

Budget ANR Headsets

You don't have to spend a grand for active noise cancelling. For under \$500, our top picks are LightSPEED and Headsets, Inc.

by Coy Jacob

Has it really been more than a decade since active noise canceling headsets first hit the market? Longer, actually. We were first wowed by the Bose Series I ANR headset in 1989. Since then, the market for ANR headsets has practically exploded, with more players and more models than ever.

Although Bose shocked the aviation world with a \$1000 price tag for a headset, the market has since become much more price stratified. Where it took a grand to play ANR a decade ago, you can now buy a decent—actually impressive—noise canceling headset for a third of that. In this

Once limited to \$600 and higher, you can now buy decent ANR for under \$300. Below, left to right, Flightcom, SoftComm C-90, LightSPEED 20XL2, XL15, Headsets, Inc. EM-1 and LightSPEED QFR.

article, we'll report on our flight trials with what can best be described as five budget ANR headsets. In a subsequent report, we'll examine mid- and higher-priced ANRs.

As the market becomes more saturated with headsets of all sorts, the manufacturers have clearly decided there's a low end and they're right. Why spend \$1000 or even \$600 if you fly 50 hours a year on short trips where long-term comfort isn't an issue? And how about the passenger seats, which are rarely occupied? There's no point in equipping those seats with high-dollar ANR when less expensive models will do for occasional use.

In any case, the bottom line is this: even budget ANR is better than no ANR, in our view. While it's true that a \$300 headset may not be as comfortable as one costing \$1000 and its mechanical detailing might not be as flawless, it's also true that the ANR in the higher-priced headset won't be perceived as being three times

better, if it's perceived as being better at all. Frankly, ANR performance is so subjective that we're not sure *everyone* would agree there's a discernible difference in performance from the cheapest headset to the most expensive. Comfort is another matter, however.

What's Wanted?

Assuming, as the manufacturers have, that not every buyer wants an expensive ANR headset, what should we expect of a budget noise canceling model? In our view, comfort, mechanical robustness, convenience of power supply, ANR performance and weight are the top considerations, in that order. In our estimation, comfort is another word for clamping pressure or lack thereof.

It's an important element in headset design because if the thing squeezes your head or clips your ears, no amount of high-tech noise canceling will make you happy. Second, we've heard from many readers who rave about the new in-the-ear lightweight headsets on comfort grounds alone, despite the fact that these devices offer no active noise canceling at all and vary widely in passive canceling capability. In-the-ear models have no clamping pressure and some users consider this important above all else.

If a headset is used much, it will get abused; dropped, rolled around in the baggage compartment and exposed to broiling and



Checklist

- LightSPEED, SoftComm and Headsets, Inc. are top picks among bargain ANR headsets.
- Flightcom Classic ANR is also competent but not a standout in this crowd.
- Advanced features such as cellphone interface and ship's power are finding their way into bargain ANR but aren't standard.

freezing cabin temperatures for months on end. This is a brutal, real-world test of the materials used in headsets, chiefly various kinds of plastics and adhesives. While we're unable to discern long-term durability of the headsets reviewed in this article, we can make on-the-spot evaluations of construction quality.

Last, battery boxes and power supplies. This has become somewhat of a sore point with users of ANR headsets and we're not sure any manufacturer has gotten it just right yet. What we pine for are unobtrusive battery boxes that are placed far enough along the audio cord not to be a nuisance.

We also want LED indicators that show when the headset is turned on and/or auto shutoff devices that turn them off to preserve the batteries when the user neglects to power down on his own. And how about a dual-power option that allows either battery or ship's power to run the headset? While we're at it, could the industry please agree on a standard power receptacle for ship's power? Why must customers jump through hoops to have this option in their airplanes?

What We Tested

There are so many ANRs on the market that we decided to sort them out by price and to limit our trials to five headsets. Among the bargain models, we skipped the Telex Echelon 150 (\$299) this time because we weren't able to get a test unit to meet our deadline. Similarly, we skipped the LightSPEED 20XL/2, at \$399, because we have tested it before and we wanted to limit our trials to a manageable number. In the under \$400 class, our group included the SoftComm C-90 (\$299), the Headsets, Inc. EM-1 (\$399), the LightSPEED QFR-XC2 and 15XL (both \$339) and the Flightcom Classic ANR at \$395.

We examined each headset carefully, cataloging its features and we then flew with all of the models in a Mooney, with two testers in the front seat and one in the back seat. We passed each of

the headsets back and forth and recorded our findings on a standard sheet, listing the categories noted in the chart on page 20. We would rate the Mooney cabin as noisier than the typical GA airplane and even noisier than typical Mooneys because it had a leaky inflatable door seal. The airplane was also equipped with an intercom. We did a ground test of the SoftComm cellphone interface but we did not test the Headsets EM-1 ship's power interface; we assumed that it works as claimed.

Some general notes on construction of headsets: David Clark pioneered the aviation headset market with a robust design consisting of a pair of durable plastic earcups mounted to a spring steel headband. Over the years, Clark has used various mic booms, chiefly a wire-frame design or a flexible rubber boom. Clark headsets have earned a reputation for being durable and all but immune to abuse. (We have a 20-year-old Clark that's never seen any repairs and continues to function as well as new.)

Clark's design was so good, in fact, that many manufacturers have simply copied its principle features, sometimes improving them, sometimes not. Generically, we refer to these headsets as "Clark clones" in that they're based on the Clark idea, if not direct copies.

With their oval plastic earcups and steel yokes, the SoftComm and Flightcom are Clark-style headsets. However, the LightSPEEDs are made almost entirely of plastic and have earcups and earseals of an entirely different design. These we consider to be "clean sheet" ANRs, not Clark-type designs with ANR added.

One complaint users have about Clark-type headsets is high clamping pressure. In a passive-only headset, higher clamping pressure is necessary to obtain a good seal between the user's head and the earcup. Without it, passive noise attenuation is less effective. With active noise cancelation, high clamping pressure isn't as important but



LightSPEED QFR, top, is light, comfortable and has effective ANR. Headsets, Inc. EM-1, lower photo, is a Clark-style design.

any ANR designed in the Clark style may have it. We've found that this, more than any other factor, impacts headset comfort.

Flightcom Classic ANR

As the name implies, this is a Clark-style platform that's stoutly built, with heavy earcups and a unique mic boom that has both a wire frame and universally adjustable rubber boom. For earseals, it uses thick Confor pads—perhaps a little too thick, in our view—and it comes standard with a headpad and volume control on each earcup.

At 18.5 ounces, this was among the heaviest of the ANRs we tried but, as noted, we're not convinced that weight is much of a determinant for comfort; clamping pressure is. The Classic ANR is

FIVE HEADSETS COMPARED

Model	Price	ANR Rating*	Passive Rating	Comfort	Dual Power
SoftComm C-90	\$299	Fair to good	Good	Fair	No
Headsets Inc. EM-1	\$399	Fair to good	Fair	Fair	Yes, patch cable
LightSPEED QFRXC2	\$339	Good to excellent	Excellent	Excellent	No
LightSPEED 15XL	\$339	Poor	Excellent	Excellent	No
Flightcom Classic ANR	\$395	Good	Fair to good	Fair	No

*perceived comparative performance rated in an aircraft by three testers on four-point scale ranging from poor, fair, good and excellent.

powered by a single 9-volt battery housed in a smallish and unobtrusive case with low battery warning and on/off LEDs, a feature with which is a must. The battery case has a clip that can be attached to a belt or to an aircraft side pocket. Of all the battery cases, the Classic ANR's was the smallest. It doesn't, however, have provisions for ship's power.

As far as performance, our testers rated the Flightcom as fair to good in ANR and fair in passive attenuation when the ANR was switched off. The earseals have an overstuffed feel which,

while creating a good seal, also yields fairly high clamping pressure. But in our view, this is about as comfortable as a Clark-style headset gets. Overall, our test panel liked the Classic ANR a bit better than the higher-priced Denali. The Classic ANR comes with a carrying case and has a three-year warranty and a 30-day "fly 'em and try 'em" guarantee.

SoftComm C-90ANR

At \$299 and 19.4 ounces, this is one of the least expensive but also one of the heaviest ANRs in this

group. Overall, we thought it delivered remarkable quality and performance for the price. Like the Classic ANR, it's a Clark-style design with a continuously adjustable mic boom and a padded headband. Curiously, at this price, it has no case but it was the only headset in the bargain group to have the cellphone interface. Given the choice, we can do without the case.

On the other hand, we found that the 9-volt battery box could use some work. In our view, it's generally not up to the quality of the rest of the headset; it had no power-on LEDs and the switch is easy to accidentally bump on. Since it has no auto shutoff feature, a dead battery will be the result.

Comfort and performance wise, it runs in the middle, in our estimation. We found that perceived active and passive noise attenuation were in the fair to good range while comfort was fair. But if the cellphone interface is important and you're on a budget, this one is a winner.

Cellphone Interface: We Want It

One feature that we found useful in an ANR—or any headset for that matter—is a cellphone interface cable. This allows the headset to be plugged into a standard 2.5 mm cellphone jack so the phone can be used in handsfree operation.

Why is this useful? Ever try to pick up an IFR clearance on the ground at a remote airport? Cellphone to the local ATC or FSS facility is often the best if not the only way to do it.

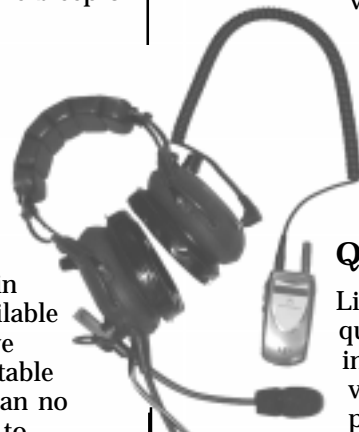
With the engine warming up for departure on a two-minute void window, using even a good cellphone in a noisy cockpit is problematical. The cellphone interface cable addresses that issue nicely.

And there's no reason the headset can't be used in ANR mode in the car, both to satisfy those states that require hands free solutions while using a cell

phone and just as a matter of convenience.

You might look a little ridiculous but at least you'll be able to hear well. We'll leave it to you to decide if using an ANR in a car makes it a little too quiet to hear traffic around you or the bleep of a nearby horn.

Among the bargain ANRs, only the SoftComm C-90 has a cellphone interface cable and we thought it worked well. Plug one end into the phone, the other into the earcup and you're in business. Audio is available only on one side but we found this to be acceptable and certainly better than no interface at all. Kudos to SoftComm for this feature. And to the other manufacturers, we say get busy and include the jack and cable, even it's a \$20 option.



LightSPEED QFR

LightSPEED has made quite a name for itself in the aviation world with moderately priced headsets that perform well while also remaining comfortable for long periods. In our view, the QFR continues that tradition, although this headset represents a point of

Battery Box	General Comments
Poor, no LEDs or auto-off	Excellent value/performance for price
Fair, auto-off	Stout design; impressive design detail
Good, LEDs, auto-off	Excellent design, comfort, performance
Good, LEDs, auto-off	Disappointing performance overall
Good, small LEDs	Good value/performance, not a standout

departure from previous designs. LightSPEED has traditionally used plastic throughout its headsets—there is a metal headband for tension inside the plastic, however—but the QFR is different. It has a pair of wire yokes to support the earcups and our guess is that these contribute to the headset's light 15-ounce weight.

For batteries, the QFR uses the LightSPEED standard: two AA cells in a well-designed in-line battery case having separate volume and LEDs for power and low battery warning. It also has auto power shutoff.

LightSPEED is well known for having large, deep earseals and the QFR follows this tradition with close cell acoustic foam for the pads. We found these to be comfortable and, just as important, dry when the weather gets warm. Sweaty earseals contribute to discomfort, in our view. Perceived noise cancellation of the QFR is excellent, according to our test panel. Overall, for comfort, construction and performance, this one earned a top rating. Worth noting here is that although we didn't test it with this group, LightSPEED offers the 20XL/2, an improved variant of the original LightSPEED models we last examined. The 20XL/2 uses what can be considered LightSPEED's standard construction, a heavily padded plastic-covered headband and beefy plastic yokes for the earcups. At \$399, this headset is also a contender.

LightSPEED 15XL

But the 15XL one isn't a contender,

in our view. Unlike the other model LightSPEEDs, we think this unit doesn't stand out in either the passive—we rated it poor—or the ANR mode. Despite its low price of \$339 and light weight, we were somewhat disappointed in the perceived performance of this product. The ANR just didn't seem as effective, in our view, letting in more extraneous noise than did its stablemate QFR and the other ANRs in this group.

The 15XL is, however, quite comfortable, thanks to the earcup and seal design. Excluding the comfort factor, however, LightSPEED's own QFR, the Flightcom, Headsets EM-1 and the SoftComm performed significantly better, in our estimation. We liked the 15XL's compact battery box and auto shutoff but it has no bells and whistles, such as cellphone interface, case or dual power. We don't see anything special to recommend the 15XL.

Headsets Inc. EM-1

Headsets, Inc. is an Amarillo, Texas-based company best known for manufacturing ad-on ANR kits that convert passive headsets to ANR. They've sold a number of kits and we've tried them twice, with good results. The EM-1 marks the company's first foray into purpose-built headsets with a Clark-style design retailing for \$399. We were impressed with the attention to detail on this headset; it has a beefy, well-made feel and look. But at 20 ounces, it's slightly heavier than the competition and we thought it had noticeably heavier clamping pressure than

the LightSPEED models.

Of course, that also gives it good passive attenuation if the ANR circuitry goes west or the battery dies. Speaking of which, it uses a single 9-volt battery in a simple battery box but with automatic shut off.

Unique among headsets in this price range, you can hardwire the EM-1 to ship's power using an optional panel-mount power supply suitable for either 12- or 24-volt systems. The power supply has its own inline fuse protection. There's no cellphone or music interface but we found the ANR performance to be on par with any of the others and comfort was fair.

Conclusion

Our top rating for this round goes to the LightSPEED QFR. It's light, performs well and the price is right. We don't find much fault with it, other than the lack of cellphone interface. As noted, the LightSPEED 20XL/2 is also a good choice, based on previous experience with this product.

Second choice? A tough call. We would say it's a toss-up between the Headsets, Inc. EM-1 and the SoftComm. We like the EM-1 construction and ANR performance but the SoftComm has that cellphone feature, which we think is a terrific feature. It's also \$100 cheaper.

Coy Jacob is an Aviation Consumer contributing editor.

Contacts

Headsets, Inc

806-358-6336

www.headsetsinc.com

Softcomm Products, Inc.

480-917-2328

www.softcommheadsets.com

LightSPEED Aviation, Inc.

503-968-3113

www.anrheadsets.com

Flightcom Corporation

503-684-8229

www.flightcom.net

Telex Communications Inc

952-884-4051

www.telex.com

The Pain of Datalink

If you're thinking about WSI's Inflight with a Fujitsu tablet computer, read this first.

by *Ian Blair Fries*

If you're thinking about datalinked weather for your aircraft, I offer this observation: the road to datalink Nirvana may be a bumpy one. You may find the trip more frustrating than it's worth.

After what I thought was careful consideration of several weather systems, I decided WSI's new Inflight product offered the performance I wanted and was the most appropriate for the airplane I own, a TBM700.

I visited the WSI Website, downloaded the demonstration software, scheduled a conference call demonstration and was impressed with WSI's offering. (If you're interested, I recommend their Website at www.wsi.com). I have enough glass—two-tube EFIS 40 and an Argus 7000CE—in my airplane and I didn't want to revamp my entire panel to add a multifunction display, such as the Garmin AT MX20. As an alternative, the WSI receiver is remotely mounted and offers the option of connecting by cable to a portable display, a tablet-type computer. So that's what I decided to do.

FSDO Says No

While my avionics shop installed the WSI receiver, my first (\$1500) surprise came when the local Philadelphia FSDO wouldn't approve installation of the non-TSOd WSI AV-100 system.

They took this position despite the fact that the WSI receiver was connected only to aircraft power and a dedicated antenna. WSI claimed most FSDOs allow their less expensive unit to be installed when displayed on a portable

device. However, only the TSOd AV-200 unit will be approved when wired to a panel-mounted display. That makes sense. It makes no sense for the FSDO to dig in on the portable option, however. Despite what WSI says, approvals for portable installations may be hard to come by. (We've since contacted WSI and asked about this. The company concedes that the FAA has been inconsistent in approving the portable set-up.)

As my airplane is pressurized, I needed special engineering (about \$800) to design and move antenna locations to accommodate the WSI antenna. The WSI antenna must be placed as far as possible from transmitting antennas to avoid interference.

My laptop computer is too big for the cockpit. Even if the copilot seat is empty, a laptop is an impractical airborne display. WSI weather can be displayed on a PDA, but I found these screens to be too small. A tablet computer used as a kneeboard was the right size, and could also display almost full-size approach plates using JeppView.

The tablet with the best display for day and night seemed to be the Fujitsu Stylistic LT P-600. You must specify the model with the transilluminated daylight-readable screen, however. The screen is quite legible in direct sunlight and in dim light, and is marginally acceptable in diffuse light. Unfortunately, this rather expensive computer is sold à la carte, and several "optional accessories" are required.

I initially ordered the Fujitsu tablet without a keyboard, as I didn't plan to use keys in the cockpit and would depend upon

the touch screen for entry. However, the computer wouldn't allow Windows 2000 to be initialized without a keyboard. I confirmed this with Fujitsu phone support and then had to purchase the keyboard (\$100).

What Ports?

The WSI system requires separate serial ports to bring weather and optional GPS information to the computer but the computer has only one serial port. Another \$200 bought a Socket-brand dual serial card that converts the PCMCIA slot into two serial ports. WSI advised that I buy the ruggedized version, as the standard model connections between the cables and PCMCIA card are tender. I support this recommendation.

Socket software and hardware has to be installed, of course. And once this is done, the computer's PCMCIA slot is filled by the Socket card and is thus unavailable for other use. The optional Fujitsu CD player (\$134) also uses the PCMCIA slot so—you can see where this is going—I had no way to load the Socket software from the supplied CD disk.

After discussion with Socket support, I downloaded the required programs from their Website to my desktop computer using a highspeed cable modem, as I do not have Internet access on the Fujitsu tablet. I loaded the required files on a USB flash card—that was a bargain at \$60—and then transferred them to the tablet computer. I then ran the Socket installation programs and then configured the two serial ports. I labeled the two serial leads WSI and GPS to prevent confusion.

I also moved WSI software downloaded from the net to the tablet using the USB flash card. I configured WSI software so it would match the Socket two-serial port assignments, correctly displayed in portrait mode on the computer screen and configured to accept Bendix/King KLN90B GPS data. I signed the WSI agreement and paid for a year of satellite access at \$600. The required agreement indemnifies

WSI from liability and limits their exposure to no greater than the cost of 12 months of service. However, it's unusual in requiring that the subscriber pay for *all* expenses in defending WSI from any third-party actions.

Meanwhile, my avionics shop wired the WSI receiver to the aircraft ground clearance voltage source so I can access weather before engine start, while leaving other avionics off, except for one navcomm and the GPS. Two leads with DB9 plugs provide serial WSI and GPS inputs for my computer. A third lead supplies aircraft power to the tablet through a Fujitsu auto/aircraft converter. Add another \$100 for that.

Switch On: Poof!

Here goes. Turn on the power and...WSI weather wouldn't display on the tablet! I could display weather on my configured laptop and the Socket PCMCIA card and software were functioning. However, I could get WSI data only once out of six tries on the tablet and never saw GPS information, which is supposed to automatically center and georeference the display.

WSI support suggested rewiring, but this confused the GPS. It responded with a flashing message warning that could not be cleared and GPS output to the Argus Moving Map display was lost. After several discussions with WSI, I was told a secret. Serial data cannot be presented to the Fujitsu tablet before it is booted. Otherwise, the computer considers the serial input as plaintive electronic cries from a confused mouse and it will not function properly.

I finally had the system working consistently and then made the mistake of trying to upgrade Jeppesen FlightStar to Version 9.0. The tablet computer locked up due to failure of the Windows 2000 operating system. Several hours on the phone with Fujitsu support didn't solve the problem.

This particular Fujitsu computer is sold without back-up operating system software on CD

and without a software image on the hard disk. So the computer had to be sent in for "repairs."

In the kind of buck passing that stands in for customer service in the computer industry, Fujitsu informed me that the software was not warranted beyond 30 days. As I had the computer for about six weeks, it would cost \$175 to reinstall Windows software! I was promised a three to five-day turnaround after receipt.

I sent the computer overnight and by the seventh day had heard nothing. After several e-mails and a phone conference, I was told that due to the holidays—this was between Thanksgiving and Christmas—seven to 10 days would be required for the repair. I received the computer by overnight delivery in 11 days and have not yet been charged a repair fee.

Of course, I had to reload all the software and complain to Fujitsu that a port cover was missing. Problems initializing Windows 2000 required two more calls to Fujitsu support, but all was accomplished in only five hours of my time. Now the system works as advertised, the FSDO has rolled over and the bugs seem to have been vanquished.

Conclusions

From my experience, I offer these recommendations:

- Do not undertake installing a WSI InFlight system on a portable computer unless you're intimately familiar with Microsoft Windows, can configure computer programs and have highspeed Internet access for downloading.

- Be prepared to spend many hours before everything will work. There are three pieces of hardware—aircraft, serial socket PCMCIA and tablet computer and three software programs: Windows, Socket, and WSI. All six must work together. Don't be surprised if they don't.

- Expect to spend about \$4000 on Fujitsu computer hardware, above the cost of the WSI receiver and aircraft installation. Thus, the



The WSI Inflight weather service plays on several tablet computers, including the Fujitsu Stylistic LT P-600, top. The receiver itself, lower photo, mounts remotely.

whole system will cost more than \$10,000. To this add \$600 per year for satellite service. For the first year, the cost works out to \$29.04 a day for this service, assuming you value your own time as worthless, as the computer industry seems to. After that, it's a bargain: \$1.64 a day. If you can do all of the above and can accept some frustration, you'll be pleased with the result. The WSI weather product is terrific.

If this sort of run-around puts you off—and who can blame you if it does—you may be better off biting the bullet and installing an MX20. It'll cost more but the shop will be on the hook to make it all work correctly.

Ian Blair Fries is an Aviation Consumer contributor, an AME and owner of a New Jersey-based Socata TBM700. Contact WSI at www.wsi.com or 978-983-6300.

Cessna 340

A fast, pressurized cabin-class twin that's an excellent step-up from a high performance single.

Although airplanes are often sold as business and transportation tools, the reality of ownership falls short of the ideal. They either lack the range, the carrying capacity or the ability to deal with real-world weather, thus an airline or a charter outfit gets the call.

Still, there are plenty of pilot/businessmen who couldn't function without an airplane. These owners typically start with single-engine airplanes and quickly outgrow them for the reasons stated above. A serious business airplane needs a decent cabin, credible speed and the ability to hack it when there's ice or thunder in the forecast. Pressurization is nice since the clients don't want to spend several hours with a plastic hose stuck up their noses.

Enter the Cessna 340. Owners looking to step-up from a high-performance single will inevitably

The Cessna 340 is a standout thanks to payload/fuel flexibility and near 200-knot cruise speeds. Pressurization is an added plus.



make a pass or two through the 340 classified section. And well they should. Although not without its shortcomings—most notably certain loading limitations and an overly complex fuel system—the 340 is nevertheless an impressive, flexible and capable airplane that meets the business mission well and can do double duty as a family airplane.

Model History

The 340 owes its existence to the boom days of general aviation during the late 1960s and early 1970s. It appeared in 1972 as a lower-cost alternative to the Cessna 414, which had arrived in 1970. In those days, the twin market was still a work in progress and it was stratified.

At the entry level, you had Twin Comanches, Apaches, Aztecs, Baron and the Cessna 310. At the upper end, the ritzy cabin-class Cessna 421, Beech Duke and Piper Navajo met the needs of well-heeled owners who could afford megabucks for an airplane. The 340 found its niche in between; a cabin class, yes, but a modest one

with an affordable price tag.

Although it carries a 300-series number, the 340 and 414 are similar, sharing the same wing, flaps, ailerons, landing gear and engines. Like the 414 and other cabin twins, the 340 has an airstair door, thus you don't need a ladder to get into it, as some have jokingly complained about the long-legged Cessna 310. With the same engines as the 414 but at a lower weight, the 340 is faster than the 414 on the same fuel burn. But there's no free lunch; it gives up some payload to the higher-priced model.

Engines installed in 340s from 1972 through 1975 were Continental TSIO-520Ks, which produce 285 HP at 33 inches manifold pressure from sea level to 16,000 feet. However, most of the K engines in early 340s have been converted to Js or Ns.

The TSIO-520J engine, used on early 414s, produces 310 HP at 36 inches manifold pressure. The N engine, installed on later 414s and 340s (the N-engine airplanes are called 340As), produces 310 HP at 38 inches.

The major difference between the K engine and the J and N variants is that the latter are equipped with intercoolers which wash the heat out of the turbo-charged induction air as it flows on its way to the cylinders. This yields better power and efficiency without stressing the jugs, something that's good for longevity.

The N engines produce their rated 310 HP up to 20,000 feet and provide higher cruise speeds and better climb and single-engine performance. Three-blade McCauley propellers, formerly an option, also became standard equipment in 1976; earlier 340s came with two-blade McCauleys.

These airplanes are prized for being all-weather machines but certification for flight into known icing conditions, when properly equipped, came only in 1977. The following year, a maximum ramp weight of 6025 pounds was approved and max weight for takeoff and landing was set at 5990 pounds for the 340A, compared with 5975 pounds for the