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## CNX80 User Newsletter

First Edition for CNX80 V1.0 software  
9/10/03

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### **CNX80 Flight Planning**

Some basic issues have come up in flight planning that are addressed in the Computer Based Training (CBT) materials you have on your owner's CD. However, they bear repeating here in order to emphasize the concept of operation.

#### ***Changing a Destination***

The CNX80 needs to know what the Origin Airport is in order to select the departure SID. It also needs to know the Destination airport in order to select the appropriate STAR or Instrument Approach at the Destination airport.

If you are training and bouncing from airport to airport shooting approaches, then you must change the Destination airport in the CNX80. This may be accomplished in a number of ways:

Method A

1. Select the flight plan page and edit mode.
2. Highlight the destination airport (if you have an approach selected you will not see the destination airport, first highlight the approach and delete it using the CLR key.)
3. Select Modify
4. Choose the new Destination airport and press Enter.

Or, if you are flying multiple approaches and receive a clearance direct to another airport and are awaiting the first approach clearance, then:

#### Method B

1. Select the Direct-To page and select the DB soft key at the bottom of the display. This allows you to select any airport from the Jeppesen database. Or you can use the NRST function and select the airport of choice if it happens to be in the neighborhood.
2. After highlighting the new Destination airport via a method above, press the Dest key. The DESTination key does a couple of things:
  - a. It throws out your existing flight plan and replaces it with a one leg flight plan consisting of a Direct-to the new Destination airport.
  - b. It replaces the old Destination airport with the new Destination airport, allowing you to select the next approach or arrival at that airport.
3. Once the Destination airport has been changed you may select any approach you wish and load it into the flight plan. This action DOES NOT automatically give you a Direct-To the IAF by design, unlike older generation GPS products. This is done specifically so that the active waypoint cannot be changed automatically unless you, as PIC, change it.
4. At any time you may select the Direct-To page and choose the IAF or other waypoint in the approach and fly direct to it, using the Direct key.
5. If you are given the full procedure, make SURE you select a transition that requires a procedure turn. The CNX80 will then build the PT and fly it for you with roll steering if you are so equipped. Do this if the IAF and FAF are the same waypoint, and then do a Direct-To the IAF. This bypasses the transition waypoint, but we don't care, we just want to get a PT out of the deal.

#### Vectors To Final:

You are given vectors at the last minute by a controller who suddenly decided to change your full approach clearance. Simply accomplish the following:

1. Select the PROC page by pressing the Function Key and,
2. Select VTF mode in the lower right hand soft key.
3. Confirm VTF mode by pressing ENTER.

This extends the inbound course to the FAF and makes that leg active for guidance. If you wish to fly the same approach more than once, and you're vectored around the pea patch, then simply activate VTF again downwind and you're all set.

## Suspend Mode

A few questions have popped up regarding Suspend mode. There are some automatic features about it that bear repeating here. Most importantly is the need to unsuspend during approach inbound from the FAF.

This is a TSO requirement, and we are looking at having this removed in future revisions. However, for the moment the logic is required. The CNX80 will automatically suspend waypoint sequencing upon reaching the FAF of any instrument approach. You must press the SUSP key to unsuspend the CNX80 at the FAF or it will not sequence to the missed approach upon reaching the missed approach point.

Auto suspend also has caused some confusion. If VTF mode is active SUSP mode will be on until the airplane is within a 45 degree intercept from the final approach course. At that point the SUSP annunciator will go out and subsequently come back on at the FAF. Again, once you check the FAF, unsuspend the CNX80 in preparation for the missed.

## What is a Discontinuity?

A discontinuity is a simple device that has existed for years in Flight Management Systems on air transport aircraft. It has a specific task, mainly to call your attention to a potential problem in your flight plan that you must rectify. Essentially think of it as a gap in your flight plan that you must resolve, and the CNX80 is asking for specific navigation information.

Discontinuities occur for one of two reasons:

1. The CNX80 is asking for your input to determine how to navigate between the waypoints adjacent to the discontinuity (deleting a discontinuity equates to flying direct between those waypoints), or:
2. There's a problem you must fix. Example: You've selected a STAR or an approach with transitions that don't match, i.e. you select a STAR that terminates at waypoint A and the instrument approach you selected starts at waypoint B. The CNX80 sees this as a potential problem and inserts a discontinuity flagging the problem for you to fix. If you made an error in selecting the wrong transition on the approach, you can reselect the approach and select the correct transition, which removes the discontinuity, or you may highlight the discontinuity and delete it if you really want to go from waypoint A direct to waypoint B.

The fundamental design consideration here is that instead of making a potentially incorrect assumption and stringing waypoints together without any further consideration, the CNX80 will ask you for resolution to the problem as PIC. Again, if you build your flight plan without any enroute or procedural errors, most likely you won't see discontinuities very often.

Should you ever fly into a discontinuity, this will be annunciated on the CNX80 and the system will roll wings level and continue on the same course it had prior to reaching the waypoint before the discontinuity.

## Intercepting an Airway

There are a couple of ways this typically happens when you're dealing with ATC (but of course there are always the really creative controllers that have something unique in mind for you,) usually a vector to intercept and occasionally the outbound radial to intercept an airway.

Vectors onto an airway are simple to deal with using your autopilot, or merely flying the heading assigned. By observing the CNX80 you can determine on the moving map approximately where you will intercept the airway (between waypoints CARRO and GLORR for example,) then simply select the Direct To page and scroll down to the next waypoint, GLORR in this example, and press Flyleg. This activates that leg of the flight plan for navigation and you will see that on the bottom of the page in magenta.

At this point, the CNX80 will provide navigation to the leg. By engaging the autopilot (roll steering capable,) the CNX80 will drive you to the active leg and then sequence the flight plan normally. For non roll steering capable autopilots, wait until the needle comes alive and then engage the NAV mode, making sure you've set the course appropriately.

For radial to intercept an airway, this can be accomplished a couple of different ways, depending upon what's most convenient. You can set the frequency on the VHF Nav radio using the NRST function and selecting VOR's and using old fashioned VHF Nav radio skills, or you can select the VOR if it's in your flight plan or directly from the database and use the OBS mode located on the Direct To page.

This reads your HSI or CDI resolver and allows you to use the GPS WAAS navigation function to essentially treat any waypoint as a VOR station. The system automatically goes into suspend mode and the outbound radial you've selected will be shown on the moving map. As you reach the intercept of the airway, simple press the SUSPend key and the CNX80 will capture the airway and fly onto it. This again is automatic if you have roll steering capability. For non roll steering autopilots, wait until you are within the turning radius of the autopilot, press the SUSPend key and select the new course. Done in a timely fashion, you should not have to leave autopilot NAV mode.

## Roll Steering vs. Deviation Only Autopilots

The vast majority of the existing autopilot installations are deviation only autopilots. That means they track the CDI needle and are reactive systems, essentially “needle chasers” and do not have the ability to turn short or anticipate turning maneuvers.

Roll steering capable autopilots function in a very different fashion. They can accept roll steering commands from the CNX80, which allows for smooth transitions from leg to leg and allows the CNX80 to fly the procedure turns and holding for you. This is why the CNX80 has two different symbols on the map for the active flight plan. The solid magenta line being course information (driving the CDI deflection which in turn drives the autopilot,) and dashed line flight plan showing where GPS roll steering is available but not CDI deviation guidance.

This was done by design to accommodate the limitations of GA HSI's/CDI's which unlike air transport systems, do not have the ability to slew the course automatically. That means the pilot gets to twist the knob in order for the CNX80 to read the resolver and the autopilot to track the guidance.

The magic of roll steering is that this knob twisting and needle chasing is completely unnecessary with roll steering. This allows the CNX80 to drive the autopilot laterally to track the course or perform the procedure turn or other complex turning maneuver without the need to twist the course selector knob, since reading the CDI resolver is unnecessary. You can literally forget about turning the course selector knob and watch the airplane fly the flight plan or procedure (of course we don't recommend this as good pilot practice.)

The upshot of all this is that if you are limited by a deviation only autopilot, the roll steering maneuvers must be complete by the pilot manually. For full instrument approaches, make sure that the CNX80 transitions on the procedure turn and then set the inbound course and capture the inbound course using NAV mode (or as applicable.)

Deviation only autopilots may utilize a “happy box” that accepts the roll steering output commands from the CNX80 and turns them into voltage outputs that mimic the inputs from the HSI/DG heading bug. This allows the CNX80 to drive the autopilot in heading select mode as if you were twisting the heading bug to track the flight plan.

Currently there are a few on the market that work with various autopilots and your installer should be able to help. UPS AT has an engineering unit in development that will be interoperable with a number of different autopilots. Availability is not known today, but we should have something definite shortly.

## V2.0 Upgrades and Capabilities

The primary new functionality that will be provided by V2.0 is LNAV/VNAV and LPV approaches. This will allow you to select those approach types and fly them using the vertical guidance provided by the CNX80 the same as you would fly an ILS approach. The VNAV capability at this time will not extend beyond the FAF.

There are approximately 750 LNAV/VNAV approaches in existence, and LPV approaches are in work and being commissioned as this newsletter is being written. The FAA hopes to have as many as 300 new approaches at various airports approved over the next year or so. There is a production schedule for these approaches which we expect will change as the process proceeds and greater familiarity with the development process is gained. We'll pass along more info as it becomes available.

There will also be automatic flight plan transfer and user waypoint transfer between CNX80's in dual installations for V2.0. This will eliminate the need to modify the flight plan on both units in dual installs.

There will also be a mini HSI page in lieu of a moving map only display. This will not be certified as a primary nav display, but for supplemental use.

We have committed to supporting display of traffic on the CNX80, it will consist of TCAS 1 (L-3 Com Skywatch), and TIS-A (via the GTX330 Mode S transponder) as of this writing.

Please let us know if you have any questions or comments. We want our customers to know we work hard at providing the best possible value in avionics with the features most important to you.

Please feel free to contact us by visiting [www.garminat.com](http://www.garminat.com) and send your comments to the technical support group ([support.salem@garmin.com](mailto:support.salem@garmin.com)): Attention Paul Damschen, Flight Test.