

October 13, 2020

Chantal Davis
Director of Spectrum Regulatory Best Practices
Innovation, Science and Economic Development Canada
235 Queen Street (6th Floor, East Tower)
Ottawa ON K1A 0H5

SUBJECT: Consultation on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band

Dear Ms. Davis,

The aim of this letter is to provide comments on the consultation document directly impacting Aviation in Canada. In order to do so, Transport Canada Civil Aviation (TCCA) will focus on questions 51 and 55f.

In the frequency band 4200-4400 MHz, allocated under 4.10 of the Radio Regulations which is reserved for use by airborne radio altimeters and wireless avionics intra-communications (WAIC) Radio, radio altimeters are a critical element in aircraft automatic landing systems and also serves as an active sensor in ground proximity warning systems (GPWS) that is operational during all phases of flight. WAIC provides aircraft safety communications between points on an airframe. Interference from terrestrial 5G fixed stations has the potential to affect the safety and operations of both of these systems if not mitigated and safeguarded.

ITU-R WRC 15 C0000/MSW-E , Chapter II – Article 4, Assignment and use of frequencies, paragraph 4.10 indicate that: Member States recognize that the safety aspects of radio navigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of safety of life frequencies.

The Radio Technical Commission for Aeronautics (RTCA) Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations (RTCA Paper No.274-20/PMC-2073) is clearly demonstrating that 5G base stations present a major risk of harmful interference to radar altimeters across all aircraft types, with far-reaching consequences and impacts to aviation operations. In the worst case, the safe interference limit is exceeded by the 5G fundamental emissions in the 3.7–3.98 GHz band and for the 5G spurious emissions in the 4.2–4.4 GHz band. The potential impacts to aviation operations in

Canada, may lead to catastrophic failures, Controlled Flight into the Terrain (CFIT) and multiple fatalities.

When accounting for the 6 dB International Civil Aviation Organisation (ICAO) safety margin, the results presented in the RCTA report reveals a major risk of harmful interference to radar altimeters on commercial transport airplanes; business, regional, and general aviation airplanes; and both transport and general aviation helicopters, caused by 5G telecommunications systems in the 3.7–3.98 GHz band. Further, this risk cannot be adequately mitigated by the aviation industry acting alone.

Even a technical solution which may be viable for retrofit installations, if one even exists, will take several years to properly validate and deploy across all affected civil aircraft operating in the Canada or worldwide. Therefore, it is critical that the performance of radar altimeters which are currently in service across tens of thousands of civil aircraft, be fully understood and the risks and operational impacts due to interference be appreciated. Given the planned timeline for deployment of 5G systems in the 3.7–3.98 GHz band, these radar altimeters will be exposed to such risks and operational impacts if proper mitigations are not put in place. The interference can come from the source (antenna, satellite), the end users on board the aircraft or end users on the ground. Here are some aviation Specific Interference Scenarios that in the worst case may lead to CFIT:

- 1) an aircraft conducting a precision instrument approach procedure, more so for CAT I/II/III procedures,
- 2) a medical evacuation helicopter landing at elevated heliports at urban hospitals,
- 3) low level military operation or search and rescue operations (more so at night or in low visibility weather conditions),
- 4) Unmanned Aircraft Systems (UAS) operating commercially with radar altimeter requirements, and
- 5) Loss of situational awareness due to erroneous or unexpected behavior of: 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).

Question Q51

Innovation, Science and Economic Development (ISED) is seeking comments on its proposal to not implement any technical requirements for the coexistence between flexible use operation in the 3650-3980 MHz band and radio navigation operations in the 4200-4400 MHz band, noting the 220 MHz frequency separation between the bands of operation. If this is not sufficient for coexistence, what other measures would be appropriate?

Response to Q51

ISED will need to implement technical requirements to ensure freedom from harmful interference to onboard aircraft essential equipment operating in the 4200-4400 MHz band. Safety measure and mitigations to be considered but not limited to:

- Proper base station geographical safety separation distance to airport or aviation operation (air ambulance): Up to 35 km away from CAT I/II/III precision approach procedures to ensure the ICAO 6 dB safety margin is respected.
- Limits on the output power of terrestrial base station.
- Band-stop filter beyond 3.98 GHz.
- Ensure operating bandwidth that would reduce that potential interference and remain within the 3.7-3.98 GHz.
- Base station Advance Antenna System (AAS) designs for operational limitations to scan angle ranges.
- May want to consider reducing the upper limits of the operating band below 3.98 GHz in some geographical areas.

Question 55 f

ISED is seeking comments on what elements from sections 7 to 10 of this consultation would still apply or need to change if ISED were to implement the Telesat proposal, in particular:

f) technical considerations for coexistence between FSS and aeronautical radio navigation systems.

Response to Q55 f

Based on the findings of the RCTA report, Telesat phase I to operate in the 3700-3820 MHz band should have minimal interference to aviation, but in some cases, safeguards may be required to respect the ICAO 6 dB safety margin. Telesat phase II to operate up to 4.1 GHz would represent a significantly higher risk of harmful interference to radar altimeter and WAIC, which could not be mitigated to respect the ICAO 6 dB safety margin. This would significantly increase the potential for impacts to aviation operations in Canada and leading to catastrophic failures and multiple fatalities. Please see response to Q51 to ISED, consider the potential mitigation factors and reduce the proposed operational bandwidth to or below 3.98 GHz.

Conclusion

There are liability concerns with 5G implementation and ISED needs to consider the seriousness of harmful interference to aircraft onboard radar altimeter equipment that may be caused by 5G telecommunications systems in the 3.7–3.98 GHz band implementation in Canada with the potential loss of lives if an Aviation accident would occur due to 5G interference with Radar Altimeter or WAIC. ISED needs to establish appropriate safety

measures to respect the ICAO 6 dB safety margin, by implementing specific technical requirements and mitigation measures. Frequency band selection should not be swayed by economic reasons or harmonization with the USA, rather human safety should be the priority. ISED should also consider reducing the 5G operational bandwidth in some geographical areas near airports to increase the frequency guard band with the aviation frequency band in order to ensure aviation safety.

Should you have any further questions please do not hesitate to contact Francis Mercier at (343) 550-4226 or email francis.mercier@tc.gc.ca

Yours sincerely,

A handwritten signature in black ink, appearing to read 'R. Sincennes', with a long horizontal flourish extending to the right.

Robert Sincennes, P.Eng.
Director, Standards
Civil Aviation