

Electronic Charts

The marriage of GPS and accurate electronic charting isn't quite ready for single-pilot IFR.

By Wally Roberts

A MOVING MAP DISPLAY IN THE cockpit has great appeal to all of us. I suspect many, if not most, active instrument pilots have either flown some form of moving map on either a laptop computer, handheld or panel-mount GPS, or have seen it demonstrated in a simulated mode. More than half of the air carrier fleet in this country is equipped with a good en route IFR moving map, albeit of late 1970s technology.

Operational gap

This technology has great promise, but there's an emerging fly in the ointment. Engineers, instead of pilots, are driving the technology. Then, like the dog who chases its own tail, pilots try to make do with the engineer's concept, although the end-product is often lacking some rather fundamental operational necessities.

The airline moving maps were developed long before the advent of GPS. Most of the airline systems don't support IFR-certified GPS, so the airlines are now pushing to use questionable navigation sources based on sampling of random, non-certified DME or VOR radial fixes. Further, both airline and general aviation pilots who use electronic maps are tending to rely on these incomplete maps, at the exclusion of the real map, i.e., the current paper product.

Far too many airline crews fly the nation's jet routes while their Jeppesen high-altitude en route chart remains folded inside the crew's nav kits. I sense the same (low rather than high en route charts, though) happening with general aviation pilots who have either IFR-certified GPS avionics, or use VFR GPS avionics to "supplement" the basic VOR/DME en route system.

There's paper, then there's paper

The high-end airline stuff has full

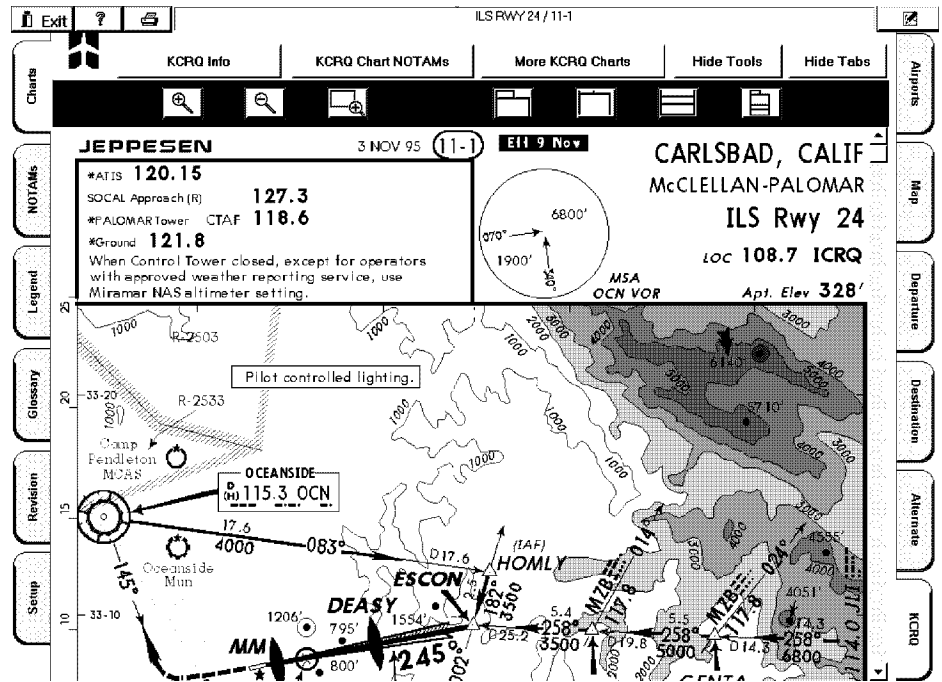


Figure 1. JeppView screen showing partial plan view of KCRQ ILS Runway 24. Because the standard PC screen doesn't scale to the approach chart's dimensions, it's necessary to select portions of the chart at a time. On a good PC display, the plan view of any JeppView with color terrain contours is spectacular.

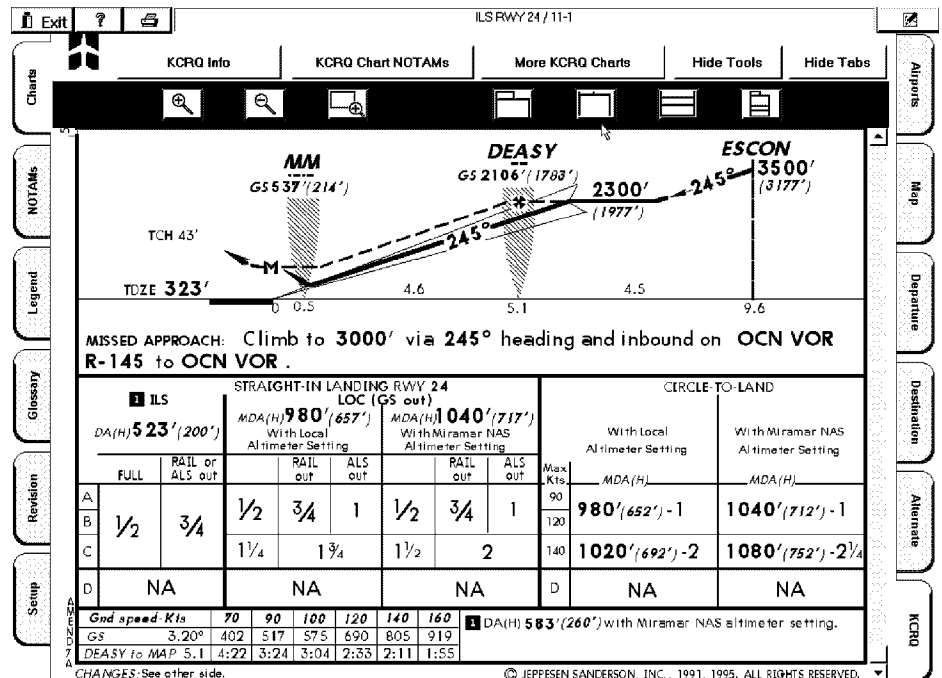


Figure 2. JeppView screen of KCRQ ILS profile view and minimums box.

route databases, so not having the en route paper chart handy doesn't typically cause too much problem, provided ATC doesn't come up with a sudden big difference in the route. If the route change is major, and the airplane is in the terminal area, it can get rough enough when the paper chart is out, handy, and properly folded. But when the paper is in the binder, the situation can go to overload real fast.

Then there's the issue of the paper approach chart. Some pilots don't feel compelled to use the paper approach chart where they have a database area nav system onboard. This compulsion is understandable—after all, what are all these new expensive electronic goodies for? Well, everyone please listen up: we're not there yet. The approach chart contains regulatory and operational information not available in any other form.

Granted, the "magic" airline LNAV system and general aviation IFR GPS avionics have the approach's requisite waypoints, bearings, and distances. Missing however, are segment altitudes, the all-important profile view, (often complex) MDA/DH and visibility minimums, and those often critical procedural data notes.

Much of these complex chart graphics and data don't lend themselves to meaningful reproduction on a general-purpose moving map display, such as dedicated airline and general aviation lateral navigation panel displays. It would be an arduous recertification process to get such information integrated into IFR-certified general displays. I also question whether the detailed electronic equivalent of the paper chart would be readable at instrument panel distances from the pilot's eyes.

Enter JeppView

IFR Refresher routinely features Jeppesen charts because virtually all of our readers use either Jeppesen or NOS instrument charts. For those who fly scheduled operations (Part 121 or 135), Jeppesen is almost always the chart provider of choice, because the product is oriented to commercial operations. The

following discussion of JeppView results because Jeppesen is the only chart maker in the world with the vision to now offer some of its approach and departure charts in an electronic version (presently JeppView is available for the contiguous 48 states).

Not only does the JeppView version of Jepp's charts faithfully reproduce its paper counterpart, it has the *potential* to vastly outperform the paper version, although it hasn't yet arrived at that point. Because of my work, I was a natural candidate for JeppView, because I wanted to have a full U.S. subscription readily available as a desktop reference.

Not only does the JeppView version of Jepp's charts faithfully reproduce its paper counterpart, it has the potential to vastly outperform the paper version, although it hasn't yet arrived at that point.

Strictly as a desktop reference, JeppView is already better than its paper counterpart. Figures 1 and 2 (page 10) show the primary JeppView screen, with my home airport's ILS approach selected in the display.

Because the standard PC screen doesn't scale to the approach chart's dimensions, it's necessary to select portions of the chart at a time. There are both tool and scroll options to make this easy. Some charts, such as horizontally-oriented SID and STAR charts can be flipped from portrait to landscape orientation on the PC screen.

There is a tool option to display the entire chart, but the resolution of today's PC screens is not up to that task, thus the full-screen chart on a 14- to 17-inch PC screen is unreadable. Conversely, though, you can select a zoom-in area on a JeppView chart with spectacularly clear results, because JeppView uses vector graphics.

Printed JeppView chart

All JeppView charts can be sent to

your printer. With a good printer, the printed version (because of Jepp's use of vector graphics) is likely to be easier to read than the original Jeppesen paper counterpart. This is because you get an almost full-page chart, and probably on paper that doesn't bleed through. Of course, those approach charts with color terrain features are reduced to grayscale, unless you have a color printer.

Jeppesen recommends that any charts needed for a flight be printed-out prior to departure, rather than attempting to use the charts directly from a laptop PC during flight. This is prudent, conservative advice, for the time being.

On a good PC display, the plan view of any JeppView with color terrain contours is spectacular. These vivid colors cannot be reproduced on the paper Jepp uses for its paper product. I suspect those of you with high-end color printers could print out some real colorful charts.

Small leap of logic

After working with JeppView at my desk for a couple of months, it didn't take much of a leap of logic for me to want to work this concept onto my laptop and integrate it with GPS. I flew the Boeing 767 for a couple of years, and that razzle-dazzle glass cockpit stuff has been a part of me ever since.

Until recently, I had not been too impressed with any general aviation laptop moving map program. Then, in a form of mother-goes-inventing, I hit the world wide web and sought out a moving map program that would let me use my own maps. I found it in the form of RMS Technology's Vista for Windows. (This is not a product endorsement. I paid full retail for Vista out of my own pocket. It wouldn't be fair of us to show screen captures from Vista without crediting the source.)

Proof of concept

Not only does Vista let me use any to-scale graphics file as a map, it permits more than one map to be shown and tracked simultaneously. Figure 3 (below right) is a screen capture of simu-
(continued on next page)

Electronic Charts

(continued from page 11)

related GPS flight during the non-radar transition from over Oceanside, CA VOR onto the KCRQ Runway 24 ILS. Note the delta wedge which represents the aircraft's present position. The map on the left is a screen-capture from JeppView, converted into a Vista-useable map. The map on the right is a color scan I made of a portion of the San Diego 1:250,000 VFR chart for the area near KCRQ. Jeppesen charts are easily adapted to a program such as Vista because Jeppesen rigorously draws its charts to scale.

Figure 4 (below right) shows the aircraft over the approach lights. The map on the right is a zoom-in on the map which is on the left in Figure 3. The map on the left in Figure 4 is a scan of the Jeppesen airport diagram for KCRQ. Because my source GPS (Garmin 195) was operating in the simulator mode, the aircraft is right on the money over the approach lights. Nonetheless, this demonstrates the validity of the moving map, because the Vista program is receiving real NMEA 0183 data from my GPS. In actual operations, the *largest* offset I've seen when operating at the scale of the map on the left in Figure 3, is to be just to the edge of the runway on landing.

Figure 5 (page 13) shows a portion of the Jeppesen LAX Area Chart. The airplane is on a vector towards higher terrain. Note the aircraft symbol is nearing V-165 on an 036 degree heading. A feature of Vista is active, which shows the distance from the aircraft to the selected point as marked by the electronic "X." The box at the lower right shows various pertinent data, including how long it will take to get there at present ground speed.

The Jeppesen LAX Area Chart is too large to scan as one map. I've scanned it in four overlapping pieces. These four charts are coded in accordance with a Vista convention so that the aircraft symbol will proceed automatically from one chart to another as position dictates.

Several hours in Seat 2A

I've used my map setup on a few recent flights on a major airline. The results are consistent and are an unending source of amazement to me. The B-767 I flew had nothing that approached this sophistication.

It has yet to come together

I've done a fair amount of evaluation of simulated IFR flying, both using only

the Garmin 195's moving map and CDI, and using the Garmin 195 as an engine for Vista on my laptop. Some of this evaluation has been done in a light aircraft. My conclusion thus far is that it's too much for single-pilot IFR unless you have a good autopilot. Two competent pilots can handle it just fine.

JeppView's natural evolution is to appear in the cockpit on a display that is both "flightworthy" and scaled to the dimensions of an approach chart, thus

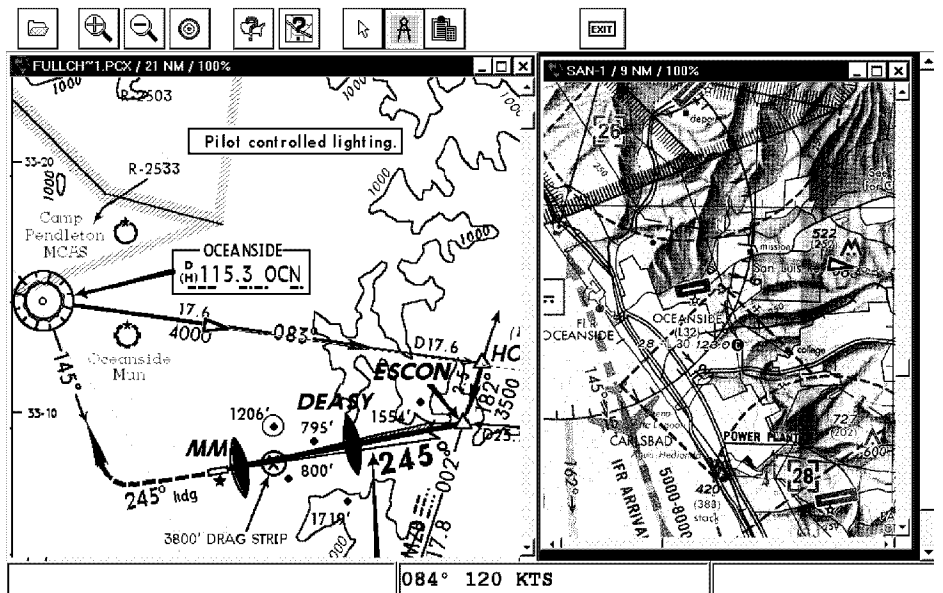


Figure 3. Vista map screen capture. Moving airplane symbol is delta icon tracking OCN-HOMLY feeder route.

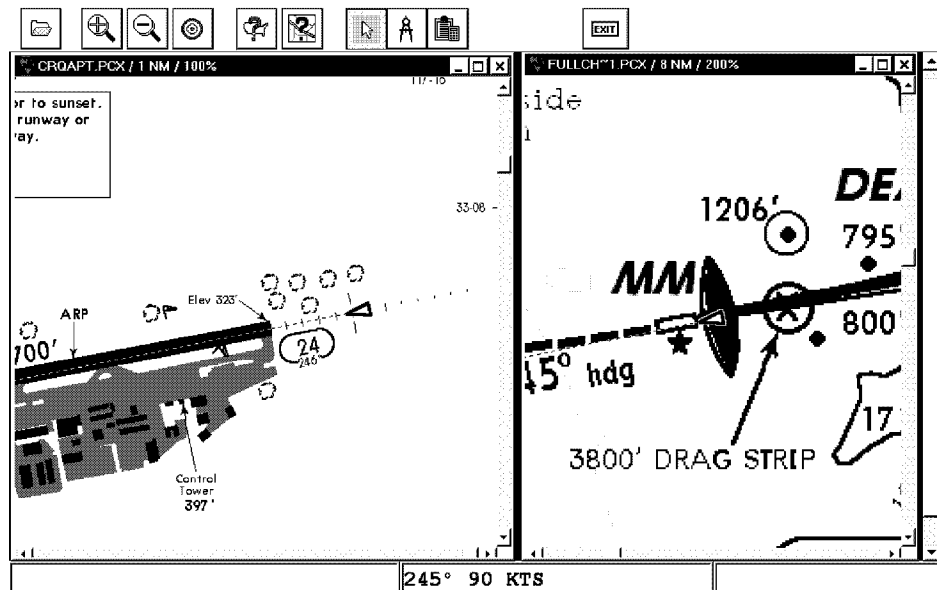


Figure 4. The delta symbol shows the airplane "over the lights" on ILS final.

the full JeppView chart could be displayed at high resolution. The plan view will ideally contain a GPS-driven aircraft symbol of present position. Such a display would be independent of any moving map display on the aircraft's instrument panel. This display would be ideally located where the pilot normally locates his/her at-hand approach charts. This electronic chart display would work equally well in all types of cockpits—glass and “steam gauge.”

Available now on a limited basis

For anyone who has computer hardware similar to mine (800x600 active matrix color display, and really big hard drive), there is no reason why you couldn't make and use moving map charts for your more frequently used airports. If you're flying non-commercial, none of this would need to be IFR-approved, because it would merely supplement your primary means of en route and approach navigation.

Enhanced situational awareness

I can see this being used in conjunction with either VOR/ILS or an IFR-certified panel-mount GPS. In the latter case, the IFR-certified GPS would contain the approach database that would

be driving the instrument panel CDI or HSI, and *that* would be the determinant of procedural track. The supplemental GPS, however, combined with the moving aircraft symbol on the approach chart's plan view, would add immeasurably to situational awareness.

Managing the options

There is so much information and equipment to be juggled with a improvised arrangement like my personal setup. Until this stuff evolves to the point
(continued on next page)

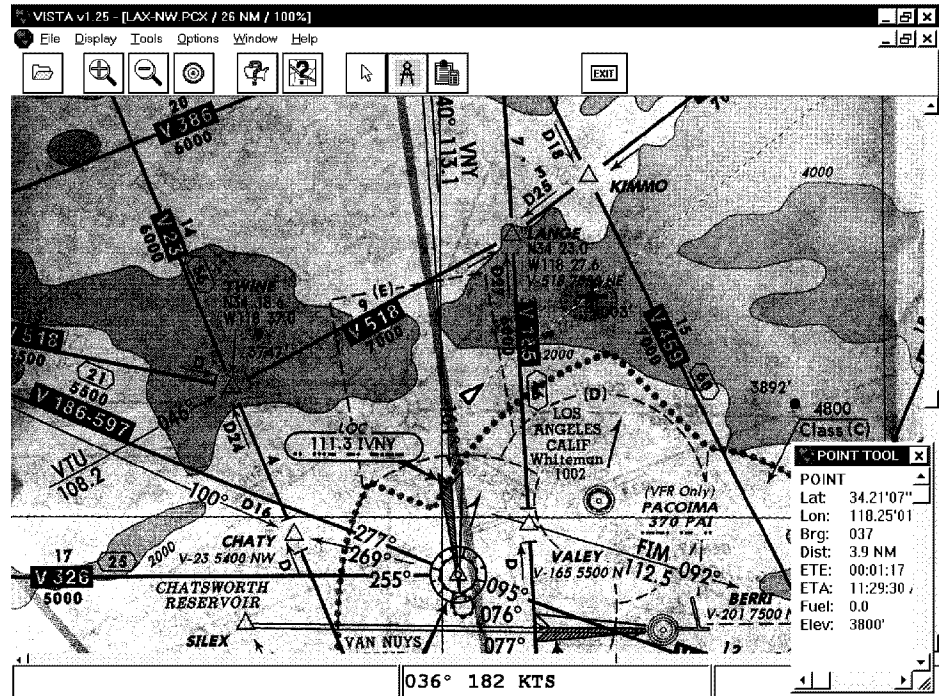


Figure 5. Radar vector toward higher terrain with high terrain point selected and marked by pilot.

Subscribe to *IFR Refresher* today!

Yes, please enter my order for:

- 1 year of *IFR Refresher* for \$60 (U.S. and International).
- 2 years of *IFRR* for \$110 (U.S. and International).
- The back issues I've listed below, for just \$7.50 each, plus \$2.00 shipping and handling per total order. (For a listing of feature articles in each issue, see other side; cash or check only for back issue orders.)

\$ _____ Total for items selected above.
 \$ _____ Shipping & handling (not applicable to subscriptions)
 \$ _____ Total this order

Name _____
 Address _____
 City _____
 State _____ Zip _____
 Please bill my: MC/Visa _____ American Express _____
 Card # _____ Exp. Date _____
 Signature _____
 Daytime Phone # (required for MC/V) _____

Mail to IFR Refresher, 75 Holly Hill Lane, Greenwich, CT 06836-2626

***IFR Refresher* Guarantee**

If you are not completely satisfied with any item you order from us, you may cancel or return the item for a cheerful refund.

Electronic Charts

(continued from page 13)

of being fully integrated into the aircraft's avionics suite, the pilot who elects to use such augmentation must carefully manage the supplemental information vs. the primary information that comes from the aircraft's avionics. Like anything else involving IFR flying, it requires a fair amount of practice, insight, and proficiency.

With such equipment properly used, a pilot should never become disoriented during an approach, much less ever make an errant-blunder-flight into the side of a mountain. This type of equipment won't keep you out of the weeds along the desired course, however. Diligent management of the altimeter is still the order of the day to stay out of the weeds under the approach segments.

Wally Roberts is a retired airline captain, former chairman of the ALPA TERPs Committee, and an active CFII in San Clemente, CA. Visit Wally's web site at <http://www.terps.com>

Product Info

JeppView requires Windows 3.X, 95 or NT. The JeppView software engine has a one-time charge of \$329. Chart coverage includes a CD-ROM every 14 days. Paper en route and area charts are included as part of the JeppView coverage. NOTAMS are contained on the CD-ROM. The annual chart coverage for JeppView varies from \$119 for the Northwest to \$508 for the full U.S. (48 states). Optional accompanying paper approach charts are available for a discount of up to 28 percent over the price of just the paper subscription. Contact Jeppesen: 1-800-621-5377 or <http://www.jeppesen.com/jeppview.html>

Vista for Windows sells for \$198 and includes one CD-ROM map disk of your choice (48 states sectional charts, vector graphic road map program, world maps, etc.). Contact RMS Technologies: 1-800-533-3211 or <http://www.RMSTek.com/vista.html>