

SAFETY NOTICE

S.N. N° SN GEN-22-001

DATE: January 21, 2022

REV. 0

POTENTIAL INTERFERENCE OF RADAR-ALTIMETER (RA) BY WIRELESS BROADBAND OPERATIONS (5G)

SUMMARY AND DISCLAIMER

This Safety Notice has been prepared in order to provide operators with general and safety information concerning the potential interference of Radio Altimeters by Wireless broadband operations (5G) as recently identified by FAA Airworthiness Directive 2021-01170-R-D.

The main objective is to provide customers with an information on the topic, a status on ongoing investigations by rotorcraft manufacturer(s) and recommendations to the flight crew for operations where the use of Radar-Altitude Meter may be used.

Although specifically addressing the concern identified by the abovementioned FAA Airworthiness Directive, it is recognized that this document provides technical and operational information which may have wider utility in the context of 5G deployment in other places in the world. It is however underlined that in absence of specific national authorities restrictions, and due to possible differences in 5G frequency/power allocations in the various countries, the information provided here is not directly applicable to situations other than the FAA Airworthiness Directive.

Leonardo Helicopters to the extent permitted under the applicable laws, accepts no liability for any damage arising out or in any way connected with the use of this document.

SUBJECT: Potential interference of Radar-Altimeter (RA) by wireless broadband operations (5G).**For the attention of: [Flight Crew]****Aircraft Concerned: [ALL]**

Dear customer,

At the end of 2021, FAA published two Airworthiness Directives (2021-01170-R-D for rotary-wing and AD-2021-1169-T-D for fixed-wing concerning potential interference of Radar-Altimeters (also named Radio Altimeter) from wireless broadband antennas operating in frequencies from 3.7GHz to 3.98 GHz (5G C-band). Both AD's therefore limit certain aircraft operations when Radar-Altimeter data are required.

On its side the EASA did not consider the FAA AD eligible for adoption. However, EASA has published a Safety Information Bulletin dealing with the same technical topic (EASA_SIB_2021-16, dated 17th December 2021).

All aircraft fitted with one or more Radar-Altimeter system are affected by the FAA AD's, EASA SIB's and so by the present document.

The target of this document is to provide customers with information on the topic, status of ongoing investigations by rotorcraft manufacturer(s) and recommendations to the flight crew for operations where the use of Radar-Altimeter may be used in the presence of 5G C-Band interference.

Background information, issue description:

The Federal Communications Commission (FCC) reallocated a portion of the 3.7–4.2 GHz frequency band, making the frequency spectrum from 3.7–3.98 GHz available for 5G wireless applications. This frequency band may introduce harmful radio frequency (RF) interference to Radar-Altimeters currently operating in the globally-allocated 4.2–4.4 GHz aeronautical band. Radar-Altimeters are the only sensor onboard civil aircraft which provides a direct measurement of the clearance height of the aircraft over the surface or other obstacles. A Special Committee (RTCA SC-239) formed a 5G Task Force to lead an investigation in the matter. Using technical information supplied by the mobile wireless industry and Radar-Altimeter manufacturers, the conclusion of the research effort revealed a risk that 5G telecommunications systems in the 3.7–3.98 GHz frequency band may cause interference to Radar-Altimeters on all types of civil aircraft—including commercial transport airplanes; business, regional, and general aviation airplanes; and transport and general aviation helicopters.

This conclusion led the FAA to release the AD's mentioned above and the NOTAMs addressed below.

Early in January 2022, telecommunication industry agreed to delay the activation of the 5G C-Band. It is now planned for deployment on the 19th of January.

Preliminary feedback from our Radar-Altimeters suppliers indicates that 5G interference with Radar Altimeters may be manifested in many ways, including Radar-Altimeter failure; freezing of the Radar Altimeter display; erratic Radar Altimeter behavior; Radar Altimeter incorrectly displaying height (under/overestimated height...); etc.

Note that the Radar-Altimeter is often linked to other aircraft systems that rely on height-above –surface (Auto-Pilot, TCAS, and other alerting systems such as landing gear non-extension warning, etc.). Therefore, these systems may also be affected (loss of warning or spurious warning) by the 5G cellular interference which may reduce their safety benefit.

Current Status:

According to the latest information available to the aeronautic industry, the United States 5G C-Band technical characteristics is the more likely to create interferences than 5G C-Band network deployed elsewhere. This situation may evolve according to future deployment planning in other countries and their 5G C-Band characteristics. Therefore, the aeronautic industry may expect that 5G interferences may be possible in other areas of the world.

For operations in U.S. airspace, the AD states that the FAA has published NOTAMs (Notice to Air Mission) detailing specific areas in which the AD is applicable. In general, the NOTAM's are issued for areas surrounding major airports. In the future new NOTAMs may be published as new 5G C-Band networks are deployed and current NOTAM may be also revised to reflect changes in the cellular transmission characteristics, refer to <https://notams.aim.faa.gov/notamSearch/nsapp.html#/results>.

Note that the FAA AD and the FAA NOTAMs only restrict operations requiring the use of Radar-Altitude data. Thus, if procedures do not require the use of Radar-Altitude data, the AD and NOTAM do not apply to that operation.

Nevertheless, since helicopters frequently operate at lower altitudes and in areas where 5G C-Band has been deployed and where no airport exists, 5G C-Band interference may still impact Radar-Altitude performance. The absence of a NOTAM for a particular area does not necessarily imply that Radar-Altitude interference will not be encountered. Flight crews experiencing Radar-Altitude malfunctions should not assume that this has been systematically caused by 5G interference and should follow normal operating procedures for any malfunctions or failures, as they may be caused by other factors.

Leonardo Helicopters Division (LHD) is working jointly with the other aircraft manufacturers, the FAA and EASA, and with several Radar-Altitude manufacturers to evaluate the operational impact of 5G on Radar-Altitude.

As of today, no occurrences have been reported to LHD which have been attributed to aircraft operations within a 5G environment around the world.

Please note that Radar-Altitude installations and STC's not developed by LHD or its subsidiaries are not covered under the scope of this investigation. The investigation will assess the nature of Radar-Altitude interference (if any).

LHD will inform you as soon as possible regarding the results of our investigation. Depending on the results of our investigation, LHD will assess which protective or corrective measures, if any, may be appropriate.

Feedback Request:

To support our investigation, LHD kindly invites you to forward the following information associated with possible Radar-Altitude malfunction or erratic behavior experienced on your aircraft in the vicinity of 5G antennas:

- Aircraft type and S/N
- Radar-Altitude information :
 - P/N
 - S/N
 - System Configuration (1x or 2x Radar-Altitude)
- Flight Phase (Hovering, Approaching, En-Route..)
- Estimated distance altitude and bearing from the 5G antenna (if known)
- Country, town and Position (area, lat/long)
- Height of the aircraft (MSL and AGL)
- Type of terrain
- Duration of the phenomenon
- Brief description of anomaly and aircraft / system behavior
 - Nature of Radar Altitude interference:
 - Frozen display
 - Failed Radar Altitude
 - Erratic display
 - Under- or over-estimation of height
 - AFCS (please detail AFCS status: upper mode(s) engaged / Armed, etc.)
 - Displayed Radar Altitude, associated caution/warning
 - Other Systems
 - Etc.

To the following address: engineering.support.lhd@leonardo.com

LHD will monitor in service findings and will continue investigation/analysis.

OEM position and rationale is based on the following elements

The Radar-Altitude system has been certified on our helicopters considering the risk of failures of the system. Erroneous Radar-Altitude information is always considered, and the associated consequences remain acceptable for the operation for which the helicopter is certified for.

In general, there is a minimum altitude where the visual references are required to be acquired (Operational Regulations - Rotorcraft Flight Manual).

For operation to/from an airport the minimum visual conditions are specified in Airport procedures.

For operation to/from helipads inside cities, the use of barometric altitude is already the basis for the crew to cross-check the Radar Altitude decision height. Indeed Radar Altitude height is often not consistent in this context due to the terrain profile (buildings, streets, trees, etc) the helicopter is flying over.

Finally, SAR and offshore operations are often conducted away from the coast-line (far away from 5G antennas).

AMOC Process and recommendation:

In the meantime, LHD is thinking to develop an AMOC (Alternative Means of compliance) as described in "Background" § page 6 of the AD, which will be submitted to the FAA. The aim of this AMOC would be to provide compensating feature that will remove the operational restrictions detailed in § (g) of the AD, which requires the following limitations be included in the Rotorcraft Flight Manual (RFM) as follows:

"When operating in U.S. airspace, the following operations requiring radio altimeter are prohibited in the presence of 5G C-Band wireless broadband interference as identified by NOTAM (NOTAMs will be issued to state the specific areas where the radio altimeter is unreliable due to the presence of 5G C-Band wireless broadband interference):

- Performing approaches that require radio altimeter minimums for rotorcraft offshore operations. Barometric minimums must be used for these operation instead.
- Engaging hover autopilot modes that require radio altimeter data.
- Engaging Search and Rescue (SAR) autopilot modes that require radio altimeter data.
- Performing takeoffs and landings in accordance with any procedure (Category A, Category B, or by Performance Class in the Rotorcraft Flight Manual or Operations Specification) that requires the use of radio altimeter data."

Customers that are impacted by the FAA AD's as they are used to fly such AFCS HOVER mode, AFCS SAR modes, Take Off and Landing (CATegory A or B or other performance class) are invited to contact LHD to assess if an AMOC is suitable for their operations.

If AMOC is approved by the FAA, these RFM limitations would no longer be required.

The rotorcraft industry position (Leonardo Helicopters, Airbus Helicopters, etc.) will be shared with the FAA, proposing measures to alleviate the restrictions detailed in the FAA AD's. These measures are intended to be applicable to all rotorcraft and radar altimeter models. Further communication will be made available later on to operators regarding the AMOC process result. This process could take several weeks to analyze the data and develop appropriate mitigations to include in the AMOC.

Until the AMOC process is completed the recommendations below are for the help of operators and do not supersede the above mentioned FAA AD restrictions. As the investigation results are not yet available the only possible recommendations are based on Operational Approach only.

LHD concurs that the first restriction provided in the AD is applicable and therefore barometric minimums must be also used for those phases of the Off-shore approaches which require or are predicted on Radar-Altitude, where notified by NOTAMs.

NOTE: for operations far offshore or in very remote locations (e.g., desert or mountainous terrain) far away from any wireless broadband operations (5G) antennas the risk to have the Radar-Altitude malfunction is extremely unlikely. As of today industry is not aware of 5G C-Band antennas installed on oil rigs or offshore platforms, this situation may evolve in the future.

Helicopter Industry joint position and recommendation to flight crews for the 3 other points:

For any operations that require Radar-Altitude information as mentioned in the AD: AFCS HOVER mode, AFCS SAR modes, Take-off and Landing (CATegory A or B or other performance class):

- A. The use of barometric altitude rather than Radar-Altitude data is recommended
- B. If not possible, before engaging the intended maneuver:
 - Check appropriately the barometric altimeter setting (Reference Pressure – QNH/QFE (Hpa or Hg),

- Respect the minimum altitude as provided in the RFM (visual references need to be acquired before this minimal altitude),
- During the flight/manoeuvre cross check Radar-Altitude data with barometric altitude,
- Be ready for possible failure/degradation annunciations, altitude and attitude of the aircraft and its environment,
- If erratic behavior is detected or suspected, RFM procedures relevant to failure/loss of Radar-Altitude must be applied.

In any condition, if possible, an over fly / reconnaissance is recommended before engaging such sensitive manoeuvres (e.g. hover, SAR, approach, landing).

At this stage, it is also required that Transmitting Portable Devices (T-PEDs) with 5G capabilities and taken onboard the aircraft are switched OFF during flight operations. The clearance to use other T-PEDs services remains as per the extant aircraft / operator obtained clearance.

NOTAM evaluation is mandatory and remains under the responsibility of the Pilot-in-command.

LHD also encourages each operator in considering in its operational risk assessment the potential interference from 5G ground stations that might impair the reliable functioning of Radar-Altitude meters. Among the possible mitigations, operators should:

- For all phases of flight and particularly for the approach and take-off phases and overwater operations: consider exposing flight crews to unreliable Radar-Altitude scenarios in recurring flight training sessions conducted in the Flight Simulation Training Devices. Such mitigation is particularly relevant in case flight crews undergo Low Visibility Operations training.
- Whatever the type of approach conducted, ensure awareness of the crews of the potential degradation in the performance of installed Radar-Altitude meters and of other systems dependent on data from Radar-Altitude meters.

The above recommendation are valid for any type of helicopters and any Radar-Altitude meter model.

Summary:

5G wireless telecommunication network deployment may affect the Radar-Altitude meter and systems linked to it on helicopters. Up to now the worst case situation seems to be in the US and starting on 19th January. Misleading/Erroneous data may be experienced by the crew, Radar-Altitude meter malfunction could not be excluded also. On aeronautic industry side, the investigations are ongoing to better understand the possible behavior, further communication will be done on time. Customers are asked to report any strange functioning linked to 5G interference to OEM.

FAA limit the helicopters operations thanks to the AD's. LHD and other OEM will apply for AMOC to alleviate the restrictions provided in the AD's. EASA will be in the loop of such AMOC discussion and process.

In the meantime LHD provides recommendation to the crew regarding this possible risk of interferences.