

Next Generation Avionics

Dealing With Data

BY GARY PICOU

In some cockpit of the not too distant future, say next July, the first thing you hear after the avionics master comes on may not be the autopilot test tone. It may well be,

- “You’ve got mail.
- “You’ve got weather.
- “You’ve got clearance.”

The next generation of avionics, which is being developed and deployed even as you read this, will make the traditional way of getting your clearances look

like a quill pen inkwell. Information transfer at the speed of, well the speed of the internet.

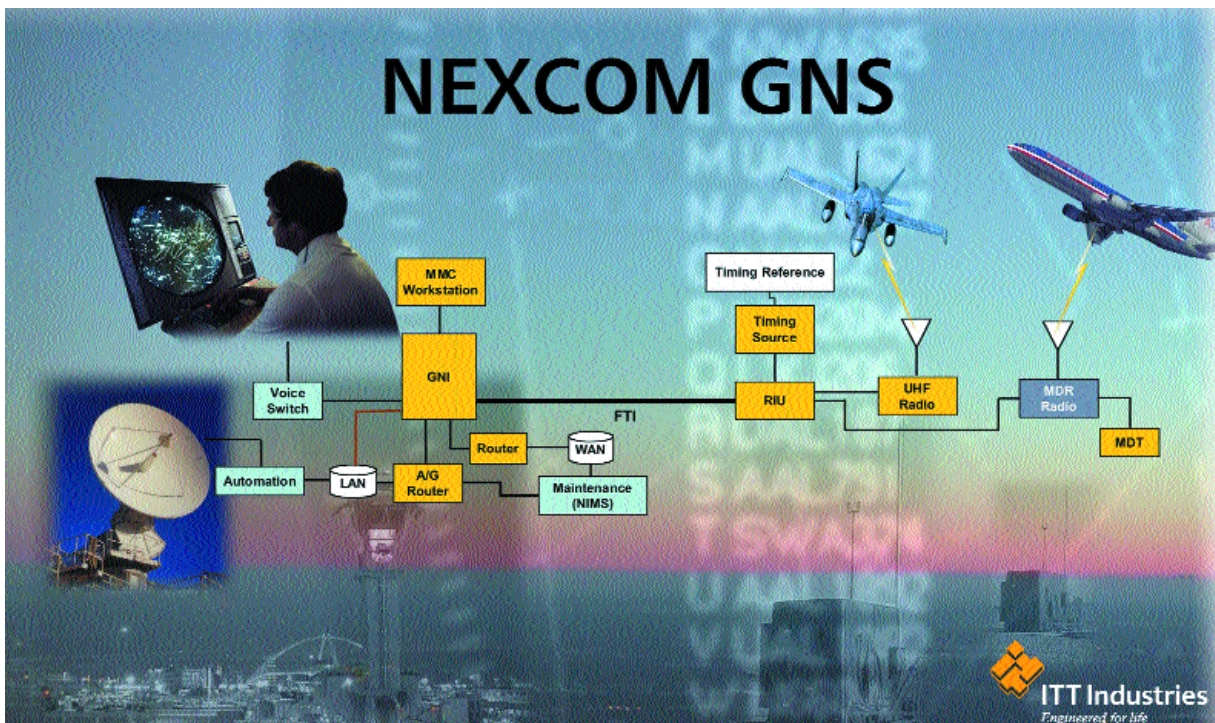
The problem, which any pilot can identify with, is that the least efficient data transfer medium is through the ears. One controller can talk to one airplane at a time, and the information stream is serial data—one word following another.

Even with a decrease in air traffic, there is still an increasing need to provide all types of infor-

mation from the ground to the pilots.

Just as the internet has dramatically increased the accessibility of information to the home, a datalink established from the ground to the cockpit will have a similar impact on aviation. Aviation safety will be beneficiary, along with less stress (“what’d he say, what’d he say??”) and more accuracy.

As consumers, aircraft owners are going to be faced with a con-



fusing array of choices, including services, service providers, system types, and data transfer protocols. Sound familiar? Cable modem or DSL, dial up, Explorer, Netscape, etc.

SERVICES

Weather

Let's start with the services.

The most popular and first available is weather. Providing real-time weather data, including maps, has been a boon to aviation safety. If a leading cause of accidents is unexpected flight into IMC, showing the weather boundaries in the cockpit will go a long way towards preventing it.

One such provider is Flight Information Services Data Link (FISDL), or what used to be called Graphical Weather Service (GWS), although there are many different names and providers to choose from.

In addition to weather hazards, the FISDL can present another hazardous area, the Temporary Flight Restriction (TFR). In today's changing airspace, the man made hazard is at least as challenging as the weather to monitor.

Both Honeywell and ARNAV have been given FAA sanction on the official FISDL. The basic services are free to the well-equipped and flying public. Fee-based enhancements are offered.

In addition, weather data is available from other companies, such as WSI In-Flight, Echo Flight, ControlVision, or SATELLINK Technologies' Merlin system. Where there is a con-

cept of value, you can count on the private sector to leap in, and create a market. Everybody talks about the weather, and these companies will provide products to keep you in touch with the flying environment.

Traffic

Traffic Information Service, or TIS, is another way that ground to air data can be used to enhance safety. The TIS system collects aircraft position information from ATC, and transmits it to the cockpit display. You see what they see, but enhanced from your local perspective. This presents a TCAS-like awareness of collision threats, at a fraction of the cost of an on-board system.

The TIS displays all transponder equipped target aircraft within five miles, within their altitude (if within 1200 feet), in relative position to other datalink-equipped aircraft.

You'll often see TIS as TIS-B, for Broadcast. The system is similar to the collision avoidance system being deployed in air transport, called ADS-B, or Automatic Dependent Surveillance-Broadcast. TIS-B is like ADS-B, except it accommodates ALL aircraft with transponders, and depends on the ground ATC for uplink. ADS-B is independent of the ground, but requires that other airplanes be ADS-B equipped for the full capability.

Essentially, these systems are all about telling other aircraft where you are, and listening for them. If you think of uncontrolled field protocol, announcing your position and intentions, you can

get an idea of how this datalink will work.

TIS-B is a fusion of ground based information, and other Mode S equipped aircraft, into a single threat presentation.

Although this system can't ever replace the human element entirely, it is actually pretty smart. The datalink passed between the systems is more than just position and altitude. It can contain information, such as aircraft type, current direction and speed, vertical speed, and so on. Imagine if you are able to have the threat aircraft's GPS display in front of YOU, to know his intentions. The system will be able to know that your Bonanza is going to be passing a Boeing 757 that is climbing, and that significant wake vortexes will be likely.

NEXCOM

The aviation radios we use today would be familiar to Guglielmo Marconi. Many pilots are surprised to know that these are simple AM radios that are not too different than a CB. While navigation has moved into the satellite era, communication remains rooted in the past. That's because when you have to communicate, you are forced to the lowest common denominator.

As the voice communication requirements increased, the only option has been to slice the existing radio spectrum into smaller pieces, and hope that the older radios didn't create too much interference. That's how we migrated from 90 channel radios to 360 and 720 channels, smaller bits of the same radio

Continued on following page...

NEXT GENERATION AVIONICS

Continued from page 2

real-estate. Sort of like starting with a crayon and graduating to a fine point pen, you can put more words in the same space. But we are reaching the limits of our pencil sharpener.

The FAA anticipates that the voice traffic will increase at least 4 percent every year. Four percent doesn't sound like much (unless it is a passbook savings account), but consider that the lifetime of our avionics packages is 30-plus years. If you want to make a difference, you need to make new gear available NOW. A new technology must be used if we are to improve voice communication.

That next technology is called NEXCOM. Amaze your friends by knowing that NEXCOM is the acronym for Next Generation Air/Ground Communications.

You can understand the concept a little better if you consider that NEXCOM is analogous to the touted digital television. Less interference, better quality.

NEXCOM will be the communications protocol for the 21st century, but the FAA is v-e-r-y conscious of the user segment. One of the requirements is that it coexists with the old junk we use today.

By the way, in your lexicon of avionics, be sure to include the term "legacy." Sounds like a good thing, right? The company founder has a "legacy of excellence." In the context of avionics, legacy means, "Gear which the cheapskates won't part with and we have to work around." In 2003, it includes 100 percent of general aviation comm radios.

NEXCOM will have so many benefits that we will wonder why

we waited. The sound quality will be superior; the security will be enhanced, because anybody with a handheld won't be able to become a 'tower.'

Another benefit may be that digital transmissions can be aircraft specific. If you hear it, ATC is talking to YOU. Frequency chatter and stepping on each other are eliminated. This sounds great! Still, we may lose something, because we will not be able to hear what else is happening on the frequency. In general gossip is bad, but when we are all moving through the ocean of atmosphere, listening to other folks' tribulations can be very educational. It is a tradeoff, quiet cockpit, or informed cockpit.

NEXCOM offers the promise of both voice AND data over the same aviation frequencies (118-137 MHz).

Uplink

Datalink is like internet, there are several different ways to deliver the information to the airplane. Not all are compatible, not all services are available on the different types. Actually, the whole industry is so infantile that there is no clear standard.

In this section we'll describe the formats, so you can be aware of them.

VDL

VHF datalink radios are the first incarnation of NEXCOM. The hardware uses adaptations of comm transceivers, and so is less expensive for pilots to install and maintain—no special antennas, etc. The ground segment is more complicated, and its fate lies in the government funding circumstances. Every year the FAA will have to decide how they

will spend their money, and the burden of security can pressure the advancement of technology.

Mode S

Mode S was envisioned from the outset as THE medium for datalink. In 1988 it was a promising technology, and had a mandate from the FAA for equipage. However, the user segment (that's us) stayed away, and the FAA, unable to effectively deploy Mode S ground stations or engage the customers, backed away. Now after a dozen years, the utility has caught up with the technology. Major avionics manufacturers have Mode S transponders that will not only fulfill the ATC requirements, but will give a direct benefit to the consumer.

Mode S datalink is limited to a service area that is defined by the FAA's deployment of ground stations. These will be wherever better radio services are provided. The ground based hardware is expensive and complex, but provides more benefit for the government than the pilot. This means that the systems will be rolled out eventually, if slowly as finding permits.

Satellite

One of the emerging ways to provide data is as old as Sputnik. Satellites have the ability to blanket whole continents with datalink. Several providers have already begun using satellites for everything from communication (Iridium, Globalstar) to weather (Echo Flight, SATTELLINK) to entertainment (XM Radio, DTV and Sirius). There are user-volume, coverage and cost issues to be worked out. One satellite on orbit may cost as much as a continent-wide terrestrial service

deployment, but it has tremendous availability advantages for flight.

Summary

All of this new technology will benefit pilots, as well as avionics manufacturers and shops. Let's face it, in order to continue, general aviation needs an inflow of new ideas and products to keep the industry alive, and hopefully to grow.

As a consumer, we know that you would want nothing more than for us in the avionics industry to tell you what to do. "Buy this, that and this other gadget, and you're set for life." But it isn't so.

In technology, there is no definitive answer. Just go buy a computer, cell phone or TV.

In general aviation, our crystal ball is clouded with uncertainty. We exist at the pleasure of the FAA and far larger electronics marketplaces. If we're lucky, we can co-opt technology that is in widespread use for our specific purposes. If we are lucky, the interests of commercial aviation and security for the civilized world will intersect with the technological advancement for general aviation, and we will have a win-win situation.

Still, absent a total collapse of civilization, the worst-case scenario is that, the government funding and commercial viability will not materialize, and we will maintain status quo. "Gardner Traffic, Cessna 610 Papa is entering downwind for landing." ■