Safety Information Bulletin

Airworthiness

SIB No.: 2024-05

Issued: 13 March 2024

Subject: **Incorrect Computation of the Hybrid Flight Path Angle by LCR-100 Attitude Heading Reference System**

Ref. Publications:

- Northrop Grumman LITEF GmbH Service Bulletin (SB) 145130-0024-845 dated 18 August 2023.
- EASA SIB 2023-09 - Erroneous Computation of Flight Path Acceleration and Potential Vertical Speed, dated 27 July 2023.

Applicability: Northrop Grumman LITEF GmbH LCR-100 Attitude Heading Reference System (AHRS), having software Part Number 145130-1000-028, 145130-1003-028, 145130-1004-028, 145130-1004-029, 145130-1006-028, 145130-2010-028, 145130-2011-028 or 145130-3000-028.

Description:

Code analysis on LCR-100 System Software revealed an issue with the computation of the Hybrid Flight Path Angle, as ARINC Label 263. LCR-100 AHRS with modification (mod) 28 and/or mod 29 embodied, hereafter referred to as “affected LCR-100 AHRS”, wrongly compute the Hybrid Flight Path Angle when “Lever Arms to Centre of Gravity” constants with a value that equals to zero (= 0.00 m) are stored in the Installation Data Module (IDM), which results in the following incorrect behaviours:

- The Hybrid Flight Path Angle is not computed by using the Hybrid Vertical Velocity but using the Baro-Inertial Vertical Speed only, without Global Navigation Satellite System augmentation.
- When the Baro-Inertial Vertical Speed is lost (e.g. after loss of both pressure altitude inputs), the Hybrid Fight Path Angle will not be computed as expected. ARINC Label 263, however, is still transmitted with a valid Sign Status Matrix (SSM). In such case, the output value of ARINC Label 263 is dependent on the operational Mode of the LCR-100 AHRS, as follows:
  - When operating in Navigation Mode, the ARINC Label 263 is transmitted as zero degree.
  - When operating in Attitude Mode, the ARINC Label 263 transmits continuously the last computed value before the AHRS stopped computing the Hybrid Flight Path Angle.

This issue also contributes to a wrong computation of the Hybrid Potential Vertical Speed (ARINC Label 134) and the Hybrid Flight Path Acceleration (ARINC Label 262). Please refer to the latest revision of EASA SIB 2023-09 for a detailed analysis of the issues related to these parameters.

The Hybrid Flight Path Angle computation is a non-ETSO function, i.e. a function which is not defined in the standard to which CS-ETSO refers. The functions which are defined in the ETSO for AHRS are not affected.

At the date of publication of this SIB, no in-service occurrences have been reported by operators or owners of aircraft equipped with an affected LCR-100 AHRS.

At this time, the safety concern described in this SIB is not considered to be an unsafe condition that would warrant Airworthiness Directive (AD) action under Regulation (EU) 748/2012, Part 21.A.3B.

Recommendation(s):

This SIB is issued to inform type certificate (TC) and supplemental type certificate (STC) holders, about an erroneous computation of the Hybrid Flight Path Angle by affected LCR-100 AHRS.
TC and STC holders are recommended to:

- Assess whether any affected LCR-100 AHRS (units with embodied mod 28 and/or mod 29) have been installed;
- Assess whether other installed aircraft systems make use of any data transmitted by the LCR-100 AHRS (any of the possibly affected ARINC 429 Labels as defined in paragraph B of the above-referenced SB;
- Assess whether any “Lever Arms to Center of Gravity” constant(s) stored in the approved IDM equals to zero (= 0.00 m), and
- If all the three points above are true, develop a design change to introduce the upload of a “Lever Arm to Center of Gravity” constant(s) of 0.01 m in x-direction into the IDM and provide instructions (to all affected aircraft operators and owners) to reprogrammethe IDM. More information is provided in Appendix A of the above-referenced SB.
- Report analysis results and any planned corrective actions to the competent authority, in accordance with Regulations (EU) 376/2014 and 748/2012.

Contact(s):

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