FIJI AERONAUTICAL INFORMATION CIRCULAR

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AIRW

POTENTIAL RISK OF 5G TO RADIO ALTIMETERS AND MITIGATIONS

1. INTRODUCTION

1.1 5G or fifth-generation wireless technology is the latest advancement in mobile telecommunication.

1.2 Due to traffic congestion in data networks, 5G was introduced to relieve this congestion by adding lanes in the form of spectrum bandwidth to increase capacity which leads to faster data speed and better performance.

1.3 5G -known as the Fifth Generation, is the next leap forward in mobile network technology. 5G delivers faster downloads, seamless streaming, and gaming in real time. 5G presents a future for device interconnectivity, at a faster speed.

1.4 While 5G is primarily associated with improvements in mobile communications it also has the potential to impact various industries including aviation

2.0 Objective

2.1 The objective of this AIC is to raise air operator's safety awareness, provide information and guidance for operators on the potential risk of interference to radio altimeter (RA) from 5G cellular broadband technologies, and provide information on the implementation of 5G in Fiji and other neighbouring States.

3.0 Background

3.1 5G is the new generation of mobile networks and it's transforming the world as we know it. 5G is the fifth generation of cellular networks. Up to 10 times faster than 4G, 5G is creating never-before-seen opportunities for people and businesses.

3.2 Its performance is set by the International Telecommunications Union (ITU)an agency of the United Nations.

3.3 It allows for faster connectivity speeds, ultra-low latency, and greater bandwidth is advancing societies, transforming industries and dramatically enhancing day-to-day

experiences. Services that we used to see as futuristic, such as e-health, connected vehicles and traffic systems and advanced mobile cloud gaming have arrived.

3.4 While 4G emits its signal in all directions,5G will directly send out the signals to the receivers which will allow numerous benefits to businesses, for increased capacity, lower latency and better connectivity. It improves streaming, enhances video conferencing, and provides the opportunity to perform tasks remotely. With faster response times, and access to near real-time data, businesses can power technologies in industries such as healthcare, construction, education, industrial automation, public safety and virtual and augmented reality where quick response times are crucial.

3.5 5G uses 3 frequency bands:

i. FR1: 410Mhz – 7127Mhz
ii. FR201 24250-52600Mhz
iii. FR2-2: 52600Mhz – 71000Mhz.

3.6 While the benefits of 5G are many its introduction can potentially have an effect on aircraft radar altimeters, which are instruments used to measure an aircraft's altitude above the ground during takeoff, landing, and low-altitude flight.

4. How does 5G affect the Aircraft

4.1 The introduction of the 5G technology can potentially have an effect on aircraft radio altimeters which are instruments used to measure an aircraft's altitude above the ground during take-off and landing.

4.2 Radio Altimeters operate on the frequency band 4.2-4.4Ghz known as the C-band.

4.3 Radio altimeters are connected primarily to the auto-pilot and auto-throttle system and are very critical during landing operations in providing important height data to the pilot.

4.4 Concerns have been raised that high-frequency bands could interfere with the radio altimeter bands.5 G-based stations that are placed on the approach path could potentially start sending interference signals to the radio altimeter.

4.5 A number of states and regions are currently considering or have already begun deploying 5G cellular broadband technologies. Some of the 5G networks are operating in the C-band, at frequencies that are close to the frequencies utilized by the radio altimeter.

4.6 CAAF has been closely monitoring the global development of the subject.

5. 5G operations in Fiji

5.1 CAAF has worked closely with the Ministry of Communication and the Telecommunication Authority of Fiji to ensure the roll-out of wireless broadband services of 5G ensures the safety of aircraft operations, with precautionary mitigations

to protect against the risk of 5G interfering with radio altimeters and minimize disruptions to aviation operations.

5.2 These mitigations restrict deployments around the runways and approaches including limits on power and unwanted emissions and possible installation of RF filters.

5.3 Digicel Fiji has licensed spectrum on 3.5Ghz from 3.425 – 3.600Ghz (175hz bandwidth) which is currently used for P2P/P2MP for corporate ICT client's links.

5.4 Digicel plans to re-farm(re-purpose) the 100Mhz bandwidth of this spectrum to use for 5G while the remaining 75Mhz bandwidth is continued for use on P2P/P2MP. With this plan, no new frequency spectrum is being introduced for 5G as this frequency spectrum is already in deployment and existing live on the network.

5.5 The planned 5G operations by Digicel do not pose any threat to Fiji Aviation or any other system which are operating today. However, pilots have been advised to report any interference and ensure that relevant log entries are made on any suspected or encountered interference.

5.6 Currently Digicel is conducting tests but has not finalized a deployment plan.

6. 5G Operations in the USA

6.1 The Federal Aviation Administration ("FAA") conducted an assessment of the increased risk, specific to the United States. FAA has published associated Airworthiness Directives ("AD") and in certain airports, there is potential for FAA to publish NOTAMs prohibiting certain operations.

6.2 FAA ADs 2021-23-12 and 2021-23-13 must therefore be followed by airlines operating in the USA, including areas where NOTAMs are in place.

7. 5G Operations in Australia

7.1 CASA has worked closely with ACMA for the deployment of 5G, in the 3.7 – 4.0 GHz band (mid-band. CASA issued its latest airworthiness bulletin on the 5G issue on 4 March 2022.

7.2 CASA has not confirmed any radio altimeter system failure from 5G interference but continues to monitor this situation. Pilots are encouraged to report any spurious radio altimeter incidents by using the CASA defect reporting form or to the ATSB via their notification form.

8. Recommended Actions

8.1 Operators should ensure their flight crew is aware of the possible implications of radio altimeter malfunctions for the types of aircraft operated; this may be particularly relevant when conducting Low Visibility Operations and RNP Authorization Required Approaches.

8.2 Whilst being reminded of the obligation to comply with the laws, regulations and procedures of those States in which operations are conducted, operators should pay particular attention to any information promulgated by the State of the Aerodrome (e.g. through NOTAMs) prohibiting instrument approach procedures. Such NOTAMs might significantly affect the approach and landing capability and can be issued without prior notice.

8.3 Operators should consider in their safety risk assessment potential interference from 5G ground stations that might impair the reliable functioning of radio altimeter installed on the aircraft. Among the possible mitigations, operators should:

8.3.1 Consider exposing flight crews to unreliable radio altimeter scenarios in the approach and take-off phases of recurrent flight training sessions conducted in the Flight Simulation Training Devices. Such mitigation is particularly relevant in case flight crews to understand the high risks involved in the approach and landing phase of the flight

8.3.2 Whatever the type of approach conducted, ensure awareness of the crews of the potential degradation in the performance of the installed radio altimeter and of other systems dependent on data from the radio altimeter.

8.4 Flight crew experiencing radio altimeter or auto-flight malfunctions should not assume that this has been caused by 5G interference and should follow normal operating procedures for any malfunctions or failures. Although flight crew should be aware of the possibility of 5G interference, any malfunctions observed may well be caused by other factors such as radio altimeter and associated antenna technical failures, for example, due to poor antenna bonding, water ingress, or poor antenna cable connections. It is therefore essential that the appropriate maintenance actions continue to be performed in response to a report of anomalous radio altimeter behaviour.

8.5 Operators are responsible for ensuring compliance regarding the use of Portable Electronic Devices on board an aircraft.

9.0 Safety reporting

9.1 Any flight crew observations of radio altimeter or auto-flight malfunction should be reported using normal company safety reporting procedures. Flight crew should include as much detail regarding the type of malfunction, including duration and location (particularly if during an approach or departure phase), the runway in use and the height above the ground that the malfunction was observed.

9.2 Ensure that events of anomalous radio altimeter behaviour, including results of the defect investigation and rectification, are reported to the aircraft manufacturer without delay.

9.3 Reports of consistent anomalous radio altimeter behaviour in approximately the same location could be an indication of potential interference. Individual cases may however be due to other causes than interference from 5G ground stations.

9.4 In the event that a pilot experiences radio altimeter behaviour anomaly due to potential 5G interference shall be reported to CAAF using the Mandatory Occurrence

10.0 References

10.1 The following articles can be accessed in order to know more about the 5G

- ICAO State Letter SP 74/1-21/22
- EASA Safety Information Bulletin No. 2021-16
- United Kingdom CAA Safety Notice No. SN–2021/017
- CASA Airworthiness Bulletin AWB 34-020 Issue 7
- RTCA Paper No. 274-20/PMC-2073
- ICAO RASG-APAC/12-WP/2

11.0 Reporting Form

10.1 Reporting form is available on the CAAF website link:
https://caaf.org.fj/form/mandatory-occurrence-reporting-form