

5G Interfering with Aircraft Altimeters

On June 15, 2021, Transport Canada released a Civil Aviation Safety Alert. This followed on the heels of the Innovation, Science and Economic Development Canada spectrum auction the day before. The auction was for a range of frequencies to be used for future 5G telecommunications and the Internet of Things (IoT).

The Civil Aviation Safety Alert was to warn that the 5G frequencies that ISED had auctioned off, along with ones telecom was recently allowed to operate in, were likely to cause interference in the nearby part of the spectrum that aircraft altimeters use.



Below is a link to Transport Canada's Civil Aviation Safety Alert:

<https://tc.canada.ca/en/aviation/reference-centre/civil-aviation-safety-alerts/potential-risk-interference-5g-signals-radio-altimeter-civil-aviation-safety-alert-casa-no-2021-08>

"The Radio Technical Commission for Aeronautics (RTCA) report which concludes to a likelihood of disturbance for certain radio altimeter models by 5G radio waves in numerous operational scenarios and most notably at low height (less than 1000 ft) in the frequency band 3700-4000 MHz."

"The most undesirable outcome of interference is the indication of an undetected wrong height information given by the radio altimeter. Depending on operations, equipment model and aircraft type, this kind of error could have significantly adverse impacts on flight safety. It may impact Terrain Awareness Warning Systems (TAWS), Traffic Alert and Collision Avoidance Systems (TCAS) and Airborne Collision Avoidance Systems (ACAS), Wind Shear detection systems, flight control systems, and autoland systems (including auto-throttle and automated landing flare and rollout) and loss of situational awareness due to erroneous or unexpected behavior."

Eight months prior, on October 7, 2020, the Radio Technical Commission for Aeronautics released a white paper to warn of the serious risk to aircraft safety by interference from 5G telecommunications systems.

Below is the link to their website, along with an excerpt from the results of their report:
<https://www.rtca.org/about/>

“The results presented in this report reveal a major risk that 5G telecommunications systems in the 3.7–3.98 GHz band will cause harmful interference to radar altimeters on all types of civil aircraft—including commercial transport airplanes; business, regional, and general aviation airplanes; and both transport and general aviation helicopters. The results of the study performed clearly indicate that this risk is widespread and has the potential for broad impacts to aviation operations in the United States, including the possibility of catastrophic failures leading to multiple fatalities, in the absence of appropriate mitigations.



Given the extent to which the safe interference limits are exceeded and the breadth of the impacts to aviation safety, the risk of harmful interference to radar altimeters cannot be adequately mitigated by the aviation industry acting alone.”



Shortly after, the National Business Aviation Association (NBAA), along with a coalition of more than a dozen aviation organizations, sent a letter to Congress expressing, “concern with the Federal Communication Commission’s (FCC) continued reallocation of certain frequency spectrum, utilized by critical aviation safety equipment, for flexible uses including 5G telecommunications applications”.

“We feel it’s time for Congress to intervene and ensure these important decisions are made with proper consideration of these unintended, though potentially deadly, consequences to our national aviation infrastructure,” NBAA Chief Operations Officer Steve Brown added.

<https://nbaa.org/nbaa-aviation-groups-ask-congress-to-prevent-5g-interference-to-critical-safety-systems/>

Defense News published another article the following month on December 21, 2020.

<https://www.defensenews.com/2020/12/21/the-military-is-scrambling-to-understand-the-aviation-crash-risk-from-a-new-5g-sale/>



“According to a memo obtained by Defense News, those concerns are shared by the head of the Federal Aviation Administration and the number two at the Department of Transportation, who are calling on the FCC to pause the sale (a similar spectrum auction held in the States) so the

safety issue can be studied more closely. The FCC, in turn, has said its own technical studies show little to no risk involved and it intends to continue moving forward.”

So why is the Canadian Government allowing 5G communications to go ahead in parts of the spectrum that are going to compromise aircraft and passenger safety?

Well, the 8.9 billion dollars that they made from the June 2021 ISED auction might be part of it.



<https://www.theglobeandmail.com/business/article-canadian-spectrum-auction-for-coveted-5g-airwaves-raises-record-891/>

The extent of the problem created is not just from 5G infrastructure on the ground, but the 5G enabled mobile devices that most people will be carrying with them onto aircraft. Smart phones are supposed to be put on airplane mode while in flight, but to police that is impossible with planes filled with hundreds of passengers.

A safer option might be to have all phones turned entirely off during the flight which is what French Aviation Regulators are suggesting.

<https://www.courthousenews.com/5g-phones-may-interfere-with-aircraft-french-regulator/>

But the safest option might have to be something beyond having your phone off, as people often do not comply with directions from the airline staff to stop using their devices.

So the solution is to not use frequencies that can interfere with aircraft systems.

We can look to a similar problem that occurred in 2014. It was found that wi-fi was blanking out the cockpit display units (DU's) on Boeing 737 and 787 aircraft. These are the screens that pilots use to fly the plane and monitor systems. If the DU's were to blank out at critical phases of flight, such as approach or takeoff, it could result in loss of control of the aircraft at an altitude insufficient for recovery.



An Airworthiness Directive (AD) was issued on October 14, 2014 by the Federal Aviation Administration (FAA) that became effective on November 5, 2014 requiring DU's to be replaced. Airlines had 5 years to comply with the changes. Affected aircraft had to operate their wi-fi only above 10,000 feet, which was deemed high enough for the aircraft to recover if screen loss were to occur. At the time, over 10,000 aircraft world-wide were compromised.

But the Du went on to mention that, "The cause of the unsafe condition stated in the Discussion section of this AD is a known susceptibility of the Phase 3 DU's to RF transmissions inside and outside of the airplane. **This susceptibility has been verified to exist in a range of RF spectrum (mobile satellite communications, cell phones, air surveillance and weather radar, and other systems), and is not limited to wi-fi transmissions.**"



NASA A satellite, as seen from space, tracks over Earth.

While wi-fi systems can be turned off for these critical phases of flight, Radio Frequency (RF) sources coming from outside the aircraft cannot, and again there is the problem of passenger devices that can also affect aircraft systems.

The difference between the situation from 2014 and the one in 2021 is that in 2014, the interference with the display units was understood after all these wireless systems had already been built. In our present situation with the interference of altimeters, the 5G infrastructure hasn't been built yet here in Canada. This leaves us time to take the logical steps of either finding different frequencies to use for telecommunications or changing altimeters before implementing 5G, but that is unlikely to happen that way even though that is what would be safest for aircraft and passengers.

If the AD required 5 years for changing out aircraft display units, it can be assumed a time period along those lines will be given to aircraft operators. So in the meantime it seems that the likely action will be to not to limit the telecommunication infrastructure while these changes are made, but to allow aircraft to continue flying whilst the 5G build goes on.



Passengers will be asked to keep their phones on airplane mode, or have them off, and to make sure the devices in their luggage are also turned off. Additionally if there are any altimeter problems the pilots are to report the incident to Air Traffic Services (ATS). Nav Canada and ISED will providing guidance on how these incidents will be reported, will establish a procedure to alert the aviation community and corrective actions to be implemented.

So is corrective action going to be based on reporting altimeter and aircraft incidents?

The logical and ethical choice is to not allow 5G infrastructure to be built until the altimeter changes are made or alternate telecom frequencies are allocated that won't cause interference with aircraft. As well, the 5G frequencies need to be disabled on already existing 5G phones or better yet, banned from flight, and further incorporation of 5G frequencies on phones delayed.

So we must ask ourselves again, why is our government allowing 5G communications to go ahead in parts of the spectrum that are going to compromise aircraft and passenger safety?

I think some swift reconsidering of this plan needs to happen.