REPUBLIC OF ALBANIA

ALBANIAN CIVIL AVIATION AUTHORITY

SAFETY INFORMATION

Global Navigation Satellite System (GNSS) Outage and Alterations Leading to Communication / Navigation / Surveillance Degradation

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Accepted by:

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0.1 Record of Amendments

The table below describes the dates and reason for the different amendments of the current procedure. A vertical black line on the left-hand side of the page identify the changes with the previous version.

Issue No.	Revision No.	Date	Amended by	Reason
01	00	07.11.2023		Initial Issue
01	01	16.05.2024		Revision as per ICAO State letter Ref.: E 3/5-24/54
02	00	08.07.2026		Revision of EASA SIB 2022-02R3

0.2 Revision table

Page #.	Issue No.	Revision No.	Date	Edited by

Safety Information Bulletin

Subject: Global Navigation Satellite System (GNSS) Outage and Alterations Leading to Communication / Navigation / Surveillance Degradation

Ref. Publications:

- EASA Safety Information Bulletin No. 2022-02R4, dated 03 July 2026, "Global Navigation Satellite System Outage and Alterations Leading to Communication / Navigation / Surveillance Degradation";
- Commission Regulation (EU) No. 965/2012 of 05 October 2012;
- Commission Regulation (EU) No. 376/2014 of 03 April 2014;
- Commission Regulation (EU) 2017/373 of 1 March 2017;
- EUROCONTROL Guidelines on a Process for Civil and Military GNSS Interference Testing, EUROCONTROL-GUID-190, Edition Number 2.0, dated 06 March 2023;

Issue date: 03.07.2026.

Valid until: Until further notice or unless reviewed earlier.

Applicability

This Safety Information Bulletin is applicable to:

- Air Traffic Management / Air Navigation Service providers;
- Aircraft operators;
- Aerodrome operators;
- Aircraft and equipment manufacturers, where applicable;
- Organisations involved in the design or production of ATM/ANS equipment, where applicable;
- Other organisations involved in civil aviation operations where GNSS interference may affect the safety of operations.

Description

This Safety Information Bulletin is issued by the Albanian Civil Aviation Authority (ACAA) to address the increasing operational safety concern associated with Global Navigation Satellite System (GNSS) outages and alterations, including GNSS jamming and GNSS spoofing, which may lead to degradation of Communication, Navigation and Surveillance (CNS) capabilities during aircraft operations.

Since February 2022, the European Union Aviation Safety Agency (EASA) has observed a continuous increase in GNSS jamming and spoofing occurrences. Analysis of recent operational data indicates a further increase in both the severity of their impact and the overall intensity and sophistication of such events. These occurrences particularly affect geographical areas surrounding conflict or geopolitical risk zones, including the South and Eastern Mediterranean, the Black Sea, the Middle East, the Baltic Sea and the Arctic region.

GNSS jamming is an intentional radio frequency interference with GNSS signals. Such interference prevents GNSS receivers from locking onto satellite signals and may render GNSS services ineffective or significantly degraded within the affected area.

GNSS spoofing consists of broadcasting counterfeit satellite signals intended to deceive GNSS receivers into calculating erroneous Position, Navigation and Timing (PNT) information. Unlike jamming, spoofing may remain undetected for a longer period because onboard systems may continue to display apparently valid navigation information while providing incorrect position, navigation or timing data.

There are currently no specific flight crew alerts capable of positively identifying whether the aircraft is experiencing GNSS jamming or spoofing. The effects of jamming are generally immediate and readily noticeable, as systems fail to receive GNSS signals. Spoofing, however, may be considerably more difficult to detect and therefore presents a greater operational safety risk, requiring flight crews to recognise abnormal aircraft behavior and verify navigation information using independent sources.

Operational experience has demonstrated that GNSS interference may occur during any phase of flight and, in some cases, has resulted in aircraft re-routing, diversions, increased workload for both flight crews and Air Traffic Controllers, as well as deviations from Air Traffic Control (ATC) clearances or instructions.

The operational impact of GNSS interference depends on several factors, including:

- the geographical extent of the affected area;
- the duration of the interference;
- the density of air traffic;
- the phase of flight;
- the level of aircraft system dependency on GNSS signals;
- the availability of alternative navigation infrastructure.

GNSS degradation may affect aircraft systems and functions relying upon Position, Navigation and Timing (PNT) information. Possible operational effects include, but are not limited to:

- temporary or non-recoverable loss or degradation of Position, Navigation and Timing (PNT) information;
- misleading aircraft position or GNSS altitude;
- misleading aircraft position displayed on the Navigation Display or Electronic Flight Bag (EFB);
- misleading ground speed or wind information;
- loss of waypoint navigation capability;
- loss or degradation of GNSS-based Area Navigation (RNAV) or Required Navigation Performance (RNP) capability;
- route divergence or uncommented turns;
- deviations from ATC clearances or instructions;
- loss or misleading Automatic Dependent Surveillance–Broadcast (ADS-B) information;
- misleading Terrain Awareness and Warning System (TAWS) indications, including spurious "PULL UP" alerts;
- misleading information presented on Synthetic Vision Systems (SVS), weather uplink functions, predictive wind shear systems and other surface functionalities;

- loss or degradation of GNSS time- or date-dependent systems, including onboard clocks, fuel computation systems, Flight Management Systems (FMS) and Controller–Pilot Data Link Communications (CPDLC);
- inability to continue using GNSS navigation after leaving the affected area or for the remainder of the flight.

The combination of two or more of the above effects may have cumulative adverse consequences on flight safety. Furthermore, repeated or widespread GNSS disruptions may significantly increase the workload of both flight crews and Air Traffic Controllers, potentially leading to confusion, cognitive overload and an increased likelihood of operational errors.

GNSS jamming and spoofing may also affect ground-based systems, particularly where GNSS is used as the primary source of timing and synchronization for Communication, Navigation and Surveillance (CNS) infrastructure.

Based on the above, and taking into account the recommendations contained in EASA Safety Information Bulletin No. 2022-02R4, the Albanian Civil Aviation Authority issues this Safety Information Bulletin to promote awareness and encourage the implementation of appropriate operational mitigation measures by all affected aviation organisations.

At present, the safety concern described in this Safety Information Bulletin is not considered to constitute an unsafe condition requiring the issuance of a Safety Directive Nevertheless, ACAA will continue to monitor developments related to GNSS interference and may review this Safety Information Bulletin or introduce additional safety actions should operational circumstances require.

Recommendation(s)

To address the operational safety concerns associated with Global Navigation Satellite System (GNSS) jamming and spoofing, the Albanian Civil Aviation Authority (ACAA) recommends the implementation of the following mitigation measures.

These recommendations should be considered by organisations conducting activities within the scope of this Safety Information Bulletin whenever operations are performed within Flight Information Regions (FIRs) where GNSS interference has been identified through operational information published by EASA, NOTAMs, Air Navigation Service Providers or other competent authorities. They should also be applied, where appropriate, in any other area where GNSS interference is known or reasonably expected to affect the safety of aircraft operations.

Specific recommendations applicable to aircraft operators are presented separately for GNSS jamming and GNSS spoofing in recognition of the different operational characteristics and associated risks associated with each type of interference.

The recommendations contained in this Safety Information Bulletin are addressed to:

- Air Navigation Service Providers (ANSPs);
- Aircraft Operators;
- Aerodrome Operators;

- Aircraft and Equipment Manufacturers, where applicable;
- Organizations involved in the design or production of ATM/ANS equipment, where applicable.

Air Navigation Service Providers (ANSPs) should:

- Establish and maintain appropriate contingency procedures to ensure the continued safe provision of air navigation services during GNSS degradation events.
- ANSPs should establish arrangements for collecting, assessing and exchanging information related to GNSS jamming and spoofing events in coordination with ACAA and other competent authorities, as appropriate.
- Operational information concerning GNSS degradation should be disseminated to airspace users through appropriate channels, including voice communications, ATIS, NOTAMs and the Aeronautical Information Publication (AIP), where applicable.
- ANSPs should assess the operational impact of GNSS degradation on Communication, Navigation and Surveillance (CNS) systems, particularly where GNSS is used as the primary source of timing or synchronisation, and ensure that appropriate technical and operational contingency measures remain available.
- Where practicable, conventional navigation infrastructure, including Instrument Landing Systems (ILS), Distance Measuring Equipment (DME) and Very High Frequency Omnidirectional Range (VOR) facilities, should remain available to support aircraft operations whenever GNSS capability becomes unavailable or unreliable.
- Surveillance systems should be sufficiently resilient to continue supporting aircraft operations during GNSS degradation events. Where surveillance services remain available, ANSPs should be prepared to provide radar vectoring or other navigation assistance to aircraft experiencing degraded GNSS capability.
- Communication, surveillance and navigation capabilities should be periodically reviewed to ensure that they remain adequate for the provision of contingency services during widespread GNSS interference events.
- Contingency plans should include clearly defined procedures addressing both short-term and prolonged GNSS jamming or spoofing events.
- Where operationally justified, ANSPs should consider implementing local GNSS interference detection or monitoring capabilities in addition to existing regional or network-based monitoring systems.
- Air Traffic Controllers should closely monitor aircraft flight paths whenever GNSS degradation has been reported in order to promptly identify unexpected track deviations or altitude deviations and provide assistance where necessary.
- ANSPs should periodically assess whether controller workload, ATC sector capacity and applicable separation standards remain appropriate during significant GNSS degradation events.
- Training programmes for Air Traffic Controllers should include operational scenarios involving GNSS jamming and spoofing, enabling controllers to recognise these events, understand their operational consequences and provide timely assistance to affected aircraft.
- Controllers should be familiar with the standard ICAO phraseology applicable to GNSS interference events to ensure clear and consistent communication with flight crews.
- Operational and maintenance procedures should incorporate the recommendations and technical guidance provided by equipment manufacturers concerning the management of GNSS interference affecting ATM/ANS systems.

Aircraft Operators should

- Ensure that flight crews are aware, appropriately trained and prepared to recognise and respond effectively to GNSS jamming and spoofing events encountered during flight.
- Ensure that flight crews understand the importance of promptly reporting, by means of a Special Air Report (AIREP), any interruption, degradation or anomalous performance of GNSS equipment or related avionics to Air Traffic Services. Reports should include, where applicable, events such as map shifts, suspected GNSS spoofing, loss or misleading position information, time anomalies and their observed duration.
- Evaluate operational scenarios relevant to the type of operation in order to provide flight crews with timely operational information and increase awareness of potential GNSS jamming and spoofing events.
- Ensure that GNSS jamming and spoofing are incorporated into recurrent ground training programmes for flight crews and other relevant operational personnel, particularly when operating within or in the vicinity of affected areas. Training should include operational scenarios enabling personnel to recognise and respond appropriately to both jamming and spoofing events.
- Assess the operational risks and limitations associated with the loss of onboard GNSS capability, including the potential impact on aircraft systems requiring reliable GNSS inputs, such as Terrain Awareness and Warning Systems (TAWS).
- Maintain appropriate communication with aircraft and equipment manufacturers in order to obtain operational guidance and maintenance instructions applicable to GNSS interference events and incorporate such guidance, where appropriate, into standard operating procedures and maintenance programmes.
- Ensure that any navigation system intended to provide redundancy to GNSS is fully serviceable before commencing a flight into known affected areas and is not inoperative under the provisions of the Minimum Equipment List (MEL), except where dispatch is permitted solely for the purpose of positioning the aircraft to a location where repairs can be accomplished.
- Ensure that systems providing redundancy for equipment deferred under the Minimum Equipment List are not themselves dependent upon GNSS before commencing operations into affected areas, except where dispatch is permitted for a single positioning flight to a maintenance location.
- Ensure, whenever operationally practicable, that flight planning for operations through affected areas includes the availability of suitable non-GNSS navigation procedures for the entire flight, irrespective of the type of operation. Flight planning should also take into account the availability of radar surveillance and radar vectoring services within the airspace to be crossed.
- Consider the operational impact of contingency procedures, including longer approach paths, extended holding patterns and possible rerouting, when establishing fuel planning policies, inflight re-planning procedures and inflight fuel management.
- Where Flight Data Monitoring (FDM) programmes are required and the necessary data are available, use FDM to identify, monitor and assess GNSS jamming and spoofing events in support of operational safety improvement.
- Ensure that flight crews are familiar with the standard ICAO phraseology provided in **Appendix 1** of this Safety Information Bulletin in order to communicate clearly and consistently with Air Traffic Services during GNSS jamming or spoofing events.
- Consider the use of Electronic Flight Bag (EFB) applications capable of displaying areas affected by GNSS Radio Frequency Interference (RFI), as described in **Appendix 2** of this Safety Information Bulletin.

GNSS Jamming – Specific Recommendations for Aircraft Operators

Aircraft operators should ensure that flight crews and other relevant flight operations personnel:

- are aware of the possibility of GNSS jamming when operating in or near affected areas;
- verify aircraft position using non-GNSS navigation means whenever flights are conducted in proximity to areas where GNSS interference has been reported;
- verify that the navigation aids required for the intended route, arrival and approach remain available before and during the flight, where applicable;
- remain prepared to revert to conventional non-GNSS navigation procedures whenever operationally necessary;
- submit a Special Air Report (AIREP) to Air Traffic Services whenever unexpected GNSS irregularities are observed, particularly where flight safety may be affected or ATC assistance is required;
- use the standard ICAO phraseology contained in **Appendix 1** of this Safety Information Bulletin to ensure clear and consistent communication regarding GNSS jamming events.

GNSS Spoofing – Specific Recommendations for Aircraft Operators

Aircraft operators should ensure that flight crews and other relevant flight operations personnel:

- are aware of the possibility of GNSS spoofing when operating in affected areas;
- whenever practicable, monitor aircraft position using conventional navigation aids together with all available onboard navigation accuracy monitoring functions, including the Estimated Position Uncertainty (EPU);
- compare GNSS-derived time information with independent non-GNSS time sources whenever available;
- closely monitor Air Traffic Services frequencies while operating in areas where spoofing has been reported or is suspected;
- apply the aircraft manufacturer's procedures and guidance for recognizing and managing suspected GNSS spoofing events;
- submit a Special Air Report (AIREP) whenever unexpected navigation anomalies are observed and operational safety may be affected or Air Traffic Services assistance is required;
- use the standard ICAO phraseology contained in **Appendix 1** of this Safety Information Bulletin to ensure clear and consistent communication regarding suspected GNSS spoofing events.

Aircraft and Equipment Manufacturers should

- Assess the effects of GNSS jamming and spoofing on their products, taking into consideration the cumulative effects that may result from the simultaneous degradation or failure of multiple aircraft systems.

- Provide guidance to aircraft operators on the identification and recognition of suspected GNSS spoofing events when using their aircraft, systems or equipment.
- Provide guidance to aircraft operators on the assessment of operational risks and limitations associated with the loss or degradation of onboard GNSS capability, including the potential impact on aircraft systems requiring reliable GNSS inputs, such as Terrain Awareness and Warning Systems (TAWS).
- Provide operators with appropriate operational and maintenance instructions describing how their aircraft, systems or equipment should be operated and maintained when affected by GNSS jamming or spoofing, and ensure that such recommendations can be incorporated, where appropriate, into operators' standard operating procedures and maintenance programmes.

Organisations Involved in the Design or Production of ATM/ANS Equipment should:

- Assess the effects of GNSS jamming and spoofing on their products, taking into consideration the cumulative effects that may result from the simultaneous degradation or failure of multiple systems.
- Support Air Navigation Service Providers (ANSPs) by providing guidance on the identification and recognition of suspected GNSS jamming and spoofing events affecting the operation of their products.
- Provide operational and maintenance instructions to Air Navigation Service Providers describing how Air Traffic Safety Electronics Personnel (ATSEP) should operate, monitor and maintain ATM/ANS equipment affected by GNSS jamming or spoofing in order to ensure the continued safe provision of air navigation services.

Occurrence Reporting

All organizations concerned are reminded of their obligation to report any occurrence affecting aviation safety in accordance with Minister Order No. 89, dated 5 May 2022, "On the Approval of the Regulation on the Reporting and Follow-up of Occurrences in Civil Aviation in the Republic of Albania.

Aircraft operators are also reminded to report suspected GNSS spoofing events, as well as significant GNSS jamming occurrences presenting an elevated operational risk, to the relevant aircraft manufacturer. Operators should support the manufacturer's investigation by providing all relevant operational and technical information available, in accordance with point ORO.GEN.160(b) of Minister Order 80/2023.

APPENDIX 1- Phrases to communicate with ATC and Flight Information Services (FIS) in clear and unambiguous manner

Note: Updates introduced in the phraseology are highlighted in bold, while deleted phraseology is indicated using ~~strikethrough~~.

Circumstances	*Phraseologies*	*Applicable to* ATC	FIS
GNSS service status			
... use **REPORTED** when information is received from aircraft operating in the respective area	a) GNSS [REPORTED] UNRELIABLE (*or* GNSS MAY NOT BE AVAILABLE) [DUE TO (***reason, e.g.*** INTERFERENCE, or **JAMMING, or SPOOFING**)]~~}~~; 1) IN THE VICINITY OF *(location) (radius)* [BETWEEN *(levels)*]; or 2) IN THE AREA OF *(description)* (*or* IN (name) FIR) [BETWEEN *(levels)*];	☑	☑
... when planned activities or interferences affect the GNSS availability for specific operations for a duration of time	b) ~~BASIC~~ GNSS (*or* SBAS, *or* GBAS) UNAVAILABLE FOR *(specify operation)* [FROM *(time)* TO *(time)* (*or* UNTIL FURTHER NOTICE)];	☑	☑
... the reason depends on the information available to pilot	*c) ~~BASIC~~ GNSS UNAVAILABLE (***or UNRELIABLE**) [DUE TO (*reason, e.g.* LOSS OF RAIM *or* RAIM ALERT, *or* **INTERFERENCE *or* JAMMING *or* SPOOFING**)];		
	*d) GBAS (*or* SBAS) UNAVAILABLE ;		
	e) CONFIRM GNSS NAVIGATION;	☑	☑
	*f) AFFIRM GNSS NAVIGATION.		
	'*' denotes pilot transmission.		

RNAV			
...RNAV arrival or departure procedure cannot be accepted by the pilot	***a)** UNABLE (designator) DEPARTURE [or ARRIVAL] DUE RNAV TYPE;		
...pilot is unable to comply with an assigned terminal area procedure	***b)** UNABLE (*designator*) DEPARTURE [*or* ARRIVAL] (*reasons* ***e.g.*** INTERFERENCE, **or JAMMING, or SPOOFING**));		
...ATC unable to assign an RNAV arrival or departure procedure requested by the pilot due to the type of on-board RNAV equipment	**c)** UNABLE TO ISSUE (designator) DEPARTURE [or ARRIVAL] DUE RNAV TYPE;	☑	☐
...ATC unable to assign an arrival or departure procedure requested by the pilot	**d)** UNABLE TO ISSUE (designator) DEPARTURE [or ARRIVAL] (reasons ***e.g.*** INTERFERENCE, **or JAMMING, or SPOOFING**));	☑	☐
...confirmation whether a specific RNAV arrival or departure procedure can be accepted	**e)** ADVISE IF ABLE (designator) DEPARTURE [or ARRIVAL];	☑	☐
...informing ATC of RNAV degradation or failure	***f)** ~~(aircraft call sign)~~ UNABLE RNAV DUE EQUIPMENT;		
...informing ATC of no RNAV capability	***g)** ~~(aircraft call sign)~~ NEGATIVE RNAV;		
	'*' denotes pilot transmission		

Terrain alert ....after a flight crew starts to deviate from any ATC clearance or instruction to initiate climb in response to a terrain alert warning	***a)** (aircraft call sign) TERRAIN ALERT, (suggested pilot action, if possible). **Note 1: — possible action —PULL UP due to GNSS INTERFERENCE, JAMMING, or SPOOFING;.** **Note 2: — the TAWS / EGPWS requires an immediate GNSS-based escape maneuver ("GNSS PULL UP")** ***c) GNSS PULL UP, PASSING (*level*)[*intentions*];** **b) ATTENTION ALL AIRCRAFT IN VICINITY OF (or AT) (*significant point or location*), TERRAIN ALERT CLIMB [IN PROGRESS] FROM (*level*) or PASSING (*level*) (*followed as necessary by specific instructions, clearances, traffic information, etc*)** **'*' denotes pilot transmission**	☑	☐
...when due to GNSS INTERFERENCE flight crew experiences time anomalies	***a)** REQUEST TIME CHECK; b) TIME (time **in minutes and seconds, followed by the word NOW);**	* ☑	 ☑

APPENDIX 2 – EFB GNSS Interference Map

Some Electronic Flight Bag (EFB) application providers already offer solutions capable of displaying areas affected by GNSS Radio Frequency Interference (RFI) using near real-time operational data. Although the information provided is not instantaneous, these applications may enhance flight crew situational awareness by presenting recent GNSS interference activity along the intended route.

The Albanian Civil Aviation Authority (ACAA) considers that the use of such applications may support flight crew awareness when operating in areas affected by GNSS jamming or spoofing.

Where used, such applications may be classified as Type B EFB applications in accordance with AMC1 CAT.GEN.MPA.141(b) to Commission Regulation (EU) No. 965/2012, as implemented through Minister Order No. 80/2023.

The use of a Type B EFB application remains subject to the applicable operational approval requirements in accordance with Subpart M of Annex V (Part-SPA) of Minister Order No. 80/2023, under the responsibility of the aircraft operator and the oversight of the Albanian Civil Aviation Authority.

All applicable EFB requirements contained in CAT.GEN.MPA.141, the associated Acceptable Means of Compliance (AMC) and Subpart M (Part-SPA) of Minister Order No. 80/2023 remain applicable. Operators may apply the considerations established for In-Flight Weather (IFW) applications under AMC9 SPA.EFB.100(b)(3) by analogy to GNSS Radio Frequency Interference (RFI) information.