



Bob Nuckolls
6936 Bainbridge Road
Wichita, Kansas 67226-1008
Voice/Fax: 316-685-8617
E-mail: nuckolls@aeroelectric.com

The American General Aviation Technology Experiment (AGATE): A future for you and me?

Here's a copy of an exchange I had with a gentleman who was obviously enthusiastic about the AGATE program. I too would like to see the program succeed but I believe it's successes will be far removed from that which the program's advertising hype suggests. Please consider the following and let me know what you think:

Bob,

I have been enjoying everything you have put on the list and I've learned one heck of a lot from it to. Thank you for that. However, in the spirit of your motto, "show me where I'm wrong", I would like to take exception to some of your statements about the AGATE program. (I am very familiar with AGATE having developed it with Bruce Holmes of NASA since its beginning when I was the technical assistant to the FAA Administrator and until recently when I was the FAA R&D Manager for GA. Now retired so I can build my Kitfox.)

I'm familiar with some of the AGATE program having consulted with the folk at Raytheon who are working it. I also wrote the AGATE paper on electrical system reliability and components selection. B&C is a supplier of components to the AGATE study and I expect to have future involvement as well.

Yes, currently there are no immediate "on the market" results, but in a few short years I think the work in areas like the integrated design and manufacturing team will begin to payoff by the knowledge designers are acquiring on new manufacturing techniques, new materials, and expanding capabilities. The same holds true for integrated flight systems, where a low cost (affordable) GA data bus will be developed that will lower the price for new and advanced avionics that are under design.

That's certainly consistent with the hype surrounding the AGATE program. I could agree if the components are being developed by the likes of Sony or Hitachi for consumer markets. But integrated flight systems of the complexity and responsibility assigned to the AGATE mission are totally unrealistic in a regulated environment. You think software certification to DO-178 is tough now, wait until that software has responsibility for keeping a 40-hour pilot and family SAFE in IFR conditions.

And I'm still wrestling with the idea that concepts like "GA data bus" and "low cost" go together or even belong in a little airplane. What data? If there's lots of data to be exchanged between multitudes of black boxes on an airplane, how can this ever translate into "low cost?" I've seen some data busses demonstrated at OSH . . . even some that purport to make things "easier to install" and "more reliable" . . . One such system operated all the lights and trim system through a common communications bus . . . every transceiver on the bus had a microcontroller to handle each function. Complexity is UP, and flipping the switch still does the same thing . . . turns on a light. Looks like a lot of overkill to replace a few fuses, switches, lamp fixtures and \$2 worth of wire.

If you need to trade navigation and flight control data around on the panel, pick a bus. ARINC 429, RS485, IEE488, it's already 'fat city' when it comes to bus structures, and they're already "low cost." By the time AGATE ever hopes to fly, fiber optics will be used to hook up consumer products at tens of megabits per second data rates. The AGATE guys will still be arguing over who's 2-megabit wired bus should become "standard."

. . . Mostly likely it will be the homebuilders and the better kit companies that will bring the technology forward initially, but it's the 60+ companies who signed on to do the AGATE work that include every major airframer and avionic

company who are in it for the long haul.

I'd be surprised if one in five of the 60+ companies you mention has any corporate awareness of the amateur airplane industry. The folk you speak of have been "long-hauling" now since Duane Wallace and Walter Beech started convincing average citizens that, "you too can learn to fly and own your own airplane". In terms of cost-performance ratios, the small airplane has been in decline for the past 15-20 years. An old refurbished Bonanza is a much better value than a current production airplane. How many other consumer products have survived with so dismal a performance in the marketplace? Why has it survived? Because it's the only game in town . . . no competition, no real progress (except in avionics).

What's all the cheering about government bringing the "great consortium" together? Geezzzz . . . the Japanese have been whipping our technological socks off for bringing new technology to consumer markets for years. The South Koreans have rocketed themselves into the worldwide marketplace in just 20 years. Why should a group of 50+ year old businesses in the US depend on the "vision" of government to do their job (make money for their stockholders). I'll suggest it's because government has a strangle hold on them and they'd better dance government's tune if they are to dance at all.

How are technology advancements alone going to change this condition? If you could wave a magic wand, make anything in way of technological advancements occur between now and tomorrow morning, what would you chose to create? Now, in our "perfect world" turn those creations over to the people who are currently building certified airplanes. Explain how that wonderful product will be any more saleable than my 20 year-old refurbished machine, much less a new one at \$400K to \$2M a copy.

My observations suggest that design-by-committee is guaranteed to produce mediocre products. The output from large groups tend to be very middle-of-the-road . . . products built of ideas that irritate the least number of people. Having worked on teams of 5-8 companies before with a supposedly singular goal, I don't have much faith in 60+ companies doing much better.

The program although initially developed by government folks, is not run by them, but by a consortium of private companies who match the government dollars, either by \$\$\$ or in kind service and these same companies are the essentially the Board of Directors that provide the direction for the whole program.

But the market is still CONTROLLED by government. If the FAA can be convinced to exercise ANY relaxation of require-

ments in the face of new technologies they don't understand, it will be a momentous milestone in history of government.

For example, Cirrus has been in AGATE since the beginning and some of the designs for that aircraft incorporate lessons learned from AGATE experience. The SR-20 has benefited from AGATE and is one heck of an aircraft, and I speak from first hand experience here. I was fortunate enough to have had the opportunity to fly the SR-20 prototype for an hour or two last year and it's an outstanding flying machine and luxurious to. (Check out the price and specs between that aircraft and any available currently certified aircraft and tell me where the VALUE lies.

Point very well taken. The "value" of current certified designs is headed down the chute . . . has been for about 20 years. Fly a Lancair, Glasair, or a Kiss and we can wax long and eloquent about their flying qualities, none of those airplanes have any connection with AGATE. Cirrus was in the business of pushing out the leading-edge of flight technology before AGATE came along. I suspect they and their contemporaries will continue to do so with or without AGATE. I do not doubt that there will be some trickle-down and I'm pleased that some of it is already happening. Want to kill any of those aircraft dead in its tracks? Make it the baseline aircraft for an AGATE machine.

. . . (This is not to take anything away from the familiar names in GA that have produced outstanding flying machines that have stood the test of time, but the new breed will bring a healthy challenge to the whole industry.) Granted, certification is not an easy road to take, but in the long run, it's the many people who see aircraft as transportation and not a sport that will make GA prosper. Lastly, the FAA Small Aircraft Certification Office is also a partner in the AGATE program and for a group of "bureaucrats", they are doing the best possible job of trying to make future certification less costly and simpler. They really do believe this is possible. I have seen them in action and believe it to be a truth!

An endeavor charted to do "the best possible job" can have any conceivable outcome and still be labeled a "success". "Best possible" is not quantified. There are no benchmarks by which the program will be pressed forward or scrapped as a poor idea. Advancing the science of designing, building, flying and maintaining small airplanes in a cost effective manner is a broader issue than AGATE. When you have an entrenched bureaucracy dedicated to the idea of retiring after X number of years on a GOOD pension paid for by somebody else, it's going to take more than a small cadre of visionaries working the AGATE program to make a real difference.

Assuming for a moment that an AGATE airplane will ever hit the tarmac, the same people that instigated the Bob Hoover, Delmar Benjamin, Kieth Peshak and Bill Bainbrige affairs will still be in business, doing the "best possible job of keeping airplanes safe and saving lives no matter how much it costs."

Finally, for a group of "bureaucrats", I challenge anyone to match the vision and the fortitude it took to get a government agency to get \$60 million dollars for GA from the US Congress, put in place a program like AGATE that brings together 60 diverse companies, 3 or 4 government agencies, and gets them to work together yet not be in violation of anti-trust laws. If that's what our bureaucrats are doing for GA then I'm all for them.

Baring monumental changes to the way the FAA does business, I'll suggest that GA is going survive (not flourish) - NOT because of successes in any one program. It will struggle along because of un-encumbered, collective efforts in tiny pockets of progress throughout the industry. \$60 million is pocket change . . . that amount of money wouldn't certify a new airplane of any genre under current rules. And where's the demonstration of vision and fortitude? For example, there are over 700 separate educational bills in force spending tens of billions more, what's that done for education so far? Who knows? Aside from the Interstate Highways system it's hard to name anything government has touched that has become a demonstratable, enduring success. If government had sanctioned the Voyager program, I'll bet it would have cost 10x more dollars and would have failed. Wild-eyed people with talent, working on their own, without interference make more progress with a higher probability of success than any consortium will ever do. Remember Steve Jobs? How about Bill Gates? The Wright Bros did very well too, thank you.

Darryl Phillips suggests, "We owe the Wright Brothers a great debt. But not for the reasons we've grown to embrace. Suppose Will and Orv hadn't been first. If Langley had been first, aviation might easily have become a state secret; sole property of government and the military." As it turned out, the brothers first contract was to sell to the military and the initial research and development stayed in private hands. Aviation as we know it today could have evolved VERY differently.

It's been suggested to me that Langley might have been more productive had he NOT been subservient to the will of Congress. He certainly had the skills. We've not been totally free of the benevolent touch from Washington since Langley's time; institutionalized aviation for small aircraft has been on the downhill slide for years . . . there's no money in it and no tax breaks either. What might we be able to buy from Cessna

today if aviation had been allowed to evolve the same way Chevrolet's did?

I'll save my GA propulsion program (GAP) speech for some other time, but I think everyone who saw the V-Jet-2 and Teledyne IC engine mockup at Oshkosh will believe that our government and industry teams are serious about revitalizing GA.

What does "revitalize" mean? I was at Cessna the first year they broke the 10,000 airframes per year mark in 1966 when the factories put out about 16,000 airplanes in one year. The market peaked again in 1978 with 17,000 airplanes . . . and fell like a stone shortly thereafter. Why? Was it a technology problem? I suspect not. If we look at changes to tax law about then I think we'll find that big changes allowed people in business to take huge deductions for capital improvements. Most of the airplanes pushed out the door back then were not purchased by guys like you and me but by businesses who got a LOT of help from the American taxpayer.

If AGATE comes to be, will it cost less than 10x the price of a luxury car? I suspect not. Who's going to buy these airplanes? I'm sure not. Do you expect to own one? What's the airplane going to do for you that you would value enough to spend the money? Will it meet or even approach airlines reliability for point-A-to-point-B transportation? Will it carry more payload for less money? Think about how much each passenger is allowed bring along for the price of their ticket. Where are you going to stuff it all in the AGATE machine?

Suppose the airplane is only 3x the price of a luxury car . . . certainly more will be sold, but again aside from business travel (taxpayer subsidized of course), who has discretionary, personal travel requirements that will even allow them to make use of such a machine . . . no doubt some of our newly minted millionaires can consider it. I cannot think of any way I'd use such a machine enough to justify owning one and I travel a lot. What about the guys who presently own the aging spam cans which are falling off the registry to the tune of 5,000 airframes a year . . . will the AGATE machine be a likely replacement airplane for them?

It may be heartwarming to see everyone getting excited and involved but I don't see the AGATE machine becoming a replacement for any of today's airplanes. They are worlds apart in mission, cost and development risks. Government is pushing the program because like pushing education, environment, drug wars, etc. etc. it's a politically expedient thing to do. I'll bet you a killobuck that not one Washington bureaucrat in ten can accurately describe the real value of small airplanes to guys like you and me. Most of them believe that people fly airplanes to get from one place to another. You

and I know that we do it for the pure fun of it. We chose not to own a bass boat or motor home. We derive our pleasure from operating a flying machine. It's the ultimate expression of freedom; push the throttle in and go almost anywhere in a manner that very few people understand and enjoy.

Understand it or not, bureaucrats push it for its press value. Are they held to any degree of accountability for results? Of course not. I can tell you that nobody I've talked to INSIDE some of those 60+ companies really expects an AGATE airplane to emerge . . . they're chasing their own little niche markets and hoping some of that trickle-down rains on them too.

Sorry if I rambled on, but I have always liked your "signature trademark" and thought I would take you up on it. I'd be glad to go into even more detail offline (or on) if you'd like. Geez, you just gotta love aviation!!!

You gotta love it or you wouldn't be in it . . . it's damned hard to make a living in it and it's sure that nobody's going to get rich! Phil, please indulge me in my skepticism. For the life of me I cannot see where this program is going that will benefit the current 0.2% of our population who hold a pilot's license. Even if we quadrupled . . . the number of pilots were still less than 1% of the population. Clout in Congress? Never. The only clout that will accrue to aviation is that wielded by the manufacturers of the airplanes. Ever rise to the power of GM, Chrysler, Ford? Don't think so, except perhaps for builders of Hawkers, Lear's, Citations and Gulfstreams.

If I had any money to invest, I'd sure put it in something like wireless communications, computers, or 1000 other consumer products that have better chances of making money. They make money because they're very light on their feet and able to incorporate modern technologies as fast as they roll over . . . one-year-or-less-cycles. It takes government a year to make simple, mediocre decisions-by-committee; major moves to capitalize on an emerging technology never happen. As support of that statement, I'll suggest that the computer sitting on my desk has more snort and costs a tiny fraction of the dollars as the junk our brothers in Air Traffic Control have to put up with. The FAA is the world's single largest

consumer of vacuum tubes.

When government holds the big stick in the form of regulatory oversight and control, consumer aviation will never enjoy the degree of advancement (and increases in value) as automobiles and Nintendo games. For my own future in aviation, my bets are on the guys building Kitfoxes, Lancairs, et. als. For serious transportation machines? Only a VERY low percentage of the experimental market falls into that category. If I REALLY have to be someplace, I'll buy a ticket . . . and there will be times when even a Lancair IVP pilot will need to do the same thing.

Government may wake up to the fact that in light of current trends, experimental aircraft will outnumber certified single engine ships in the next 10-15 years. They'll figure out a way to bring experimental ships under their "protective" wing as well. Now, if by some stroke of Congressional vision and imperatives for cost controls, Cessna 172's (and future AGATE airplanes) could be built, owned and operated under the same rules currently enjoyed by an RV-6 or Lancair IV, it's a whole new ballgame! I could get really enthusiastic about that! If the AGATE vision and efforts do produce a marketable machine, I cannot see that it will be a replacement for the machines you and I like to fly. It will be a whole new genre of airplane for a whole new genre of pilots. Except for experimental airplanes, aviation as you and I have grown to love is dying.

A bad thing? Not at all. I often ask my forum and seminar attendees if the steam locomotive was a bad machine. Of course not. When it was the machine of choice, it served its purpose admirably. But the people who prospered in the design and construction of steam machines were not the same folks who ultimately ruled the rails in diesel electrics. There's nothing carved in stone saying that builders of our beloved spam cans should be massaging our needs as airmen of the future. Indeed, it may be time for them to move on to greener markets. If none of the over-hyped goals of AGATE are achieved, I for one will shed not a tear. Shucks, it was ONLY \$60,000,000 . . . we (Congress) has blown a hell-of-a-lot more on programs more foolish.