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The Aviation Consumer®



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FIRST WORD

Convenience: A Government Subsidy

Two of the tenets of good habit formation is that you give people a motivator to do the right thing, and you make it easy to do so. Up until the fall of 2010, the Aeronav Services branch of the FAA could have been a poster child for building good pilot habits on keeping current with airport, approach and charting data. Printed charts were available at virtually every FBO and digital charts were a free download for all.

As our investigation on page 5 reports, the party started winding down in 2010 with restrictions to paper chart sales, and now a whole micro-industry of flight planning apps and websites are hanging in limbo, knowing free downloads of data will disappear by April 12, 2012. In the meantime, downloads that were available weeks in advance are now available 24 hours in advance.

There has been much hand wringing on both sides of this row that access to this data is a safety issue. The FAA says poor or incomplete repackaging of its data jeopardizes safety; the industry says restricting pilots' access to this data in any way jeopardizes safety.

As we show in our investigation, the core issue here is money. But isn't it still a safety issue? I think not.

We do accident scans for this magazine every month, ranking the causes into categories. We've never had to create category for "Didn't have the right radio frequency," "missed the NOTAM" or even "Used an out-of-date approach plate." Terrain warnings have an obvious safety potential. Aircraft position on the approach plate is arguably a boon to safety. But there are simply enough checks and balances in the system that flying with obsolete data rarely causes a serious mishap. Embarrassment, maybe. But nearly universally, this is the stuff of NASA forms, not NTSB reports.

There is, however, something significant to be said for convenience. Howie Keeife built a sizable business on his various chart atlas systems because it was more convenient to have a bound book when traveling than collect and organize all those separate charts. The iPad and similar devices make it easy to have the right data available. You're less likely to call on the outdated Tower frequency or blunder into restricted airspace en route. You can call up an approach chart without fear (or guilt) that maybe the circling minimums changed last month.

Even if that isn't going to put a detectable dent in the fatal accident rate, it's good for the industry. The FAA NOTAM system may still be in the communications Bronze Age, but clever app developers have parsed and organized the data so it's easier to get it right. The FBO that rented out a 172 might not have the margin to keep the GPS database current, but for \$75 a year, all the airport information is at a pilot's fingertips—on the phone that pilot had in his pocket anyway. This kind of technological hipness is one of the shining exceptions in an industry that's got a bit of an image problem. While it's important to reduce the fatal accident rate, we need to aim a bit more broadly to really attract new pilots and keep the ones we have.

In the pay-to-play, NextGen future the FAA is shaping, it's no surprise that someone latched onto the idea that the government should stop giving this valuable data away for nothing. (Well, except we paid for it last April, right about the 15th of the month.) But the scheme can't work. If there's anything the website world has proven is that people won't pay more than peanuts for digital data if there's any way around it. If the FAA tries to recoup serious royalties from the data the way it made a return on paper chart sales, it'll kill the industry. Most people will get just the barest charts they need (paper or digital), troll the internet for bits of free data to supplement (even though free sites like RunwayFinder will vanish), and fly with whatever stuff they have. Up goes another barrier to entry for new pilots. On goes another weight on the back of existing pilots. Down goes the industry further, which means even fewer people to pay.

And if they only charge a small royalty, it's hard to imagine it would be enough to even be worth the trouble on Aeronav's bottom line. But it's not hard to imagine how it could squelch this corner of aviation where free data has been the foundation for something truly beneficial. —Jeff Van West

Fun With a 150

One thing not emphasized in the article in the Cessna 150 is that the non-aerobatic 150 is a great little spin machine. The straight-tail models in particular are wonderful. William Kershner's book describes how an extended spin will get going faster, then slower, then faster in a cycle.



Climb up to 10,000 feet and you can demonstrate this for yourself. Given how long it takes to get that high, it's not something you'll do more than a couple of times, but it's certainly educational.

The straight tails will recover from the spin more or less on their own—I never quite had the nerve to let go of the controls and see if it's completely true. But that doesn't seem to be as true of the swept tails.

My 1970 seemed to get winding up a little after three spins and I never tried more than four before recovering. But up to two turns was benign and better than any roller-coaster. Aerobatics it ain't, but it'll impress or scare the heck out of your friends.

I also tried other tricks, like using a half-spin to turn a super-tight 180 degrees (works, but uses up too much altitude), or going into a spin to avoid a collision (really bad idea, you'd just loop at low altitude).

Friends of mine did aileron rolls in them as well. Not approved but probably safe enough if you're an expert.

David T. Chuljian
Port Townsend, Washington

Droid vs. iPad

A problem I have in my Cherokee 6 is the iPad blocks part of my instrument scan when mounted on the yoke—the location I prefer. What are the most popular locations pilots are choosing to install iPADS on Chero-

kees? Been looking at smaller tablets, including the 7-inch Samsung Galaxy, which seems the ideal size.

Will you be expanding into Android-based tablets in a future article? Will WingX Pro and Fore-Flight run on the Samsung Galaxy? Any disadvantages going from the iPad-sized screen

to a 7-inch?

Gordon Doherty
Garden Plain, Kansas

All good questions we can't answer yet. And yet, we will be exploring Android pads and apps. However, we'll concentrate on the apps, since there are too many pads for us to consider.

Life Cycle Costs

As a part of returning to the U.S. after living overseas and re-entering GA, we have once again subscribed to *Aviation Consumer*. And once logged in, I began digesting a decade's worth of technology advances and news about both new and old (but surviving) aviation companies.

Without a doubt, the single most apparent miss that exists in your coverage of all things aviation is the disconnect between you covering the cost vs. performance of today's avionics and the cost of living with these products due to their often-required government and public domain data.

Yes, you've acknowledged this, at least in the form of a general promise to take a one-time look at this in the future. What you need is a new, standardized format that equates the data cost to an assumed life cycle of the product. From lawn weed whackers to coffee makers to cable installations, most of us who shop for a product know to do this.

What will it cost me over the span of time I assume I will own the product? I encourage you to take a

similar standardized approach to all the various plastic boxes you review, normalizing product cost over time. It's sorely needed given the subscription charges I'm seeing.

Jack Tyler
Jacksonville, Florida

Good points. In this issue, we're looking at general trends in charts and data cost and we'll try to roll these into reviews of avionics.

Rating Paint Shops

Your last evaluation of paint shops in the September 2011 issue was excellent. However, I did note that there were some shops on the list last year and not on this year...and the reverse.

A thought might be to indicate what shops are on the list for multiple years, such as ABC Paint Shop (third year). At the same time, a good paint shop can easily fall victim to a few over-demanding and over expectant customers.

I don't know this solution, but am sure that a good paint shop can fall in disfavor in one year that is based on nothing more than pilots who expect Van Gogh workmanship and are simply unrealistic except in their own minds.

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The Data Debacle: Hidden Costs, Fine Print

Time and money spent on data currency have become leeches on the back of GA, owners say. And even then, the data may be incomplete. Are sales suffering?

by Jeff Van West

Way back when RNAV for light aircraft was the Bendix/King KNS80 rho-theta system, keeping current charts was easy. For 20 bucks and a stop at the local FBO, you replaced all your data: One sectional, the local approaches, an A/FD and an enroute chart or two.

If you were a serious traveler, price, weight and hassle escalated if you paid a premium to get updates mailed to you—in big packs or neat little envelopes—so you always had the latest charts.

Those quaint days are gone forever, done in by the “convenience” of modern digital navigation where all your data lives on cards that you plug into your navigators. But judging by the e-mail we receive, owners are getting wise to the fact that all this data is more expensive than charts ever were.

There seems to be more of it and some has to be bought in duplicate, causing many owners to say: enough. We're hearing this complaint more frequently than ever and some own-

ers are bailing out of GA because of it.

And while the iPad seems to have made chart access cheaper and easier, there are economic and bureaucratic trends afoot that could wither the bloom on that rose. While there's no question we've stepped forward in capability and convenience, the patina of perfection on the digital cockpit is wearing thin for many consumers as the burdens and limitations of digital reality show through. Some problems are slowly getting solved, but others are unlikely to change. Some are destined to get worse.

HOLES IN THE SYSTEM

The marketing claim for digital charts and data is that you always have the most current information. This is patently false on several counts. One of the selling features of the iPad is the seamless sectional and enroute charts, allowing users to scroll across the country as they fly. But there were problems. Where separate charts got stitched together, the lines didn't

line up on

some programs. Sometimes, the overlap obscured the name of a facility or fix. Altitudes and other details of MOAs and Restricted areas are printed on chart margins, but those margins are cut off by the stitching.

Those specific problems have been fixed by major app makers, but not before they got the attention of the FAA's charting arm, which is now flexing its muscle to ensure its charts are “used in a responsible means.” They also weren't the only problems. One of our editors was sitting in an idling airplane and realized he needed the frequency for the on-field VOR test facility (VOT).

The most popular apps, ForeFlight and WingX, both struck out because it wasn't in their extracted airport data or the airport-specific A/FD pages. VOTs are available in the printed A/FD. FlightGuide's app had it in their airport data and it could be found on the back of the airport diagram approach plate in Jepp's app, if you knew to look there.

But most users aren't magazine editors with five apps on their phone. The lesson is that the paper charts were—and still are—an integrated system. Information not present on one product could be found on another. The same is true of the Jepp system. Chop all that up and stuff falls through the cracks. App makers are actively patching the holes, but they don't have it done yet.

The myth of current data extends to cockpit avionics as well. We received a phone call from a pilot in Florida who pulled out his iPad chart for an RNAV (GPS) approach into Fort Myers, Florida. No approach could be found. It had been dropped for that charting cycle.

Jepp told us these deferrals are a rare occurrence. When we asked how rare, they sheepishly gave us a definition of rare we were heretofore unaware of: Out of the past 13 cycles,

At left are at least 12 separate—yet often redundant—databases. And that's not counting an aera 560 (five databases) for backup and the iPad in the lap (gobs of databases). Total yearly cost to keep all that data current (assuming U.S. Jepp coverage): \$3600. Datalink weather not included.



approaches have been deferred six times. That's not six approaches. That's six cycles, or almost 50 percent. Each time somewhere between three and 12 approaches didn't make the cut, out of all approaches in the western hemisphere. So it's rare to come across one of these, but they are often out there lurking.

Jepp showed us as well that the number of pages of source data they process is on a steady rise, with the number of deferrals on a slow rise in consequence. Jepp is redistributing resources to try and squash this problem, but they tell us that won't have any sizable impact until they complete the process next year.

There are now more than 23,000 instrument flight procedures in the U.S. alone. FAA administrator Babbitt's comments to Congress underscore how this problem will get worse before it gets better: "The FAA also plans to publish Wide Area Augmentation System Localizer Performance with Vertical Guidance (LPV) approach procedures for all suitable runway ends by 2016. . .Through our new NAV-Lean process, we are working to streamline the...Implementation of new instrument procedures to ensure that users can benefit from them as quickly as possible."


Finally, the data on your iPad or the usability of your database full of approaches is only as current as the latest publishing cycle. Any of those items could be superseded by a NO-TAM you need to retrieve from the FAA's Nixon-era information system. At least the better apps make it easier to parse and, we're told, the FAA is working to improve things.

PRICE OF KNOWLEDGE

That brings up the issue of cost, both in money and in time. We hear a steady stream of complaints here. Just a single WAAS GPS costs \$575 for full U.S. NavData revisions and current obstacles. And you have to download the NavData from Jepp, but the obstacle data from Garmin.

That's peanuts compared to keeping up a glass cockpit. The cheapest solutions are the fully integrated systems like a Garmin G1000. Here, there's only one copy of each database. Expect about \$1300/year for CONUS data and charts for a G1000, using Garmin's government-source charts. Add about \$600/year for Jepp charts.

GOVERNMENT WATCH

 Effective October 20 2011: Next Editions will be available 24 hours prior to their effective dates. For additional information, contact AeroNavWebmaster@faa.gov.

Product	Effective	Ending
digital - Terminal Procedures (1111)	20 October 2011	17 November 2011

FREE FAA CHARTS: THE PARTY'S OVER

A green oasis in the bleak landscape of data is the availability of government charts for cheap on portables like the iPad (ForeFlight, WingX) or for free on the internet (RunwayFinder, SkyVector, Aeronav). The fuel for this micro industry has been digital charts and other products free for the downloading from the FAA's Aeronautical Navigational Products Directorate, a.k.a., Aeronav.

But after April 5, 2012, the products will cease to be free. Initial reports were that this decision stemmed from concerns about safety. We spoke at length with Abigail Smith, Manager of Business Development for Aeronav, concerning this policy change. While Aeronav has concerns about digital representations altering their charts—such as the stitched-together, seamless charts that can obscure or remove information—it's really about the money.

Aeronav is funded federally on a cost-reimburse basis. They must recover the costs attributed to the actual production and distribution of their products. Smith tells us that for digital products, that would include the databases and software to create and maintain the charts, compilation, production equivalent to printing (such as rendering the chart's image) and distribution, which would include the servers for putting the data on the internet.

"Because we're legislated, we can't collect more money than our cost," says Smith. "We're committed to the most affordable product line for the end user. But if revenue diminishes, the product line diminishes." Smith went on to say that Aeronav is determined not to create a situation where there would be "only private sources" for charts. By this we understand her to mean only one or two private sources, as individuals won't be able to buy any products directly from Aeronav, digital or paper, after April 2012. A chart source monopoly is exactly what happened when NOAA made a similar policy change with their charts, and the results were a bit of a fiasco in the marine industry.

By press time, Aeronav wasn't able to give us hard numbers on how much money they need to recoup. We've heard estimates as high as \$50 million—larger than the entire aviation app industry combined. Aeronav neither confirmed nor denied that number when we asked them, answering only that they wanted to "remain compatible with the market."

After April 5, 2012, anyone wanting digital versions of Aeronav charts will have to enter an agreement similar to a paper chart sales agent. At meeting set for December 13 of this year, Aeronav will reveal their best guess at what the digital product agreement and the pricing structure will look like, with "a rough order of magnitude" on the actual price. They will also set the standards a digital chart agent must follow to ensure the "integrity of the product." This won't mean the elimination of something like stitched-together charts, but it will probably mandate some changes in apps and Websites to ensure all the information on the paper chart is accessible.

The proposed structure will be a licensing deal where, say, zero to 500 users would merit a fee of \$X, and 501-1000 users might be .95 times that \$X. Part of the uncertainty in the price of "X" is that it's uncertain what X will represent. Is that per user of all potential products? Or does one sectional cost X, but one sectional and a region of approach charts cost 2X? Either system would have winners and losers. But the record keeping for even a simple plan would be enormous, and even though the onus would fall on the vendor to handle their

continued on page 6

subscriptions, Aeronav would have to audit the process to prevent cheating. This raises expenses on both sides of the equation, making it even more difficult for a vendor to maintain a profit margin while still charging a price the app market will sustain and making Aeronav's bar higher for recouped expenses.

The burden will be disproportionately high on the smallest vendors, who will pay the highest per-use royalty while simultaneously trying to build a customer base willing to pay a premium price. Mark Spenser of Avilution is one of the few makers of aviation apps for the Android platform. His users pay \$4.95/month for charts on his app. "When I put it out, it was \$10. I didn't sell many. Finally, one guy wrote this long drawn-out e-mail saying this was highway robbery," he told us. When the price dropped, subscriptions took off. While Aeronav's Smith has a point that people are getting for cheap charts they used to pay for, the reality is that the consumer has repeatedly refused to pay the same for digital as they once paid for paper. So the fallout of this new policy may be strangling the low-end of the market where innovation has been strongest.

For those who do pay up, they're likely to mitigate costs by going back to buying the minimum coverage they need, or look at what else they can get for the money. Tyson Weihs, president of ForeFlight, says, "Let's suppose we all have to have raise prices \$100 to \$150. We're now competing with Jeppesen. None of us have the resources of a \$600 million company."

Of course, Jepp could make a case that the app makers have gotten a free ride, basically reselling the government's cartography work. The underlying data to make all these charts, which Jeppesen uses, will still be free. Weihs says ForeFlight is exploring using that data to make their own kind of enroute charts, but approach charts are out of the question. While some have speculated that companies like Jeppesen, or the bigger paper chart agents, influenced the FAA here, our investigation hasn't been able to turn up any evidence.

The smallest vendors have another problem: The billing structure of systems like Google Checkout don't allow them to raise the price unless the subscriber cancels and resubscribes. Avilution, a one-man company, sold those \$4.95 subscriptions through Google and can't simply raise the price.

Then, of course, there are the sites that are currently free. We spoke with Dave Parsons of RunwayFinder, who has already had a tumultuous road dealing with a patent-infringement lawsuit with FlightPrep. He says that even a few thousand dollars a year in additional burden would force him to shut down. Ironically, RunwayFinder gets about 1300 visits a month from computers within the FAA network. Lockheed Martin also uses his site. Perhaps they'll switch to using a flight planning Website Aeronav says they will offer to pilots for free—but with no downloads of the charts.

In October of 2010, the FAA cut costs on the paper side by requiring every \$5000/year (wholesale) in sales to maintain a contract. The move saved about \$3 million. That's an ominous precedent if the management of digital royalties gets difficult and they go looking for a way to trim the costs.

Our conversations with Smith left us believing she and her group genuinely want to corroboratively build a system that works for all. They are also developing products that could provide better source material for better apps. But when we asked what happens if the minimum dollars the FAA needs exceeds the maximum dollars the industry can bear, she couldn't tell us where that difference might get made up.

Putting all this together, there's little doubt in our minds that April 2012 will mark a sea change in our paperless cockpits. The days of \$20 U.S. coverage will end. Actually, it's already begun. In October of this year, Aeronav changed their policy to only publish the new (still free) digital products on the Website 24 hours before they become effective. Some app makers have switched to buying the products on DVD so they had time to process the data. Finding the players and getting income may have figured into that change. But others just adapted to crank out the updates in one day. Some admitting to publishing old data for a day or two until they could get everything up to date.

in retrofit glass cockpits with multiple pieces of hardware that communicate, but that each have their own database, costs can top \$3000/year if you want everything up to date. And you'd better dress warmly for updating all those systems in the winter. That, and get a ground power unit to keep your battery from dying.

Part of the problem is that even though a GNS 430W and an Aspen MFD essentially use the same navigational data, they encode the data differently. Jeppesen "packs" the data for each kind of device before selling it, which is why your GPS database won't work on your MFD.

Do you get a refund if the approach you paid for isn't in the database? Not if Jepp tells you about it. There's a link for chart notices when you download your Jepp NavData. In the bulletins, it will warn you of missing approaches. "We provide a system," says Mike Pound of Jeppesen Corporate Communications. "If it's in the chart bulletins, then it's part of the system." However, there have been cases where notes about missing approaches weren't in the notice. In that case, says Pound, the customer would be justified in asking for some kind of credit.

Watching your invoices and comparison shopping is now part of the digital aviator's life. Both Jepp and Garmin offer bundle discounts when you order multiple databases for a device (panel-mount or portable) or own redundant units, such as two Garmin GPS navigators. You can save hundreds, but we've gotten multiple e-mails about these discounts not being billed correctly. The companies always make it right, but you may need to sit on hold with customer service for a while to get the credit you're due.

Might a system like Aspen's tablet-based Connected Cockpit fix this? Not likely. Not yet anyway. Future systems might be built with updating and sharing more in mind. "If you go 20 years down the road, I think all aircraft will be on the internet," says Steve Podradchik of Seattle Avionics, the company that supplies government approach charts for Aspen MFDs, among other things.

While it couldn't happen with current avionics, future systems with a Wi-Fi link, such as Connected Cockpit has, could download their data automatically when they get within range of an FBO Wi-Fi. It's also true



Do you check the notices that come with each Jepp NavData update? We don't either. But lurking in there are warnings of approaches that didn't make this cycle—three to 12 of them every other month.

that the FAA still holds the keys to the spectrum reserved for microwave landing systems (MLS), which happens to be a great frequency for Wi-Fi.

Until then, the best you can do is either suck it up or pare down what data you can.

ARE THERE ALTERNATIVES?

We've explored ways to shave the cost and time burden of the digital world in various ways. One is clearly to let data expire. Terrain and obstacle data is an obvious candidate as it changes slowly. Garmin offers one-time updates instead of subscriptions here.

NavData is trickier, as currency is usually required to legally conduct GPS approaches. Check the flight manual supplement for your avionics to confirm what's legal, as you might be able to use expired data so long as that approach hasn't changed since the data publication cycle.

But now you're saving money at the expense of time checking all these details, or just gambling it won't matter even if it has changed. Many pilots we talk to would rather pay extra and not bother. Both Jepp and Garmin have offered more bundle pricing and one-time update options in response to customer demand. Also, NavData for only half the U.S. might save you \$70/year.

On the digital charts side, cheap iPad apps may have become their own worst enemy. The move to digital charts in the cockpit eroded the sales of paper products and motivated the FAA to change its sales policy to its charting agents in 2010. Smaller vendors largely disappeared, leaving mail order the only option for paper products for many pilots. See the side-

Jeppesen NavData CHANGE NOTICES highlight only **significant** changes affecting Jeppesen navigation data that may be currently stored in your aircraft navigation system database.
IMPORTANT: CHECK FOR NOTAMS AND OTHER PERTINENT INFORMATION PRIOR TO FLIGHT.

FOR NavData BASE
22 Sep 11 THRU 19 Oct 11 CYCLE 1110

GENERAL

"PROCEDURE NOT IN DATABASE" notes will be removed from charts as these procedures are added to the database. This effort will start with US RNAV Multiple Approach Indicator Procedures. A Multiple Approach Indicator Procedure is one which has a special designator such as a Y or Z in the approach title; for example, RNAV (GPS) Z Rwy 22. Not all avionics equipment is able to accept these added procedures. If a special designator is shown on a chart but does not appear in your avionics display, it is critical that you confirm which procedure manually paging through in your equipment and procedure.

TERMINAL

CALIFORNIA
KMCE, Merced Mun/Macro Merced, RNAV (GPS) Rwy 1 in cycle 1109. Procedure 1110 NavData.
KWLW, Willows-Glenn Co Willows, RNAV (GPS) Rwy 34 (R34) was not included in cycle 1109. Procedure will be included in cycle 1110 NavData.

FLORIDA
KFMY, Page Ft Myers, RNAV (GPS) Rwy 05 (R05) and RNAV (GPS) Rwy 23 (R23) and RNAV (GPS) Rwy 13 and RNAV (GPS) Rwy 31 (R31) were not included in cycle 1109. Procedures will be included in cycle 1110 NavData.
KMIA, Miami Intl
KHUL, Houlton Intl Houlton, RNAV (GPS) Rwy 5 (R05) and RNAV (GPS)-A (RNAVA) were not included in cycle 1109. Procedures will be included in cycle 1110 NavData.

MASSACHUSETTS
KGBR, Great Barrington Great Barrington, RNAV (GPS) Rwy 11 (R11) was not included in cycle 1109. Procedure will be

Rwy 09/27 length 13,000'; Rwy 09 displaced threshold 1350', LAHSO distance 9750', TODA & TORA 13,000', ASDA 12747', LDA 11397'; Rwy 27 displaced threshold 253', TDZE 8', TODA, TORA & ASDA 13000', LDA 12747'; Rwy 09 - N25-47-09.95 W080-18-53.34; Rwy 09 displaced threshold - N25-47-10.56 W080-18-38.50; Rwy 27 - N25-47-15.83 W080-16-31.26; Rwy 27 displaced threshold N25-47-15.7165 W080-16-34.0226.

GEORGIA
KFZG, Fitzgerald Mun

bar on pages 5-6 to see how the FAA is going after that lost income.

Jepp has felt the pinch of dwindling paper, too. Seven years ago, they printed enough approach charts to circle the equator 12 times: 2.5 billion sheets. That doesn't count their enroute charts, either. Last year, it was 1 billion sheets. This year should be about 800 million and with airlines going to digital plates, the total will plummet over the next few years.

Jepp tells us they aren't seeing dwindling subscriptions so much as a shift to digital. That started with pilots going with only digital charts on their MFDs and now many are letting the MFD subscription lapse, choosing to subscribe on the iPad instead.

This actually gives Jepp a market wedge. Jepp subscriptions to a small area of the U.S. can cost under \$100. But the full U.S. is actually on each iPad and can be unlocked remotely. Need more coverage for only 28 days? Call Jepp with a credit card number and you get it in 30 minutes or less. International data can also be added on a one-time basis.

ForeFlight has taken the leap to add Canadian coverage for an additional fee and has plans for all of North America. That's a gamble as interna-

tional data is expensive and more complex to manage, and is a shot across the bow of Jepp's market share.

HAD ENOUGH YET?

Another lurking issue is that anything built up from consumer-grade electronics has a limited lifespan. The GNS 430 design is 13 years old, but don't expect more than three years usefulness out of your iPad.

Here's a twist on that for owners of older Entegra MFDs. The system is based on Windows NT and can't recognize a USB stick over 2GB. You can't buy 2GB USB sticks new anymore, so as the sticks eventually fail (and they do) Entegra owners have to go hunting for replacements to upload data or download engine logs. E-bay anyone?

Our takeaway from all this is that the digital cockpit revolution has paralleled the personal computer: A Lilliputian army of hidden annoyances, unforeseen consequences and cumulative costs tarnish the leaps in capability and the potential for ease. You must become your own mechanic, making decisions to provide what you need, recognizing the limitations of what you get and hoping the costs don't swamp the benefits.



Bendix/King's Silver Crown Plus line, the KX155A, left, proved a capable box, but is limited to 28-volt airplanes.

In that interface, Aspen's ACU (analog converter unit) takes the KX155's and others' analog nav signal and converts it to a digital format for needle presentation.

Before they install any navcomm system, a good shop will eyeball the condition of the existing antennas. Antennas are generally neglected and as airframes age, deteriorated antennas will degrade both comm radio and navigational signal performance.

Fiberglass comm antennas with noticeable cracks and peeling of the outer layers are begging to be replaced. In fact, if you battle performance issues with an existing navcomm, it might make sense to replace antennas first (after bench test) which might also include coaxial antenna cabling. Expect some teardown and an invoice that could reach high triple digits, but the payoff could be worthwhile. In many cases, it's unavoidable.

If you're adding a navcomm that has glideslope, it might require upgrade of the navigational antenna coupler. This is a coaxial signal splitter that allows VOR, localizer and glideslope signal feed from a single antenna. Further, Garmin's SL30 receiver design requires a specialized splitter since it has a single nav antenna input to its digital receiver. Your installing shop works this out and you pay for it.

AVIONICS MAINTENANCE

Is the Navcomm Dead? Not Quite Yet

Not everyone needs or can afford a new color mapcomm, so there's still a place for venerable navcomms as second fiddle. Here's how to buy smart.

by Larry Anglisano

Back in the day, you were top dog if your panel sported dual KX155 or MK12D digital navcomms. These days, that same panel begs to be upgraded to all-in-one navigators while the standalone navcomm plays second fiddle as backup. But that doesn't make the navcomm radio extinct. For IFR flying, you'll want the second comm radio while a backup nav receiver could be handy for raw data crosscheck on an RNAV approach. For basic LSAs, a standalone navcomm might be the only radio you'll ever need.

Still, we're not sure dropping nearly seven grand for a new navcomm install always makes sense. That's what a brand new Garmin SL30 or KX155A install could cost. Instead, a good eye on the used market can uncover some bargains worth chasing. This includes reaching deeper into your

pockets to buy a used legacy GNS430. If you're a Narco owner, condolences. Those radios are toast.

THINK INSTALLATION FIRST

Whether the project includes replacing an ancient navcomm with something newer or adding one to a stark radio stack, there are some prerequisites that add to the bottom line and up the performance. Unless you have an Aspen PFD or HSI, the radio needs to pair with an indicator.

There's little flexibility here because there's little standardization. Don't expect an old Narco or ARC OBS indicator to work with a used KX155 you've found. On a higher level, don't expect a KX155 to work with Garmin's G500 PFD—the KX155 lacks the digital output needed to connect. We applaud Aspen for being compatible nearly across the board.

CHECKLIST

-  You can find reasonable deals on used KX155s on the market.
-  The most modern design in an aging product segment is Garmin's SL30.
-  Don't opt for a navcomm unless it fits a precise niche you have in mind.
-  No matter how good the deal, don't even look at a Narco radio.

On the topic of add-ons, the install of a navcomm could be a good time to upgrade the audio panel since a good portion of the radio wiring is interfaced through the panel.

Understand, too, that not all navcomm installs are created equal. If the project requires removing an ancient radio for a new model, it's prudent to ask if the job includes all new wiring or if the new radio will be connected with the existing harnesses. A quick and easy install is to chop the old connector and tie it in with the existing wiring. But if this wiring is non-shielded—which is what you'll find in many old panels—performance could suffer. And, if the new radio is smaller than the old one, do you want a restack or can you live with an awkward gap between radios? Don't assume fancy sheet metal cosmetic work is part of the job. Ask.

CHOICES: BENDIX/KING KX155

The KX155 is an icon that remains in the Bendix/King product line. It's a lively seller on the used market, but after so many years of production, there are various vintages to choose from. From our experience, older serial-numbered units with traditional circuit design (as opposed to newer units with surface-mount board design) seem to be good performers, particularly on the nav receiver side. However, failures of the gas discharge displays are routine maintenance events that tally a shop invoice of around \$400 to \$500. Be sure the one you pick has a healthy display.

Frequency channeling problems aren't uncommon, the result of dirty or eventual failure of the gold-plated channeling switch contacts. The KX165 model has the integral VOR converter required to drive analog HSIs.

When Cessna started building aircraft again in the late 1990s, Honeywell launched what looked to be the KX155 replacement through the Silver Crown Plus series. This birthed the KX155A and KX165A. These models had some growing pains and reliability issues earlier on. They bring limitations to the aftermarket



Even many older airframes, like the antique TravelAir, above, have been upgraded with GNS430 mapcomms. Legacy units are a good buy. Don't forget the cost of indicators. The Bendix/King KI208, left, won't necessarily play with the radio you have in mind. The SL30, below, was originally developed by UPSAT/Apollo and remains the best full-featured choice for a new dedicated navcomm.



because of their 28-volt input requirements. On the plus side, they sport a more contemporary-looking bezel and useful features that were missing in legacy KX155s. This includes flight timer, frequency memory and recall, plus nav radial display.

Like vintage KX155s, the units are built with and without integral glideslope receivers. If you're also shopping the standalone used GPS market, the 155A units support a KLN94 feature Bendix/King calls Quick Tune—an RS232-driven interface that plucks frequencies from the KLN94 database based on your position so you don't have to search for and load them

yourself. It works well and adds a bit of automation to otherwise ho-hum functionality. It also adds more wiring effort to the installation.

Pricing for used KX155s is all over the board, with non-glideslope and 28-volt KX155s selling for as low as \$1200 while 14-volt and glideslope-equipped flavors demand \$2500 and up, not counting indicator or install kit. List pricing for a factory-new KX155 with glideslope is \$4560 and the KX165A is \$5600.

But that's not where it ends. A used KI209 CDI can sell for around \$900 while a new one tops out at nearly \$1700. Speaking of CDIs, we found

THE USED GNS430 OPTION



If the estimate for a new standalone navcomm option will total \$7000 or more, at least sweep the market for a used GNS430. But this takes a good eye, cooperation from a shop and the right timing. Given the growth potential and capability it brings to the panel, it's an option that shouldn't be overlooked. If you plan to always fly VFR over short distances, a reliable navcomm system and portable GPS should get the job done. But if IFR training and an expanded mission that includes lots of cross-country flying is in the cards, you should be thinking about a panel-mounted IFR GPS and a navcomm.

With Garmin's new GTN series making market inroads, dealers are handing a lot of used, non-WAAS GNS430s. One shop we know had one on hand for which the owner wanted \$4000. After some haggling, adding a used OBS indicator plus installation, the bottom line for the system was \$8100. While that was more than the proposed KX155 navcomm installation, it made more sense in this airplane, which was intended as an all-weather transportation machine. And the legacy GNS430 can always be upgraded to WAAS status as the budget rebounds.

It's odd that the low-end, VOR-only KX125—a unit with an economy LCD display and integral CDI—has a price nearing \$5000. In our view, this makes little sense since the unit doesn't have glideslope.

GARMIN SL30

The Garmin Slimline SL30's claim to fame includes a digital DSP signal

processor. DSP technology eliminates the unstable needle scalloping found with analog nav receivers. Scalloping navigation needles can induce autopilot S-turns and the SL30, with its digital receiver, solves that slop. The catch with a standalone SL30 interface is the need to buy the \$2395 Garmin MD200-306 OBS indicator, a high-quality indicator that's made by

Mid Continent Instruments. This, coupled with the unit's \$4395 price tag, drives the bottom line up in a hurry. Better are interfaces that already include an Aspen or Garmin PFD or an HSI, of course.

Thanks in part to the DSP circuitry, the SL30 displays digital To/From, automatic display

of station ID by encoding the received stations Morse code and digitally decoded OBS setting on the unit's display. It has a built-in glideslope receiver and an 8-watt, 760-channel comm transceiver that features automatic emergency frequency call-up, frequency storage, and National Weather Service broadcasts.

Aside from the benefits of the SL30's panel-saving, slim footprint that measures 1.3 inches high the unit comes with a unique operating logic. One feature we've grown fond of (that's also standard in the standalone SL40 Comm transceiver) is the ability to monitor the tuned standby frequency at a lower volume than that of the active frequency. This is much like having dual nav and dual comm functions in a single box. It also allows for listening to ATIS, for example, without having to leave the active frequency. There's even a serial interface for connecting to some Garmin portable GPS units for frequency automation.

TKM DIRECT REPLACEMENT

For quick and easy replacement of the old KX170-series, ARC/Cessna radios and some Narco models, you could drop in a TKM radio. Veteran manufacturer TKM/Michel Avionics in Scottsdale has the market covered with the MX-series slide and fly replacements that sell for around \$1600 and won't require mods to the wiring.

These are digital, 760-channel navcomms with the ability to channel an existing remote glideslope receiver. There's the Bendix/King replacement MX170C (not to be confused with the MAC1700 digital conversion to the KX170B front end), the ARC-replacement MX300/385 series radios and the MX12 if you still have the tube-driven Narco MK12A. The MX12 bypasses the remote power supply with its own solid state supply.

TKM sells overhauled and rebuilt products on their eBay store. These discounted radios carry a one-year warranty and are supplied with FAA 8130-3 airworthiness paperwork.

The TKM/Michel MX series, left, was a popular slide-in replacement for the KX170 series. They're a step down in performance from the KX155, but adequate for many.



Despite some grumbling from a few shops and end users, we recently dealt with TKM on a repair and found the factory service to be quite good and reasonably priced. Our only beef was the length of time it took to get the repair accomplished and the MX385 back from Scottsdale.

CONCLUSION

There's no question the standalone navcomm radio is a dying breed, evident by the lack of fresh models in the market and the lethargic sales of existing products. The popularity of integrated all-in-one navigators and the widespread need for IFR-approved GPS has a lot to do with this trend.

If you're in the market for a new navcomm, either for primary or backing up an integrated navigator, our top pick is the Garmin SL30. We think it offers reliable and high-end comm and nav performance with a host of useful features packed in a space-saving chassis. If you have the space and need a reliable secondary backup, we think picking the best from the used KX155 litter makes the most sense. A plus is that the KX155 works well with Aspen PFDs, easily interfacing electronically as nav 2.

Last, before making a move on any navcomm upgrade, solicit a quote or two for a used GNS430. We think the right unit will offer a better solution with sizeable long-term growth potential and functionality, something a traditional navcomm might not offer.

Larry Anglisano is Aviation Consumer's avionics editor. He works at Exxel Avionics in Hartford, Connecticut.

CONTACTS

Honeywell/Bendix King
www.bendixking.com
877-712-2386

Garmin International
www.garmin.com
800-800-1020

TKM, Inc/Michel Avionics
www.tkmradio.com
800-233-4183

GOT NARCO? FUGGEDABOUT IT

When Narco Avionics recently fell into bankruptcy and closed the doors after 65 years, it was hardly a shock or huge loss to the industry with one exception: It abandoned the support of MK12D navcomms that still remain in many radio stacks.

The venerable MK12D was produced in many variants and was once hugely popular for both retrofit and OEM equipage. Narco's once-loyal following was well-deserved and the digital MK12D had much to do with the success. It was a good performer, offering similar reliability and performance as the competing Bendix/King KX155, although with a larger vertical footprint. Logically, major avionics upgrades often include shuffling an existing primary MK12D to the secondary navcomm position for use as backup to a new GNS430, for example.

Not unlike the KX155, Narco's MK12D was prone to display failures by virtue of the high-voltage-drive theory behind gas-discharge display technology. If you've owned a MK12D, you'll likely recognize the symptoms that point to the shotgun replacement of a pricey display assembly to include missing display segments plus brightness and dimming problems.

A trip to the shop where you forked over a cool \$400 to \$500 easily solved that hassle, although Narco made the experience difficult in the later years by cutting off parts supply to the dealer network. This alienation of dealers did major damage to the company's reputation and brand loyalty.

Now, shops and owners scramble and struggle to find

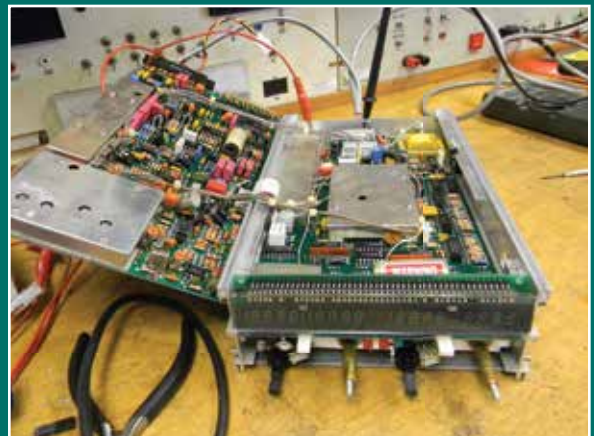
replacement parts for broken MK12Ds and while some of the electronic parts that are found under the cover are generic, many can't be substituted including the brand-specific display.



If you own a MK12D (or any later-vintage Narco radio) of any kind and aren't in a position to upgrade, you might consider sweeping the used market for spares that your shop can mine for parts.

We searched our used equipment sources and found a scarce supply of MK12D radios in any condition and model, including the MK12D/R, which is designed as a plug-in replacement for ancient MK12-series navcomms and the MK12D Cessna replacement units that slide into ARC installs.

We think Narco's demise will force-feed upgrades which in turn will replenish the availability of spare units for swap-out or for parts salvage, at least for the short term. But the handwriting is already on the shop wall as the orphaned MK12D navcomm in your panel is obsolete and universally considered a throw-away.



Rotax Overhauls: Simple Options

The good news is that you probably won't need cylinders, but you'll always get a new crank. Buying a factory-new exchange is sometimes a practical choice.

by Paul Bertorelli

When Diamond introduced the two-seat Katana to North America in 1995, it might as well have been powered by alien technology. The 81-HP Rotax 912F3 was about as familiar to aircraft mechanics as brain surgery is to a plumber.

But all that has changed. Rotax has made serious market inroads and with the advent of light sport aircraft, it has become more familiar to maintenance shops and an overhaul infrastructure has sprouted.

In North America, there are two sources for full overhauls. Rotech Research in British Columbia owns the North American territory and in Sebring, Florida, Lockwood Aviation Supply is a Rotech dealer for overhauls. Both serve the U.S. market. There are other U.S. service centers, but none have the capability of splitting cases, although they can

do heavy repairs up to building up a short block. For this report, we visited Lockwood and spoke to Rotech.

THE BASICS

Although the Rotax 900-series got a chilly reception in the 1990s because of its weirdness, it's really not that weird. It's just that it has more in common with a water-cooled motorcycle engine than a traditional air-cooled aircraft engine.





The 912 engines are four-cylinder powerplants now available in 80- and 100-HP versions, with the turbocharged 914 producing 115 HP. They have air-cooled cylinders with watercooled heads and a pair of Bing constant velocity carburetors mounted in downdraft manifold configuration do the fueling. The Rotax is remarkable for its high power output at light weight, with typical installations weighing about 125 to 150 pounds.

It delivers the power through high compression (9 or 11 to 1) and high RPM—typically 5500 RPM—re-

Rotax 912s have become all but the standard powerplant for light sport aircraft, with some inroads into the experimental market. The market for overhauls is developing, albeit slowly.



CHECKLIST

-  Although they have their foibles, the Rotax engines seem to be making TBO.
-  Cylinders rarely fail and some are on their third overhaul.
-  Unlike a Lycoming or Continental, the owner doesn't have to make many choices.
-  There's no aftermarket supply chain, so Rotax prices are what you pay.

duced to prop range through a 2.27:1 gearbox. For ignition, the Rotax engines eschew traditional mags in favor of a dual capacitive discharge design that's operated by a rotor/stator arrangement behind the flywheel. No ship's power is required to run it. It's not a closed loop system, but it does have electronic advance. The most recent 912s have 2000-hour TBOs, but earlier models, with improved crankcases, are limited to 1500 hours.

OVERHAUL CHOICES

Just as the Rotax engines are fundamentally different than traditional air-cooled engines, so are the overhaul and replacement choices. In reality, the decision tree for a Rotax owner seeking a replacement engine is simpler than it is for a Continental or Lycoming owner. The choices are essentially two and will be guided by price, in most circumstances. Technically, a third option is heavy repair, but we're focusing on overhauls here.

The top money choice is a factory-new engine with everything new: cases, crank and camshaft, gearbox, cylinders, ignition system and carburetors. What the customer pays for this depends on the condition of the core submitted for credit, says Rotech's Mark Paskevich. That much of the equation is similar to a Lycoming or Continental.

What constitutes a "good" core will vary, but Paskevich says at the top end, a core is worth about \$3500 or a little more, but at the bottom end, it may be worth nothing.

ing. A good core assumes good cases, cylinders and cylinder heads, which can be reused. Crankshafts aren't reused in new engines or overhauls. At Lockwood, Phil Lockwood told us cores are typically worth \$2000.

Typical retail for a ready-to-go 912-series engine is \$19,600 (100 HP) and \$17,621 for the 80-HP version. Less the core, that's \$17,600 for the 100-HP version on the high side or \$16,100, using Paskevich's peak core value of \$3500.

In addition, the removal and reinstallation will typically take a day or a little more—call it another \$800. To that, add any costs for overhauling or replacing the prop. This price doesn't include any prop work, which may or may not be necessary.

OVERHAULS

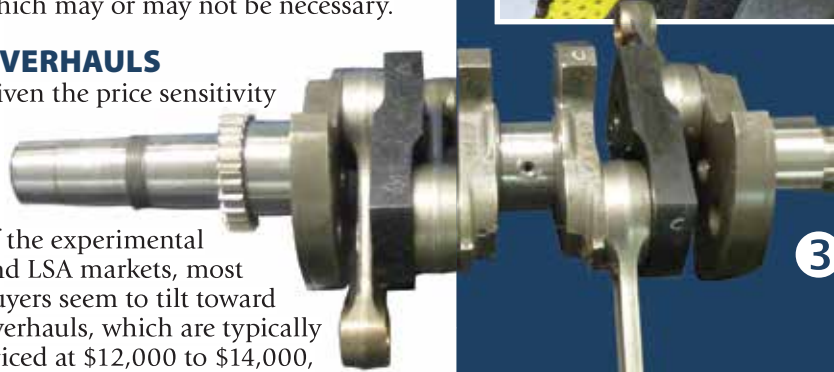
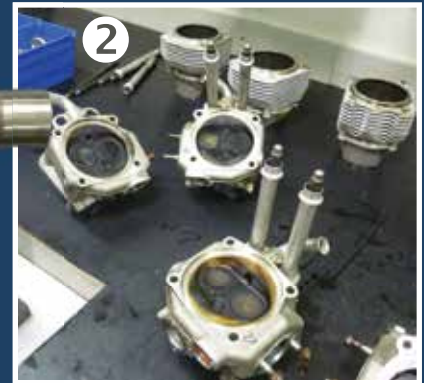
Given the price sensitivity

of the experimental and LSA markets, most buyers seem to tilt toward overhauls, which are typically priced at \$12,000 to \$14,000, depending on what parts are needed. If your core is worth a couple of grand, a factory-new engine will cost about \$17,500, a \$4000 or 23 percent upcharge against the overhaul. Compared to Lycoming and Continental, the price Delta between overhauled and factory new on a Rotax is much less.

For instance, even a modest engine such as Lycoming's O-320 costs nearly 70 percent more to buy new than to overhaul. Exchanges, says Paskevich and Lockwood, are good choices for owners or businesses who don't want the downtime of an overhaul—at least a week—and who can afford the upcharge. And unlike traditional engine overhauls, where there is some latitude in what constitutes an overhauled engine, Rotax seems to keep a shorter leash on its field overhauls.

Are any options of what an owner can pick and choose? "There really aren't," says Lockwood. Each overhaul starts with a kit that includes a new crankshaft, valves, rings and all the seals and gaskets. The camshaft is replaced on condition, as are other parts, including the ignition com-

INSIDE A ROTAX



1 Like a Lycoming or Continental, the Rotax has a split case, but no accessory case and a gear reduction drive on the front. **2** Cylinder heads and barrels are separate assemblies held together with bolts rather than threaded joints. **3** Crankshaft assembly is not a single forging, but three pieces pressed together with single-piece connecting rods. **4** Rear of engine houses stator for alternator and ignition coils.



Reduction gearboxes have been troublespots in many automotive engines converted for aircraft use, but evidently not in the Rotax. It's common to reuse gears through at least one overhaul. Cylinder, at left, show signs of heat stress, but the jug itself is reusable. The head

that attached to it, however, is heat-warped and in need of replacement.



Both shops report seeing cylinders routinely make TBO and some are on their second go around. We examined one set of used cylinder whose bores were smooth, with no sign of stepping.

The same can't necessarily be said of cylinder heads, although replacement of them is relatively rare for engines that haven't been abused.

Upgrading the case halves to the 2000-hour design is an option, but isn't always economical. Paskevich says it's done on a case-by-case basis (pardon the pun), but a new engine may make more sense.

"A lot of customers seem to figure the 1500-hour cases will get them through the rest of their flying career," says Paskevich, "so they don't bother with the upgrade."

Each overhaul kit comes with replacement exhaust valves; the intakes are changed on condition. The same is true of pistons. They are not considered standard replacement

items, although the rings are. For as impressive as the Rotax's overall durability is, one particular component impressed us more than any other: the gearbox. Given all the grief suffered by Thielert in trying to make a durable gearbox for its diesels, we expected similar problems with the Rotax gears. But, says Paskevich, these are routinely cleaned up, inspected and put back into service in a freshly overhauled engine.

One potential wear item is the discs in the overload clutch, which protect the gearbox and prop against damage from a prop strike. If an engine is run on 100LL without frequent oil changes, these discs can become lead-fouled and will need replacement.

This system is essentially a captive, fixed motorcycle-type clutch that remains engaged in normal service. If the prop encounters an obstacle, it slips and prevents the torque from damaging the crank or at least avoiding the need for an expensive teardown, a big plus for owners.

Although neither the Rotech mothership nor Lockwood are doing high-volume overhaul trade, the number of Rotax engines in service continues to increase at a steady pace, so we suspect neither business will suffice for customers.

Paskevich points out that shipping engines around the country and cross border is not a problem; they take care of cross-border paperwork. Rotech also maintains a stock of used parts to give owners more options.

Finally, Rotax appears to have done what it didn't do when the engine appeared on the original Katana in 1995: built out a service network that actually works. And with periodic training classes for owners and mechanics, Rotax familiarity continues to improve.

ponents and gearbox parts. The two Bing carburetors are overhauled.

When Lockwood's Dean Vogel heaved an old crankcase up on the overhaul bench, we could easily see why it's spec'd for new only. Two of the counterweight cheeks were visibly misaligned, probably the result of detonation from low-octane fuel. "It's not likely to break," Vogel said, "but it will twist. We see this from time to time."

What about cylinders? Can they be bored or reconditioned? Nope, says Paskevich, the Nikasil coating precludes that, but it wears so well that cylinder replacement is a rarity.

AC TV

For a podcast with Lockwood's Dean Vogel on what to look for when buying a used aircraft with a Rotax

engine, scan the tag below with a mobile app or log onto www.avweb.com/podcast/



CONTACTS

Rotech Research Canada, LTD
250-260-6229
www.rotech.ca

Lockwood Aviation Supply
800-527-6829
www.lockwood-aviation.com

Garmin's 796 vs. iPad: Purpose-Built Still Wins

The 796 is no "iPad killer," but it's the most complete and capable solution. The iPad options offer a bit less, but can cost a lot less. How much polish do you need?

by Jeff Van West

Imagine a NASCAR-style race where only one car is built from the ground up by a pro team with heavy corporate backing. The rest of the field consists of modified street machines borne of garages where three gearheads worked through the night and drew straws to see who was going to drive. Would it be a surprise when the pro-team won?

The surprise would be if the little guys even came close, yet that's just what's happening with aviation apps for the iPad and the latest aera 796 GPS from Garmin. We don't think any aviation app running on an iPad can truly supplant a 796. But not everyone needs the hottest vehicle or is ready to pay the price that comes with it.

HARDWARE

The 796 was built for the cockpit. Its size was pegged to fit between the handles of most aircraft yokes in

either portrait or landscape configuration, yet still be big enough for presbyopic eyes to read an approach plate. The iPad can fit most yokes in portrait mode, but it usually blocks part of the panel. It's more of a lap device. Garmin kept the 796 thin enough to work that way as well.

The backlight on the 796 can run from a bright that bests the iPad's glare-prone screen to so dim it works with night vision goggles. An aviation-grade GPS is built in. XM weather requires only the antenna, as power and receiver are also in the 796. Contrast that to connecting up external GPS units and weather receivers to the iPad and spaghetti tangle of power cables plus time






spent pairing up devices over Wi-Fi or Bluetooth.

Charging cables are built into the 796 mount, and you get a dock for the desktop for easy updating. You can wire it to Garmin panel-mount GPSs for automatic flight plan cross-fill and use it to drive experimental and LSA autopilots.

Hands down hardware winner over the iPad? Not so fast. The bigger iPad screen is a selling point for some. The iPad is thinner and lighter. The iPad's battery lasts longer for equivalent operations. The 796 runs four to six hours; an iPad can do five to eight, depending on wireless and backlighting.

CHECKLIST

IPAD SOLUTIONS




-  For iPad owners, or without datalink, iPad options are much cheaper.
-  Small, innovative companies constantly expand iPad capabilities.
-  Many yearly data subscriptions offer a choice for every budget
-  Powerful flight-planning and productivity tool outside the cockpit
-  Piecemeal hardware solution can be frustrating.

We think the only iPad app that can seriously compete feature-to-feature with an aera 796 is WingX (including a split screen and weather). Even there, some features are so different your personal preference may be the most important deciding factor.



CHECKLIST

GARMIN AERA 795/796

-  Purpose-built hardware and software generally outperforms iPad rivals.
-  Datalink weather really costs about \$300 more than an iPad solution.
-  Yearly data subscriptions \$100-\$300 more than iPad.



FEATURE FOR FEATURE

Here's the most even-handed chart we could muster putting popular iPad apps head-to-head with the aera 795/796. We'll rate how apps compare to each other in a later article.

	AERA 795/796	FLIGHTGUIDE	FLTPLAN.COM	FOREFLIGHT	JEPPESEN FD	PILOT MYCAST	SKYCHARTS	WINGX
SYNTHETIC VISION	YES	NO	NO	NO	NO	NO	NO	YES 1
SPLIT SCREEN	YES	NO	NO	NO	NO	NO	NO	YES
DATA-DRIVEN MAP	YES	NO	NO	YES	YES	LIMITED	NO	YES 2
FAA VFR CHARTS	SECTIONAL, WAC, TERMINAL	SECTIONAL, WAC, TERMINAL	SECTIONAL, WAC, TERMINAL	SECTIONAL, TERMINAL	NO	SECTIONAL, WAC	SECTIONAL, TERMINAL	SECTIONAL, TERMINAL
FAA IFR CHARTS	HI AND LOW	HI, LOW, AREA	HI AND LOW	HI AND LOW	NO	HI AND LOW	HI, LOW, HELO	HI AND LOW
APPROACH CHARTS	GEOREF'D FAA OR JEPPI	GEOREF'D FAA	FAA	FAA (GEOREF OPT)	GEOREF'D JEPPI CHARTS	GEOREF'D FAA	FAA	FAA (GEOREF OPT)
FLIGHT DATA ON MAP/CHARTS	YES	YES	NO	YES	YES	YES	YES	YES
AIRPORT DIAGRAMS	SAFETAXI, GEOREF'D	PROPRIETARY, GEOREF'D	NO	BASIC AFD 3	JEPPI CHARTS, GEOREF'D	SAFETAXI, GEOREF'D	NO	BASIC AFD 3
ADS-B WEATHER	NO	COMING	NO	COMING	NO	NO	NO	YES
XM WEATHER	YES	COMING	NO	YES	COMING	COMING	NO	COMING
INTERNET WEATHER	NO	YES	YES	YES	COMING	YES	YES	YES
TRAFFIC DISPLAY 4	ZAON OR TIS-B	ZAON	NO	NO	NO	NO	NO	ZAON
VNAV	YES	YES 5	NO	NO	NO	NO	NO	NO
TFRS	YES (XM ONLY)	COMING	NO	YES	COMING	YES	YES	YES
TERRAIN DATA AND WARNINGS	SYN VIS, MAP OVERLAY, PROFILE, ALERTS	NO	NO	NO	MAP OVERLAY	NO	MAP OVERLAY	MAP OVERLAY, SYN VIS
FUEL PRICES	NO	YES	NO	YES	NO	YES	NO	YES
PRICE WITHOUT DATALINKWEATHER 10	\$2199	\$1000	\$800	\$950	\$2040	\$920	\$820	\$1205
PRICE WITH DATALINKWEATHER 10	\$2499(XM)	\$2224 (XM) \$1950 (ADS-B)	N/A	\$2174 (XM)	TBD	\$2144	N/A	\$2425 (XM) \$2155 (ADS-B)
SUBSCRIPTIONS								
FULL U.S. NAV DATA	\$295/YR	\$129/YR 6	FREE	\$75/YR	\$899/YR 9	\$120/YR	\$20/YR	\$100/YR
ADDITIONAL (AOPA OR OTHER) DATA	\$195/YR	PROPRIETARY, INCLUDED	FREE	INCLUDED	INCLUDED	INCLUDED	N/A	INCLUDED
GEOREFERENCING FOR APPROACH AND AIRPORT CHARTS	\$200/YR 7	ADD \$70/YR	N/A	ADD \$75/YR	INCLUDED	INCLUDED	N/A	ADD \$75/YR
FUEL PRICES	N/A	INCLUDED	N/A	INCLUDED	N/A	INCLUDED	N/A	ADD \$30/YR
TERRAIN/OBSTACLES	\$150/UPDATE		N/A	N/A	INCLUDED	N/A	INCLUDED	INCLUDED
TOTALSUBSCRIPTION	\$500/YR 8	\$200/YR	FREE	\$150/YR	\$899/YR	\$120/YR	\$20/YR	\$405/YR 1,9
ADDITIONAL DATA?	SOME WORLDWIDE DATA AVAILABLE FOR A FEE	CARIBBEAN DATA INCLUDED	FREE CANADIAN APPROACH CHARTS	CANADIAN DATA FOR A FEE, LIMITED WORLDWIDE DATA INCLUDED	WORLDWIDE DATA AVAILABLE FOR A FEE	N/A	N/A	N/A

1: Syn vis costs \$100/year extra. Optional true AHRS input for \$795. 2: Data can be layered on top of charts as well. 3: If a FAA airport diagram exists and approach charts are georeferenced, then that diagram is georeferenced. 4: Zaon traffic requires separate receiver. TIS-B weather requires Mode-S transponder and connection. 5: Requires \$299 Wi-Fly GPS receiver. 6: Less expensive VFR data plan available or coming. 7: Actually, georeferencing is free, but current approach charts require \$200/year subscription for FAA or \$899/YR for Jepp. 8: Bundle discount applied. 9: Includes SynVis. 9: Continental U.S. only. 10: Includes \$800 for iPad2, case, GPS, RAM mount and 12v/24v charger, plus one year of data. XM subscription not included.

The biggest point for the iPad, however, is that it does a lot more than just fly. Even if you only use it for aviation, it's a powerful preflight tool. The 796 is not. And, of course, you might already own an iPad. That knocks several hundred dollars off the total cost.

SOFTWARE

Here's where the two systems really diverge, and it's probably the right place to look if you're trying to decide between investing in a 796 or being assimilated into the merry iPad-toting masses.

Garmin has been honing their aviation GPS software for over 20 years, and it shows. The operating logic mimics other aera GPS units and the GTN panel-mount avionics. Dedicated direct-to and nearest touchpoints do exactly what anyone who's used an aviation GPS in the last 10 years expects.

While the 3D view is the flash of the 796, it's the rest of the software that gets the job done in the real world. The 796 has all the major bases covered here: a high-resolution moving map with datafields, airport information, flexible navigation (flight plan, direct-to and nearest), vertical navigation, georeferenced charts and approach plates, taxi diagrams, pop-up terrain warnings and datalink weather if your subscription is paid up. The only iPad app that comes close to hitting all these points, in our opinion, is WingX.

"Our software also won't automatically delete your data," says Jim Alpiser, Director of Aviation Aftermarket Sales for Garmin. While said tongue-in-cheek, he's got a point. Update 5.0 of the iPad software included a change that let the device delete data—like downloaded charts—from the iPad automatically (5.0.1 is fixing this). Conflicts and crashes are part of life with the open platform of the iPad. It's astoundingly stable considering, but you will see programs lock or quit if you fly long enough with an iPad. You might never see that even with thousands of hours behind a 796.

Open software and an open market can offer huge plusses, and is why the iPad may be a better choice for some users. The first is development speed and variability. Our chart points out that WingX doesn't

have VNAV. We'll bet it does within a month after Hilton Goldstein of WingX reads this article. All the major apps have either added or are testing major new features in response to user input. Competition drives this because it's easy for a user to try several apps and stick with the one they like best—or change when the find a new one.

The open platform also means choice. We noted in October that one of the best new features of the 796 was in charts. But this is where the iPad is strongest—better than the 796 in our view. We pegged ForeFlight as our Gear-of-the-Year champion last summer for its terrific user interface, and much of the iPad market seems to agree. But if you prefer a split-screen setup, WingX might be your tool. If you want customized airport data and georeferenced taxi diagrams at 5000 U.S. airports (rather than the about 1000 of Garmin SafeTaxi), you can try Flight Guide. Just need some basic charts and the occasional approach chart? Try SkyCharts for cheap data or even Fltplan.com's app for free.

Ongoing cost is another turn where the iPad pulls ahead. If you want current data for everything, the 796 will cost you \$500 per year. Solutions for the iPad start at zero dollars and top out at \$400 (excluding Jeppesen data). Aa middle ground of all the essentials but none of the frills is only \$75 a year.

Tyson Weilh, President of ForeFlight, stressed another place where the rapid development on the iPad matters: "2012 will be a tipping point for ADS-B adoption. I think we will play a role in making that a reality." WingX already offers ADS-B weather and FlightGuide is hoping for late winter. ForeFlight hints theirs will be in the spring, along with some new hardware options. Garmin won't confirm plans to make ADS-B weather available on an aviation portable, but subscription-free weather on the iPad will probably force their hand lest they get left behind.

DECISIONS

The best help we can offer in trying to decide which way to go is ask:

CONTACTS

Garmin International www.garmin.com 800-800-1020	Jeppesen www.jeppesen.com 800-353-2107
Flight Guide www.flightguide.com 800-359-3591	PilotMyCast www.digitalcyclone.com
FltPlan.com www.fltplan.com	Sky Charts Pro www.skycharts.net
ForeFlight www.foreflight.com	WingX www.hiltonsoftware.com

What do I want this device to do?

If your primary need is current charts with your GPS position and airport data, we think an iPad just makes sense. Even the cheaper 795 without datalink weather would be overkill. If your needs extend to flight planning, again the iPad would be our recommendation. If you want charts and a basic GPS navigator but don't need datalink weather, the iPad solutions are significantly cheaper (especially if you already own an iPad), if a bit less capable than the 795/796.

However, the fat middle of the potential buyers are probably looking for a device that works well as a navigator, a chart library, a weather source and an airport database. Now the costs to acquire and keep current close to within a couple hundred dollars. Pay more and you get the perks of a purpose-built machine. Pay less and you've got a bit more user hassle with hardware, but you also get an iPad, which has all sorts of uses outside the cockpit. Considering that 796 sales are outstripping Garmin's projections by 50 percent, quite a few pilots seem willing to pay the extra.

For the still undecided, Alpiser offered this option: "There may be an attractive opportunity to have both. People love redundancy."

Or you can wait a week. Little companies adapt quickly. With new consumer hardware hitting the market all the time, Garmin will have to keep one eye in the rearview mirror if they want to keep their lead for the most complete and capable aviation portable.

Rain-Repellent Cleaners: All Kleer, LP Are Tops

Cleaners and polishes don't always do exactly the same thing. In this report, we're looking at a half dozen that claim at least some rain repellancy.

Single-engine airplanes don't have windshield wipers and neither do a lot of twins. While it's true that prop and airblast blows the water off, that process can use a little help and that's where windshield cleaners and polishes come in.

There are literally many dozens if not

hundreds of these products, some intended for glass, some for plastic and some both. To keep this inquiry under control, we're testing only those cleaners that claim some degree of rain repellency, on the theory that if you're going to clean your windshield, you might as well do it with something that makes it easier to see through when it's raining. This is especially helpful at night when taxiing to and from runways.

A few aircraft windshields are made of glass, but

generally only those found in pressurized airplanes or with heated windshields. The vast majority are made of cellcast acrylic plastic, which is cast in sheets and thermoformed to shape. Acrylic is tough stuff and capable of resisting some stiff whacks of the sort a bird strike can deliver. It's also resistant to damage from many chemicals, but certainly not all chemicals, which is why so many cleaners and polishes are formulated specifically for acrylics.

The cleaners we reviewed here break into two broad categories, liquid solvent-type materials and paste materials which appear to have less aggressive solvents but work as slurries to remove dirt and, especially, bug smats.

To some degree, all of these products contain silicone or wax materials that do the sealing, forming a slick layer that's supposed to repel water and in some cases snow and frost. Some are just polishes and some are combination cleaners and polishes.

To test these materials, we





prepared a new acrylic sheet for each one, soiled it with crankcase oil and dirt and used the cleaner as directed. For bug removal, we used the products on a motorcycle fairing after it had been run 200 miles through the Everglades at night. (Yuck.)

RAIN-X

The best-known rain repellent is Rain-X, an automotive product intended for glass, not plastic. Although owners use it on aircraft windshields with good effect, it's not recommended for plastic, according to the company that now makes it, ITW Brands.

Spokesperson Lauren Raymond told us that Rain-X contains ethanol, acetone and isopropyl alcohol, plus silicone and perhaps other materials.

The major no-no here is acetone, which degrades acrylic by fogging or softening it. However, Raymond told us not all plastics are affected, which may explain why owners who use the stuff seem to get good results.

On our test panels, Rain-X did okay getting the oily mess cleaned up, but it was less impressive with bug removal. Despite its high solvency, it took effort to dislodge the baked-on critters. Its water repellency is good, but not the best. We also tried Rain-X Extreme Clean, which is intended for plastic. It works well with bugs, but claims (and offers) little rain repellency. Rain-X costs \$4.98 for a 3.5-ounce bottle.

RAIN AWAY

Rain Away (\$5.95 for 4 ounces) claims to be produced for aircraft use and is thus safe for plastic. It smells a bit like Rain-X, which is explained by the fact that it contains isopropyl alcohol, but no acetone. It's applied

similarly: rubbed on and allowed to form a haze, then wiped off. In performance, it's quite similar to Rain-X in removing the oily mess from our sample panels. Ditto with the bugs. It will get them off, but it takes work. Water repellency is similar to Rain-X.

210 PLUS

This product bills itself as a cleaner, polish and scratch remover. It's a paste-type material that's runny enough to dispense through a small nozzle. In general, the paste-type materials are a little messier to use than the water-clear solvent products. You'll need two clean, dry rags to complete the job.

210 Plus did a good job on the cleanup, but its rain repellency is only so-so, in our view. It sells for \$11.75 for 15 ounces.

PLEXICLEAR

This is a Cessna-branded product made under contract by Jetstream and retails for \$9.95 in a 16-ounce spray bottle, making it one of the better values on volume alone.

It's intended specifically for aircraft windows and is a blend of ethanol and other components not named on the product's Material Safety Data Sheet. It claims to be both a cleaner and polish capable of producing a "microscopic, high luster soil retarding and water repellent finish."

Does it? It seems to. It's available in both spray bottle and aerosol and we like one thing about it: You wet the surface first, then

If you think rain repellents don't work, the two photos above should convince you otherwise. Left panel is untreated, right panel is the view through plastic treated with LP's Polish and Sealant. Paste cleaners, below, are messy but do a good job at removing bugs.



A BETTER WINDSHIELD TO BEGIN WITH

For an aircraft stored outside, the glass gets sandblasted with blowing dust, bombarded with UV and IR solar radiation and exposed to airborne chemicals that degrade the material.

Replacements are made of the same stuff as the original—cellcast acrylic. Twenty years ago, there was more U.S. competition in this field than there is now, but the primary supplier in the U.S., Polycast, is still pitching improved products. One of its latest has become the material of choice for windshield replacement. It's called Polycast SC and although it looks like conventional acrylic, SC sharply reduces the transmission of infrared wavelengths, keeping the cabin as much as 20 degrees cooler on the ground and in the air.

This in turn reduces degradation of interior components such as upholstery and the tender parts of avionics. However, ultraviolet is the larger problem for bleaching out and degrading upholstery and although SC helps there, too, the best defense remains an exterior cover, which blocks UV and protects the acrylic from wind-borne abrasion. LP Aero Plastic, a major supplier of aircraft windshields, offers the choice of either conventional clear acrylic—really lightly tinted in gray or green—or Polycast SC. LP's George Mesiarik told us that despite the premium price, more buyers are tilting toward the SC option.

"At Oshkosh, every single order I took for a tinted window was in the



UV/IR blocking. Now, people are asking for it rather than my trying to sell them," Mesiarik said.

"We do a demo box and we have a floodlight with two sample pieces directly in front and temperature sensors right behind those. We have recorded between the clear acrylic and the UV blocking anywhere from 10 degrees up to 30 degrees cooler," he says. SC blocks 99 percent of UVA and 100 percent of UVB and reduces near infrared radiation 30 percent more than standard tints.

SC is available in thicknesses between .08-inch to .5-inch at about a 30 percent cost premium. In real dollars, a Cessna 172 windshield in standard tinted acrylic would cost \$456.80 and the UV-blocking SC would cost \$593. For more, contact LP Aero Plastics at www.lpaero.com and 800-957-2376.

apply your rag or microfiber cloth. This reduces the risk of scratching. Plexiclear worked well on bugs and had good water repellency, although not the best.

ALL KLEER

This is another paste-type material, although it's more the consistency

of milk than paste wax. Like Rain Away, it contains isopropyl alcohol as a primary ingredient and it smells like it.

Of all the products we tried, this one seemed to float the bugs away the best. A few wipes and the smats were gone; a little polishing gave a smooth, hard finish. Rain repellency was good,

making this one of our top picks. Price is \$6.95 for 8 ounces.

LP ACRYLIC POLISH/ SEALANT

This stuff isn't really a cleaner, but a polish, and the instructions recommend cleaning first with something else. That can be plain water and a clean rag. If the windshield isn't gritty or too soiled, this material can act as a combination cleaner and polish. It did pry loose the bugs, but not as well as All Kleer did, probably because it lacks a solvent.

But what it lacks in cleaning power, it more than makes up for in a slick, rain-resistant surface. We noticed this immediately as we were polishing our test pieces. Its rain repellency is the best of all the products, in our view. It sells for \$15.75 for a 16-ounce bottle.

RAINCOAT SPRAY

This is a wax-type material intended only as a rain repellent. It's too waxy to work as a cleaner, so it requires a clean substrate to begin with. Application is a bit labor intensive, requiring some elbow grease to polish.

It leaves behind a smooth, hard protective layer, but not quite as smooth as the LP product. Its water repellency is good, about like Rain-X. At \$14.85 for 4 ounces, it's the most expensive of the products tried.

CONCLUSION

You won't go wrong with any of these products. Although our tests have never revealed any visible damage from Rain-X, aircraft windshields are too expensive to take the chance, especially when other products perform better. Our top picks are LP's Acrylic Polish and Sealant whose water repellency was excellent and All Kleer, which did well removing bugs, leaving behind a moderately effective rain-repellent surface.

We liked Plexiclear as a heavy lifter cleaner to keep around the hangar when you return with a truly filthy and bug-spattered mess. Wetting the surface with this stuff makes quick work of it.

CONTACTS

Aircraft Spruce and Specialty
877-477-7823
www.aircraftspruce.com



PHOTO: JIM LAWRENCE

Premier's XLS Upgrade: Improving the DA40

Even in a tight market, buyers want all the options, including air conditioning and plush leather seats. Premier's upgrade offers both.

by Paul Bertorelli

The aircraft mod business isn't what it used to be. Hell, nothing's what it used to be in a world where aircraft sales are struggling back from the abyss. In the heyday of mods, dozens of companies offered all sorts of upgrades—fuel tanks, intercoolers, wingtips—were available for new airplanes, but lately not so much.

One new mod that caught our eye recently was Premier Aircraft Sales upgrade to the Diamond DA40, a popular entry level cruiser that also has

Premier's upgrade includes luxury-car type improvements to the seats. (They're wider at the top.) Carpet and trim, near right, are also improved. Although the seats still don't slide, the rudder pedals do.

legs as a trainer and personal transportation aircraft. By the standards of yore, the Premier Edition upgrade is modest, consisting of improved seats and carpet, exterior paint tweaks, a composite prop, an HID flasher system and some additional extra-cost options including an auxiliary alternator and—the biggie—air condition-



CHECKLIST



The XLS was nicely refined to begin with. Improved seats and carpet are a plus.



AC was once considered a nice-to-have but is now apparently a must-have feature.

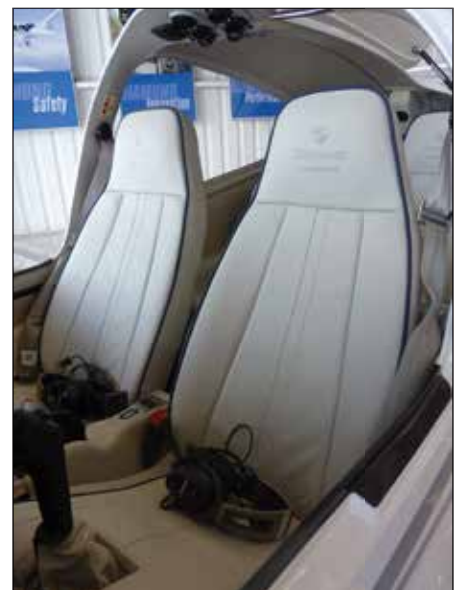


AC installation is clean, but the cowl mod for the compressor could do with some smoothing.

ing. Add all that up and the cost and impact on the airplane's appeal isn't necessarily modest anymore, but Premier's Fred Ahles says it's enough to get customers to pull the trigger and more opt for the options than not.

STAR IS BORN

Don't look now, but Diamond has sold nearly 1600 DA40 Stars since the model was first introduced in 2000, more than half again more than Cirrus has sold of the SR22. Diamond appears to have found a sweet spot with the DA40, an airplane that's priced about with the SR20, a bit more than the Cessna 172, but a lot less than the 182. Diamond CEO Peter Maurer says the company believes the DA40 fleet is evenly split between private owners, leaseback deals and fleet operators using them for flight training. Since all new DA40s are equipped with Garmin G1000s, the airplanes are a flight





Premier's AC installation puts the compressor on the lower front of the engine, left, requiring a squarish bump in the cowl, lower left. Condenser air intake, upper left, is always open, imparting some drag. Photo above shows plenum and eye-ball vents for rear passengers.

school favorite as a reasonably fast, affordable glass-equipped trainer.

Diamond got the airplane mostly right out of the box, so it hasn't changed much since its introduction, although it has been tweaked quite a bit. It's also gotten quite a bit faster with an improved interior. (The early models didn't really have much of a baggage compartment.) In 2006, the DA40-XL appeared with the G1000 and Garmin GFC700 autopilot. A year later, the XLS model—upon

which Premier builds its mods—added a higher and wider canopy, plus a luxury interior, PowerFlow exhaust and active traffic.

When we flew the DA40 intro model in the spring of 2000, it was equipped with the same Lycoming IO-360M1A the latest models have, but those early airplanes were swinging a three-blade MT composite prop. That combination delivered an adequate but not overly impressive 141 knots. But these days, thanks to prop

changes and airframe cleanups, the DA40 is an honest 150-knot airplane. Premier's air conditioning knocks that back a bit, but more on that later.

Diamond did a superb job on both build quality and balanced, benign aerodynamic manners. Want see what good glass work looks like? Take 10 minutes and walk around a DA40, casting special attention to flap and aileron gaps, which are crisp and even.

When we first flew the DA40, we allowed as how it was like a larger DA20, which it, in fact, is. Control forces are on the light side and nicely harmonized between pitch and roll. The stall characteristics are remarkable for being unremarkable, which is to say benign. In 11 years and at least 1.5 million fleet hours, we can't find a single stall-related accident and, indeed, not that many accidents of any kind. As far as we know, no other aircraft can claim such a stall-free record.

Ergonomically, the DA40 is quirky but competent. A decade ago, we wondered if buyers would balk at that forward-hinged canopy. They haven't. We further opined that the unique, rear-opening hatch for access into the backseat might be just a little too weird. It has proved not to be.

We predicted that the bubble canopy, a huge plus for cockpit visibility, would be a pan broiler in the summer. That has turned out to be true, although it's not as bad as we thought because Diamond added a shade to the top of the canopy and there's a partially open ventilation lock position for the canopy. These make ground operations tolerable, but not exactly cucumber cool.

"That just wasn't good enough," says Premier's Fred Ahles, who, by 2007, was losing a sale a month because the airplane didn't have an AC option. Since he couldn't talk Diamond into developing the air conditioner, Diamond convinced Ahles that Premier should do it.

PREMIER UPGRADE

But air conditioning is just one of the options. The core of the Premier Edition upgrade is an improved interior. Although the XLS was no slouch to begin with, Premier's upgrade widens the seat by 3 inches at the top and adds a higher quality memory foam and leather with piping. Ahles describes it as more Cadillac, less BMW. The carpet is also upgraded with

AC TV

For a video report on *Aviation Consumer's* flight in the DA40 Premier Edition, scan the tag below with a

mobile app or use this direct URL to see the video: <http://snipurl.com/2la7x9>



thicker material. The upgrade costs \$11,500. (The new airplanes are flown from Canada with old interiors and Premier installs the new stuff.)

Also included in that package is the Hartzell two-blade composite prop. It's lighter, less vibey and claims improved cruise performance, although we couldn't confirm this in our flight trial. It seems smooth and quiet.

Air conditioning is the big ticket item among the additional options and at \$27,900, the most expensive. AC has always been problematical for airplanes because it saps payload and power and usually nicks the airspeed a little. Premier's installation is no exception, although the performance hit is small.

The compressor is belt driven and requires a substantial square bump in Diamond's otherwise sleek cowling. The evaporator and air handler live in the belly, behind the baggage compartment. Inflow air comes from a scoop on the belly. When we flew the airplane, we noted that it could still achieve 151 knots true at 5000 feet on about 11 GPH. Since the DA40's POH has never been revised to reflect its speed gains, we're not sure how that compares to a stock DA40. Owen

told us his numbers reflect a 3 or 4 knots speed reduction, which seems realistic. But it will take higher power to achieve that. The AC option reduces useful load by about 70 pounds, to 754 pounds in the airplane we flew.

Interior details are well executed, including a touchscreen digital control panel and purpose-made ductwork and vents. The system looks like it belongs in the airplane.

Another option Premier offers is a second alternator, a 20-amp B&C unit that sells for \$4995 and exacts a eight-pound weight penalty. Base price for the DA40 XLS is \$359,800. Add the interior upgrade, the AC, prop and alternator and the invoice will top at just over \$411,000.

For more information, contact Premier Aircraft at 954-771-0411 or www.premieraircraft.com.



PREMIER: THE PREMIUM NICHE

Dealers who ply the luxury car trade know about a niche in the world of selling stuff to consumers that has to do with high price versus value. In other words, customers won't quibble about expensive cars or service, as long as both are performed to perfection by a business with a customer-centric view. This niche exists in every market from boats to appliances to cookware and it includes airplanes.

That's where Premier Aircraft Sales has positioned itself, even though it doesn't sell the sort of top-end luxury found in a business jet or turboprop. What it does sell is near-factory expertise in two airplane lines—Diamond and Mooney—with extensive backshop support, maintenance and modifications. Premier's niche seems to aim not so much for the premium price, but the premium customer experience.

Premier, which is located at Fort Lauderdale Executive Airport, opened for business in 2003, with Fred Ahles as a prime mover. Ahles had been a VP of sales for Piper Aircraft at AMR and Signature and before that had done turns selling both Cessnas and Pipers as an independent dealer.

As Diamond came into its own during the early 2000s in a strong economy, Ahles saw it as a good fit with the more established Mooney. At the time, Diamond's DA40 was a mid-performance entry-level airplane, but Diamond had no step up. Mooney had only expensive, high-performance airplanes, but no entry-level model. Taken together, says Ahles, the two represented an opportunity to build the business he had in mind—a leading seller of personally flown piston airplanes, not a provider of everything that flies. Despite the ragged economy, Premier has made strides in achieving that goal. As of October 2011, Ahles told us the business had sold more than 1000 airplanes and even in the darkest days of 2009, it was able to move almost two airplanes a week.

Premier isn't the only company around with this sort of business model, but as far as we know, it's the only one combining Mooney and Diamond and also offering maintenance and support beyond the basic independent shop, to include expertise in Thielert and Austro

engines, plus it's also a service center for Mooney, Diamond and Continental. "All of that came as an outgrowth of us wanting to give customers greater choice," Ahles says.

The depth of Premier's maintenance and mod work is considerable. When we visited, there were a handful of Diamond DA42s flown in from various parts of the country for service. Premier has carved out a place as a go-to shop for specialized work on these airplanes, not just an independent facility that can service anything.

"We're quite a lot different than that," Ahles says, "We want to be the shop that others call for technical advice and service. It's our goal, if you bring your Diamond here for an annual, that we'll already have the parts here that you're likely to need to get that work done."

In just eight years, Premier has weathered two ferocious storms: Thielert's bankruptcy in 2008 that tanked what had been robust DA42 sales and the financial crisis and recession that began later that year. In its peak year, 2007, Premier sold 219 airplanes and was on track to beat that in 2008 when things went south. And 2011? As of October, Premier had matched its sales performance of 2010, so Ahles thinks the graph may have bottomed out. He believes Mooney may find enough demand to resume limited production sometime next year.



Cessna 421

The aptly named Golden Eagle is fast, stylish and hauls a lot. Cheap to fly isn't on the list.

Like the Lockheed Constellation, Cessna's 421 Golden Eagle is an airplane of another age. Impossibly sleek, fast and comfortable, it's hard to imagine such a thing ever being built at all, never mind again.

But owners rave about the 421's exceptional combined capabilities and even though many of them could easily afford turbines or light jets, they stick with their Golden Eagles for delivering the best value for the money spent.

But that's not to say owning a 421 is cheap. Far from it. The engines alone can amount to \$50,000 or more each and with known ice, pressurization and even a lav of sorts, there's a lot to maintain. Said one owner: "Don't even ask what it costs to run it. That just shows you can't afford it."

HISTORY

The 421, which shares its basic airframe with most of the other 400-series Cessna twins, was introduced in 1968, when GA was booming along. Cessna aimed it at buyers who wanted better carrying capacity and performance than other piston twins offered, but who were put off by the high cost of turboprops.

To get the performance these buyers were looking for, Cessna decided to use Continental's GTSIO-520 geared engines, producing a healthy 375 horsepower apiece. That's nearly three-quarters of a horsepower per cubic inch, and the inevitable stress meant short service life. Originally, the TBO was a mere 1200 hours. Later engines sported heavier crankcases that increased TBO to a still-low 1600 hours, which is where it remains. Durability isn't the engines'

Owners rave about the 421's exceptional combined capabilities, even though many of them could easily afford turbines or light jets.

strong point.

While most owners report that the engines will reach TBO with good care, the fact that they're so unusual means that they're very expensive to overhaul: an estimated \$47,000 each just for the engines, plus R&R. While that's pretty steep, it's actually less than the overhaul cost for the 421's two direct competitors. The Beech Duke's engines cost \$55,000 each, and the Piper P-Navajo's engines cost \$50,000 a side to overhaul.

The first 421s shared many of the features of the smaller 400s and the 300 series. The "Stabila-Tip" fuel tanks, 170-gallon fuel system, and electromechanical landing gear were all quite similar to those of the 310. The original 421 also had a short nose. Maximum gross weight was a respectable 6800 pounds. The standard fuel system gave a range of some 800 miles, while an optional 255-gallon system boosted the range to nearly 1200 miles. Owners say the higher fuel capacity is much prized and worth looking for.

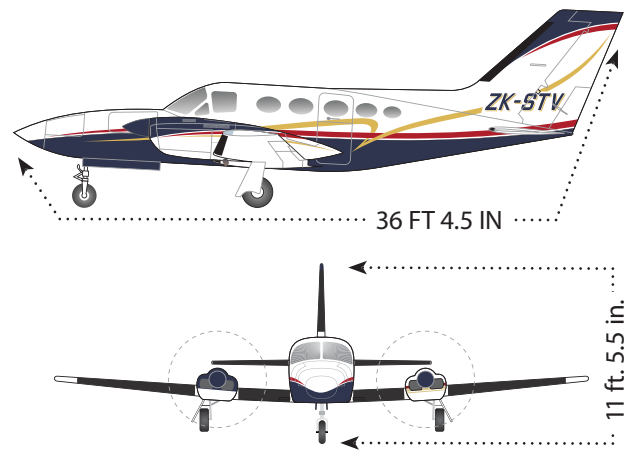
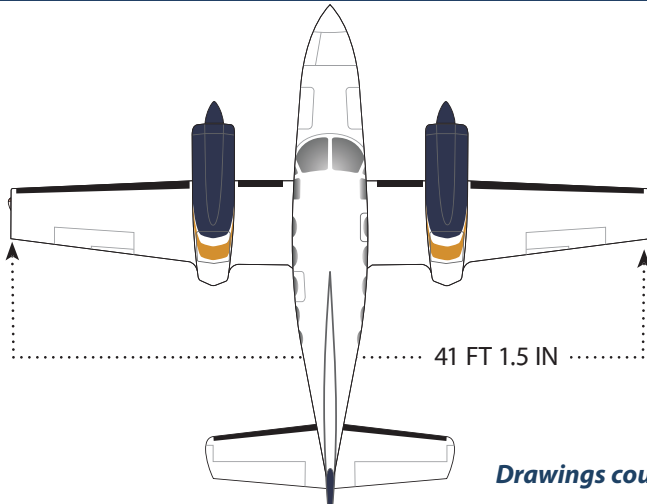
The airplane was an immediate hit, with 200 sold that first year. Clearly, the Golden Eagle was something the market was looking for. As is common, refinements were immediately applied

and the 1969 model was redesignated 421A. The alterations were minor: a three-inch stretch, five more gallons of fuel, and a 40-pound increase in gross weight.

In 1971 the 421B got more sig-

Dale McCallum's 421B, above: "What a wonderful airplane. There is simply no other airplane out there that has the capabilities of a 421 for the dollars invested."

CESSNA 421

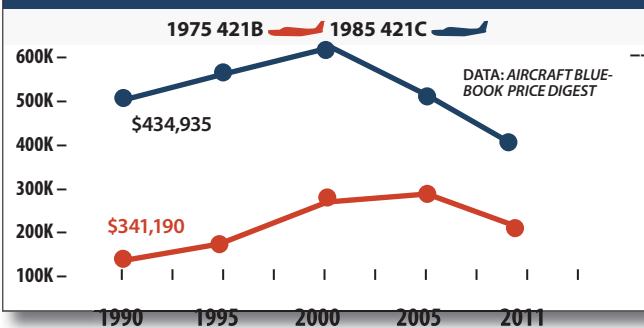


Drawings courtesy www.schemedesigners.com

SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1968 CESSNA 421	CONT. 375 GTSIO-520-D	1200	\$47,000	170/255	2563 LBS	222 KTS	\$100,000
1969 CESSNA 421A	CONT. 375 GTSIO-520-D	1200	\$47,000	175/255	2588 LBS	227 KTS	\$105,000
1970-73 CESSNA 421B	CONT. 375 GTSIO-520-H	1200	\$47,000	175/255	2588 LBS	235 KTS	±\$120,000
1974-75 CESSNA 421B	CONT. 375 GTSIO-520-H	1200	\$47,000	175/255	2588 LBS	235 KTS	±\$140,000
1976-77 CESSNA 421C	CONT. 375 GTSIO-520-L	1200	\$47,000	213/270	2402 LBS	241 KTS	±\$172,000
1978-1980 CESSNA 421C	CONT. 375 GTSIO-520-L	1600	\$47,000	213/270	2402 LBS	241 KTS	±\$300,000
1981-1982 CESSNA 421C	CONT. 375 GTSIO-520-N	1600	\$47,000	213/270	2402 LBS	241 KTS	±\$325,000
1983-1984 CESSNA 421C	CONT. 375 GTSIO-520-N	1600	\$47,000	213/270	2402 LBS	241 KTS	±\$400,000
1985 CESSNA 421C	CONT. 375 GTSIO-520-N	1600	\$47,000	213/270	2402 LBS	241 KTS	±\$415,000

RESALE VALUES



SELECT RECENT ADS

AD 05-20-25	AVIONICS BREAKER SWITCHES
01-01-16	EXHAUST SYSTEM INSPECTION
97-01-13	FUEL, OIL, HYDRAULIC HOSES
92-16-18	PASSENGER SEAT MODS
91-25-08	FRONT SPAR UPPER CAP INSPECTION

SELECT MODEL COMPARISONS

PAYLOAD/FULL FUEL		CRUISE SPEEDS		PRICE COMPARISONS	
CESSNA 421	800	CESSNA 421	220	CESSNA 421 (1980)	(\$300,000)
CESSNA 414	1200	CESSNA 414	220	CESSNA 414 (1980)	(\$290,000)
BEECH DUKE	1600	BEECH DUKE	240	BEECH DUKE	(\$190,000)
PIPER P-NAVAJO	1200	PIPER P-NAVAJO	220	PIPER P-NAVAJO	(\$320,000)
CESSNA 340	1600	CESSNA 340	240	CESSNA 340	(\$195,000)



Early 421s had Cessna's tuna tanks on the wings, top, but with the 421C in 1976, lower photo, they were dropped with all fuel carried in the wings.

nificant improvements. Weights (both gross and empty) increased significantly, with a maximum gross of 7450 pounds. The wingspan was increased two feet, raising the service ceiling by 5000 feet. The nose was stretched two feet to accommodate a baggage compartment capable of carrying a six-foot-long, 600-pound object, assuming the space was not taken up with extra avionics. (The compartment is about 51 inches long with the avionics bay fully occupied.) The aft cabin area could handle another 340 pounds, with a further 200 in each wing locker for a total capacity of 1340 pounds. The wing lockers serve as bays for optional fuel

tanks, so they may or may not be usable for baggage.

The B model gained a few extra refinements over the next four years. The pressurization system was improved, raising the pressure differential first to 4.2, then 4.4

inches. The cabin and windows were made larger and in 1975, a known-icing package was offered.

In 1976, Cessna brought out the 421C, incorporating the sweeping design changes that the company was applying to most of its twins at the time. The distinctive "Stabila-Tip" tanks (with their bladders) were gone, replaced by a simpler, bonded wet-wing fuel system. This system raised the standard fuel system capacity to 213 gallons, or 270 with all optional tanks installed.

Removing all that weight from the wing tips increased the airplane's stability, as did an increase in the size of the fin and rudder. The end result was better handling in both normal and single-engine operations. The new wing also improved single-engine performance, with increased single-engine service ceiling and rate of climb.

The electromechanical landing gear was replaced by a hydraulic

system. This featured trailing-link mains and a high-pressure nitrogen blow-down bottle for emergencies. The new system increased reliability slightly.

The maximum gross weight of the C model was 7450 pounds—the same as the B—but the standard empty weight was higher.

The C model was produced, relatively unchanged, for nine years. In 1985 it, like all the other piston Cessnas, was discontinued for lack of sales. Overall, the 421C represents about half of the production run of 1920 aircraft.

CREATURE COMFORT

Where the 421 really shines is in its comfort, especially for passengers. While aircraft owners and pilots can debate the relative noisiness of various airplanes, the fact remains that they're all loud: It's just a question of how loud. The 421's cabin is among the quietest in the business, thanks mostly to its geared engines that produce plenty of power at low prop speeds.

The pressurization system delivers shirt-sleeve comfort at altitude, providing sea-level pressure up to 10,000 feet and maintaining at 10,000-foot cabin altitude at true altitudes of more than 26,000 feet.

The cabin is also quite wide at 55 inches and has sufficient room for such amenities as a galley and toilet. "It is because of these capabilities that I sold my very early position on the Eclipse when I finally saw the mock-up plane at Oshkosh. That nice little jet would have brought me to the destination a half hour earlier, but I would have been forced to leave most of my stuff behind," one 421 owner wrote us.

The 421's ample baggage compartments also contribute to usable cabin space. For most flights, it's not necessary to carry anything in the cabin. As is common in many cabin-class twins, the door is blocked by the left-rear seat. To get in or out, you have to move that seat all the way forward. This can complicate emergency egress and make for some musical chairs during loading.

Up front, the cockpit is generally well laid-out, with good seats offering plenty of adjustability. The view outside is hindered a bit by the thick window pillars. On ice-equipped

421s, the entire windshield is heated, eliminating the flat hot plate common on many twins.

The panel shows good design for the most part, with the engine gauges right up top and near the pilot's line-of-sight, where they ought to be. On the 421C, the fuel gauge is way over on the right (out of sight, out of mind), but is a capacitance type calibrated in pounds, which is more accurate than float gauges. Many owners have added modern glass and totalizers to render the mechanical gauges superfluous.

HANDLING

Owners report that the 421 has no real vices, and makes for a good, stable instrument platform. If it comes down to a choice between models, however, we recommend the C version. Eliminating the tip tanks, increasing the wing span and enlarging the fin and rudder made for somewhat improved handling, particularly in roll and during single-engine operations. The changes also improved stability in turbulence.

Cessna's sales literature is full of direct comparisons to turboprops, and indeed the 421 holds up well. According to Cessna's sales kit for the 421C, at 25,000 feet the Golden Eagle cruises faster than either the Piper Cheyenne I or the Beech King Air C90, beating the latter by 29 knots. All-engine rate of climb is almost 200 FPM better than the Cheyenne and within 15 FPM of the King Air. Service ceiling is much higher with both engines running and quite close with only one prop turning. Single-engine rate of climb is not as good—no surprise there—but it's still within striking distance, about 200 FPM less than the King Air.

On paper, the 421 is quite fast. In the real world, though, cruise speeds are a bit less. Pilots report flight planning for anywhere from 195 to 215 KTAS at about 20,000 feet. Fuel burn is 50 gallons for the first hour, 40 thereafter. On shorter hops, however, it doesn't pay to climb that high. Trips of 300 miles or less are normally flown at lower altitudes and speeds.

Like most aircraft, the 421 is not able to fill all the seats, baggage compartments and fuel tanks at the same time. It will, however, carry four or five adults, their bags and full or near-full fuel. Owners are unanimous



If you view an airplane as a canvas upon which to paint avionics art, you couldn't ask for a better one than the 421. Daniel Herr's 421C, top, has a Garmin G600 and a newly installed GTN750. It retains the stock power gauges. For his 1980 421C, Max Nerheim went several better with the G600, both GTN models, a GMX200 and a JPI 960 monitor to replace the Cessna engine instruments.

in their praise of the airplane's real-world usefulness in load carrying.

"Sometimes we look like the Beverly Hillbillies when we unload the plane and tie a bunch of strollers and bikes onto the roof of the car," said owner John Keagy.

SYSTEMS

Systems-wise, the 421 is quite complex, with both good and bad points.

The fuel system is a case in point. The 421C has a simpler system than earlier 421s, which generally simplifies management. It's far less complicated than, say, a 310. But the wing locker tanks, which have no gauges (just "empty" lights), are used by transferring fuel to the mains via an electric pump. If there isn't room, the fuel goes overboard. Also, the pump is fuel-lubricated and will burn out

ACCIDENTS: LANDING GEAR ISSUES

Our review of 121 Cessna 421 accidents between 1990 and 2011 revealed that landing-gear-related mishaps lead the list of uniform causes. The majority of these are system, structural or maintenance related, although a couple were the result of pilots forgetting to put the wheels down.

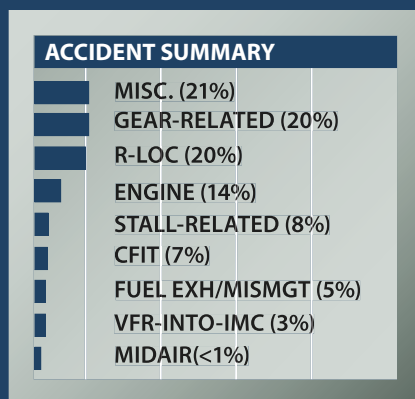
The takeaway is this: The 421 has a good gear system, but it is complex, with a lot of plumbing and wiring to look after. At least two of the gear wrecks were due to water in hydraulic fluid that

froze. That's avoidable with regular maintenance.

The miscellaneous category included all sorts of accident causes too unusual to merit their own listings. We found a couple of structural breakups due to thunderstorm penetration, a half dozen structural icing events and some garden-variety loss of control accidents.

One in five accidents were runway loss of control (R-LOC) involving losing it in a crosswind or sailing off the runway during take-off or landing. Golden Eagle pilots may do this from the comfort of a luxury cabin, but they still do it.

Another thing they do is stall the airplane. At 8 percent, stalls were a surprisingly large presence in our accident review. You'd think by the time a pilot advances to the level of flying an airplane this capable, stalls wouldn't be a risk. But that appears not to be the case, despite insurance requirements for initial and recurrent training.



if left to run too long after the locker tanks are dry.

Good points include the availability of fire detection and extinguishing systems for the engine nacelles in later models, a good annunciator panel and an available angle-of-attack indicator.

ENGINES

Cessna chose the geared Continentals for their combination of high power and low prop speeds, which allowed the 421 to deliver good performance without punishing noise levels. But, the geared engines proved to be more delicate than their direct-drive siblings, developing a reputation for cracking cases.

The owners who responded to our survey all noted that they will go to TBO if treated well. That TBO was, in the early models, a dismally short 1200 hours. Later engines had beefed-up cases that raised the mark to 1600, typical for engines of this size, but this did not eliminate the case-cracking problem entirely.

Temperature and throttle abuse

are pure poison: those GTSIO-520 engines need to be carefully managed. Overboosting on takeoff is one of the big reasons behind the GTSIO's case-cracking reputation. The throttles must be handled slowly and carefully, with the pilot constantly checking manifold pressure during the ground roll, watching for upward deviations.

In flight, engine temperatures demand attention. Cylinder head temperatures that go too high or too low lead to cylinder problems. Letting down calls for precise planning to prevent shock cooling. Steady climbs demand equally good management.

One charter operator who wrote in had a different engine complaint, one aimed at Continental for taking a very long time (several months) to deliver factory remanufactured engines.

Of course, the 421 also shares the exhaust system design with other turbocharged Cessna twins, and this system was implicated in a string of accidents during the late 1990s which resulted in 29 deaths. The difficulty with the system stems from the loca-

tion of the turbocharger, which is mounted to the airframe rather than the engine. This requires a flexible exhaust system to allow for differential movement of the engine and turbo. Cessna achieved this flexibility through a combination of ball and slip joints. This system can develop cracks, which allow hot exhaust gases to escape.

The hot exhaust then hits the aluminum box-beam keels that serve as engine mounts. These burn through, serving as a conduit to allow the gases to strike and burn through the firewall to the unprotected fuel cross-feed lines beyond. These lines have no shutoff valves.

In some cases, the exhaust weakens the wing spar, which then fails. In others, the loss of the fuel lines results in dual engine failure due to fuel starvation.

The fact that the exhaust is a weak link is nothing new. A 1975 AD requires visual inspections every 50 hours, but the plumbing is so convoluted and tightly packed that this is difficult to do.

The string of accidents prompted the Cessna Pilot's Association to call for immediate, thorough visual inspections of the exhaust system, including removal of top and bottom cowls, induction air filter canisters, head shield and anything else that might block an inspection. The Association also called for a complete pressure check of the system. The CPA and AOPA also called on the FAA to issue an emergency AD, though none appeared.

One of the latest ADs is in fact on the exhaust system. AD 2000-01-16 requires inspection and replacement of exhaust system components, but it's not 421 specific. The 300 series is also covered. This AD supersedes 75-23-8. Other ADs of note include 95-9-13, replacement of non-compliant fuel inlet valves; 92-16-8, modification of commuter seats and tracks; 91-25-8, repetitive inspection of the wing front spar upper caps; and 90-2-13, inspection/replacement of the main landing gear inner barrel bearings.

MODS, GROUPS

The same mods available for other 400-series Cessnas can also be had for the 421. Notable ones include engine upgrades and winglets from

RAM, vortex generators from Micro Aerodynamics, Robertson and V/G Systems, STOL kits from Sierra Industries, speed brakes/spoilers from Precise Flight and Spoilers, Inc., and intercoolers from American Aviation.

A club that covers the 421, in addition to all other twin Cessnas, is The Twin Cessna Flyer. It was originally started by Larry A. Ball but is now run by Bob Thomason, who also edits the association's must-have magazine, *The Twin Cessna flyer*. Contact at www.twinessna.org.

Also worth joining is the Cessna Pilot's Association (www.cessna.org, 805-934-0493).

OWNER COMMENTS

I am the second owner of a 1982 Cessna 412. Its first owner, like myself, used it as his personal airplane and it was never flown for hire. Since a lot of my flying has been between the Midwest and the Rocky Mountains, I found the 414 I owned definitely underpowered, especially in the summer. The first 421 solved that problem.

The 1980 model introduced a trailing link gear and, in 1982, improvements were introduced to the engines with heavier cases and a seventh nozzle. Differences between the Cessna 421 models are striking. I think that for speed, range, level of pressurization, de-icing capabilities, and loading capabilities combined, no airplane can rival the 421, unless you step up to a whole different class of aircraft.

I generally fly in the low 20s and get 230 knots true airspeed at 65 per cent power, gulping about 38 GPH. You can fill all tanks, including the auxiliary tanks, for a total of 260 gallons, and be left with an astounding payload of more than 950 pounds.

One can fly nonstop from Chicago to Denver with IFR reserves, even a with headwind.

It is because of these capabilities that I sold my very early position on the Eclipse when I finally saw the mock-up plane at Oshkosh. That nice little jet would have brought me to the destination a half hour earlier, but I would have been forced to leave most of my stuff behind.

The 421 is a very stable airplane and surprisingly forgiving. Approaches are very relaxing since once you



have set up the numbers, the airplane essentially flies itself down to the runway with very little input. But you want to fly this airplane by the numbers, like most complex airplanes.

I rarely need any work done in between annuals and the typical annual costs between \$7000 and \$10,000, not a tremendous amount for an airplane of this size and complexity.

There are several modifications available to make it even better. For example, vortex generators bring the stall speed down to 70.5 knots and increase the gross weight by 129 pounds to 7629 pounds. Speed brakes will allow you to stay high much longer to avoid turbulence closer to the ground, so common in the west. You can come down at 1500 feet per minute with very little change in power. The engines love that. The panel is enormous and you can put all the toys you like in there. I just finished the installation of the new Garmin GTN 750/650 boxes, both linked to an EX500 and a Sandel 3500.

Finally, something needs to be said about the myth of the "troubled geared engines" that people, mostly without experience in these airplanes, like to talk about. It is true that these engines need to be treated properly, especially if you are the one who will pay for their maintenance. Throttles need to be moved in a slow, deliberate manner, and, especially, descents have to be made with

The folks who ride in the back like the 421's quiet and plus cabin. Some have refreshment centers and potty seats.

slow, progressive decrease in power. Treated well, these engines will make it to TBO.

Pound per pound, the Cessna 421, especially the few airplanes produced from 1982, has to be one of the best airplanes ever engineered.

Mauro C. Dal Canto
Chicago, Illinois

In September 2004, after a long search, a 1981 421C with 262 gallons and no damage history came on the market through Blackhawk. Blackhawk had taken the 421 in trade from a buyer who purchased a Conquest I with Blackhawk's upgraded engines.

Within two weeks of Blackhawk putting the plane on the market, we had agreed upon a price. After negotiating a number of pre-buy squawks, Blackhawk agreed to my number and I wired funds to escrow.

The first few months of ownership were largely consumed with maintenance on the Cessna 800B autopilot and its associated gyros and altimeter, tweaking engine fuel flows, installing GAM injectors and battling the

heater. Thereafter, I had almost no maintenance to the autopilot itself, but was spending about \$3000 per year on the associated gyros, altimeter, and altitude selector. One of the hard lessons I learned early on is to never exchange these 4-inch gyros or the delicate altimeter; always get your own stuff repaired.

My first annual inspection was about \$40,000—even after the \$50,000 in post-purchase work—mostly due to my desire to comply with as many Service Bulletins as possible, as well as other improvements and inspections that I wanted. My second annual was under \$30,000, my third and fourth about \$12,000. And, of course, there was no shortage of expenses between annuals. In the last five years, maintenance has averaged about \$27,000 per year with an average flight time of 110 hours per year.

My GTSIO-520-N maintenance experience has been phenomenal. My initially mid-time engines are now at TBO without my having had to remove a single cylinder. The engines are delightfully smooth and run well as long as the mags, harnesses, plugs, baffles and fuel flows are kept in shape.

As for flying, 421s are incredibly comfortable and quiet, with low prop RPM. They're roomy, pressurized, air conditioned, toilet equipped and usually heated when need be. Before our kids arrived, my wife and I could load up with bags and 262 gallons useable and travel 1000-plus miles as long as headwinds were less than 20 knots.

My current useful load is 2190 pounds. However, I use about 100 of those pounds with my normal assortment of stuff: lifevests, headsets, water, oil, tools and spare parts.

I usually stay at FL190 or below with the kids, which yields a cabin altitude of about 7000 feet. And I can keep the cabin rate change to 300 feet/minute or less. The cabin is big enough that the kids can wander around in cruise and the toilet gets frequent use on family trips.

I would preach the importance of annual sim training, but the insurance companies seem to have a strong mandate covering that. I was very pleased with my years at Flight Safety International and thoroughly displeased by one experience at a dis-



count recurrent sim training center.

My double overhaul is coming up in January. By the time I add in install expenses and various accessories, I expect to easily hit \$160,000, so that's 1600 hours x \$100/hour just for the engines.

Despite the high cost of owning and operating a 421, my research indicates that it is not possible to upgrade from a 421 to something more capable without being subject to a large increase in marginal cost. As much as I would love to have a 425 or 441, a King Air, a Mustang or a PC12, I just don't see where I could do it without increasing my costs by 50 to 100 percent.

Daniel R. Herr
Via e-mail

Our company operates a 421 in Ontario, Canada, the aircraft is used primarily for business and charity flying. In the five years we have operated the aircraft, it has become an integral part of the business. For the average leg length we fly, it is the ideal aircraft with enough payload and known icing capability to make it a reliable, safe operation.

We have considered replacing the aircraft with a turbine, but given our present route structure, the numbers are on the side of the 421. We are fortunate in having an excellent AMO looking after our maintenance, Griffin Technical Services, located in Lachute, Quebec.

We do not fly the aircraft single-pilot IFR. In fact, I use the other seat

Jim Kirvada of Dellwood, Minnesota, sent a photo of this 1982 421C, which is used as corporate transport. He says annuals cost between \$9000 and \$14,000.

as a training tool to give deserving young pilots real-world, multi-engine IFR experience. All in all, the 421 fills a niche not covered by any other aircraft.

Larry Loretto
Via e-mail

I'm an owner/pilot of a 1980 421C. I've had 100% dispatch reliability in 550 hours of use over the last six years. The biggest maintenance delay that we've had was only a few hours and then we were on our way. Of course, my beauty gets great maintenance from Turbine Air in Hayward, California, a shop that specializes in Cessna twins.

Both the cockpit and passenger seating are super spacious. Getting into and out of the pilot and copilot seats is far easier than other piston aircraft and VLJs. My wife often looks quite comfortable in the back, sleeping in seats that recline like business class. We have plenty of room for our large dog to stretch out on the floor and once we even brought a dresser along.

We routinely find that we can fit more into our airplane even when the seats aren't full than we can fit

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Cessna 421

(continued from page 30)

into our Suburban. Sometimes we look like the Beverly Hillbillies when we unload the plane and tie a bunch of strollers and bikes onto the roof of the car.

The pressurization system works great. I'd struggle to go back to travelling with young kids and a dog without pressurization. We travel at 25,000 feet with no problem and I often do fly over moisture even though the plane is known-ice certified. I love the heated glass windshield and I'm thankful I don't have to stare through a hot plate.

If you want a comfortable, pressurized, known-ice-certified family airplane, then the 421 is the optimal choice. A Conquest would be safer and faster, but since it features the same cabin, I'm not sure that my wife would know the difference, which means it probably isn't worth the huge extra cost.

John Keagy
Via e-mail

We have owned our 1982 Cessna 421C Golden Eagle for six years. Awesome tends to be an over-used word but in this case, most fitting. Our business requires an (almost) all-weather airplane for Western flying. Our typical flight is 1.5 to 2 hours with the occasional 4- to 4.5-hour haul. There isn't much to not like about the 421C. Trailing link gear makes me look good on virtually every landing. We have the option of up to 272 usable gallons of fuel

for the long trips. Standard fuel in the wing main tanks is 206 gallons, which is more than adequate for most of our round trips.

We typically cruise in the mid-teens at 1700 RPM, 30 inches of MAP, 200 to 210 knots true on 38 to 39 GPH. Rate of climb at 130 knots indicated and normal weights is usually around 800 FPM. Useful load is almost 2200 pounds. Typical load (fuel and folks) for us is about 1700 pounds.

We only go up into the 20s for weather or good eastbound winds, but even then, seldom much higher than FL 230. Fill up all of the tanks, throttle back to about 185 knots and my passenger and I can make it from Concord, California, to Dallas Love non-stop, plus reserves. Alternatively, put in enough fuel for a trip to Van Nuys and put in six adults and a few bags with weight to spare.

The 421 is the most comfortable piston airplane I have flown in and more comfortable than some turbo-props and older jets. The comfort is derived from a solid airframe that handles turbulence quite well and the ability to turn the props at such a low speed.

Cautions: We were concerned about the negative press on the geared engines but have found that if they are flown gently (no ham-fisted power changes and keep MAP up on descents and final approach; speed brakes help with that) and consistently, they present no particular problem. Having owned lots of Continental engines, we are used to eternally chasing small oil leaks. Like any airplane, it pays to have maintenance done by someone familiar with the airplane. We have been happy with Pacific Aircraft Service in

FEEDBACK WANTED

CESSNA 195



For the March 2012 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Cessna 195, a classic taildragger. We want to know what it's like to own these venerable classics, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs you'd care to share. We accept digital photos e-mailed to the address below. We welcome information on mods, support organizations or any other pertinent comments. Please send correspondence on the Cessna 195 by January 1, 2012, to:

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7820 Holiday Drive South
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Sarasota, FL 34231
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Modesto. We put GAMInjectors on the engines a couple of years ago, ran all of the tests and replaced some of the injectors for better balance. I don't think they helped much on smoothness and the engines still are too rough for me operating lean of peak. One thing we learned is that if the airplane sits for an extended period—months—the oil pumps may need to be primed. That happened to both of our engines when we went to pick up the finished plane after the paint and upholstery. No oil pressure on start up gets your attention.

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