquired enough signals to calculate a position. This process may require several minutes. *WARNING*: Altitude displayed on the ICDS is the altitude provided by the navigation source. Verify whether the altitude is corrected for barometric pressure.

2. Turn on your ICDS 2000 unit. - The ICDS 2000 will perform a power-on self-test to verify all components are operational. When this test is complete, the ICDS 2000 determines your position from the GPS/LORAN and displays the map window. This window contains the airports, navaids, man-made obstacles, geographical information, and MEF (Maximum Elevation Figure) centered on your position.
NOTE: The ARNAV 5000/7000 GPS/LORAN units output your last known position while acquiring enough signals to calculate a position. This allows the ICDS 2000 to display the area around your last known position even before the GPS/LORAN come into track.

3. Start Flying - The ICDS 2000 automatically follows your flight and graphically displays the waypoints around your position without user interaction. When a flight plan is entered into the GPS navigation system, the waypoint information window will display distance, desired track, bearing, groundspeed, actual track, and estimated time en-route. The fuel to next waypoint is provided if the ARNAV EngineView equipment is installed

Distance is displayed in nautical miles; speed is displayed in knots

Accessing Functions

User Interface - The pilot interfaces with the ICDS 2000 in one of three methods:

1**. Line-select-key (LSK),** where a menu choice or graphical ICON is shown, and the pilot pushes the adjacent bezel mounted line-select-key;

2. **Alpha-numeric entry**, to choose airports Identifiers and;

3. **Toggle selection,** to choose between two options presented to the pilot using the <> keys to highlight the pilot's choice.

Pressing the line-select-key associated with the software ICONs allow common functions such as changing chart scale, viewing airport information, or accessing sub-menus. Other LSKs allow for controlling of add-on hardware features of the Go odrich Wx500 Stormscope Lightning detection system and the ARNAV EngineView engine monitoring system.

When necessary, sub-menus are used by the ICDS 2000. The

- − The Menu ICON LSK-5 provides access to **DISPLAY OPTIONS** sub-menu.

- − **Press & hold** LSK-9 for approximately 2 seconds allows entry into the Extended **CHECKLIST** Menu.

Two line-select-keys are located side-by-side at the LSK-8 position. These two keys are used for scrolling through the alphabet in alphanumeric entries, or for setting screen brightness.

Shown below are the primary ICONs and a brief explanation of their function. The balance of this ICDS 2000 Pilot Operation Handbook offers an expanded explanation for the functions available to the pilot.

Airport Information - Press key to select airport information window by identifier or cursor– when information is displayed, press LSK-2 to slew to the selected airport. Press key again to remove airport information.

Aircraft Center/Edge -Toggle aircraft position between center and edge of screen – will also re-center to aircraft if slewed function is enabled.

De-Clutter function, DC- 0 through DC- 3 - This key will remove base map and non-navigational database information. DC-0 includes base map; DC-3 has navigational info only.

Stormscope Control Button will cycle through Stormscope Strike, Cell, and Clear modes. ICON is displayed only if WX-500 lightning detection equipment is installed.

Menu selection to enable display options: Pressing this button will access the Display Options menu for options to display airways, compass rose, map orientation, population centers, and hydrography.

Scale up or down to desired map level
Available scales (nm) 5-10-15-25-50-100-200-regional-national. The current scale is indicated below the "+" ICON. **Press & Hold** is available to rapidly cycle through all scales.

Brightness select
Use left or right buttons to decrease or increase ICDS 2000 brightness

Mini-Checklist toggle
When pressed, the QuikRef checklist will cycle through Pre-Takeoff, Climb, Cruise, Descent, Landing and Go-around; **Press & Hold** to bring up full checklist menu.

Engine Monitoring Selection button
ICON is displayed only if EngineView engine monitoring is installed. This LSK allows up to three EngineView display options.

LSK-1 Airport Selection

Selecting the LSK-1 AIRPORT ICON, , from the map screen allows you to the use the Airport Identifier entry screen or to select, LSK-1 cursor icon, and display nearest airports around the cursor.

Using Airport Identifier

When entering an airport identifier, the ICDS 2000 utilizes a feature called 'ID Completion'. As the user enters the letters and numbers of the desired airport, the ICDS 2000 displays the first match for the entered characters, including the airport name, state or country.

LSK-8 left or LSK-8 right keys are used to scroll forward and backward through alphanumeric characters. **SEL** is used to select a character and move the cursor forward; **ACK** is used to acknowledge the entire entry. LSK-7, the **BK** ICON is used to backspace to the previous character.

A solid line cursor appears underneath the character to be entered or changed. If you press **SEL** and move to the next character space, then realize you made a mistake, press LSK-7, BK ICON to backspace the cursor under the incorrect character. You then enter the correct character by pressing LSK-8 left or LSK-8 right line-select-keys.

When you have verified the desired airport, press **ACK** (LSK-5) to accept the information. After the ACK, LSK-2 ICON will allow you to "slew" to the selected airport. The **SLEW** function allows you to move your viewpoint to other areas of the world. With **SLEW**, you can "look ahead" to your destination airport and visualize the waypoints along your flight plan.

If you have selected **SLEW,** the word "SLEW" will display below LSK-2 as a reminder that you have actively chosen a new center point for the map display. If the aircraft is no longer on the screen, the message "OFF MAP" displays at the bottom of the map.

The information about the selected airport will display in the Airport Information Window on the top-right of the map screen. To remove the

Airport Information Window from the map screen, press the **AIRPORT** ICON again.

IMPORTANT: Once the map has been slewed, the user must select LSK-2 again to return the map to the aircraft's present position.

Using Cursor Movement

After selecting cursor icon, press LSK-7 to move cursor up, LSK-8 left or LSK-8 right keys to move cursor left or right, LSK-9 to move cursor down to the desired area. Press LSK-5 ACK to display list of nearest airports. Select desired airport to display airport information including runway depiction. Press any LSK to return to the nearest airport list. If more than 5 airports are available, press LSK-9 PGDN to view additional airports. Press LSK-8 PGUP to return to the first 5 airports or select EXIT to return to mapping.

The last airport information viewed displays in the airport information window on the top-right of the map screen. To remove the Airport Information Window from the map screen, press the **AIRPORT** ICON again.

LSK-2 Aircraft at Map Edge / MAP Center

LSK-2 has several functions, depending if the map viewpoint has been "slewed" to another location, or centered on the aircraft.

If the "slew" function has been selected (See LSK-1), pressing the LSK-2 button will re-center the map viewpoint back to where the aircraft is the center of action.

If the map viewpoint is centered on the aircraft, pressing LSK-2 will toggle the aircrafts position from center-to-bottom or bottom-to-center.

If the aircraft is centered, the user gains information both in front of and behind the aircraft. If the compass rose is selected ON, it will be 360-degrees around the aircraft.

With the aircraft at the bottom of the screen, the majority of the screen is used to display information in front of the aircraft. If the compass rose is selected ON, it will appear is an arc across the top of the display.

LSK – 3 Declutter

The LSK-3 Declutter button allows the pilot to quickly change the amount of information shown on the screen.

There are four levels of screen complexity, level 0-3. The level selected is shown below the ICON as DC-0 through DC-3. As the level number increases, the amount of information and complexity of data on the screen decreases.

The Declutter level will cycle from DC-0, DC-1, DC-2, DC-3, and back to DC-0 with each button push. The information shown at each level of declutter is:

DC-0 – Terrain base map, rivers, lakes, bodies of water, airports, navaids, special use airspace, Class B & C names, with altitude restrictions, victor airways, city names, hydrography names, man-made obstacles, summits, and geographical boundaries.

DC-1 – All databases shown in DC-0, except terrain base map.

DC-2 – Same as DC-1, except the removal of rivers, lakes, and bodies of water.

DC-3 – Navigation database only - airports and navaids.

Note: Some of the database items will only appear if selected ON in the Display Options sub-menu. Many of the database items are automatically de-cluttered by the user-defined scale declutter levels in the ICDS200 SYSTEM MENU SETUP program. SETUP information is found at the end of this document.

LSK-4 Stormscope

The Stormscope ICON, LSK-4, appears only if the Goodrich WX-500 lightning detection equipment has been installed on the aircraft.

When lightning is detected, the ICDS 2000 will trigger the Lightning ICON to change colors, and a letter "L" will appear on the ICON. Each element of the lightning data is converted to latitude, longitude, and time, and stored until cleared by the pilot, or expired. The lightning data is superimposed upon the map display, and automatically rotates as the aircraft turns. The lightning information expires after 3 minutes, and is automatically removed from the screen.

LSK-4 allow for the selection of three modes of operation. Each press of the LSK selects that next operating mode. The mode selected is displayed beneath the ICON. The three modes for this key are:

 Off – This disables the display of lightning information.

 STRK – In this mode, Lightning strikes will be depicted on the map screen as an "X". Each strike will time out after 3 minutes, or may be cleared by pressing the LSK-4 button 3 times.

 CELL – In this mode, groups of lightning strikes will be depicted on the map screen as an "+".

When the Stormscope is enabled in **STRK** or **CELL** mode, the ICDS 2000 limits the scales to 25nm, 50nm, 100nm, and 200nm. All waypoint and navigation data may be layered with lightning functions enabled.

Pressing the LSK-4 after the CELL mode will allow you to clear strikes, and to cycle to the **OFF** mode.

LSK-5 DISPLAY Options Sub-Menu

The **DISPLAY OPTIONS** sub-Menu allows you to turn on and off various display features and to configure the ICDS 2000 display to your own particular needs and flight style. Each option is displayed on the menu with the current status (ON/OFF) or selected parameter (Track-Up, North-Up, or Desired Track-Up.) Choosing an option toggles the setting and the option redisplays on the menu with the current status. Press the line-select-key corresponding to the desired option to toggle that feature on or off or to chose between options, such as Track-up / Desired Track-up / North-up. After you have made all your selections, press **EXIT (LSK-10)** to return to the ICDS 2000 map mode with the chosen features enabled.

Display Options

LAT/LONG – When On, the aircraft's latitude and longitude displays at the bottom of the map window.

AIRWAYS - Airways are displayed as dashed lines. Airway identifiers will display at the center of each airway segment at the selected scales.

ROSE - When Compass Rose ON is selected, the ICDS 2000 displays a compass rose drawn around the aircraft.

TRACK-UP / DESIRED TRACK-UP / NORTH -UP - The ICDS 2000 may be configured to display the map either with a Track-up, desired Track-up depiction, or North-up orientation. On scales greater that 200nm, all base maps are oriented North-up.

Additional database items will appear on the DISPLAY Menu if they are available on the database card. Examples of additional database elements include City Names, Water, and Custom Databases.

LSK - 6 & 7   Scale Options

The ICDS 2000 has multiple chart scales from which to choose. By using the Scale options, your view can range from final approach to a national view. To view a larger area around and ahead of your present position, choose a large chart scale, such as 100 or 200 nm. To increase the amount of detail shown, choose a smaller scale. Scales are listed in nautical miles and refer to the approximate distance displayed from top to bottom of the map window.

Scale up and scale down ICONs displayed on the map screen allow quick changing of scales. Available scales are 5, 10, 15, 25, 50, 100, 200, Regional, and National.

The   ICON increases the scale; whereas, the   ICON reduces the scale. For example, if the map is currently on the 25nm display, pressing the line-select-key, LSK-6 adjacent to the "+" ICON, will redraw the map at 50nm. Then pressing the line-select-key, LSK-7, adjacent to the "-" ICON results in the map being redrawn at the 25nm scale. The current scale selected is shown between the scale ICONs. You may **Press & Hold** the scale line-select-keys to rapidly increase or decrease scale without the need for the map to load the appropriate databases and to render the map. This allows for a quick selection of higher or lower scales.

On scales greater that 200nm, all base maps are oriented North-up.

LSK – 9 QuikRef Checklists

The QuikRef function allows the pilot to display reference checklist data without going to the full checklist pages. When selected, the QuikRef window displays in the bottom right hand corner of the map screen. The QuikRef does not replace the need for checklists or the Aircraft Pilot Operating Handbook, but it serves as a simple guide during flight.

There are 7 pages of QuikRef consisting of 11 lines of 15 characters. The seven pages include Pre-Takeoff (1), Pre-Takeoff (2), Climb-Cruise, Descent, Landing, Go-Around, and After Landing guides.

Slowly (once per second) press the QuikRef ICON, [icon], LSK-9, to display the QuikRef window. QuikRef pages will advance in an order depending upon ground speed. Continued slow pressing of LSK-9 will cycle through the various pages. Pressing LSK-9 after the last page in the cycle will clear the QuikREF window.

NOTE: If you Press & Hold LSK-9 for approximately two seconds, the extended checklist menu will appear.

QuikREF PAGE	<51 knots	>50 knots
PRE-TOFF (1)	X	
PRE-TOFF (2)	X	
CLIMB-CRUISE		X
DESCENT		X
LANDING		X
GO-AROUND		X
AFTER LANDING	X	

LSK-9 Push & Hold Extended Checklist

Overview

To review the ICDS 2000 Extended Checklist, it is necessary to **Press & Hold** LSK-9. After approximately two second of LSK-9 depression, the Extended CHECK LIST sub-menu will appear.

The ICDS 2000 extended checklists has three checklist titles, Normal Checklist, Performance Charts, and Emergency Checklists. Each checklist title displays a submenu of items that can display another submenu, graphical chart or text, or a toggle page with check-off items. The user may move forward or backwards between the check-off items or exit the checklist at any time.
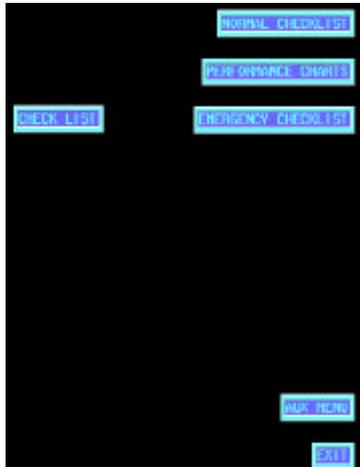
Items on the Normal Checklist submenu display a toggle page with check-off items. Colors are used to distinguish lines of text. Item headings appear in cyan. Current item selection appears in magenta. Items that are checked-off display in green with a check mark next to the line. Press **PREV** or **NEXT** to move to the desired item. When completed, press **DONE** to toggle the line to green. Pressing DONE again toggles the line back to normal or unchecked.

Checklist items may be checked off in any order and will remain checked off unless chosen again, the checklist is cleared, or the ICDS 2000 is turned off.

Choosing A Checklist

1. **Press & Hold** LSK-9 for approximately 2 seconds; the **CHECKLIST** Menu will appear listing three checklist sub-menus.

2. Choose a checklist from the sub-menus listed on the screen by pressing the corresponding line-select-key. A toggle page, graphic page or submenu will display.

3. An example of Performance Charts and toggle page checklists are shown in the examples below:
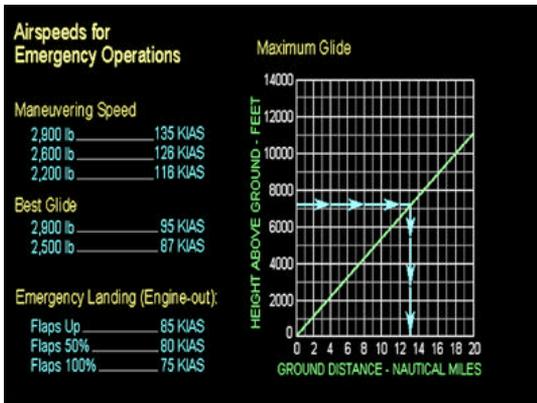
1. As you complete each checklist item, press **DONE (LSK-2)** to check the item off. A check mark will appear in the space beside the item you checked and that item will then be displayed in green. To remove the check mark and return the display of the item to white, press **DONE AGAIN**.

2. To skip an item without completing it, press **NEXT**. To select a skipped item, press **PREV** to move to the previous item.

3. Some checklist toggle pages have additional information in the form of text or graphic page. If an additional page exists, **MORE** will appear on the screen. Press **MORE** to display additional information about this checklist.

Press **EXIT** from the checklist page to return to the checklist title page.

Note: On checklist screens with no labeled exit, press any line-select-key to return to a menu.

| **Terrain OBSTRUCTION Proximity Warning System (TOPS)** |

The Terrain Obstruction Proximity System (**TOPS**) uses the man-made obstacle and terrain databases to display the aircraft's altitude in relation to terrain and man-made obstructions important to the aircraft. When in Track-up orientation, a bounding box will project in front of the aircraft to show the TOPS protection area.

TOPS evaluates the highest obstructions in two ways:

1. **Look-Around** function verifies the highest obstruction within 3 nm of the aircraft, and is shown as the first square under the aircraft.

2. **Look-Ahead** function projects a line 34 nm ahead of the aircraft, and determines the highest obstruction every 2 miles forward and two miles on each side of the projected line.

If the aircraft's altitude is below the obstruction altitude, the box associated with the obstruction will turn red.

Distance and time (at present groundspeed) to end of Tops Box

↓ 34 ⁿᵐ 13 Min
ALT: 3000
OBS: 800

Look-

Look-Ahead
2 nm per

ALT: Aircraft altitude from GPS, rounded downward to nearest 100 feet.

OBS: Highest terrain or man-made obstruction within 3 nm of aircraft location, rounded upwards to nearest 100 feet.
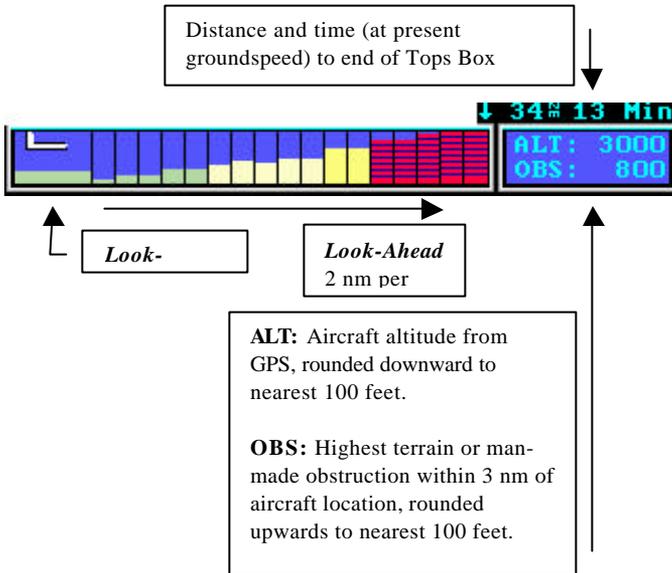
LSK –10 EngineView

An optional function available for the ICDS 2000 is EngineView Engine Monitoring System. By adding EngineView, engine operation for power setting, leaning, and fuel management becomes much easier.
To perform engine monitoring, additional hardware and sensors are added to the aircraft. This hardware converts all sensor data into electrical signals, which are then presented to the pilot. The Engine Monitoring Module has the ability to monitor and record up to 70 channels of information.

Upon power-up, the ICDS 2000 will display a full-page of engine information as shown below. Line-select-keys allow engine mode selection, engine leaning, fuel entry, or switching to the ICDS 2000 moving map display.
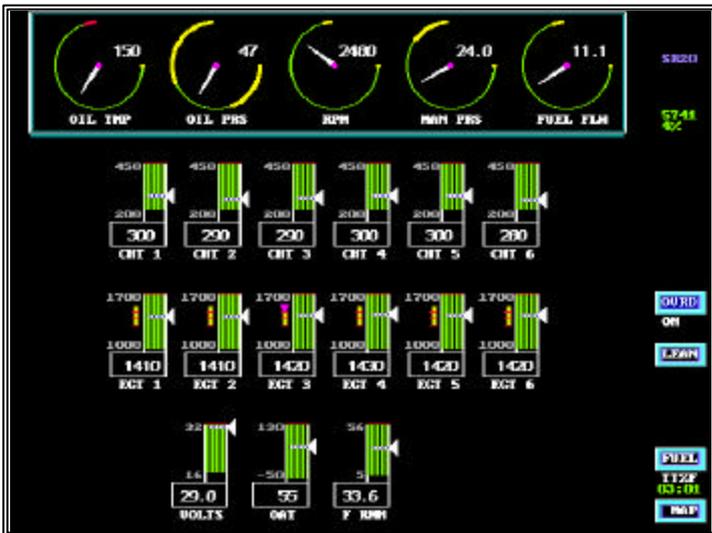
The line-select-key functions available in the full-engine page are described in the following sections.

LSK-6 - Over Ride Function (OVRD)

The OVRD function is a toggle function; pressing LSK-6 will turn the OVRD function on – press the LSK-6 again to turn the function off. When OVRD is ON, the line select soft key legend will be highlighted.

If the OVRD function is off, and the pilot is in the moving map, the ICDS 2000 performs a background check of engine sensors to determine if they are within limits. If any parameter is outside limits, the ICDS 2000 will automatically flip to the full-page engine display page. The pilot will now be able to observe all engine parameters and make decisions on engine adjustments. If the pilot wishes to go into MAP mode without an automatic return to the full engine page, the OVRD function must be turned on.

LSK-7 - Leaning the Engine

Leaning of the engine should follow the engine manufacturers recommended procedures as outlined in the Aircraft Pilot Operating Handbook (**POH**). The following procedure describes the ICDS 2000 display during engine operations, and should not be used in any way that contradicts the POH.

The engine monitoring system responds to any *decrease* in cylinder EGT by generating a narrow vertical bar that extends down from the top of the EGT gauge display. Until the EGT reduction exceeds 50 degrees below peak, the bar is cyan. Beyond 50 degrees below peak, the vertical bar turns yellow, with white "tick" marks at each 25-degree increment. Beyond 75 degrees below peak, the "tick" marks turn red. The first cylinder to peak is indicated by a magenta triangle on the first-to-peak cylinder.

When in EGT/CHT window mode, the value of the hottest EGT and CHT is shown at the top of the window. A cyan box at the bottom of the window represents the cylinder with the highest instantaneous EGT. Leaning may be performed in full engine display mode, or in the EGT / CHT window. The leaning procedure is:

1. Press the "**LEAN"** LSK-7 on the full-page Engine display to cancel any fluctuations in EGT that occur during takeoff and climb. The software automatically performs this "LEAN" function if power has downwardly transitioned from greater than 78% to less that 76%.

2. Move the Mixture control toward Lean. The Engine Monitor checks the EGT value for each cylinder to determine when the peak for that cylinder is reached. After the peak temperature is reached, a small vertical bar above the related EGT begins to descend. The first cylinder to reach peak will display a small magenta pointer to indicate the cylinder that has reached its peak temperature, and has begun to fall.
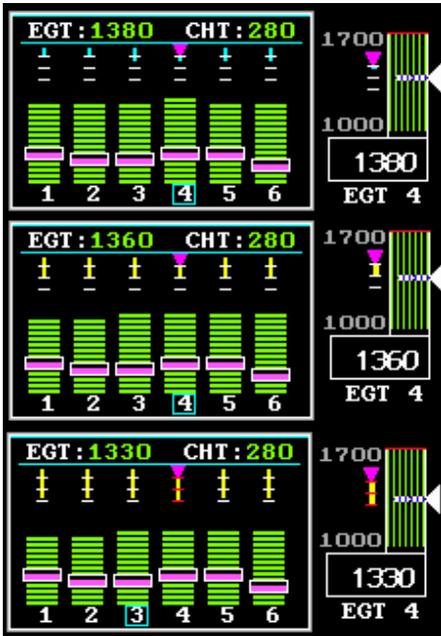
The sequence shown here from top to bottom is 25, 50, and 75 degrees down from peak EGT.

Note: EGT 4 was the first to peak.

?? Best economy and Best Power leaning may be achieved by observing the vertical EGT bars, and adjusting the mixture control to either Rich-of-Peak (ROP) or Lean-of-Peak (LOP) as stated in the aircraft Pilot Operating Handbook.

?? When the first-to-peak cylinder reaches peak minus 50 degrees, the EGT vertical bar turns from cyan to yellow. Moving the Mixture control toward Rich will shorten the EGT vertical bar, and will return to a cyan color when the EGT is less than 50 degrees down from peak.

?? When the first-to-peak cylinder reaches peak minus 75 degrees, the "tick" marks will turn red.

LSK-9 Fuel Computer functions

When fuel is added to the aircraft, the pilot may enter the fuel onboard by pressing the "FUEL" button on the full engine page (LSK-9). This will pull up the **FUEL ADJUST** sub-menu as shown below.

The pilot may **ACK**nowledge (LSK-5) the fuel amount shown, or use the <> keys to increment or decrement the fuel onboard. LSK 2 will allow the pilot to accept the default full fuel amount for the aircraft with a single key press.

After the fuel onboard is input, the ICDS 2000 reverts to the full-page engine display.

Fuel Remaining Considerations

1. The fuel amount entered into the fuel computer function should be the amount of fuel onboard since engine start. The engine monitor system will <u>automatically subtract the amount of fuel that has passed through the fuel transducer since start-up.</u>

2. Fuel quantity and fuel remaining indications use completely different sensors. Inaccuracies and tolerances in both systems can combine to cause a visible disparity of a few gallons during flight. The fuel remaining display should not be used as the only source of fuel management. The aircraft fuel level gauges, POH, and FAR's govern proper fuel management techniques.

3. The primary variables affecting the fuel remaining calculation are the total fuel loaded in the tanks and the calibration of the fuel flow sensor. If necessary, an authorized ARNAV dealer may adjust the "k-factor" of the fuel flow transducer. The "k-factor" must also be adjusted whenever the fuel flow transducer is replaced.

4. The TTZF display under the "FUEL" selection is "Time to Zero Fuel", with **no reserves**. This is a simple calculation based on fuel remaining and fuel flow, but presented in hours and minutes.

LSK-10 Engine Display Options

The EngineView engine monitoring system allows four options for the display of engine data. EngineView display options are controlled by the bottom line-select-key. The display options are:

1. Monitor engine data in background - no display on Map

2. Display all data except EGT/CHT on map

3. Display all data including EGT/CHT on map

4. Display full-page engine data – no map

To select the four different engine display modes, press the lower right line-select-key (LSK-10) to cycle the display through the various options. Each key press of the LSK-10 will select the next display option.

Basic Engine Data Window on Map
The Basic Engine Data Window shows Percent Power, Outside Air Temperature, RPM, Manifold Pressure, Oil Temperature, Oil Pressure, and fuel information.   Pressing the LSK-10 again will place the EGT-CHT window on top of the Basic Engine Data as shown below. Six green vertical temperature gauges display the EGT for each cylinder, and six magenta bars overlay the EGT showing the CHT for each cylinder.

At the top of the window, a digital value shows the highest temperature of the six EGT and CHT values. The blue box surrounding the cylinder number indicates the highest EGT value.

The magenta downward pointing triangle indicates the cylinder that was "first-to-peak". The narrow bars projecting downward from the top of the window show the reduction in current EGT from peak EGT since the "LEAN" button has been pressed, or power setting has transitioned downward from above 78% to below 76%.

EGT / CHT window

Power Window
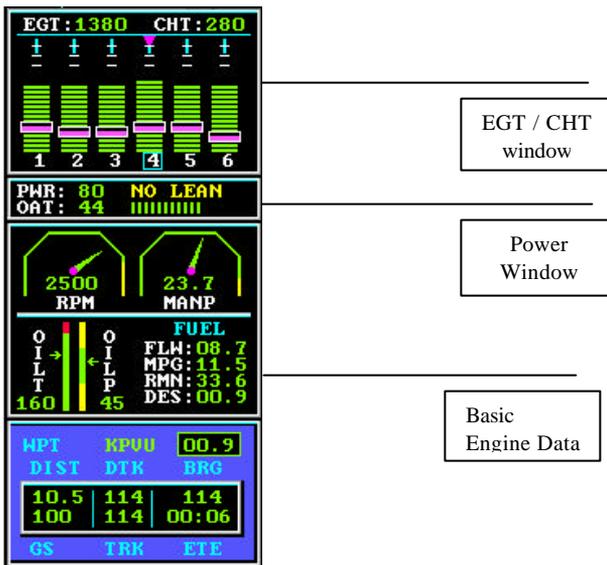
Basic Engine Data

The Fuel panel in the lower-right corner of the Basic Engine Data Window has four values:

FLW - Fuel flow in gallons per hour.

MPG - Miles (nautical) per gallon is derived by taking ground speed divided by fuel flow, and represents a continuous indication of instantaneous flight efficiency.

RMN - Fuel remaining, derived from initial set fuel load minus fuel used since start-up.

DES, Fuel to destination based on current ground speed and fuel flow. Subtracting **DES** from **RMN** provides a continuously updated value of destination fuel aboard. NOTE: The **DES** calculation assumes a direct flight from present position to the last waypoint entered into the GPS navigator. The **DES** calculations do **NOT calculate fuel to destination along intended flight plan.**

The **DES** value will change to a yellow color if the **DES** value leaves less than 30 minutes of fuel upon arrival at destination.

% Power Calculation - Percent Power (**PWR**) is computed using manifold pressure, RPM, outside air temperature, altitude, and aircraft POH data. The % power indication is based on the engine leaned for Best Power. At any time when the computed PWR exceeds 76%, a "NO LEAN" message appears.

OAT – Outside air temperature in degrees Fahrenheit, derived from electronic probe installed as part of the engine-monitoring module. This OAT value does not replace the factory installed and certified Outside Air Temperature gauge, and is only used for the %PWR calculation.

Engine data recording
An optional data-recording feature is available for the ICDS 2000 EngineView. If installed, the number of records and percent usage of the data-recording card will be displayed in the upper right hand corner of the full engine page. When the data-recording card has reached 80%

of it's capacity, the number of records and percentage of card capacity indicators will turn yellow.

During normal operation, all measured parameters are recorded at a rate of once per minute. Data records include latitude, longitude, and altitude from the GPS Navigation System. At any time, this recorded data may be used for engine maintenance purposes or for flight path replay.

The ICDS 2000 has a data storage capacity of 120,000 records, or 2,000 hours of flight. Variable engine recording intervals may be chosen in the ICDS Setup Options, but will reduce the number of hours available before storage capacity limit is reached.

A Personal Computer (PC laptop) may be connected to extract the recorded data via the RS-232 port. ARNAV Systems, Inc. has developed EngineWatch; an engine data extraction software (part number **453-0813**) for PC based computer systems. This software will extract, store, and display the data from the ICDS 2000. The latest version of the EngineWatch software and documentation may be downloaded at no charge from www.arnav.com.

To extract the data stored in the ICDS 2000, connect a laptop to the DB9 connector located under the right front knee panel, just outboard of the air vent. Power up the ICDS 2000, and at the SYSTEM MENU prompt, press **LSK-9**, **DOWNLOAD ENGINE DATA**, and follow the prompted messages.

```
                                        MAPPING

                                      DIAGNOSTIC

              SYSTEM MENU                  SETUP

                                             _

                                             _

                                             _

                                             _

                                             _

                              DOWNLOAD ENGINE DATA

    U2160   05-07-2002   13:37:00          AUTO DIAG
```
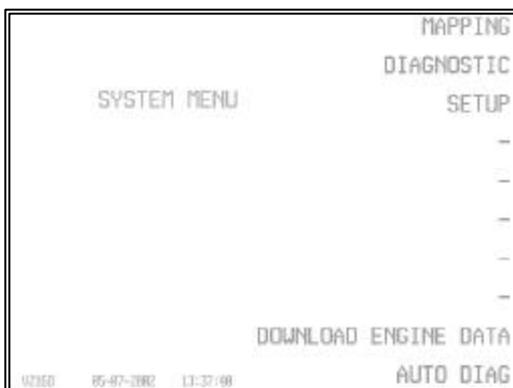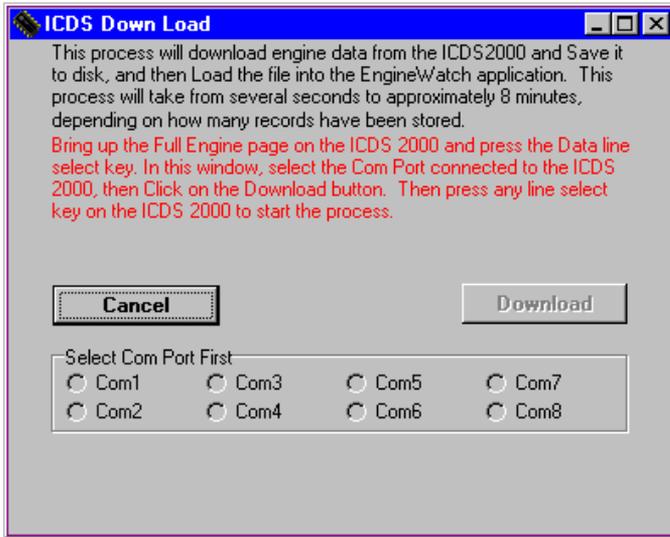
Start the EngineWatch application from a PC, until the ICDS Down Load Screen appears (shown above). Follow instructions found in the Help functions of the EngineWatch software to transfer the data from the ICDS 2000.

ARNAV offers a data extraction service that provides a printed document of the engine records, or a graphical replay of aircraft position. Please contact ARNAV for details.

ICDS 2000 Setup Options

This guide is intended to familiarize the pilot with the setup options available with the ARNAV ICDS 2000 Revision BH software.   Power up the ICDS 2000, and at the SYSTEM MENU prompt, press LSK-3, SETUP.

```
                                    STARTUP MODE

                                 SCALE/COLOR SETUP

     SETUP OPTIONS                    DEMO INIT

                                 SYSTEM CONFIGURATION

                                 ADD/EDIT USER GRAPHICS

                                  VIEW USER GRAPHICS




                                    AUX FEATURES
 ICDS 2000 T911AF DBASE:0206 EXP:07/11/02              END
```
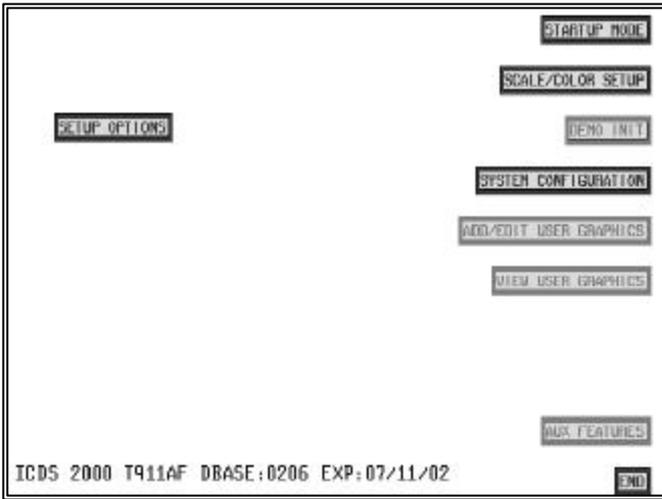
Menu items in black are described in the following pages and may be selected by the pilot. Items in gray should be selected only if instructed by ARNAV personnel and are not described below.

STARTUP MODE

Startup mode options allow the pilot to select whether an option is turned on/off upon startup of the mapping software.


```
         STARTUP MODE OPTIONS:


                    AIRWAYS :0:
          QUIKREF WINDOW :I:
          DISPLAY P-POS :0:

                                              ACK

                COMM CIRCLE :0:
                COMPASS ROSE :1:              BACK

                                              PREV

     NORTH/TRACK/DTK-UP :1:
        A/C EDGE / CENTER :0:                 NEXT

                                              SEL
```
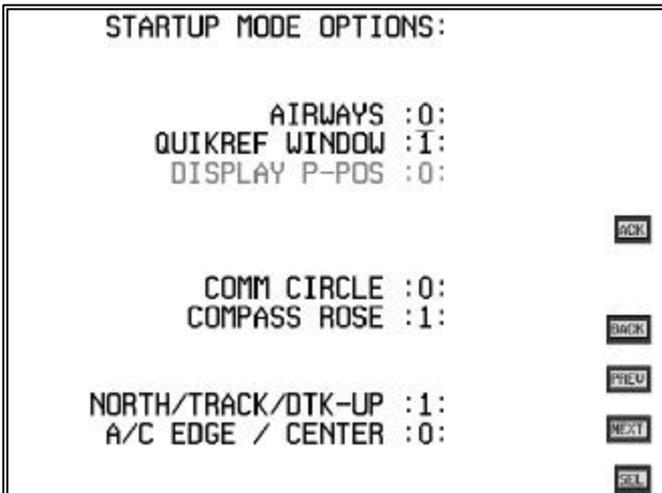
Airways – Enter 1 to have airways display on startup or enter 0 to not display airways on startup.

QuikRef Window – Enter 1 to have the Quick Reference (QuikRef) window display on startup or enter 0 to not display the QuikRef window.

Comm Circle – Enter 1 to have the communication ring display on startup or enter 0 to not display the communication ring on startup.

Compass-Rose – Enter 1 to have the compass-rose display on startup or enter 0 to not display the compass rose on startup.

North/Track/Dtk-up – Enter 0 to have the map startup in North-up mode. Enter 1 to have the map startup in track-up mode. Enter 2 to have the map startup in Desired track-up mode.

A/C Edge / Center – Enter 0 to have the aircraft startup in the center of the screen. Enter 1 to have the aircraft startup at the bottom edge of the screen.

SCALE

The first page of the scale setup allows the pilot to define the range of the first three scales. ARNAV recommends the settings shown below. The Start Scale represents the scale beginning scale that is used when the mapping program starts up.

```
SCALE SETUP:
SCALE REPRESENTS DISTANCE BETWEEN
TOP AND BOTTOM SCREEN EDGES.

    SCALE 1 (5NM STD) :5:
            RANGE=0-9
    SCALE 2 (10NM STD) :10:
            RANGE= 6- 14          ACK
    SCALE 3 (15NM STD) :15:
            RANGE= 11-24
                                   BACK

    START SCALE (1-8) :4:         PREV

                                  NEXT

                                  SET
```
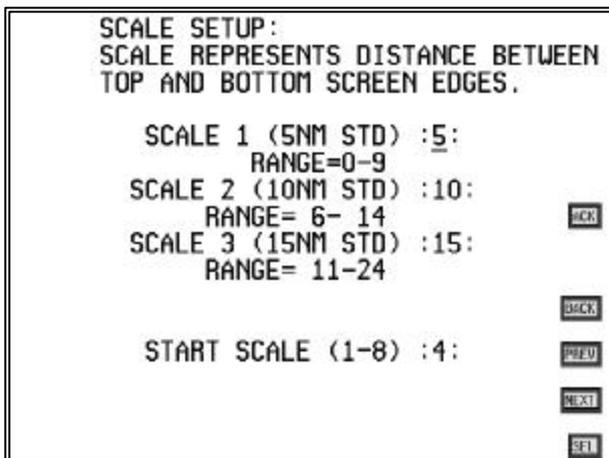
The second page of the Scale option defines the maximum scales on which symbols and identifiers display. ARNAV recommends the following settings.


```
MAXIMUM DISPLAY SCALE = 0-7
MAXIMUM ID SCALE = 0-7
0 = NO DISPLAY

              SCALE   ID
        APT  :7:    :7:
       INTX  :5:    :4:
        NDB  :5:    :3:                ACK
        VOR  :7:    :4:
    USR/HLD  :4:    :4:
    MANMADE  :5:    :4:
        AWY  :7:    :4:               BACK
        SUA  :7:    :4:               PREV
        MEF  :7:                      NEXT
                                      SEL
```

Scale=nm
1 = 5
2 = 10
3 = 15
4 = 25
5 = 50
6 = 100
7 = 200

A brief interpretation of the table follows: APT symbol displays on scale 7 (200nm) and below. The APT identifier displays on Scale-7 (200nm) and below. The INTX symbol displays on Scale-5 (50nm) and below, whereas the INTX identifier displays on Scale-4 (25nm) and below. The other options follow the same logic, however, the AWY identifier is limited to Scale-4 (25nm.)

SYSTEM CONFIGURATION

Priority OVRD is the only item recommended for the pilot to change in the System Configuration and is only used if the EngineView Engine Monitor is installed. Enter 1 to have the OVRD function ON upon startup. Enter 0 to have the OVRD function set to OFF upon startup.