Next-gen spotlight: 5G, autonomous vehicles and connected devices

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In Canada, 5G deployment is well under way. Ongoing regulation and oversight by the federal Department of Innovation, Science and Economic Development continues to define the playing field for this next generation wireless telecommunication technology. With speeds of up to 10Gbps and an ultra-high throughput potential of 10TB per square kilometre, it is no wonder that countries across the world are pushing to upgrade their telecommunications networks to support 5G.[1]

Moreover, 5G's incredibly low 1 ms latency coupled with its high reliability bodes well for both everyday cellular users who will be able to take advantage of faster speeds wherever they go, but also for autonomous vehicles and other connected devices leveraging the Internet of Things (IoT).[2]

Connected and autonomous vehicles (CAVs) in particular stand to benefit tremendously from the widespread adoption of 5G. Experts predict that 5G networks will be able to support up to one million connected sensors per square kilometre, finally providing the necessary hardware backbone to accelerate growth in smart city and CAV development.[3] For IoT enthusiasts, this means access to a network that supports a greater raw number of connected devices, including smart traffic and weather sensors, as well as devices using increasingly sophisticated algorithms requiring ever-faster speeds, like level-4 and level-5 automated vehicles.[4]

Though the benefits of 5G are expected to spur rapid technological development in the cellular and IoT industries, its broader impacts have yet to be fully understood. A particularly poignant example of such an unanticipated externality can be seen in avionics, and the ways in which 5G may interfere with radar altimeter performance.

5G and radar altimeters

An altimeter is the only instrument within an aircraft that allows the pilot to know how far above the ground they are. The altimeter measures the distance between the aircraft and the ground, using radio frequencies in the "highway lane" just above the 4GHz range. Inaccurate altimeter readings can result in significantly dangerous problem for the pilot, the aircraft and passengers.[5] 5G, however, operates within the 3.7-4.2 GHz frequency band, just below the band used for radar altimeters.

On Oct. 8, 2020, the Radio Technical Commission for Aeronautics (RTCA) distributed a 231-page peer-reviewed study evaluating how 5G emissions could interfere with an aircraft's radar altimeter performance.[6] The results of the study reveal "a major risk that 5G telecommunication systems in the 3.7-3.98 GHz band will cause harmful interference to radar altimeters on all types of civil aircraft…"[7] 5G interference could result in inaccurate altimeter readings, or complete altimeter failure, resulting in pilots being unaware of their distance from the ground. RTCA did not rule out the possibility of "catastrophic failures leading to multiple fatalities, in the absence of appropriate mitigations" due to the identified risk of 5G interference to low-level aviation altimeters.[8]

Learn more about 5G and the potential aviation-related risks.

5G risks and industry responses

Aviation represents just one case study on the unanticipated effects of the rapid introduction of 5G. Although the longer-term interactions of 5G with other technologies remains to be seen, other industries have begun preparing for 5G's inevitable widespread adoption.

Insurance

Expect insurance companies to use 5G's data capabilities to better inform their pricing and coverage policies. Home insurers could use the data from a connected thermostat or a smart oven, for example, to inform their coverage of a house fire. Drones may likewise be able to capture and transmit large swaths of environmental data. This would allow companies to examine more thoroughly natural environments and the effects of climate change to better price natural disaster policies.[9] Just as consumers will take advantage of 5G's high bandwidth and throughput, insurers will use 5G to lower costs and improve their coverage analytics.

Privacy

Of course, insurance companies and other organizations who wish to take advantage of new opportunities should consider the requirements imposed by Canadian data privacy law, which features a consent requirement and a requirement that personal information collections have gains that are proportional to their privacy impact. Prudent organizations will conduct a formal privacy impact assessment as part of pre-investment planning.

Autonomous Vehicles

5G also allows for network slicing, which will undoubtedly allow for more efficient network usage by CAVs.[10] 5G's low latency should also improve CAV safety by allowing CAVs to relay data and communicate with automated systems better and faster than ever before. Intelligent transportation systems will also emerge and make good use of the increased connectivity permitted by 5G, including smart traffic lights for monitoring traffic, street sensors for monitoring poorly maintained roads, and weather sensors for reporting inclement driving conditions.

Conclusion

With 5G's incredibly high speeds, enormous throughput, and ultra-low latency will come rapid technological innovation across many industries. Though the effects of these changes are still unclear, we can expect a combination of positive social advancements coupled with emerging unforeseen challenges.

[1] 1 Million IoT Devices Per Square Km - Are We Ready for the 5G Transformation?

[2] What 5G promises for IoT

[3] *Ibid*

[4] 5G's Important Role in Autonomous Car Technology

[5] One example of an incorrect altimeter reading leading to catastrophic losses is the tragic accident of the Boeing 736-800 Turkish Airlines flight 1951 on Feb. 25, 2009 near Amsterdam's Schiphol Airport. In this case, the Dutch Safety Board concluded that the improper functioning of one of the altimeters led to a reduction in thrust from both engines by the autothrottle. This thrust reduction occurred too soon for it to be identified and rectified. A stall then occurred and recovery was not possible, leading to fatalities. Accident Report

[6] Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations. [RTCA October 2020 Report]

[7] *Ibid.*

[8] RTCA October 2020 Report, page 88, section 11.2.

[9] The Impact of 5G on the Insurance Industry & What it Means for Agencies

[10] 5G network as foundation for autonomous driving

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