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Curb in-air delays for free

Eli Noam DECEMBER 17 2007

Things have become so bad in the skies that President George W. Bush of the US recently got personally involved in dealing with what he termed "an epidemic of aviation delays."

But a solution is possible that pays for itself. Traffic delay – as well as fuel consumption and the cost of air traffic control– could be significantly reduced by replacing the present radar-based system with a better technology that consumes only a fraction of the electromagnetic spectrum that radar does, and uses the freed-up spectrum to fund the new system.

Getting rid of radar? Ever since its heroic 1940s role in the Battle of Britain radar has had a revered status as a collective security blanket. But almost 70 years have passed, an eternity in the electronic world, and there are better options available today.

Here is how radar works today: a rotating transmission antenna, using large amounts of spectrum and electric power, pumps out high-energy pulses into the sky and, it is hoped, picks up echoes from aircraft that are "painted" by it. It can easily take half a minute for the technology and for the overworked force of traffic controllers to identify and process the information and to direct busy pilots by way of rapid-fire voice commands over scratchy radios. This antiquated system works tolerably well with aircraft that co-operate, identify themselves and fly at a reasonably high altitude. Even then errors abound. It works much less well with non-co-operating and low-flying planes.

It has been long recognised that a much better solution would be to let aircraft use their satellite navigational system (GPS) to transmit automatically their location and direction of flight to ground controllers and to other aircraft in the vicinity. These aircraft could then figure out potential hazards and avoid them, as pilots routinely do in good weather by using their eyes and brains. Aircraft would avoid each other on a peer-to-peer basis and controllers would intervene only in unusual situations.

The benefits would be substantial. Accuracy would be 10 times better and faster than for radar and aircraft could be spaced 30 per cent closer to each other, thus increasing airport landing and take-off capacity without requiring new runways that are costly and unpopular. If each commercial flight in the US saved only 15 minutes in delay and circuitous routing, the time value to passengers alone would be about $5bn a year. In the air, planes could also pick the shortest route in a system called "free flight" instead of being shoehorned into narrow, congested and circuitous airways, thus saving fuel worth another $5bn. The costs of air traffic control would also drop: radar is expensive to install and to run and a more decentralised system would require fewer new air traffic controllers. This might save another $1bn a year.

The technology is already available, such as the ADS-B system which the Federal Aviation Administration and others are testing. Increasing airport capacity in such a way is a "supply-side" approach, and much more sensible than trying to throttle the demand side through super-high fees for landing slots that will mostly just raise ticket prices. But the problem with the adoption of anything new – even if obviously superior – is the difficulty and cost of the transition. About 200,000 aircraft would have to be outfitted with the new devices, probably at a cost of $8,000 for small aircraft, even more if a cockpit display screen needs to be added, for a total cost of about $2.5bn. But the pilots of small aircraft gain relatively little from the transition, in contrast to the airlines. Imagine the reaction of car owners if they all had to outfit their automobile with $10,000 worth of new electronics to enable trains to go faster through intersections. The temptation therefore is to leave small aircraft to continue flying with the old radar system, but that would mean operating two parallel systems and losing many benefits from the new one.

But there is a better way. The main direct gain, by far, of the new system would be the freeing of spectrum. Radar is a big user of spectrum (though just how much is difficult to identify.) It uses about 500 megahertz for civilian aviation. On top of that, about 200 megahertz are allocated by various navigational beacons and devices that would become unnecessary. This would be enough for millions of high-speed cell phone data users, or millions of rural wireless broadband users. If just one quarter of this spectrum could be retired from radar use, it would free about 170 megahertz. For comparable-quality spectrum the FCC recently set a reserve price of about $170m per nationwide megahertz. So the value of the freed radar spectrum is about $30bn, and possibly a lot more. (All this is a back-of-the-envelope calculation to get the big picture.)

Taking away this spectrum from aviation would ignite ferocious opposition. Instead, the spectrum and its receipts should be placed in an *aviation trust fund* where they would generate a "digital dividend" of around $1.8bn a year, and maybe double that. The trust fund would pay for the transition to the new system, especially for the required upgrade costs of small aircraft and air traffic control. It would subsequently pay for part of the operating costs of the entire air traffic system, thus reducing the tax burden, as well as contributing to research and development in aviation and improvements in airport operations.

There are precedents for the use of spectrum revenues to fund a transition. For example, in 2009 all US broadcast television will move to all-digital, and the purchase of the required digital converter boxes by low-income households will be subsidised from the proceeds of the sale of the old analogue channels.

Just in case you are worried: the national air defence and military operations would still be handled by military radar facilities. Even here, major savings could be accomplished in the same way, while leaving the military free to preempt civilian users of the spectrum in national emergencies. Also, to strengthen security against malicious interference, the GPS satellites would be supplemented by base-stations transmitting from the ground.

Bottom line: a more efficient and safer air system; fewer delays to passengers; less energy burned; smarter airplanes; a more efficient use of spectrum; and a lower tax burden. Everybody wins.

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