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CNX80 User Newsletter

Second Edition for the CNX80
10/29/03
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V2.0 Gamma 2 and 3 WAAS Update

Version 2.0 software flight test has begun and the certification schedule has settled since the last newsletter was written. The transition to Garmin AT is complete and the two organizations are discovering that we have substantial mutual capabilities and goals. I anticipate many good things to come from the combined organization.

We have reviewed customer input and schedule, and based on those criteria we have settled on the following features for V2.0, which will be available to you in the early part of 2004, once certification flight test has been completed successfully. They are:

- Glideslope guidance for LNAV/VNAV approaches (Gamma 2) and LPV (Gamma 3) approaches (to Cat 1 or near Cat 1 minima).
- New serial interface (RS232) to display data from the GTX330/33 Mode S transponders for TIS traffic, and also control the transponders as we do the SL70R now.
- New interface to display traffic data from a L-3 Com Skywatch system (TCAS 1).
- A new smart key denoted as “NAV” which provides the user with a track up full compass rose HSI like display with DTK and bearing information.
- Minor flight planning enhancements making it easier for user identification of the active leg in the flight plan.
- Activation of an ARINC 743A compliant GPS output (ARINC 429).
- New interface (RS232) to a Guardian carbon monoxide sensor, allowing the CNX80 to display the level of carbon monoxide in the cabin sensed by the detector. Note: This does not include any alerting logic, which is provided by the sensor itself.
- Dual CNX80 flight plan updating (uses a master/slave relationship between the two units.) This will allow for automatic flight plan transfer and user waypoint transfer between CNX80s in dual installations for V2.0. This eliminates the need to modify the flight plan on both units in dual installs.
- Other minor software enhancements.

The LNAV/VNAV approaches that exist today will be embedded in the CNX80 navigation database and when you upgrade your unit to V2.0, you will be able to fly the existing 750+ LNAV/VNAV approaches in the Jeppesen database today. Most of these approaches terminate with low non-precision minimums (usually about 450-350' AGL.)

So What's The Big Deal About WAAS?

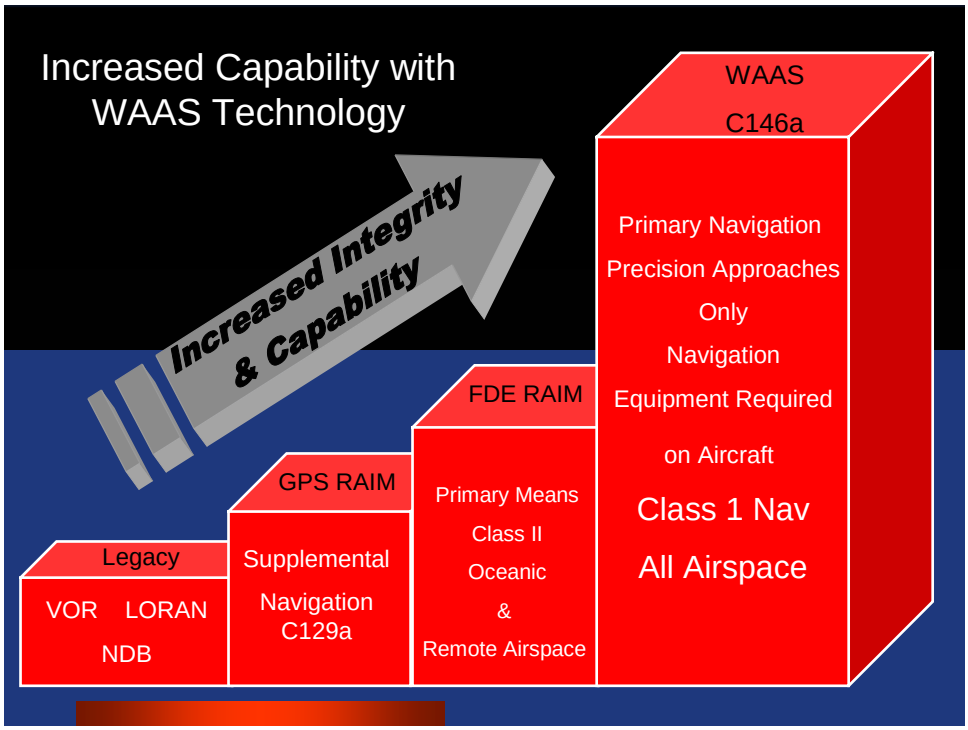
What does certified WAAS buy you? One of the limitations of GPS is the ability to determine quickly the status of the GPS constellation. As a result, WAAS has two main objectives required to safely implement GPS precision approaches (or other precision navigation operations in the future) which are:

1) Provide differential corrections for broadcast on two geosynchronous satellites and atmospheric effects data to improve position accuracies to approximately 3-7 meters horizontally and vertically.

2) Provide integrity information and alarms to users in near real-time (within 6-8 seconds) for problems with GPS satellites.

Gamma 3 or APV/LPV approaches are designed to be equivalent to Cat 1 ILS approaches, with approximately 250' AGL minima. Initially we expect the minima to be slightly higher until several approaches are published and a degree of familiarity is achieved in the aviation community with these types of approaches. However, it will make it possible for the FAA to publish precision RNAV approaches at any airport with adequate terrain clearance to support a precision approach. To this point in time, the ILS ground infrastructure makes it impossible to financially support precision approaches at airports other than high utilization airports in municipal areas.

This allows for precision approach creation with no dependence upon ground infrastructure as compared to older navigation technology. This also means you will know well in advance if the signals required for successful completion of the approach are available prior to commencing the approach. Several signal and position computation algorithms must be within tolerance to fly the precision GPS approaches and alerting for conditions when WAAS updates are not available will be made to the pilot well in advance of commencing the final approach segment of the approach. See the figure below:



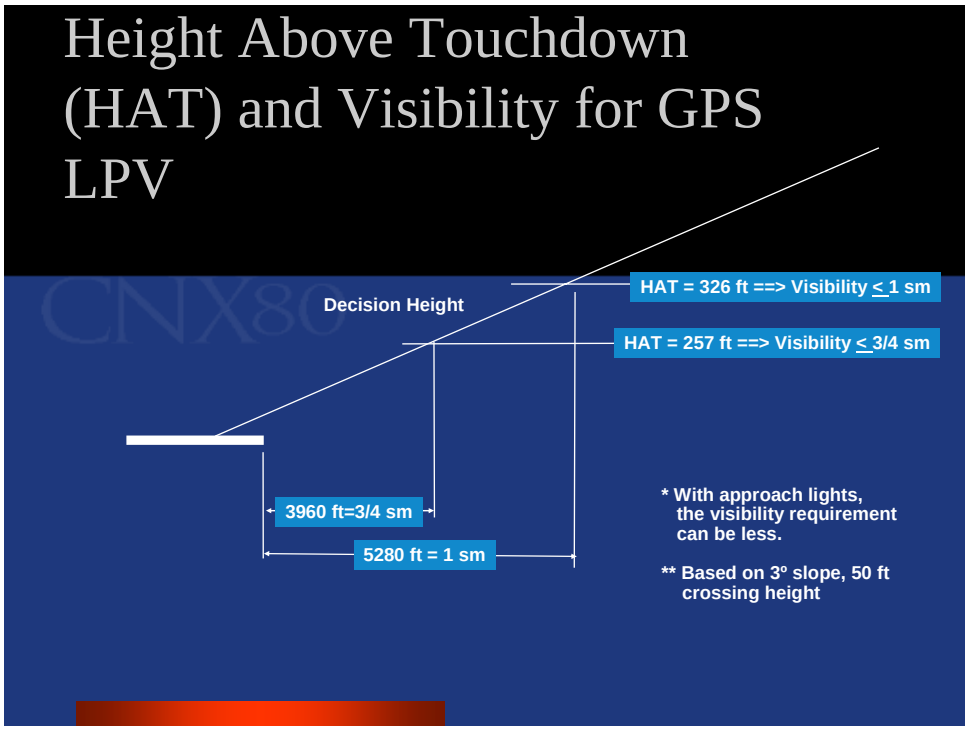
This means you will no longer have to worry about turning onto an unmonitored ILS only to discover that there's no signal from the glideslope or localizer. You will also have seamless navigation from GPS without having to toggle back and forth between VHF nav and GPS for the missed approaches.

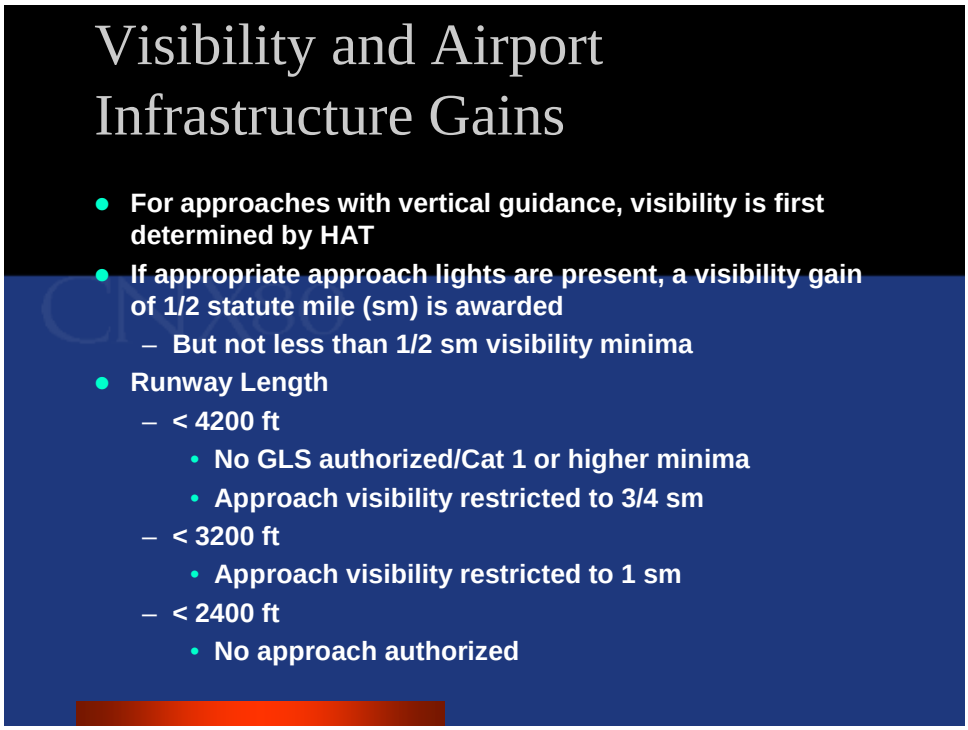
We have had some comments from people wondering what value this provides them in terms of operations. It's probably safe to say that most everyone (Part 135 or corporate operators in particular,) are concerned with the ability to make it to the desired destination safety and with a high degree of predictability.

WAAS LPV approaches are a way to achieve this. This is due to the fact that precision approaches by their nature allow pilots a much higher degree of confidence in achieving a successful approach vs. perhaps a simple non-precision approach with circling minimums. This happens to be the case with my hometown in Montana, which only has a high minima circling approach off a local VOR.

The airport doesn't have substantial operations, and therefore cannot afford or justify an ILS, although terrain clearances would allow for one to be installed. I've flown into the airport on more than one occasion in blowing snow only to find that the visibility I need is not available to complete the approach and a missed is necessary. The end result is a diversion to nearby Butte, which has an ILS. Not a big problem, but definitely an irritant since this requires an additional hour on the road to get to and from the airport, plus notifying everyone that you had to divert and they need to get back in the car to come and get you.

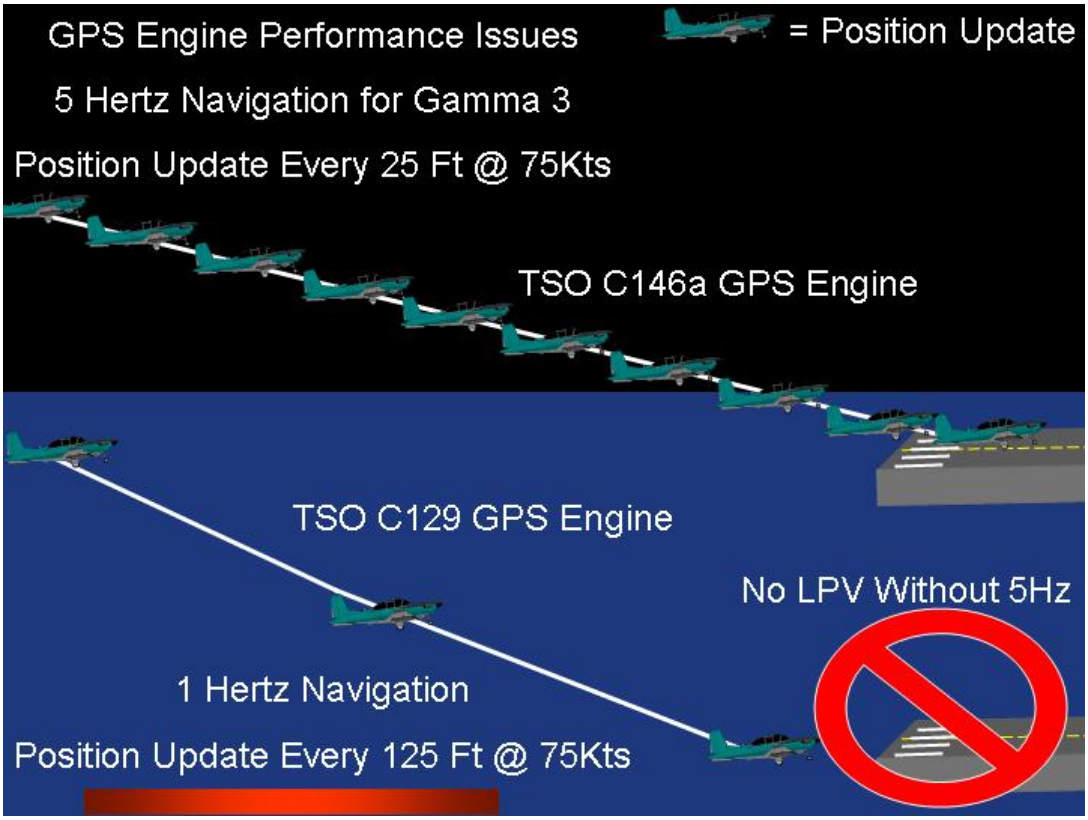
Even going from non-precision minimums (LNAV/VNAV) to Cat 1 ILS minimums makes a big difference. In the example below the minimums are only 69 feet lower, but that buys a substantially lower visibility minimum for you. Review the figures below to see the difference in approach visibility requirements:





From the figures above you can also see that GPS LPV approaches are now feasible at much shorter runways, which to this point in time would never be considered for the installation of an ILS for precision approach capability.

The figure below shows the difference between the required position updates between a TSO C146a GPS system and an older TSO C129/C129a GPS system limited to non-precision approaches. Positional update rates and computation rates are critical to the accurate and timely navigation required for precision approaches. The calculations below were done for a relatively slow approach speed of 75 kts, and many aircraft can have substantially higher approach speeds which would cause a greater position error in a previous generation GPS engine.



But my other GPS is WAAS enabled already

Just because you have a handheld that may be WAAS enabled, doesn't mean you have WAAS accuracy or integrity in the navigation solution. WAAS satellites behave just like other GPS satellites, but also have the ability to provide the data stream with the uplinked corrections and constellation status to your GPS engine.

That doesn't make your unit compliant to the WAAS TSO specifications, or make it useful for navigation requiring WAAS corrections or have the navigation information update rates necessary. We obviously don't recommend usage of any GPS system that

goes beyond its capability or certification level, and doing so will get you in trouble one way or the other at some point in time. As of this writing there are only two GPS units on the market that are compliant with WAAS TSO C146a. Your CNX80 is one of them.

Course Reversal in a Hold

There are many approaches with transitions that have holding patterns in lieu of a procedure turn. In this case, the CNX80 (with roll steering active on your autopilot) will perform the hold entry, and upon crossing the hold fix fly the hold one turn prior to sequencing to the final approach segment. It is coded this way in the navigation database, using the logic that one turn is required after passing the hold fix and thus formally entering the hold.

This is annunciated on the bottom of the MAP page or FPL page with the hold symbol and the word "ONCE". This feature allows for flexibility on your part. Many pilots simply wish to perform the course reversal and continue on to the final approach segment. To accomplish this, simply press the SUSP key once after you have completed the course reversal and are within approximately a 30 degree angle to the FAF. This causes the CNX80 to sequence to the final approach segment. If you do not press the SUSP key while within the required course intercept angle, the CNX80 will fly the hold once and then sequence to the final approach segment.

Basically, if you're all together and are ready for the approach at the course reversal, just press SUSP once when you're inbound to the FAF. Otherwise, if you're not ready for the approach and want one turn to get it together, do nothing and let the CNX80 sequence on it's own.

V1.2 Update

Version 1.2 has been released and has one significant impact, namely the ability to select the IAF as a transition whereas V1.1 did not allow for this. V1.1 requires a workaround to select a transition and then fly Direct To when appropriate to the IAF. V1.2 removes this workaround and allows for IAF to be selected directly as a transition. Your local dealer will be able to provide the software upgrade to you.

Other Topics

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 and send your comments to the technical support group (support.salem@garmin.com): Attention Paul Damschen, Flight Test.