EGNOS

Safety Assessment Guidelines for the implementation of EGNOS-based instrument approaches to non-instrument runways located at aerodromes serving General Aviation

Programme of the European Union

EUSPA European Union Agency for the Space Programme

EASA European Union Aviation Safety Agency

ESSP

General Aviation operations are mainly conducted in the absence of ATS providers, in an aerodrome with a non-instrument runway and with an aerodrome operator licensed under a national certification scheme. According to the current European regulatory framework, the “Airspace Change Initiator” has been identified as the most suitable entity in this type of scenario for leading both the Instrument Flight Procedure (IFP) implementation and the Safety Assessment activities required before implementing an Airspace Change.

This document contains the Guidelines for carrying out a Safety Assessment related to the implementation of Global Navigation Satellite System (GNSS)-based Required Navigation Performance Approach (RNP APCH) operations using Localizer Performance with Vertical guidance (LPV) at aerodromes serving General Aviation. The document is intended as the first input for starting the Safety Assessment activities in this type of scenario. For this reason, in addition to a Concept of Operations, the document also contains a list of the expected Hazards and their associated Mitigating Measures related to the implementation of a GNSS-based RNP APCH in a General Aviation environment.

The target audience of this document is mainly the Airspace Change Initiator, but it also comprises airspace users, aerodrome operators, aerodrome owners and National Competent Authorities (NCAs) willing to support the implementation of IFP procedures based on European Geostationary Navigation Overlay Service (EGNOS) in a General Aviation environment. Apart from those closely related to the Airspace Change, other readers such as Air Navigation Service Providers (ANSPs) or members of the Aviation Community may also find it useful when dealing with this kind of implementation in different capacities.

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CONTENTS

List of Figures

List of Tables

1 Introduction

The General Aviation[1] community undertakes millions of flights with aircraft equipped with GNSS-receivers without taking full advantage of the capabilities of this technology.

Within the General Aviation Roadmap, EASA has a strategic objective of increasing and facilitating Instrument Flight Rules (IFR) aircraft operations for General Aviation pilots with the final aim of enhancing the safety of operations. With this in mind, the EUSPA in cooperation with EASA and ESSP, with the participation of different stakeholders, developed a Safety Promotion Material for the implementation of IFP at non-ATC environments: ***"(GNSS-based) Instrument Flight Procedures implementation for General Aviation. Uncontrolled Aerodromes and non-instrument runways"*.** This document was published in 2019 [RD-1].

This Safety Promotion Material [RD-1] analysed the possibilities to implement IFR procedures for General Aviation to non-instrument runways, i.e. runways with less stringent requirements regarding runway dimensions, markings and lighting, obstacle clearance in the vicinity of the aerodrome etc. Additionally, this document also provided mitigating measures regarding the implementation of specific instrument approach solutions at non-instrument runways, to ensure safe and efficient operations, while taking advantage of GNSS technology and capabilities.

In order to enable IFR procedures to non-instrument runways, some areas for improvement were identified where additional support material would be useful for the General Aviation community to implement GNSS-based instrument approach procedures; especially regarding **how to conduct the safety assessment related activities associated with the implementation of such procedures in General Aviation operations.**

Operations of General Aviation aircraft, as defined in this document, are mainly conducted to a non-instrument runway and in the absence of an ATC provider at the aerodrome. Most of these aerodromes are licensed in accordance with national regulations and are not subject to Regulations (EU) 2018/1139 [RD-2] and 139/2014 [RD-5]. In this context, as will be explained in Section 4 of this document, the safety regulatory framework opens the door for any type of organization involved in the process to lead the IFP implementation.

The present document is intended to be a ***supportive guidance material to ease the undertaking of the safety assessment related activities in the local implementation process of EGNOS-based approaches in General Aviation operations.***

[1] In the context of this document, General Aviation means non-commercial aircraft operations with other than complex and complex motor-powered aircraft in line with Part-NCC and Part-NCO of the European Air OPS Regulation 965/2012 [RD-3].

2 Objective

This document contains the guidelines for developing a safety assessment for GNSS-based IFR operations (particularly RNP APCH procedures using LPV guidance) at a General Aviation environment. For this purpose, the document provides a Concept of Operations, a set of the expected Hazards, and their associated Mitigating Measures.

The main objective of these guidelines is to be the first input in the development of the local safety assessment process. An IFP implementation, along with the associated airspace change, is not an easy process in a General Aviation scenario. In fact, the mitigation of both Mid-Air Collision (MAC) and Controlled Flight Into Terrain (CFIT) risks in a scenario without an ATC provider is one of the key topics of the local safety assessment.

It should also be highlighted that the list of assumptions, expected hazards and associated mitigating measures provided in this document shall be assessed, verified and completed by the Airspace Change Initiator when developing the local safety assessment, according to both the particular characteristics of the General Aviation environment and requirements stated by the NCA.

3 Scope

This document provides the guidelines for developing a safety assessment related to the implementation of GNSS-based RNP APCH operations using LPV in a General Aviation environment. To facilitate this implementation, a Concept of Operations, a set of the expected Hazards and their associated Mitigating Measures (related to the airspace change) are also provided.

General Aviation environments are mainly characterized by the absence of an ATC provider and by taking place (mostly) at aerodromes licensed in accordance with national regulations and not subject to Regulations (EU) 2018/1139 [RD-2] and 139/2014 [RD-5]. Therefore, it is necessary to identify the applicable safety regulatory framework in these scenarios. Section 4 contains an assessment of the applicable European Union (EU) regulatory framework for General Aviation environments.

Subsequently, in order to describe the Concept of Operations, the following elements will be explained throughout Section 5:

- **Description of the General Aviation scenario**. Covering the type of traffic and operations, the expected on-board (aircraft) equipment and the main characteristics of aerodromes serving General Aviation (non-commercial operations: NCC & NCO only).

- **Navigation (NAV) service**. European Geostationary Navigation Overlay Service (EGNOS) Service Provider).

- **Flight Procedure Design (FPD) service**. FPD provider & Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) criteria.

- **Aeronautical Information Service (AIS) service**. AIS provider: including publication in Aeronautical Information Publication (AIP), charting and Notice to Airmen (NOTAM) information, including EGNOS NOTAMs.

- **Aeronautical Database Suppliers (DAT) service**. DAT provider, Flight Management System (FMS) system.

- **ATS level for two scenarios**. One with an **Aerodrome Flight Information Service (AFIS) provider** and another with **no ATS service** at the aerodrome (covering for both scenarios the necessary type of airspace structures, **Communications (COM)** infrastructure, **Surveillance (SUR)** means and **Meteorological (MET)** information). **It is important to highlight that the most relevant scenario for General Aviation is no ATS service at the aerodrome.**

To complete the description of the Concept of Operations, Safety Promotion Material [RD-1] has been used as a key input in order to go through the available solutions and different elements characterizing the scenario.

The list of expected Hazards (Section 6) and Mitigating Measures (Section 7) associated with the implementation of GNSS-based RNP APCH operations in General Aviation scenarios, will be based on the description of the elements in the Concept of Operations mentioned above.

It should be highlighted that this document is not the local safety assessment (including a risk assessment) as such, but supportive guidance material to be considered as the first input when developing the aforementioned safety assessment at a local level. The local safety assessment should

demonstrate that “risk is reduced or low” to an acceptable level for the implementation of a LPV procedure in a particular General Aviation environment.

Finally, although this document is only focused on the implementation of RNP APCH operations using LPV in a General Aviation environment (for non-commercial operations NCC & NCO); the material may be adapted at a local level for the implementation of any other type of GNSS procedure (LNAV, LNAV/VNAV or LP) or for other type of operation (CAT or SPO), considering the specific requirements of such procedures or operations and also taking into account both the particular characteristics of the environment and the local requirements stated by the NCA.

4 Regulatory Framework

An assessment of the EU regulatory framework for General Aviation environments (using Safety Promotion Material [RD-1] as reference) is summarized within this section, focusing on the safety assessment related activities to be carried out before implementing an airspace change.

However, prior to carrying out the regulatory framework assessment, it is important to clarify the definition of General Aviation, in order to determine the applicable regulations: A General Aviation operation is defined in ICAO Annex 6 Part II [RD-15] as "an aircraft operation other than commercial air transport or aerial work operations"[2]. In this type of environment, where no commercial air transport operations take place, neither ATC service providers at the aerodrome nor EASA certified aerodrome operators are expected.

4.1 *ADR (Regulation 139/2014)*

European aerodromes which serve General Aviation operations (typically not serving commercial air transport operations) are characterised by non-instrument runways and are, therefore, mostly outside the scope of EASA's aerodrome safety requirements.

The exclusion of these aerodromes serving General Aviation operations is contained in Article 2 of Basic Regulation (EU) 2018/1139 [RD-2]:

> ***Article 2***
> ***Scope***
> *1. This Regulation shall apply to:*
> *[…]*
> *(e) the design, maintenance and operation of aerodromes, including the safety-related equipment used at those aerodromes, located in the territory to which the Treaties apply, which:*
> *(i) are open to public use;*
> *(ii) serve commercial air transport; and*
> *(iii) have a paved instrument runway of 800 meters or more, or exclusively serve helicopters using instrument approach or departure procedures;*

Due to the fact that most General Aviation aerodromes will probably be out of the scope of EASA´s aerodrome safety requirements, Aerodrome Regulation 139/2014 [RD-5] will not apply to them[3]. Therefore, in these scenarios, Aerodrome Operator certificates will be issued only under national Member States' certification schemes.

However, some aerodromes which fall within EASA's scope, and are used by General Aviation operations, may have a non-instrument runway. In such cases, an aspect to be analysed within Regulation 139/2014 [RD-5] is if the runway comply with the definition of 'non-instrument runway', and whether it allows for the implementation of Instrument Flight Procedures based on GNSS[4]:

[2] I.e. non-commercial aircraft operations with other than complex and complex motor-powered aircraft in line with Part-NCC and Part-NCO of the European Air OPS Regulation 965/2012 [RD-3].

[3] Member States may also decide to exempt, from Regulation 139/2014 [RD-5], any aerodrome handling no more than 10 000 commercial air transport passengers per year and no more than 850 movements related to cargo operations per year.

[4] In the case of General Aviation aerodromes which are out of the scope of EASA's aerodrome safety requirements, the definition from Regulation 139/2014 [RD-5] may not directly apply to them.

'non-instrument runway' means a runway intended for the operation of aircraft using visual approach procedures.

Operations are activities performed by pilots (AIR-OPS [RD-3]), whereas procedures are the predetermined published series of manoeuvres that are used for those operations, and are described in ICAO PANS-OPS [RD-13].

In said reference [RD-13], circling approach procedures are described as an extension of an instrument approach procedure which provides for visual circling of the aerodrome prior to landing.

Therefore, in the previous definition of "non-instrument runway", and in relation to the implementation of instrument approaches at this type of runway, the term "visual approach" is considered to refer to the circling approach procedure, which should be designed in accordance with PANS-OPS criteria [RD-13]. It should also be noted that according to PANS-OPS [RD-13], in those locations where clearly defined visual features permit, a specific track for visual manoeuvring (circling) may be prescribed in addition to the circling area, if it is operationally desirable.

Consequently, **the definition of "non-instrument runway" is considered by EASA to be flexible enough for the implementation of Instrument Flight Procedures based on GNSS, as it does not explicitly ban them.**

However, these instrument approaches to non-instrument runways do not meet the requirements to apply straight-in criteria, and must be completed by means of circling (visual manoeuvring) procedures; i.e. the instrument approach procedure must be restricted to circling minima.
Nevertheless, it should be taken into account that most aerodromes with non-instrument runways are subject to national Member State requirements and that, therefore, a further assessment is necessary at national level to consider specific national requirements stated by the National Competent Authorities in this regard.

4.2 *AIR-OPS (Regulation 965/2012)*

RNP APCH is an IFR procedure covered by AIR-OPS [RD-3], which has recently incorporated provisions related to PBN operations, removing the requirements for specific approvals.

Following the experience and maturity already reached in approach operations using GNSS, the newly revised Air OPS Regulation [RD-3] removed the need for specific approval for RNP APCH operations within PBN operations; enabling their use not only for commercial aircraft (CAT operations), but also for General Aviation users (NCC and NCO operations).

Furthermore, specific requirements and detailed guidance material exists for circling operations using RNP APCH for Part-NCC and Part-NCO operations (ref. NCC/NCO.OP.112 Aerodrome operating minima – circling operations with aeroplanes).

4.3 *SERA (Regulation 923/2012)*

Nevertheless, the definition has been considered as the only available "starting point" for carrying out the regulatory assessment, which should be revised in accordance with the national aerodrome requirements stated by the NCA.

The objective of Standardised European Rules of the Air (SERA) Regulation [RD-7] is to establish the common rules of the air and operational provisions regarding services and procedures in air navigation that shall be applicable to general air traffic, which includes General Aviation operations.

SERA Regulation [RD-7] also **contains the general rules of the air for pilots, in addition to the airspace classification and requirements**. Regarding the airspace, each State is responsible for designating the appropriate airspace structures in accordance with the expected traffic, CNS infrastructure and ATS level, following the airspace classification defined in the regulation (A, B, C, D, E, F or G).

Throughout this document, several references to SERA Regulation [RD-7] will be considered to support airspace requirements associated to the ATS level (ATZ, FIZ or RMZ), among other aspects.

Amendments in SERA Regulation [RD-7] shall be reviewed by Member States in order to assess that those changes will not affect the existing operating procedures. In this sense and in accordance with Article 9 of SERA Regulation [RD-7], Member States shall, in order to maintain or enhance existing safety levels, ensure that, within the context of a safety management process addressing all aspects of the implementation of SERA Regulation [RD-7], an assessment on the implementation plan is conducted, preceding the actual changes to the previously applied operating procedures.

4.4 *FCL (Regulation 1178/2011)*

In order to make flying IFR procedures proportionate for General Aviation pilots, a new Basic Instrument Rating (BIR) has recently been introduced in Flight Crew Licensing (FCL) Regulation [RD-8]. This new BIR has introduced a qualification to fly in accordance with IFR but based on more proportionate requirements when compared to the traditional Instrument Rating. **Both privileges and competency-based training requirements in the BIR are tailored to the needs of General Aviation pilots.**

According to FCL Regulation [RD-8], **BIR enables pilots to fly to a DH/MDH which shall be at least 200 ft greater than what would otherwise be calculated according to Air-Ops [RD-3] (a visibility of no less than 1500 m is required).**

4.5 *ATM/ANS (Regulation 2017/373 amended by Regulation 2020/469)*

Regulation 2017/373 [RD-6] lays down the EU common requirements for providers of ATM/ANS services and for the Authorities responsible for those providers' oversight. This regulation has recently been amended by Regulation 2020/469 [RD-9] with regard to the requirements for ATM/ANS and design of airspace structures, among other aspects.

Regulation 2020/469 (amending Regulation 2017/373) [RD-9] proposes decoupling the airspace change process (led by the **Airspace Change Initiator**) from the IFP design process (conducted by an IFP Provider).

Airspace Change Initiator or **Initiator of an Airspace Change** is a new concept introduced in Regulation 2020/469 [RD-9] at Guidance Material level (ED Decision 2020/008/R: GM1 Article 3(8) Provision of ATM/ANS and design of airspace structures). Airspace Change Initiator refers to the organization in charge of leading the IFP implementation process.

For General Aviation scenarios where there is no ATS Service Provider at the aerodrome, the Airspace Change Initiator may be, but is not limited to, any of the following: the Member State, the NCA, an aerodrome operator, other ATM/ANS provider or an airspace user.

When an airspace change includes the design of a new flight procedure or the modification of an existing one and the initiator is at the same time the Flight Procedure Design service provider, both processes might run in parallel. Nevertheless, when the Airspace Change Initiator is an organisation other than the Flight Procedure Design service provider, this flight procedure design process can be regarded as a sub-process of the wider process as depicted in Figure 1:

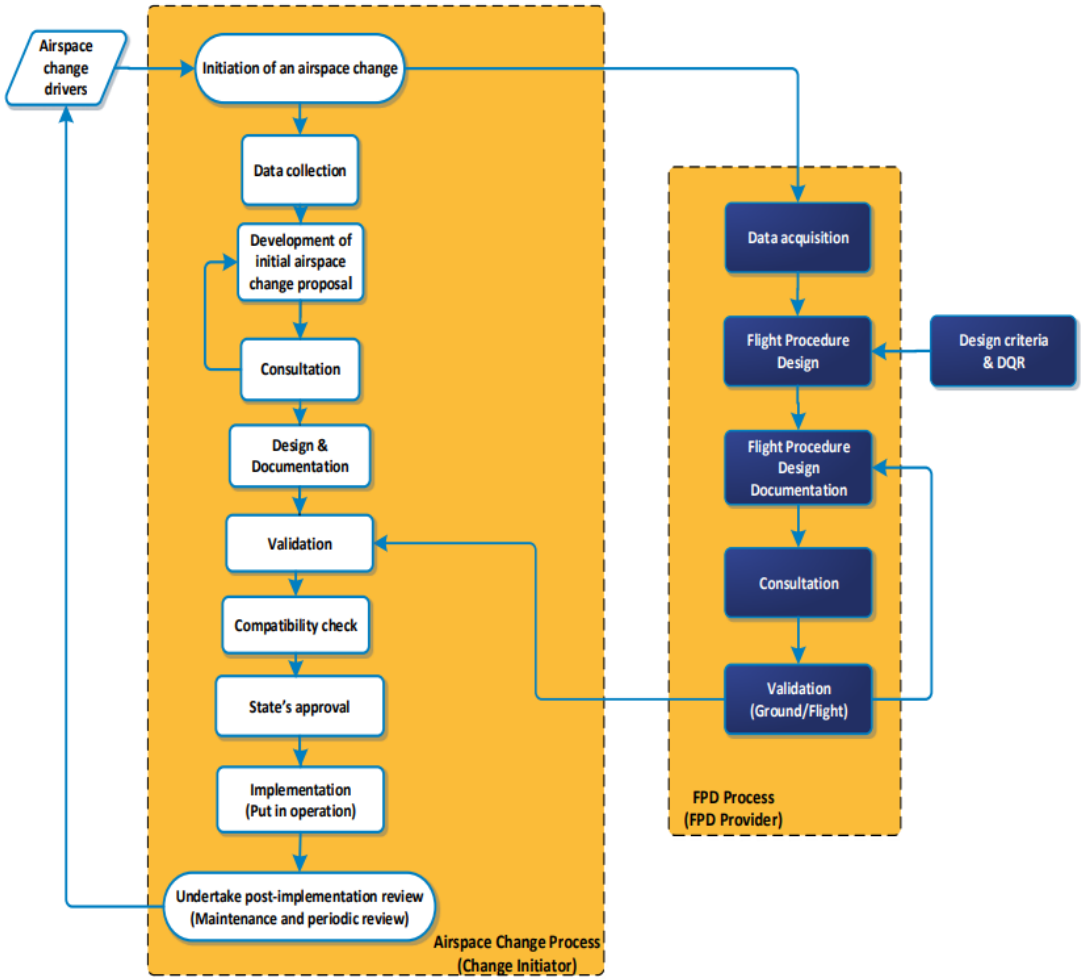


Figure 1: Interactions between airspace change process and flight procedure design process (source: EASA Easy Access Rules for ATM/ANS [RD-6])

According to Regulation 2017/373 [RD-6] as last amended, the Airspace Change Initiator should ensure that an assessment is carried out before deploying the airspace change. If a change to the airspace results in a change to the functional system of the ATS providers serving the affected airspace, those affected ATS providers need to perform a safety assessment as per Regulation 2017/373 [RD-6].

Regarding the safety assessment activities, according to Regulation 2017/373 [RD-6], service providers other than the ATS provider shall ensure that a safety support assessment is carried out covering the scope of the change. This safety support assessment would then be integrated into the safety assessment, to be developed only by ATS providers:

GM2 ATM/ANS.OR.C.005 (a)
(1) Safety support assessment and assurance of changes to the functional system
SAFETY SUPPORT ASSESSMENTS BY PROVIDERS THAT ARE ALSO ATS PROVIDERS
(a) Only air traffic services providers can perform a safety assessment. Service providers other than air traffic services providers can only perform a safety support assessment to determine that the new or changed service behaves only as specified in a specified context.

As the presence of an ATS provider in General Aviation aerodromes is not expected[5], specific ATS safety-related provisions for changes to the functional system (safety assessment and safety support assessment) should not be directly applicable in these scenarios.
In the case of a GNSS IFP implementation in a General Aviation aerodrome where no other change in the existing ATM/ANS services (such as MET, DAT, NAV, AIS or FPD services) is taking place, there is no substantiation for applicability of the requirements regarding the safety support assessments and assurance of changes to the functional system.

Taking into account all this information, the above mentioned safety requirements stated in ATM/ANS Regulation are not directly applicable to General Aviation aerodromes (without an ATS provider). Nevertheless, there would be other applicable requirements of this regulation associated to ATS (FIS & AFIS), COM, NAV, DAT, MET, AIS and FPD services, which will be considered along this document.

Additionally, it should be noted that NCAs may establish particular requirements (regarding the development of a safety support assessment and/or safety assessment) depending on the national scheme (if available) for the airspace change process in a General Aviation environment.

Airspace change national processes are not fully harmonised at EU level. In this sense, it is important to remark that some States may or may not have applicable national schemes. Such changes are generally captured via Regulation 2017/373 [RD-6] and the FUA regulation [RD-10][6] requirements. Both regulations should help the States to implement a national scheme and ensure the implementation of an airspace change process.

Finally, Regulation 2017/373 [RD-6] (as amended by Regulation 2020/469 [RD-9]) anticipates that the flight procedures are designed in accordance to PANS OPS criteria as specified in the related AMC/GM. In the context of this document and as explained in Section 4.1, only IFPs restricted to circling minima are possible at non-instrument runways.

4.6 *Conclusions from regulatory assessment*

From the EU regulatory perspective (taking into account existing Air-Ops [RD-3], ATM/ANS [RD-6] and ADR implementing regulations [RD-5]), **the current requirements present some ambiguity in relation to the implementation of Instrument Flight Procedures to non-instrument runways**.

Nevertheless, the overall conclusion is that the implementation of Instrument Flight Procedures to non-instrument runways is possible if the instrument approach procedure is restricted to circling minima (no straight-in approaches are allowed at non-instrument runways).

[5] Although, AFIS is considered within this document, the most relevant scenario for General Aviation is no ATS service at the aerodrome

[6] FUA Regulation is included only as reference to ensure coordination between civil and military operations in case necessary depending on the scenario.

The analysis of current EU regulatory framework (Basic Regulation, ADR, AIR-OPS, SERA, FCL & ATM/ANS regulations) indicates that there are also some ambiguities with regards to the aforementioned implementation **at aerodromes without an ATS provider and under the scope of the EU aerodrome Regulation**. However, most non-instrument runways fall under the scope of national requirements and this document does not contain an assessment of the different national requirements in place.

Aerodromes which exclusively serve General Aviation operations **are out of the EASA certification scheme.** Consequently, the certification process of these aerodromes will directly depend on the NCA.

Additionally, as the presence of an ATS provider in General Aviation aerodromes is not expected, **specific ATS safety-related provisions for changes to the functional system** (safety assessment and safety support assessment stated in [RD-6]) **are not directly applicable.**

Taking into account all this information, in the absence of dedicated requirements and guidance on instrument approach procedures at non-instrument runways, this document intends to provide additional guidance (in the form of a concept of operations and identification of hazards and appropriate mitigating measures) to support the safety activities to be carried out at a local level at General Aviation aerodromes.

New Regulation 2020/469 [RD-9] has introduced at Guidance Material level the **Airspace Change Initiator** as the organization in charge of leading the IFP implementation process and ensuring that safety assessment related activities will be carried out before implementing an airspace change.

The Airspace Change Initiator may be any type of organization: ATM/ANS provider, national licensed aerodrome operator, or even an aircraft operator. **EU regulatory framework does not limit who the IFP implementation initiator may be.**

Due to there being no requirement for the use of any particular safety methodology, this document is intended as a supportive guidance material to ease the undertaking of the safety assessment related activities in the local implementation process by the "Airspace Change Initiator" and to ensure safe and proportionate provisions for instrument approaches to non-instrument runways.

To reinforce the previous statement, Figure 2 shows both the FPD and Safety processes to be carried out for the correct implementation and approval of the airspace change process. Additionally, the expected steps (Concept of Operations, Hazard identification and Mitigating Measures) where this document will be integrated within the safety activities are also highlighted:

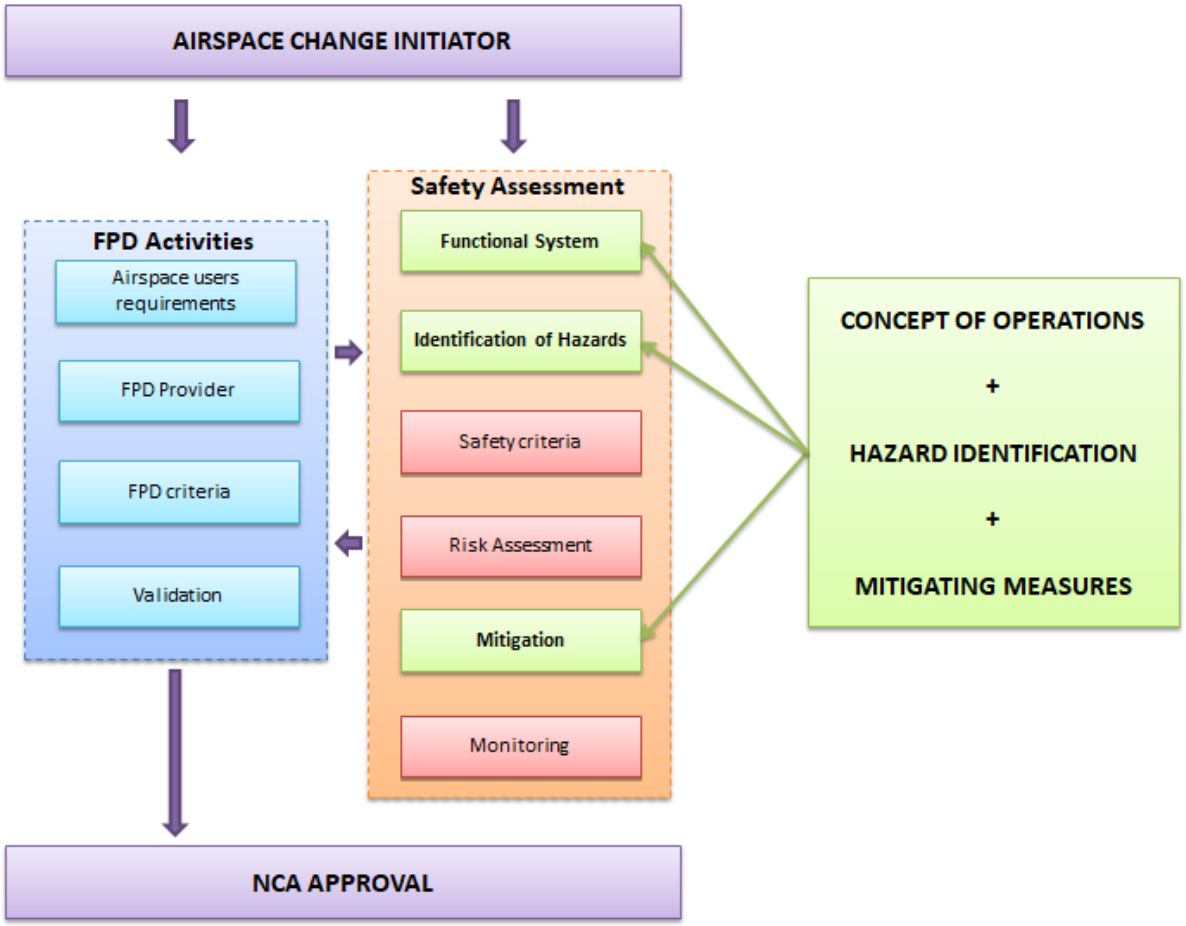


Figure 2: Guidelines for the development of a Safety Assessment within the IFP implementation process

It should be noted that the proposed steps for the FPD and Safety processes (shown in Figure 2) should only be considered as indicative, as the NCA may impose local restrictions depending on the national requirements.

In any case, as shown in Figure 2 and explained in previous sections, this document shall be considered as an important input for the development of the safety assessment activities. In this regard, the functional model definition, hazard identification and mitigation steps will be the phases where these guidelines may be injected.

Regarding the safety process, an important aspect which shall be covered for General Aviation scenarios where there is no ATS provider is the monitoring of the airspace change after its implementation. As EU regulatory framework does not limit who the Airspace change Initiator may be, if monitoring of the safety criteria is required by the NCA, both the NCA and the Airspace Change Initiator should appropriately coordinate that process for organizations without a SMS.

As previously mentioned, the airspace change process is not fully harmonised at EU level. In particular, there may be some States which do not have a defined national airspace change procedure or scheme; but it is expected that ATM/ANS Regulation [RD-6] [RD-9] will help the States define a national scheme and ensure the implementation of an airspace change process.

5 Concept of Operations for General Aviation

Safety assessment activities related to the implementation of a new IFP can only be properly conducted when considering both the existing scenario and the ATM/ANS infrastructure being assessed within the context of the operational environment in which it will be integrated. For this reason, the development of the Concept of Operations is necessary.

This Concept of Operations includes all characteristics which may be relevant when assessing the safety impact of introducing a new IFP in a General Aviation scenario. Additionally, the Concept of Operations requires a description of the current operations, infrastructure and ATM/CNS capabilities that support these operations, including also a description of the environmental characteristics.

The Concept of Operations detailed in this section contains a description of the following elements present in General Aviation aerodromes:

- **Overview of the General Aviation scenario** (concrete information of the scenario should be particularized for each local implementation - Section 5.1):
    - Local characteristics: weather, topography, or environmental constraints, among others.
    - Type of operations, including aircraft performance and equipment.
    - Proposed Risk hierarchy for General Aviation.
    - Aerodrome Infrastructure.

- **Common ATM/CNS capabilities** (expected and common ATM/CNS services for all or most General Aviation aerodromes - Section 5.2):
    - **NAV** (Navigation) → EGNOS Service Provider.
    - **FPD** (Flight Procedure Design) → FPD Service Provider.
    - **AIS** (Aeronautical Information Service) → AIS Service Provider.
    - **DAT** (Aeronautical Data Supplier) → DAT Service Provider.

- **Specific ATM/CNS capabilities** (specific ATM/CNS services depending on the existing ATS level at the aerodrome - Section 5.3):
    - **ATS** (both for AFIS service provider and for no ATS service provider at the aerodrome):
        - **SUR** (Surveillance) → No SUR service.
        - **COM** (Communications) → Depending on the ATS level.
        - **MET** (Meteorological) → Depending on the ATS level.
    - **ATS Adjacent Centre** → FIS information unit.
    - **Type of Airspace structure** → Depending on the ATS level.

Although it is out of the scope of the present document, a high-level description of the functional model of the scenario is also described to complement the Concept of Operations. This should just be considered as contextual information; only to ensure that all expected elements in General Aviation scenarios are fully covered within the Concept of Operations.

This functional model describes and identifies the functions involved in the scenario, together with the interactions and relationships between them. The more complex the scenario and functions, the more relationships the description of the functional model will contain.

Figure 3 presents, as guidance, an indicative functional diagram and its interactions, based on the Concept of Operations:

- In **BLUE**, the Airspace Change Initiator figure, as leader of the Airspace Change.
- In **GREEN**, current and future ANS expected in the scenario.
- In **RED**, NON certified ANS services.
- In **ORANGE**, external functions to the proposed scenario (IFR airspace users).

Finally, in the next sub-sections, a description of the Concept of Operations for a General Aviation scenario will be carried out covering the description of the elements mentioned above in addition to those identified in the functional model.

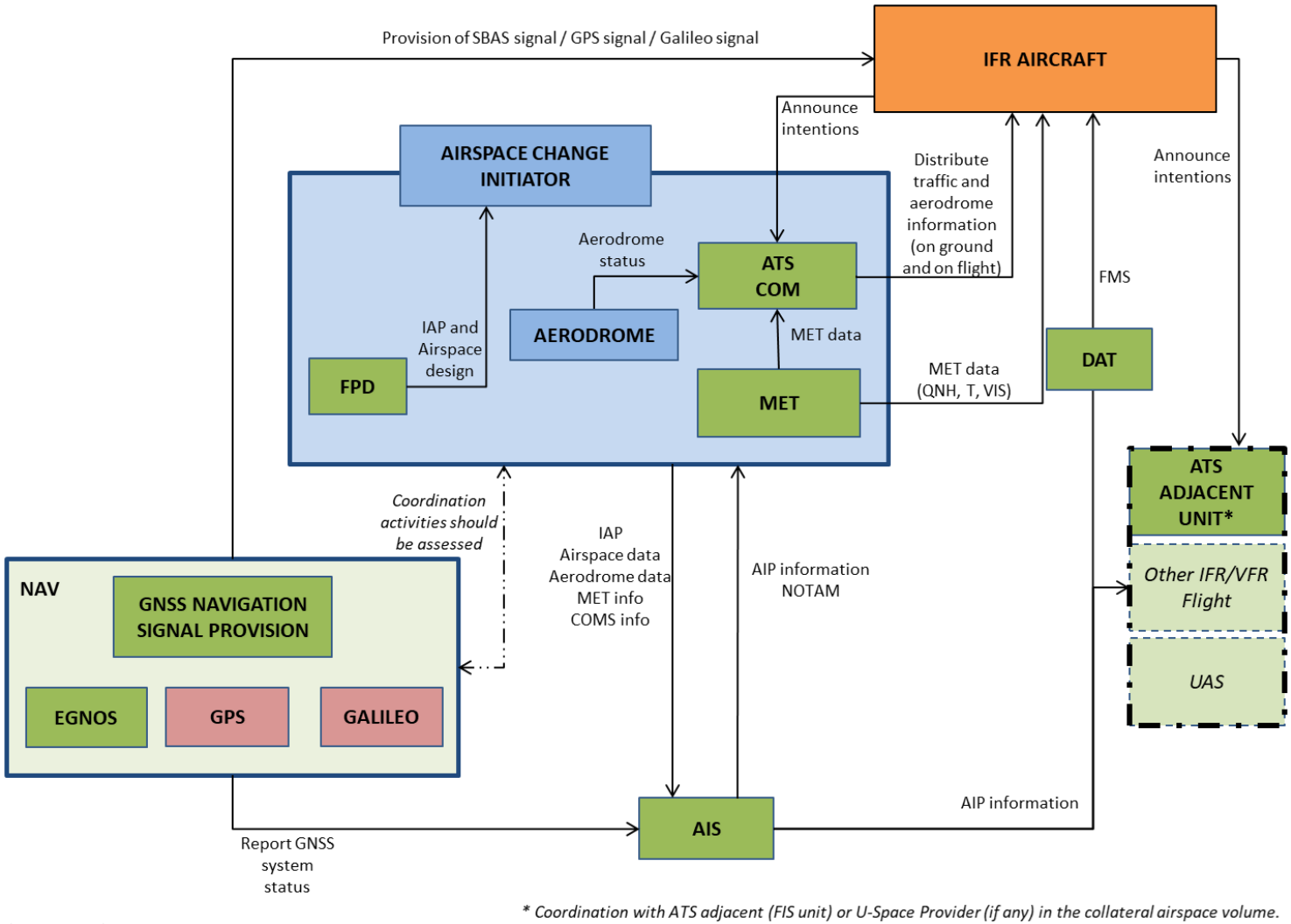


Figure 3: Simplified view of a functional model

5.1 *Overview of the General Aviation scenario*

General Aviation operations have been defined according to ICAO Annex 6 Part II [RD-15] as "any aircraft operation other than commercial air transport or aerial work operations". As a consequence, General Aviation aerodromes do not tend to serve commercial air transport operations. General Aviation thus represents private and recreational components of aviation, including business and recreational flights, flight training or flying clubs, among others.

With these characteristics, typical General Aviation aerodromes are small aerodromes serving only VFR operations, without ATS services at the aerodrome and with (at least) a non-instrument runway.

The introduction of GNSS/EGNOS technology offers enhanced vertical guidance, allowing pilots to rely on safe instrument approaches at places where previously it was not possible (maybe due to bad meteorological conditions), and with no investments or maintenance costs for ground infrastructure. This as a result will provide for additional safety of GA operations.

General Aviation aerodromes serving only VFR operations and with a limited ground infrastructure would be one of most important beneficiaries of GNSS/EGNOS technology, having the opportunity of implementing an Instrument Flight Procedure and providing for additional safety of GA operations without incurring any direct operational cost (airspace users will only need to be properly equipped for flying these types of procedures, according to Section 5.1.3).

In any case, each General Aviation aerodrome will have different characteristics and infrastructure depending on the particular environment, such as: weather, location, topography, services at the aerodrome, constraints and/or even populated areas in the vicinity of the aerodrome.

All those particular elements of the scenario must be properly described and assessed at a local level. In this regard, and due to their importance in the following sections of the Concept of Operations, the following sub-sections describe some of these elements in detail (**operations, aircraft equipment and main characteristics of General Aviation aerodromes**).

5.1.1 Risk hierarchy for General Aviation

Basic Regulation (EU) 2018/1139 [RD-2] fosters the implementation of simple and proportionate rules for General Aviation in close cooperation with the Member States.

Following the European General Aviation Safety Strategy, EASA has proposed a new approach in the way General Aviation is considered which can prevent placing undue burden on these activities, which might threaten the very existence of the sector, whilst preserving an appropriate level of safety.

At this point, it is important to recognise that General Aviation refers to non-commercial operations with other than complex and complex motor powered aircraft, also called Part-NCC and Part-NCO operations in accordance with the Air OPS Regulation [RD-3] and does not include Commercial Air Transport (CAT) operations (see Section 5.1.2).

For these reasons, General Aviation should be handled separately from commercial operations and merits a different, proportionate approach based on an acceptable risk hierarchy.

This document is built upon the premise that operators and pilots have the necessary competences to properly manage the risks associated with their specific activity.

5.1.2 General Aviation operations

Nowadays, most General Aviation flights are carried out under VFR rules, due to the absence of IFP and/or low level IFR routes, among other reasons. Nevertheless, the General Aviation community undertakes millions of flights with aircraft equipped with GNSS-receivers without taking advantage of the full capabilities of this technology.

Thanks to the implementation of GNSS, it is expected that the General Aviation sector will experience a rapid growth in the coming years. In fact, over the last years EASA has supported and encouraged the General Aviation community to gradually implement PBN operations and established RNAV and RNP capabilities to further improve flight safety and increase economic and environmental benefits.

According to AIR-OPS regulation [RD-3], EASA applied the classification shown below in Figure 4 to develop a different set of technical rules for air operations, taking into account the principle of proportionality and the need to have different safety levels:

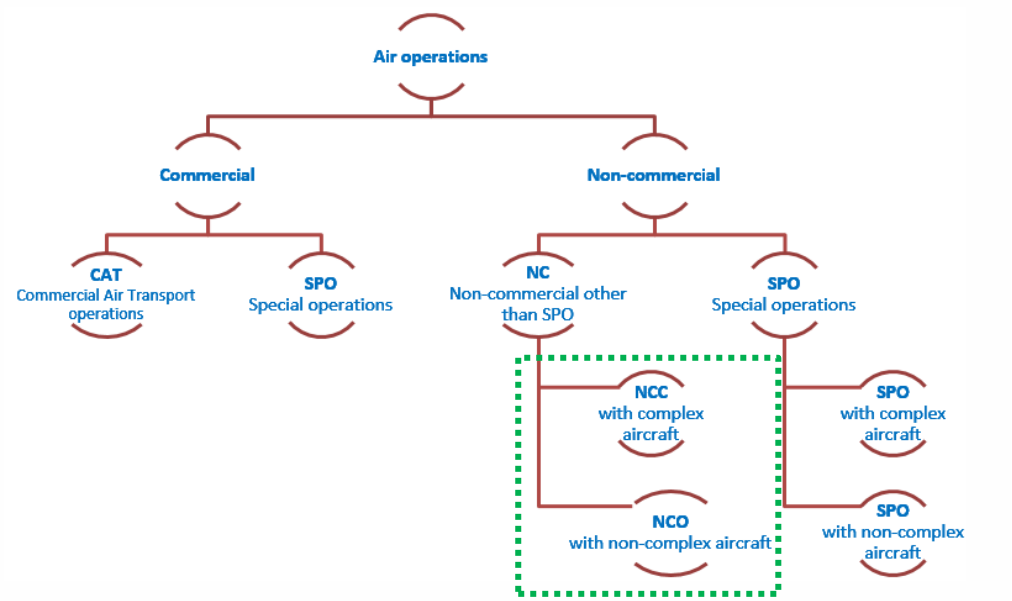


Figure 4: Operations in General Aviation (source: EASA)

General Aviation operations are thus framed within non-commercial operations. Furthermore, EASA has developed two different sets of rules for non-commercial operations, depending on the complexity of the aircraft:

- Operation of non-complex aircraft: basic safety rules apply (Part-NCO of AIR-OPS Regulation). **The term NCO stands for non-commercial operations with other-than-complex aircraft.**

- Operation of complex aircraft[7]: more complex safety rules apply (Part-NCC and partly Part-ORO of AIR-OPS Regulation); particularly considering that complex aircraft may carry a larger number of passengers and usually require professional teams for their operations. **The term NCC stands for non-commercial operations with complex motor-powered aircraft.**

Consequently, this Concept of Operations will only contain reference to Part-NCO and Part-NCC from AIR-OPS Regulation [RD-3], regarding the responsibilities of the General Aviation pilots in the IFR operation or the on-board equipment or licensing, among others.

[7] The term 'complex motor-powered aircraft' is defined in Basic Regulation 2018/1139 [RD-2].

In any case, although this document only focuses on General Aviation operations (Part-NCC and Part-NCO), all the material developed throughout other sections of this document (6. Hazard Identification and 7. Mitigating Measures) might also be useful for other types of operations, e.g. CAT operations. However, it is acknowledged that the requirements to transport passengers in CAT operations differ from the requirements for Part-NCC and Part-NCO operations.

5.1.3 General Aviation aircraft equipment

As stated in Section 4.2, **RNP APCH within PBN operations is covered by AIR-OPS [RD-3], enabling its use for General Aviation users with no need for a specific approval.** In order to benefit from GNSS/EGNOS technologies, General aviation aircraft will be required to be equipped with GNSS/EGNOS navigation systems allowing them to perform PBN operations. GNSS systems compatible with multiple-constellation satellite-based navigation systems will be the preferred navigation system for the general aviation sector in the near future.

In order to obtain the approval to fly PBN procedures, the aircraft must **meet the airworthiness certification requirements for the appropriate navigation specification.** In particular, according to AIR-OPS [RD-3], requirements for RNP APCH (LPV minima) are listed herein:

AIRCRAFT ELIGIBILITY FOR PBN SPECIFICATION NOT REQUIRING SPECIFIC APPROVAL

(l) RNP APCH — LPV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LPV operations.

(i) AMC 20-28;
(ii) FAA AC 20-138 for the appropriate navigation specification; and
(iii) FAA AC 90-107.

(2) For aircraft that have a TAWS Class A installed and do not provide Mode-5 protection on an LPV approach, the DH is limited to 250 ft.

On the other hand, the **applicable airworthiness requirements** to be met by the airborne RNP system installation, in order to obtain airworthiness approval for the RNP specifications, are also addressed in CS-ACNS [RD-4]. The existing ETSOs related to the hardware required for SBAS and EGNOS operations are: ETSO-C144a and ETSO-C190 for antenna standards and ETSO-C145c and ETSO-C146c for on-board equipment.

EGNOS SDD [RD-11] (reference document for EGNOS usage) also contains, among other aspects, information regarding on-board equipment, receivers and certification standards for EGNOS users (see Section 5.2.1). Considering this information, all on-board EGNOS receivers shall be ETSO compliant.

5.1.4 Responsibilities of the General Aviation pilots

5.1.4.1 *General considerations*

The introduction of new PBN procedures based on GNSS/EGNOS technology provides important benefits to IFR operation, but also introduces additional requirements for operators and pilots. According to AIR-OPS [RD-3], it is the responsibility of the operator and/or pilots-in command to apply contingency procedures in case of loss of PBN capability. These abnormal or contingency procedures describe the operating procedures to be followed by crew in case of system failures, loss of signal or loss of integrity, among other factors.

In the event of an on-board communication failure, the flight crew should continue with the operation in accordance with the communication procedures published in the national AIP. On the other hand, when there is a loss of PBN capability, the pilot-in-command should invoke contingency procedures and navigate using an alternative means of navigation to reduce risk of CFIT. Additionally, the flight crew might make the necessary preparation to revert to a conventional arrival procedure where appropriate.

The flight crew should also notify ATS[8] of any problem with PBN capability, which will in turn notify other airspace users of these anomalies.

[8] 'ATS' refers to the appropriate ATS unit in the airspace: AFIS, ATC, FIS units or UNICOM station.

5.1.4.2 *Pre-flight for PBN procedures*

Pre-flight briefing is considered a key activity to be carried out by pilots before starting any type of flight. In environments without ATS services at the aerodrome, pre-flight information is even more important. As guidance, pre-flight information should contain at least:

- **Meteorological information at departure, en-route and destination aerodrome** (if available)[9].
- **NOTAMs and airspace restrictions**.
- **National regulations or local procedures as laid down in the National regulations or local procedures as laid down in the AIP.**

This section compiles the pre-flight and general considerations of General Aviation pilots (NCO and NCC operations) when carrying out PBN procedures, according to AIR-OPS [RD-3]:

1) At navigation system initialisation, the pilot-in-command should confirm that the navigation database is current and verify that the aircraft position, if required, has been entered correctly.

2) The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

3) The pilot-in-command should check that the navigation aids critical to the operation of the intended PBN procedure are available.

4) The pilot-in-command should confirm the navigation aids that should be excluded from the operation, if any.

5) An arrival, approach or departure procedure should not be used if the validity of the procedure in the navigation database has expired.

6) The flight crew should verify that the navigation systems required for the intended operation are operational (only applicable for NCC operations).

[9] For General Aviation environments without ATS services at the aerodrome, Section 0 contains more details regarding how to obtain the necessary MET information. In these cases, the meteorological products/data may not be available at destination aerodromes/operating sites, so General Aviation pilots should consider other available meteorological information from certified sources.

5.1.4.3 *PBN approach procedure*

This section compiles the responsibilities of the General Aviation pilots (NCO and NCC operations) when conducting a PBN approach procedure (RNP APCH - LPV minima), according to AIR-OPS [RD-3]:

1) The flight crew will verify that the navigation system is operating correctly and the correct arrival procedure and runway are entered and properly depicted.

2) Any published altitude and speed constraints should be observed.

3) The flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

4) Prior to commencing the approach operation (before the IAF), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts, including the following elements: waypoint sequence; reasonableness of the tracks and distances of the approach legs and the accuracy of the inbound course; and vertical path angle.

5.1.4.4 *PBN departure procedure*

This section compiles the responsibilities of the General Aviation pilots (NCO and NCC operations) when conducting a PBN departure procedure, according to AIR-OPS [RD-3]:

1) Prior to commencing a take-off on a PBN procedure, the flight crew should check that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off.

2) Where GNSS is used, the signal should be acquired before taking-off.

3) Unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after take-off.

5.1.5 General Aviation Aerodrome

Considering the regulatory framework detailed in Section 4, the main characteristics of General Aviation aerodromes are listed below:

- **None of the runways of the aerodromes are currently served by a current IAP.**
- **Non-instrument runway.**
- **Licensed Aerodrome Operator, under national certification scheme (if available).**

Due to General Aviation aerodromes being subject to national regulation schemes, the characteristics may vary depending on the State. Each NCA may request additional requirements to be met. For this reason, the particular regulatory framework of each scenario shall be assessed and described in the development of the local safety assessment. However, these local considerations should not impact the flight procedure design that is subject to EU regulatory framework.

It should also be mentioned that the introduction of a new GNSS/EGNOS based procedure might lead to an increase of the existing traffic in a particular environment.

According to Article 3a from Regulation 2020/469 [RD-9], Member States shall determine the need for the provision of air traffic services at each aerodrome based on the types of air traffic involved, the density of air traffic, the meteorological conditions, among other relevant factors. So if the implementation of an IFR procedure rapidly increases traffic at the aerodrome, each State is responsible for assessing if a new ATS level is needed at the aerodrome or if there is a need to include limitations to traffic.

5.2 *Common ATM/CNS capabilities*

5.2.1 NAV

All RNP approach operations rely on the use of GNSS and the appropriate National Competent Authority needs to agree on the use of GNSS in their airspace. **RNP Approaches flown to LPV minima rely on the use of GNSS augmented by SBAS.** General Aviation aerodromes that are currently VFR only and with a limited ground infrastructure would be one of the most important beneficiaries of SBAS/EGNOS technology.

RNP Approach to LPV minima relying on EGNOS (Europe's regional SBAS) can be planned at any aerodrome within the EGNOS APV I or LPV-200 service level area as described in the EGNOS Service Definition Document (SDD) [RD-11], which is the reference document for EGNOS usage.

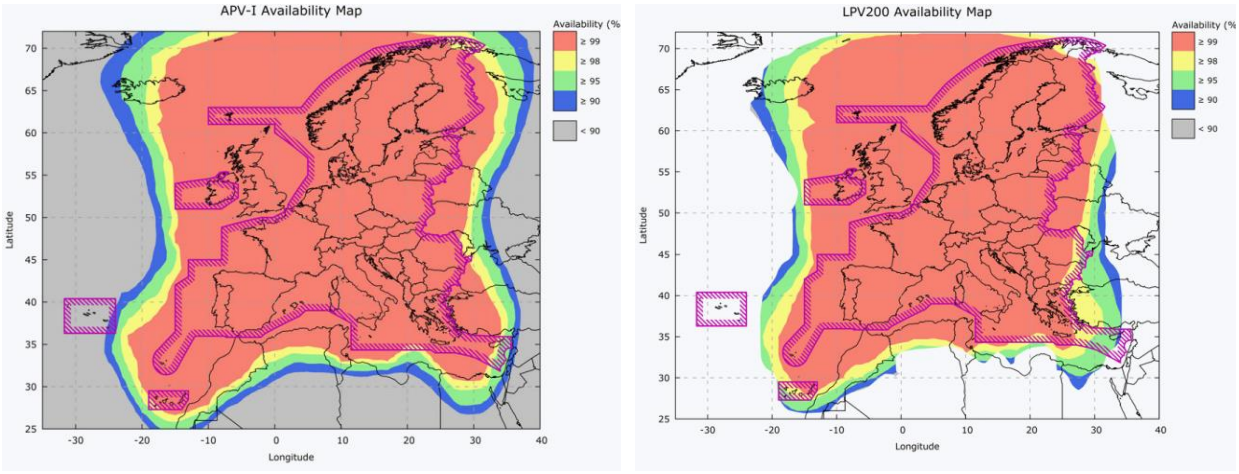


Figure 5: APV-I and LPV-200 Availability Map (source: EGNOS SDD [RD-11])

It should be noted that some NCAs may require the development of a specific assessment to confirm that the EGNOS service is available at the aerodrome concerned and is suitable for the intended operations. The detection, mitigation and control of potential spurious transmissions from services operating in frequency bands that could cause harmful interference and effects to the satellite navigation systems (degrading the nominal performances) is under the responsibility of local authorities and therefore the inclusion of particular aspects concerning GNSS Radio Frequency Interference (RFI) and spectrum protection in the safety assessment should be assessed at a local level.

EGNOS uses GNSS measurements taken by accurately located reference stations deployed mainly across Europe and North Africa. All measurements are transferred to a central computing centre where differential corrections and integrity messages are calculated. These calculations are then broadcast over the covered area using geostationary satellites that serve as an augmentation, or overlay, to the original GNSS message:

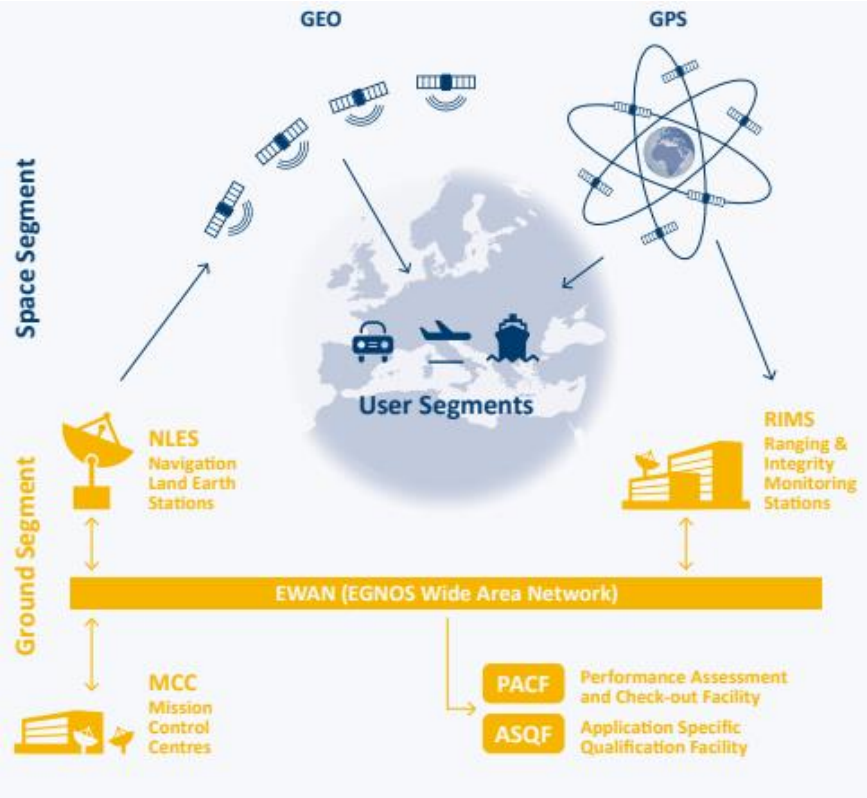


Figure 6: EGNOS architecture (source: EGNOS SDD [RD-11])

According to the current regulatory framework, any Pan-European Service used by aircraft and ANSPs, provided by an organisation established in the territory of the EU Member States, is subject to the SES Regulations. **Therefore, this also applies to the EGNOS Service Provider. Article 41 of Basic Regulation 2018/1139 [RD-2] requires that the ATM/ANS Provider holds a valid certificate**, in this case provided by EASA**.**

As is also indicated in the current regulatory framework (Regulation 2017/373 [RD-6]), an ANSP implementing an LPV procedure is required to have an agreement with the EGNOS service provider. The EGNOS Working Agreement (EWA) is a free-of-charge interface between the EGNOS service provider and ANSPs implementing RNP Approaches to LPV minima.

In General Aviation scenarios, where neither an ATS provider nor an EASA certified Aerodrome Operator is present at the aerodrome, **EASA will require the existence of an EWA between the ESP and the Airspace Change Initiator, in order to ensure that the same framework related to Navigation services is applied in a harmonized manner within the airspace under their responsibility, including EGNOS NOTAM proposals information**. If the Airspace Change Initiator is not eligible for establishing an EWA, another stakeholder could hold it if feasible.

The overall objective of the EWA is to formalise the operational and technical modalities between the EGNOS Service Provider and the Airspace Change Initiator in the General Aviation aerodrome, as well as the required operational interfaces in order to support the EGNOS based operation (mainly the EGNOS Service Provision scheme, liabilities of the EGNOS Service Provider and the EGNOS NOTAM scheme).
The need for a NOTAM service when implementing a SBAS based procedure is clearly stated by ICAO documentation and EU regulation. Affected airspace users will be notified of any malfunction or degradation detected by the EGNOS Service Provider via an EGNOS NOTAM issued by the National AIS Provider, based on the information provided by the EGNOS Service Provider:

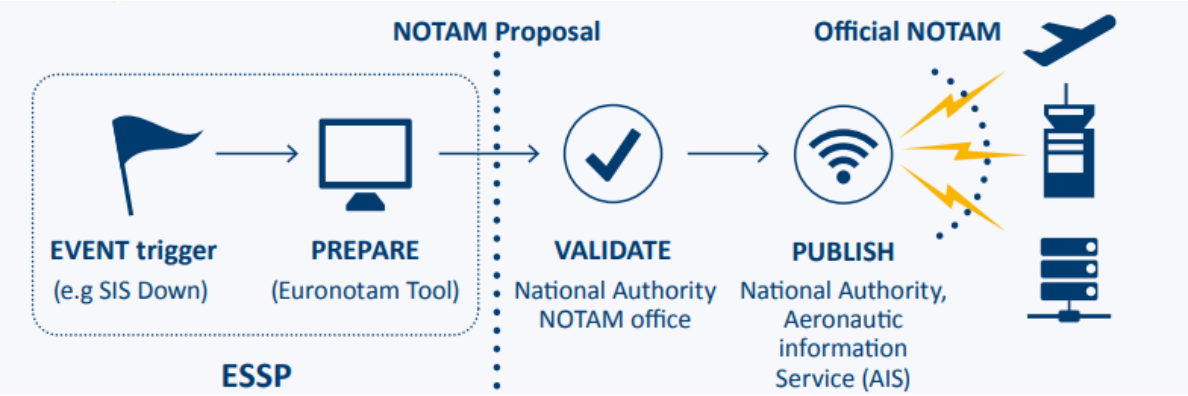


Figure 7: EGNOS NOTAMs life cycle (source: EGNOS SDD [RD-11])

The provision of an EGNOS NOTAM does not depend on the existence of an Aerodrome Operator or an ATS provider at the aerodrome. Consequently, EGNOS NOTAMs can also be provided at General Aviation aerodromes, as explained in Section 5.2.3.2.

5.2.2 FPD

As explained in Section 4, Regulation 2020/469 (amending Regulation 2017/373) [RD-9] has introduced requirements for ATM/ANS and design of airspace structures, among other aspects, and proposes to decouple the airspace change process (led by the Airspace Change Initiator) from the IFP design process (conducted by an IFP Provider).

Taking this information into account, **after the 27th of January 2022 Flight Procedure Design activities**, including design of airspace structures, **will only be provided by a certified service provider organization**.

For General Aviation scenarios, it is expected that the Airspace Change Initiator (aerodrome operator or aircraft operator, among other organizations) interested in promoting the IFP will contact a **Flight Procedure Design service provider to develop the IFP activities.**

As required by Regulation 2020/469 [RD-9], in order to perform the flight procedure design activities, FPD service providers shall only use aeronautical data and aeronautical information which meets the requirements of accuracy, resolution, and integrity as specified in the aeronautical data catalogue (DQRs). In some aerodromes, where this information may not be provided by an authoritative source nor meet the applicable DQRs, the FPD service provider would be responsible for obtaining such information from other sources.

5.2.2.1 *Design criteria*

According to Regulation 2020/469 (amending Regulation 2017/373) [RD-9], the flight procedure design criteria should be based on **ICAO Doc 8168 (PANS-OPS)** [RD-13], as last amended, to ensure safe aircraft operations.

Additionally, the FPD service shall also cover the design of airspace structures, which will depend on, among other factors, the ATS level (see Section 5.3).

5.2.2.2 *RNP APCH (LPV minima)*

The type of instrument approach assessed in this document is a RNP APCH operation down to LPV minima.

The RNP APCH navigation specification, available in the ICAO PBN Manual [RD-14], can support all segments of an RNP APCH operation, from the initial approach to the final phase of the missed approach.

RNP APCH down to LPV minima may give access to a different range of minima, depending on the performance of the navigation systems and the assessment of the responsible airspace authority. The provisions given in this navigation specification are consistent with these different sets of LPV minima (down to 200 ft or 250 ft, depending on the EGNOS service level LPV-200 or APV-I, respectively), notwithstanding any limitations due to obstacle environment.

However, as concluded in the regulatory assessment carried out in Section 4, EGNOS based procedures shall be restricted to circling minima at non-instrument runways. As guidance, the lowest OCH and MDH/DH values for this type of approaches are provided in Table 1:

Table 1: OCH vs MDH/DH for LPV approaches at non-instrument runways (circling minima)

Aircraft Category	Lowest OCH (PANS-OPS)	Lowest MDH / DH (AIR-OPS)
A	394	400
B	492	500
C	591	600
D	689	700

Finally, it should be noted that according to PANS-OPS [RD-13], in those locations where clearly defined visual features permit, a specific track for visual manoeuvring (circling) may be prescribed in addition to the circling area, if it is operationally desirable.

5.2.3 AIS

New instrument approach procedures at small aerodromes are only required to be published in National AIPs if the aerodrome is open to international traffic. Furthermore, General Aviation aerodromes which are open to public use and are certified under national Member States' certification scheme should also publish the IFPs in their national AIP.
Nevertheless, although it is not a requirement and there would be other options for General Aviation aerodromes, **publication in the AIP has been identified as the best available and preferred solution for publishing new IFP in this type of scenarios**. This is due to publication in National AIPs having many other related implications, such as the existence of an official ICAO code and ICAO compliance of charting or ARINC 424 coding of the procedures (DAT provider activities could be significantly hindered if new IFP are not published in the AIP).

According to Regulation 2017/373 [RD-6], AIS service shall be provided by certified AIS providers which shall manage the Integrated Aeronautical Information Package (IAIP), composed by the following elements:

- Aeronautical Information Publication (AIP), including amendment service.
- AIP Supplements.
- NOTAM and pre-flight information bulletins (PIB).
- Aeronautical Information Circulars (AIC).
- Checklists and lists of valid NOTAM.

For the correct preparation of IFR flights, General Aviation pilots should have access to all aeronautical information, which should be properly published in the national IAIP. The following non-exhaustive list shows the most relevant aeronautical information at General Aviation aerodromes which should be published in the national IAIP:

- RNP APCH chart.
- NOTAM information.
- Communication facilities (depending on the ATS level at the aerodrome).
- Meteorological information (local or remote - depending on the ATS level).

5.2.3.1 *Charting*

Once a General Aviation aerodrome is published in the AIP, compliance with Regulation 2017/373 [RD-6] requirements is ensured. The navigation data published in the State AIP for the IAP and supporting navigation aids shall meet the charting requirements.

Concerning the publication of LPV procedures, two aspects in addition to the publication of the aeronautical charts shall be considered:

- **SBAS FAS Data Block**[10] → The content of the SBAS FAS Data Block should be published on the verso of the chart in order to ensure that the procedure is correctly coded in the navigation database. Two of its fields (SBAS Id and Reference Path Id are also included in the chart itself).

- **SBAS channel number**[11] → Until 2019, and as agreed with ICAO and FAA, EUROCONTROL was the focal point in Europe for SBAS channel allocation. ICAO has now set up a global system of SBAS Channel assignments. This number is included in the chart too.

5.2.3.2 *NOTAM*

ICAO Annex 10 [RD-16] requires Member States to ensure that NOTAM issuance and SBAS monitoring system is available before the implementation of an SBAS-based approach. In addition, according to ICAO Annex 15, Chapter 5, NOTAM [RD-17], aviation users shall be aware of GNSS (including SBAS) availability failures at that aerodrome.

In this regard, in accordance with Section 5.1.4.1, flight crews shall verify that the navigation system is operating correctly before starting a RNP APCH procedure. **Taking all this information into account, current regulation requires that a NOTAM provision scheme be established when new SBAS based procedures are implemented.**

Regarding SBAS services in Europe, the EGNOS Service Provider generates EGNOS NOTAM proposals. As stated in Section 5.2.1, an EWA shall be established with **the Airspace Change Initiator**, to ensure the distribution of the EGNOS availability information in the form of NOTAM proposals. The EGNOS Services Provider (ESP) may provide the EGNOS NOTAM through the corresponding national AIS provider, for any published EGNOS based procedure. Hence, the ESP acts as the NOTAM originator in the EGNOS NOTAM generation chain.

In particular, the ESP provides NOTAM proposals to the corresponding national NOTAM Offices (AIS provider) of the concerned States, which are responsible for the validation and publication of NOTAMs for end users. **In this respect, it should be noted that, apart from the EGNOS NOTAM, there is no other EGNOS operational status information provided.**

[10] https://fasdb.eurocontrol.int/fasdb/
[11] https://www4.icao.int/SBAS/

5.2.4 DAT

With the publication of Regulation 2017/373 [RD-6], the practice of issuing voluntary Letters of Acceptance (LOA) was replaced by the introduction of certification by EASA as competent authority for the providers of data services (DAT). **This requirement for certification of organisations processing aeronautical data for use on aircraft (DAT providers) is applied since January 2019.**

In this context, **when the aeronautical databases are used on certified aircraft applications/equipment, they should be produced and released by certified DAT providers, not matter the kind of operations conducted:**

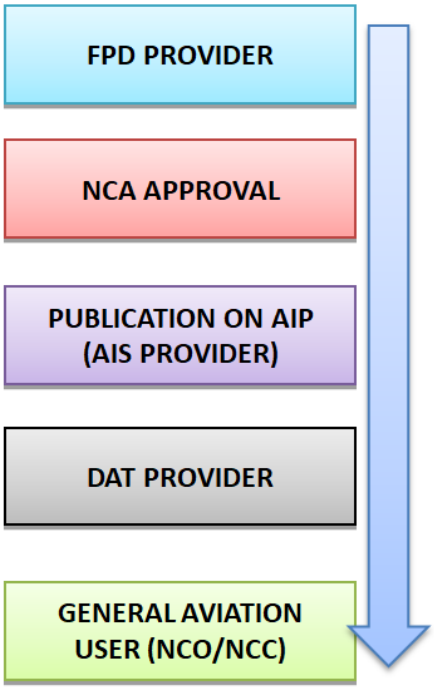


Figure 8: Data chain (from FPD to General Aviation Airspace user)

It should be highlighted that DAT Service Provider is responsible for the 'database production' while the Aircraft Operator (NCC/NCO) is responsible for the 'database installation' in the aircraft.
Following the previous data chain (from FPD provider to airspace user), publication in AIP has been identified as the preferred solution for General Aviation aerodromes[12], even though it is not explicitly required.

FPD, AIS and DAT shall be certified services according to Regulation 2017/373 [RD-6], ensuring traceability and integrity of the data, and therefore reducing both the probability of an error occurring and the overall risk in the data chain.

[12] If information is not published in the AIP, DAT providers may use data from non-authoritative sources but only if this data and information has been verified and validated by a DAT provider to conform to the relevant standards and data quality requirements, according to Regulation 2017/373 [RD-6].

5.3 *Specific ATM/CNS capabilities*

This section contains a description of the existing ATS infrastructure and capabilities to clearly define how IFR operations will be integrated in a General Aviation aerodrome where only VFR operations take place or where none of the runways of the aerodromes are currently served by a current IAP.

ATC service is not expected either at the aerodrome or during the IAP. So, all segments of the instrument approach are considered to be entirely in Class G (uncontrolled) airspace. If any part of the IAP is conducted within controlled airspace, ATC will be responsible for ensuring separation from other aircraft; however, the existence of ATC service will not be covered within this Concept of Operations.

According to the information described in Safety Promotion Material [RD-1], two possible levels of ATS service have been identified in this Concept of Operations:

- **AFIS service provided at the aerodrome.**
- **No ATS service provided (presence of non-ATS aeronautical stations: UNICOM).**

The option of a mixed environment between these scenarios (AFIS during some hours and non-ATS aeronautical stations outside the AFIS service attendance hours) will not be explicitly covered in the assessment. The Concept of Operations for said mixed environment would be a combination of both; that is, **the Concept of Operations described for non-ATS aeronautical stations will also cover AFIS aerodromes outside the hours of attendance.**

This Concept of Operations will also cover the relation between the ATS service level and **airspace structure, COM, SUR and MET services, together with a description of the IFR/VFR operations.**

As a summary of this section, the main conclusions of both ATS service levels are listed below:

- **AFIS service provided (Section 5.3.1):**
    - Airspace structure → **FIZ** (or ATZ depending on the airspace requirements).
    - **COM** service provider is required (**air-to-ground communications**).
    - **MET** service provider is required.
    - **No SUR** service provider is expected in the environment (if present it is only for awareness).

- **Non-ATS aeronautical stations: UNICOM (Section 5.3.2):**
    - **No airspace structure.**
    - No COM service provider → **UNICOM**.
    - No MET service provider → **Remote meteorological information**.
    - **No SUR** service provider is expected in the environment.

5.3.1 AFIS

AFIS means a Flight Information Service[13] delivered to assist the safe and efficient management of traffic, provided by a designated ATS provider in an aerodrome where ATC service is not delivered. Therefore, **AFIS service shall be provided by a certified ATS service provider according to Regulation 2017/373 [RD-6].**

[13] Flight Information Service is defined in SERA Regulation [RD-7] as a service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

AFIS is provided at aerodromes where, despite not being busy enough for ATC service, the traffic is such that some level of ATS service is necessary. The use of an AFIS service is extended in many countries throughout Europe.

Some small General Aviation aerodromes within Europe are currently using AFIS services with a limited schedule. Outside that limited schedule, the Concept of Operations for no ATS service provider at the aerodrome will apply according to Section 5.3.2.

Throughout the following subsections, the main characteristics of AFIS aerodromes will be detailed together with how IFR/VFR operations will take place in the scenario.

5.3.1.1 *Type of Airspace structure*

AFIS units shall be established to provide flight information service and alerting service at AFIS aerodromes and within the airspace associated with such aerodromes.

Required types of airspace structure associated to AFIS service may vary depending on the State: FIZ (Flight Information Zone) or ATZ (Aerodrome Traffic Zone)[14].

Nevertheless, the most common airspace structure associated to AFIS service would be a FIZ: Flight Information Zone. According to Regulation 2020/469 [RD-9], a "Flight Information Zone" is an airspace of defined dimensions within **which Aerodrome Flight Information Service and Alerting Service for aerodrome traffic are provided**. As AFIS does not provide a control service, **FIZs (or ATZ as appropriate) would be classified as Class G airspace.**

In addition to the RNP APCH, the Flight Procedure Design service will also cover the design of FIZ airspace structure. The FPD service provider shall review and adapt the existing FIZ dimensions to the new RNP APCH procedure, before its implementation.

In this regard, **FIZ dimensions shall encompass at least those portions of the airspace which, not being within controlled areas or zones[15], contain the paths of IFR and/or VFR flights arriving at and departing from aerodromes.** If located within the horizontal limits of a controlled area, FIZs shall extend upwards from the surface of the earth to at least the lower limit of the controlled area.

An AFIS provider will issue information to aircraft within FIZ airspace (class G) to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of an aerodrome with the object of assisting pilots in preventing collisions.

According to SERA Regulation [RD-7], within Class G airspace, IFR and VFR flights are allowed and can receive Flight Information Service if requested, but ATC clearance is not required. All IFR flights in Class G airspace shall have the capability of establishing radio communications.

[14] According to SERA Regulation [RD-7], an ATZ is an airspace of defined dimensions established around an aerodrome for the protection of aerodrome traffic. The airspace within the ATZ may be either controlled or uncontrolled.

[15] This concept of operations has been built with the assumption that the instrument approach procedures will not pass through any controlled airspace above the FIZ or beyond its lateral limits.

Class	Type of flight	Separation provided	Service provided	Speed limitation[1]	Radio communication capability requirement	Continuous two-way air-ground voice communication required	Subject to an ATC clearance
G	IFR	Nil	Flight information service if requested	250 kts IAS below 3 050 m (10 000 ft) AMSL	Yes[1]	No[1]	No
	VFR	Nil	Flight information service if requested	250 kts IAS below 3 050 m (10 000 ft) AMSL	No[1]	No[1]	No

Figure 9: Class G airspace (source: SERA [RD-7])

5.3.1.2 *FIS information*

In class G airspace, pilots are fully responsible for their own separation from other traffic and terrain, Flight Information Service (FIS) is present in order to receive and notify the presence and intentions of any VFR and IFR traffic, as a key element to reduce MAC risk within the FIR airspace. Nevertheless, it should be noted that within this airspace, VFR aircraft may not be equipped with an on-board radio (as the radio is only required if a RMZ is established). In addition, there may be some coverage limitations which prevent two-way communications between FIS unit and equipped aircraft.

Even in class G airspace, for both VFR and IFR flights, FIS is always provided by the appropriate ATS unit to all aircraft which are likely to be affected by the information. The reception of Flight Information Service does not relieve the pilot-in-command of an aircraft of any responsibility. In fact, the pilot-in-command shall make the final decision regarding any suggested alteration of flight plan (if required).

For FIS service, air-to-ground communication facilities shall enable two-way communications to take place between a unit providing Flight Information Service and appropriately equipped aircraft (e.g. radio communications equipment) flying anywhere within the Flight Information Region (FIR).

5.3.1.3 *SUR*

According to its definition, **AFIS service does not provide a control service** (clearances issued by ATC units provide traffic separation, preventing collisions and expediting and maintaining an orderly flow of air traffic).

For this reason, ATS surveillance services[16] (if available at the aerodrome) may only be used for awareness of the AFIS operator, but do not really make a difference in the provided AFIS service. Therefore, **Surveillance service will not be expected in AFIS aerodromes nor considered in this document.**

5.3.1.4 *COM*

In accordance with Regulation 2017/373 [RD-6], the **FIS service provider shall ensure that air-ground communications take place between a FIS unit and appropriately equipped aircraft flying within the flight information region:**

> ***ATS.OR.410 Aeronautical mobile service (air-ground communications) – flight information service***
> *(a) An air traffic services provider shall ensure, to the practicable extent and as approved by the competent authority,* ***that air-ground communication facilities enable two-way communications to take place between a flight information centre and appropriately equipped aircraft flying anywhere within the flight information region.***

Additionally, **the same statement is made for AFIS service providers:**

> ***ATS.OR.410 Aeronautical mobile service (air-ground communications) – flight information service***
> *[…]*
> *(b) An air traffic services provider shall ensure that* ***air-ground communication facilities enable direct, rapid, continuous and static-free two-way communications to take place between an AFIS unit and appropriately equipped aircraft operating within the airspace referred to in point ATS.TR.110(a)(3).***

Therefore, both FIS and AFIS service providers shall ensure the provision of two way air-to-ground communications between FIS/AFIS units and appropriately equipped aircraft flying in the associated airspace (FIR/FIZ respectively). [17]

[16] 'ATS surveillance service' means a service provided directly by means of ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

[17] It is important to highlight that radio is not required for airspace users within class G airspace, unless a RMZ is established.

5.3.1.5 *MET*

According to Regulation 2017/373 [RD-6], AFIS units are supplied with meteorological information for the aerodrome with which they are concerned:

> ***ATS.OR.515***
> ***Meteorological information for aerodrome control towers and AFIS units***
> *(a) An air traffic services provider shall ensure that aerodrome control towers and, unless otherwise prescribed by the competent authority,* ***AFIS units are supplied with meteorological information for the aerodrome with which they are concerned as stipulated in point MET.OR.242(a) of Annex V.***

Consequently, the presence of an AFIS service provider at the aerodrome ensures the provision of meteorological information to the AFIS unit which shall be transmitted appropriately both to VFR and IFR aircraft flying in the associated airspace (FIZ).

5.3.1.6 *Operations in an aerodrome with AFIS service*

AFIS officers will provide information to the airspace users within the FIZ volume and its vicinity for the safe execution of VFR and IFR flights. This information will consist of:

- Status of the aerodrome infrastructure.
- Status of the ground/space navaids.
- Status of runway in use.
- Weather information.
- Traffic information.
- Any other relevant information.

As AFIS does not provide ATC service, AFIS officers are not allowed to issue instructions or “approvals” (kind of clearance) for aircraft separation. Consequently, in an AFIS aerodrome, IFR and VFR pilots are responsible for spacing and separation.

For this reason, both IFR/VFR flights operating in uncontrolled airspace (Class G) within the FIR and outside the FIZ should be required to maintain a continuous “listening watch” on the frequency published on the IAP chart or in any other section of the national AIP. For separation purposes, positioning reports may be required by the AFIS provider, as detailed in the following sections.

5.3.1.6.1 Arrival traffic in an AFIS aerodrome

Figure 10 shows the expected steps to be carried out by the IFR pilot throughout the instrument approach and the required coordination actions with FIS and AFIS services respectively:

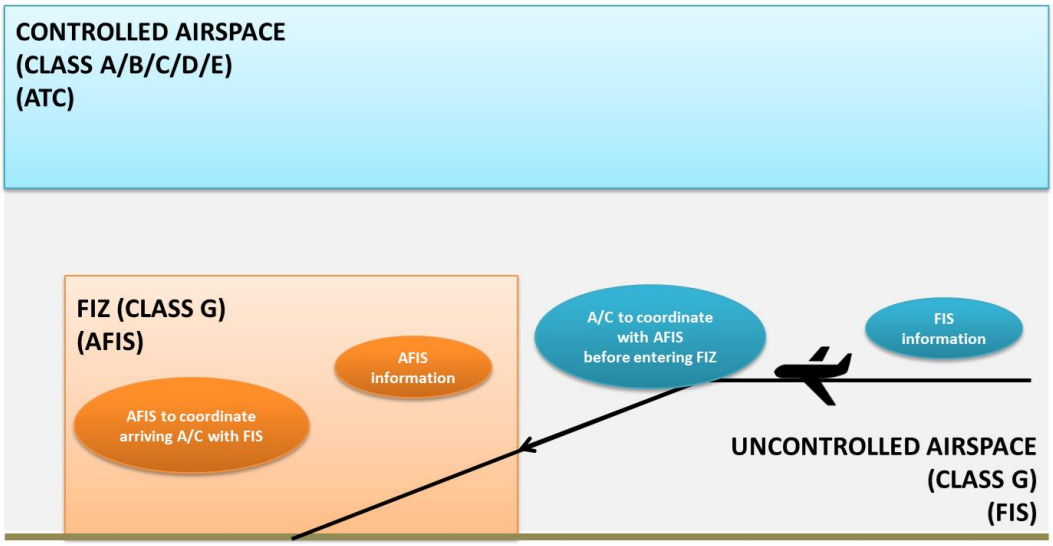


Figure 10: Arrival IFR traffic with AFIS (vertical view)

As previously explained, the Concept of Operations is based on the assumption that the whole IFR flight takes place within Class G airspace. Within the uncontrolled FIR airspace, FIS units will provide information to both IFR and VFR flights upon request from the pilots. During the course of the IFR flight, before starting the approach, aircraft will receive any necessary information from the FIS unit, upon request.

Before starting the instrument approach at the IAF, aircraft should contact the FIS service to obtain the latest information regarding the status of the aerodrome, including among others: expected traffic during the approach, runway in use, and weather (wind, QNH and visibility). The FIS unit will coordinate the provision of this information for approaching aircraft with the AFIS provider, based on a Letter of Agreement (LoA) between both AFIS and FIS.

At the coordination point, aircraft would switch to the corresponding AFIS air-to-ground frequency to establish communication with the AFIS provider at the aerodrome. AFIS units shall provide relevant information on local traffic and aerodrome conditions to assist the flight crew in deciding whether to land or go-around. Such information shall be updated at discretion or when requested by the pilot. The AFIS unit will then provide the updated information regarding existing traffic, runway in use and/or weather.

Reporting by both IFR and VFR traffic becomes essential for situational awareness in order to facilitate spacing and separation of aircraft within the FIZ. Nevertheless, concrete reporting points and procedures should be defined by each AFIS service provider at a local level, depending on the particular characteristics of the aerodrome.

According to SERA Regulation [RD-7], an aircraft operating on the ground shall also give way to aircraft landing or in the final stages of an approach to land.

5.3.1.6.2 Departure traffic in an AFIS aerodrome

AFIS units shall also provide the relevant information on local traffic and aerodrome conditions to assist the flight crew on deciding when to take-off. Such information shall be updated at the AFIS unit's

discretion or when requested by the pilot. Pilots shall inform AFIS units of their intentions before taking off.

Figure 11 shows the expected steps to be carried out by the pilot throughout the IFR departure and the necessary coordination actions with AFIS and FIS services respectively:

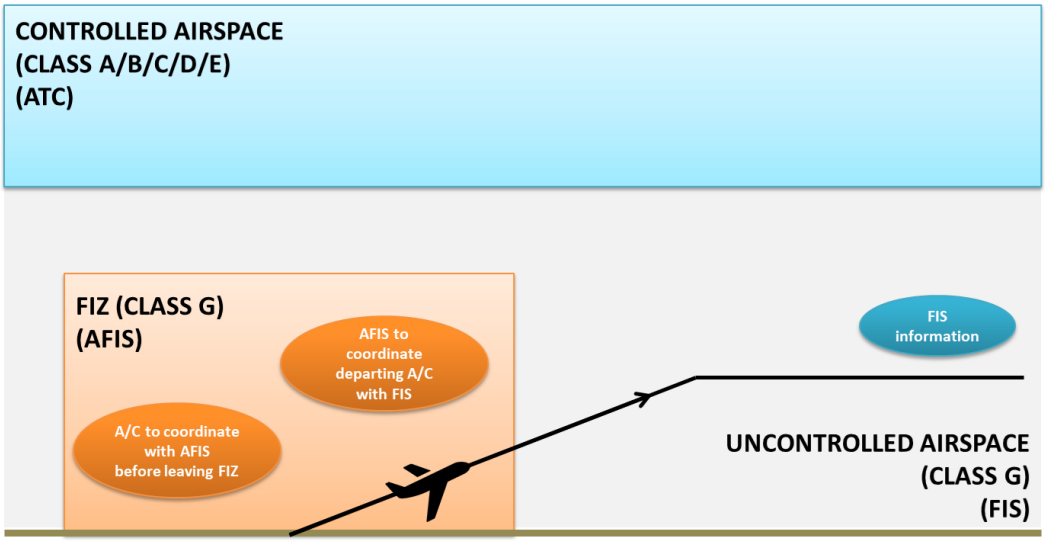


Figure 11: Departure IFR traffic with AFIS (vertical view)

Pre-flight information is necessary before any departure from the aerodrome. Pilots should compile all information required for the full course of the flight.

The AFIS unit should also coordinate with the FIS unit in order to provide departing aircraft with expected information both within and outside the FIZ, according to the LoA. In this respect, as part of this coordination, an "approval" (kind of clearance) from the FIS unit is highly expected to be transmitted to the aircraft through the AFIS officer ensuring coordination, but will depend on the existing traffic within the uncontrolled airspace in the FIR.

When leaving the FIZ and within the uncontrolled FIR airspace, the FIS unit will provide information upon request to the pilots: weather information and expected traffic along the route as well as any other appropriate information for the safe execution of the flight.

According to SERA Regulation [RD-7], an aircraft taxiing on the manoeuvring area of an aerodrome shall give way to aircraft taking off or about to take off.

5.3.1.6.3 Integration of IFR and VFR operations

In order to provide a clearer view of the future scenario with the introduction of new GNSS procedures, this section contains a description of how future IFR operations will be integrated with the existing VFR in an aerodrome with an AFIS provider.

SERA Regulation [RD-7] contains the general rules of the air for pilots. This section has been developed based on this regulation and in particular considering the principles stated in "SERA.3210 Right-of-way" requirements.

Figure 12 shows a preliminary outline of the integration of an IFR and a VFR operation in an environment with an AFIS provider.

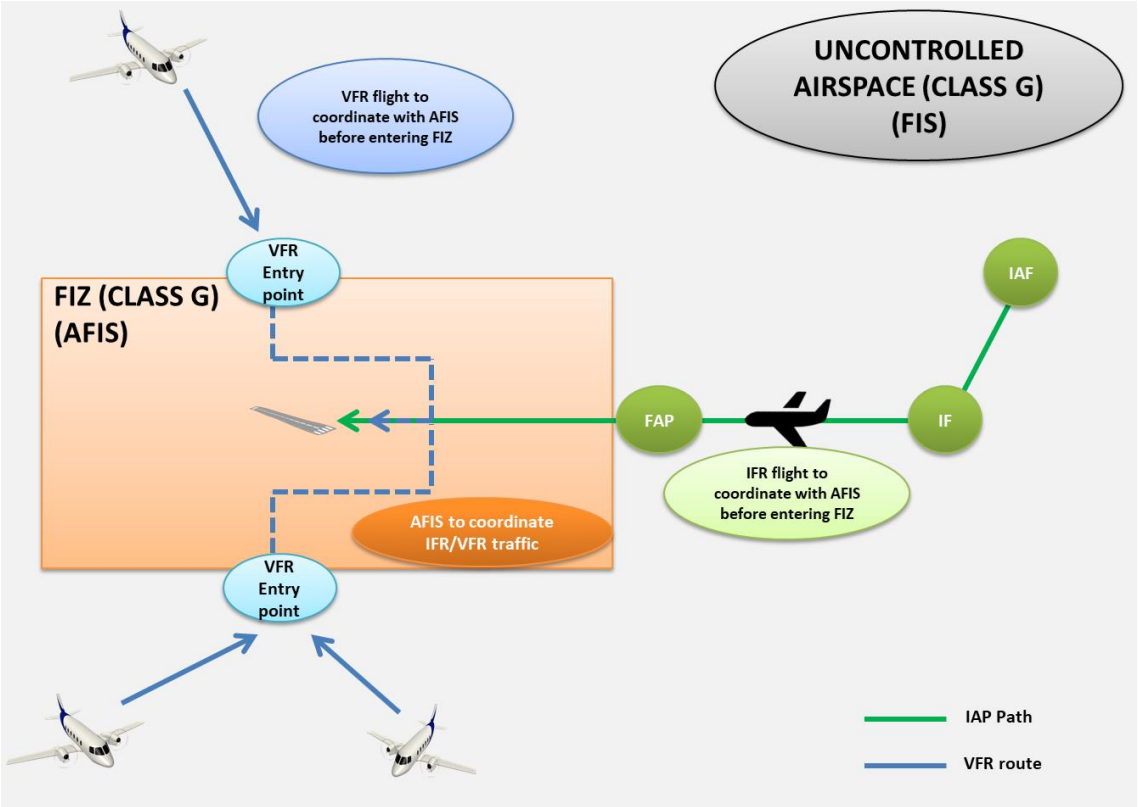


Figure 12: IFR/VFR integration within FIZ – AFIS service (plan view)

In accordance with Figure 12, herein below are listed the expected responsibilities for IFR and VFR pilots in order to manage their integration in an environment with an AFIS service provider:

IFR

- Aircraft flying the instrument approach will follow the RNP APCH chart published in the AIP.
- Before entering into the FIZ, they shall communicate with the AFIS provider on the appropriate air-to-ground frequency and wait for instructions and traffic information.
- According to the proposed mitigating measures (see Section 7), no other IFR aircraft will start the IAP until the previous instrument approach has correctly landed, so no other IFR traffic would be expected at the aerodrome at the same time.
- AFIS unit will provide information about the status of the aerodrome and meteorological and traffic conditions.
- If there is other VFR aircraft landing or in the final stages of an approach to land within the FIZ, aircraft at the higher level shall give way to aircraft at the lower level (respecting SERA.3210 Right-of-way rules) meaning that IFR traffic may need to interrupt the IAP and join the traffic circuit.

VFR

- VFR aircraft will follow existing VFR routes. Those VFR routes or FIZ entry points may be modified together with the IAP, in order to physically “separate” VFR and IFR operations.
- Before entering into the FIZ, they shall communicate with the AFIS provider on the appropriate air-to-ground frequency and wait for instructions and traffic information.
- AFIS unit will provide information about the status of the aerodrome and meteorological and traffic conditions.
- If there is another aircraft within the FIZ, VFR aircraft would be expected to join the traffic circuit while respecting right-of-way rules.

5.3.2 Non-ATS aeronautical stations: UNICOM

Although AFIS aerodromes have been identified as a feasible solution for General Aviation, **the most expected scenario for these types of environments is the complete absence of any ATS service at the aerodrome**. As previously mentioned, it should be noted that the Concept of Operations described for the case of no ATS service being provided at the aerodrome will also cover controlled and AFIS aerodromes outside the hours of attendance.

Where a Member State determines that no requirement exists for air traffic service provision at an aerodrome and its vicinity or in other airspace, non-ATS aeronautical stations (UNICOM) may be established.

Particularly, non-ATS aeronautical stations or UNICOM stations may be established in an airspace where Member States have decided that whilst en-route flight information service will be provided by a designated and certified flight information service provider, there is no requirement for mandatory two-way radio communication.

In such cases, the Member State should ensure that the aeronautical station does not provide air traffic services, but acts as an informal facility for exchanges on, for example, aerodrome conditions or other activities at the aerodrome.

Throughout the following subsections, the main characteristics for the case of non-ATS aeronautical stations being provided at the aerodrome will be detailed together with how IFR operations will be integrated in the current VFR operations.

5.3.2.1 *Type of Airspace structure*

There is no requirement to define or establish a specific airspace structure at the aerodrome associated to the UNICOM station (FIZ/ATZ or any other required by the NCA).

5.3.2.2 *FIS information*

The FIS information service within class G airspace will also be present as a key element to reduce MAC risk.

Nevertheless, it should be noted that within this airspace, VFR aircraft may not be equipped with an on-board radio (as the radio is only required if a RMZ is established). In addition, there may be some coverage limitations which prevent two-way communications between FIS unit and equipped aircraft.

The FIS service will always be provided by the appropriate ATS unit for all aircraft which are likely to be affected by the information (both VFR and IFR flights). The reception of FIS service does not relieve the pilot-in-command of an aircraft of any responsibility.

For FIS service, air-ground communication facilities shall enable two-way communications to take place between a unit providing Flight Information Service and appropriately equipped aircraft (e.g. radio communications equipment) flying anywhere within the FIR.

5.3.2.3 *SUR*

In an aerodrome without ATS services, **Surveillance services are not expected and, therefore, they are not considered in this Concept of Operations.**

5.3.2.4 *COM*

As mentioned previously in Section 5.3.1.4, in accordance with Regulation 2017/373 [RD-6], the **FIS service provider shall ensure that air-ground communications take place between a FIS unit and appropriately equipped aircraft flying within the flight information region**[18]**.**

On the other hand, in aerodromes without ATS services, the most extended solution for covering the communication service at the aerodrome is the establishment of a **UNICOM station**[18]. A UNICOM station is an air-ground communication facility which gives pilots the means to make standard positional broadcasts when operating in the vicinity of the aerodrome, and allows for the exchange of messages concerning:

- traffic information
- arrival and departure procedures
- aerodrome information
- meteorological information
- any other relevant information

It should be mentioned that UNICOM stations will be out of EASA's scope, so they shall be established following the Member State's arrangements and requirements.

In class G airspace and aerodromes with no ATS services, the responsibility for collision avoidance, sequencing and knowledge of local procedures falls solely on the pilot in command.
For this reason, two main recommendations are made for both IFR and VFR pilots using the UNICOM frequency in this type of scenario:

- **Maintain a 'listening watch'** when using the aircraft's VHF radio for the entire period of the flight within Class G airspace.

- **Make a broadcast** according to local reporting procedures in order to avoid a collision or the risk of a collision with another aircraft in the vicinity of the aerodrome through use of the UNICOM frequency.

Finally, it is important to highlight that promulgation of UNICOM stations in the National AIP is required according to Regulation (EU) 2017/373 as amended by Regulation (EU) 2020/469 [RD-9]. The arrangements established for non-ATS aeronautical stations should ensure that information regarding their availability is included in the relevant parts of the IAIP.

5.3.2.5 *MET*

In an environment without an ATS provider at the aerodrome, a MET service provider is not expected either. In this case, **meteorological information should be obtained from nearby aerodromes and/or from a responsible FIS information unit in Class G airspace.**

In this respect, where observations cannot be provided at the destination aerodrome, then the pilot should assess the expected conditions from the available forecasts, including those relating to nearby aerodromes for which information (from a certified or another source) is available and that are representative of the destination aerodrome.

[18] It is important to highlight that radio is not required for airspace users within class G airspace, unless a RMZ is established.

According to Safety Promotion Material [RD-1], the following meteorological information should be assessed for IFR flights:

- A pre-flight meteorological briefing is necessary to ensure that the flight can be undertaken in full cognisance of the expected weather conditions at departure, destination and alternate aerodromes and during the en-route phase.

  In line with SERA Regulation [RD-7], before beginning a flight, the pilot-in-command of an aircraft shall become familiar with all available information relevant to the intended operation. Pre-flight actions for flights away from the vicinity of an aerodrome and for **all IFR flights shall both include a careful study of available current weather reports and forecasts, taking into consideration fuel requirements and an alternative course of action if the flight cannot be completed as planned.**

- One of the most important meteorological characteristics to be obtained for IFR flights is the QNH. When a remote or regional QNH is used, the DH/MDH should be increased as detailed in PANS-OPS [RD-13].

  It should be noted that, **where the source of the altimeter setting is more than 9 km from the threshold of the aerodrome, a cautionary note should be inserted on the instrument approach chart identifying the altimeter setting source.**

  When the altimeter setting to be used with procedures is a forecast value obtained from the appropriate meteorological office, the OCA/H shall be increased by a value corresponding to the forecasting tolerance for the location as agreed by the meteorological office for the time periods involved. **Procedures which require the use of forecast altimeter setting shall be suitably annotated on the approach charts.**

- **Where wind, visibility or cloud information is not available, there should always be an alternate aerodrome where that information is available.** This is equivalent, for planning purposes, to presuming that an aerodrome where wind, visibility or cloud information is not available is below minima or out of limits. In any case, if wind information is not available, circling minima should be applied, to allow the pilot some time to assess the situation visually before making a final selection of runway.

Meteorological information of the aerodrome is required prior to starting the IFR flight. In fact, if the necessary meteorological information is not available or is degraded, the flight should not be continued or even started.

The absence of both ATS and MET service providers gives pilots-in-command more responsibility for obtaining the necessary meteorological information to proceed with the IFR procedure.

5.3.2.6 *Operations in an aerodrome with non-ATS aeronautical stations: UNICOM*

In an aerodrome without an ATS service provider, the only expected ATS service available during the IFR flight would be the FIS unit, as a UNICOM station is not considered to be an ATS service.

If during the IFR flight, because of intervening terrain or for any other reason, aircraft cannot communicate with the appropriate FIS unit, the following alternatives are suggested:

- Increase altitude if practicable to establish communications.

- Request another aircraft to relay your report.

- Transmit a blind call.

The responsibility for collision avoidance, sequencing and knowledge of local procedures in Class G airspace falls solely on the pilot in command. For this reason, both IFR and VFR pilots should always use the appropriate frequency in the airspace surrounding the aerodrome (UNICOM station and/or FIS service), in order to:

- Maintain a '**listening watch'** when using the appropriate frequency (FIS frequency or UNICOM station frequency) for the entire period of the flight within Class G airspace.

- **Make a broadcast** according to local reporting procedures in order to avoid a collision or the risk of a collision with another aircraft in the vicinity of the aerodrome through use of the UNICOM station (see proposed reporting points in Section 5.3.2.6.1 and Section 5.3.2.6.2).

VFR operations should enter and leave the aerodrome via the visual routes established in the National AIP to then, if applicable, join the aerodrome traffic circuit and notify their intentions. On the other hand, IFR aircraft will follow the RNP APCH chart published in the AIP.

5.3.2.6.1 Arrivals in an aerodrome with non-ATS aeronautical stations: UNICOM

As mentioned previously, the Concept of Operations described in this document is based on the assumption that the whole IFR flight will take place within Class G airspace: with FIS service within the FIR and with a UNICOM station at the aerodrome.

Within Class G airspace, IFR aircraft will receive the following information from the FIS unit upon request: meteorological information, traffic information or any other information considered relevant by the FIS. In this respect, before starting the instrument approach at the IAF, aircraft should contact the FIS service to obtain the latest information regarding the status of the aerodrome: expected traffic during the approach, runway in use, weather (wind, QNH and visibility), and any other relevant information.

Self-announcing of arrivals should generally be made on the UNICOM frequency according to the local procedures at the aerodrome, depending on the requirements stated by the NCA.

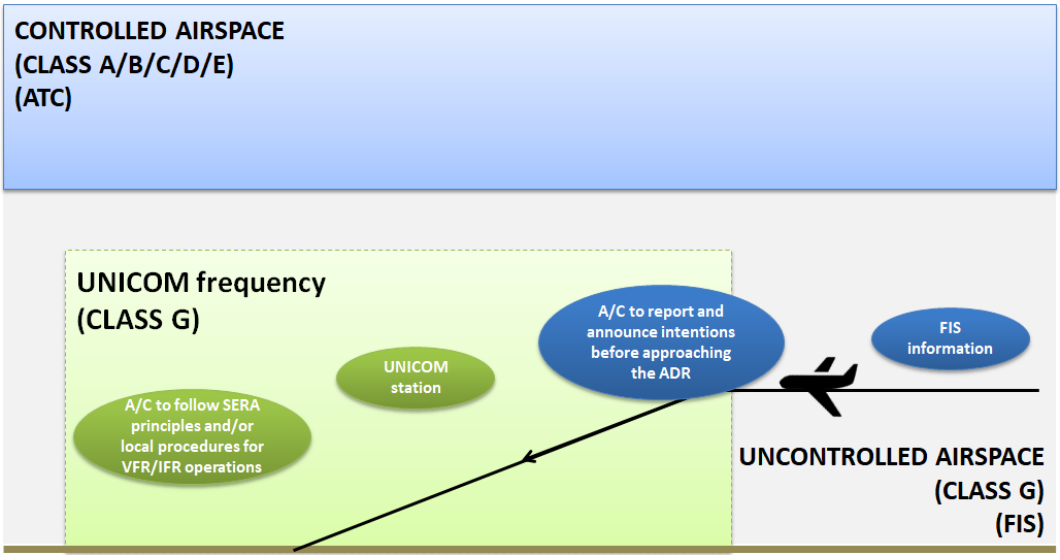


Figure 13: Arrival IFR traffic in an aerodrome with non-ATS aeronautical stations: UNICOM (profile view)

When the flight is getting close to the aerodrome, an initial call containing the call sign, type of aircraft, position, level, the intentions of the flight and other information as prescribed by the NCA, shall be made by pilots on the appropriate UNICOM frequency at the aerodrome.

Reporting becomes essential for both IFR and VFR traffic to ensure situational awareness in order to facilitate spacing and separation of aircraft in these scenarios. In this respect, for the benefit of other traffic, pilots should maintain a continuous listening watch and broadcast their position, altitude and intentions on the UNICOM frequency, as listed below:

- **In transit:**
  - Between 10 and 25 NM (indicative distance) from the aerodrome, before starting the instrument approach.

- **Approaching:**
  - Commencing instrument approach.
  - At designated points of the IAP (IAF, IF and/or FAP/F).
  - When established on final approach.
  - At the termination of the instrument procedure (i.e. when breaking off from the procedure to proceed in VMC to the aerodrome).
  - Once clear from the runway after landing: “Runway free”.
  - If aircraft join the aerodrome traffic circuit (depending on the existing traffic at the aerodrome), pilots should also report their position before joining the circuit as well as along all its segments: downwind, base and final legs.

A landing aircraft shall not normally inform “Runway free” until the aircraft has vacated the runway-in-use. The report shall be made through the UNICOM frequency when the entire aircraft is beyond the relevant runway-holding position.

In any case, concrete reporting points and procedures should be defined at a local level, depending on the particular characteristics of the aerodrome and requirements stated by the NCA.

According to SERA Regulation [RD-7], an aircraft operating on the ground shall also give way to aircraft landing or in the final stages of an approach to land.

5.3.2.6.2 Departures in an aerodrome with non-ATS aeronautical stations: UNICOM

Outbound IFR traffic shall notify its intention of leaving the ADR on the established UNICOM frequency, reporting the departure route to be used. Departing IFR flights should coordinate with the FIS unit to receive information upon request.

For the benefit of other traffic, pilots should maintain a continuous listening watch on the UNICOM frequency and broadcast their position, altitude and intentions on the UNICOM frequency, as listed below:

- **Taking off:**
  - When about to taxi to the take-off position.
  - Immediately after take-off. The following will be declared:
    - “Runway free”.
    - Departure route to follow.
  - When leaving the ADR, the expected route to be followed.

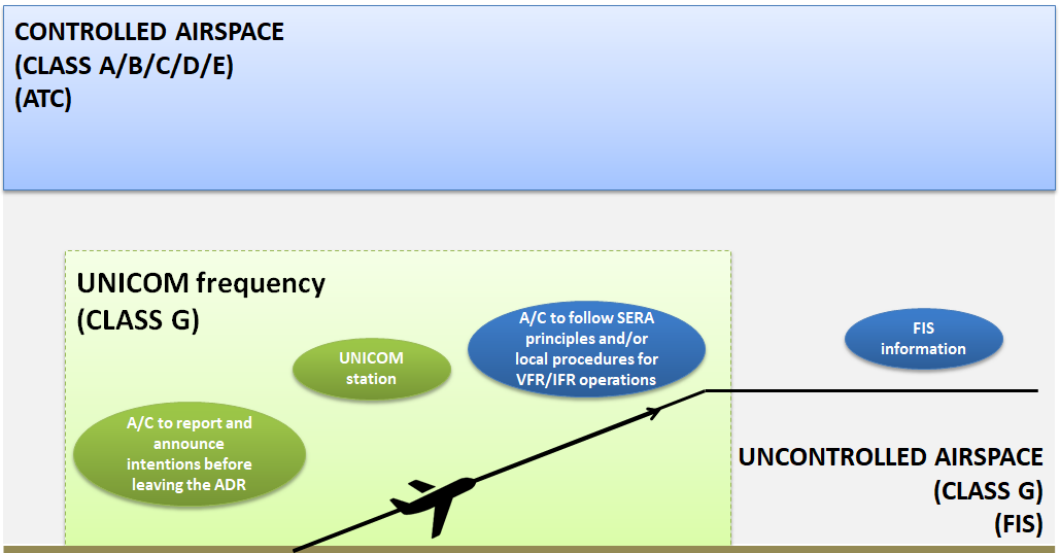


Figure 14: Departure IFR traffic in an aerodrome with non-ATS aeronautical stations: UNICOM (profile view)

In this respect, a departing aircraft shall not normally inform “Runway free” until the aircraft has crossed the end of the runway-in-use, or has started a turn. The report shall be made through the UNICOM frequency.

According to SERA Regulation [RD-7], an aircraft taxiing on the manoeuvring area of an aerodrome shall give way to aircraft taking off or about to take off.

5.3.2.6.3 Integration of IFR and VFR operations

In order to provide a more clear view of the future scenario with the introduction of new GNSS procedures, this section contains a description of how future IFR operations will be integrated with the existing VFR in an aerodrome with no ATS services.

This section has been developed based on SERA Regulation [RD-7] and in particular taking into account the principles stated in “SERA.3210 Right-of-way” requirements.

Figure 15 shows a preliminary outline of the integration of an IFR and a VFR operation in an aerodrome without ATS services:

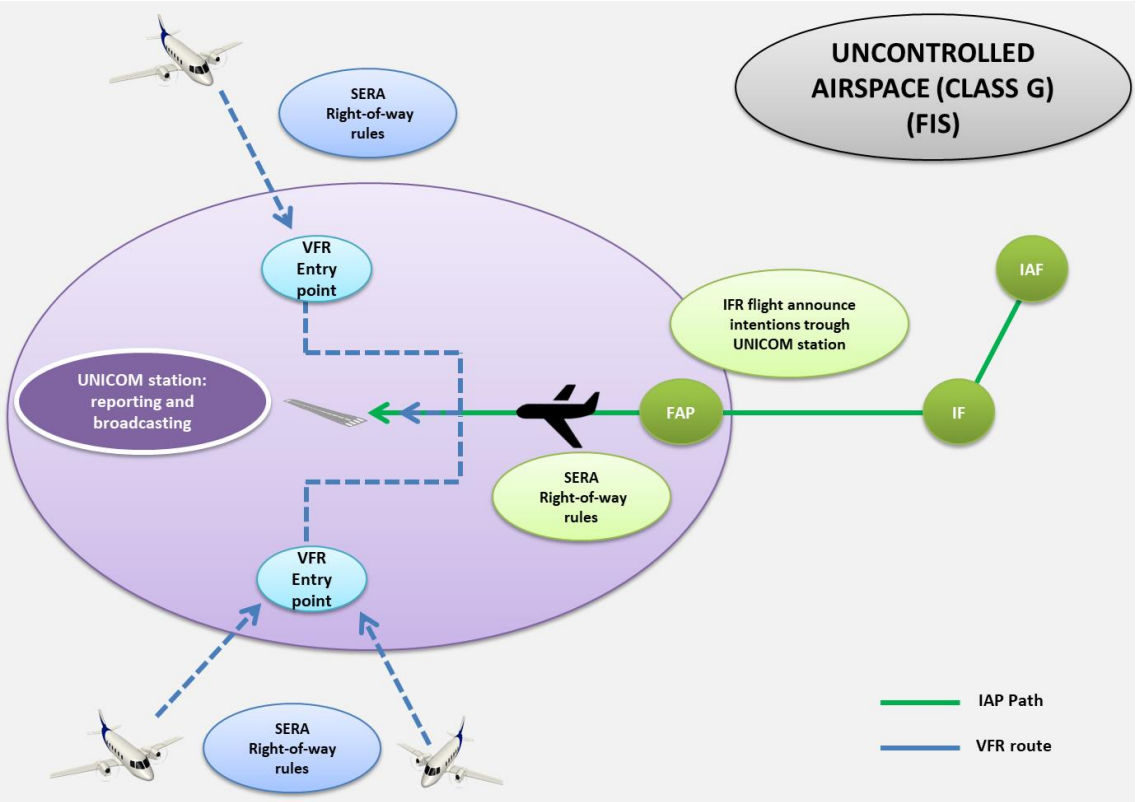


Figure 15: IFR/VFR integration in an aerodrome with non-ATS aeronautical stations: UNICOM (plan view)

In accordance with Figure 15 herein below are listed the expected responsibilities for IFR and VFR pilots in order to manage their integration in an aerodrome without ATS services:

IFR

- Aircraft flying the instrument approach will follow the RNP APCH chart published in the AIP.
- When approaching the aerodrome, they shall report their intentions on the appropriate UNICOM frequency and wait for other traffic information.
- According to the proposed mitigating measures (see Section 7), no other IFR aircraft will start the IAP until the previous IFR aircraft has correctly landed, so no other IFR traffic would be expected at the aerodrome at the same time.
- If there is other VFR aircraft landing or in the final stages of an approach to land, aircraft at the higher level shall give way to aircraft at the lower level (respecting SERA.3210 Right-of-way rules) meaning that IFR traffic may need to interrupt the IAP and join the traffic circuit.

VFR

- VFR aircraft will follow existing VFR routes. Those VFR routes or VFR entry points may be modified together with the IAP, in order to physically “separate” VFR and IFR operations.

- When approaching the aerodrome, they shall report their intentions on the appropriate UNICOM frequency and wait for other traffic information.

- If there is another aircraft at the aerodrome, VFR aircraft would be expected to join the traffic circuit while respecting right-of-way rules.

6 Hazard Identification

After describing the Concept of Operations for General Aviation in Section 5, there is a need to declare some assumptions (Section 6.1) before proceeding with the identification of hazards (Section 6.2).

6.1 *Assumptions*

The objective of declaring these assumptions is coherence with the existing conditions described in the Concept of Operation, as well as the establishment of the characteristics of the operational environment where the Airspace Change will be implemented.

Assumption declaration is necessary to ensure:

- Fulfilment of the conditions described in the Concept of Operations section.
- Proper support for the correct functioning of the CNS/ATM services provided at the aerodrome with a possible impact on the implementation of a RNP APCH procedure.
- Feasibility and effectiveness of the mitigating measures.

For this reason, it is important that the declaration of assumptions be carried out before the identification of hazards (in order to define which possible failures would be supported by assumptions).

Based on this information, Table 2 below contains a generic set of assumptions to be considered when implementing an EGNOS based approach procedure in a General Aviation aerodrome. It should be highlighted that this generic set of assumptions shall be assessed, verified and completed by the Airspace Change Initiator when developing the local safety assessment, according to both the particular characteristics of the General Aviation environment and requirements stated by the NCA.

Table 2, which is meant to help the Airspace Change initiator in the assumption declaration phase during the local safety assessment, summarizes the following information:

- Reference of the function/service associated to the assumption.
- Identification and description of the assumption.
- Expected evidence to prove the assumption.

Finally, it should the noted that the Hazard identification phase (Section 6.2) will only be valid if the list of assumptions is not modified. As explained previously, both processes (Assumption declaration and Hazard identification) are linked, so any change in the first step (Assumption declaration) would affect the second one (Hazard identification) and should therefore be carefully managed.

Table 2: Guidance for Assumption Declaration by the Airspace Change Initiator

FUNCTION / SERVICE	ID	ASSUMPTIONS	EVIDENCE TO PROVE ASSUMPTION
Aircraft (Flight Crew)	ASSUMP.1	During the IAP, flight crew continuously searches for traffic conflict (if VMC) based on traffic information provided by other aircraft and/or by the FIS unit.	Pilot Flight Training/Licensing: BIR (Basic Instrument Rating) as a minimum. Supported by AIR-OPS Regulation [RD-3].
	ASSUMP.2	Flight crew follows indications from displayed RNAV lateral and vertical navigation information.	Pilot Flight Training/Licensing: BIR (Basic Instrument Rating) as a minimum. Supported by AIR-OPS Regulation [RD-3].
	ASSUMP.3	Flight crew prepares the flight plan in accordance with the available MET information at the aerodrome.	Pilot Flight Training/Licensing: BIR (Basic Instrument Rating) as a minimum. Supported by AIR-OPS Regulation [RD-3].
	ASSUMP.4	Flight crew has the proper training and is capable of adequately executing the IFR flight.	Pilot Flight Training/Licensing: BIR (Basic Instrument Rating) as a minimum. Supported by AIR-OPS Regulation [RD-3].
Aircraft (On-board equipment)	ASSUMP.5	On-board TAWS system (when equipped) alerts the flight crew when a risk of collision with an obstacle or terrain is detected.	Aircraft certification. Supported by AIR-OPS Regulation [RD-3] and CS-ACNS [RD-4].

FUNCTION / SERVICE	ID	ASSUMPTIONS	EVIDENCE TO PROVE ASSUMPTION
	ASSUMP.6	On-board ACAS system (when equipped) alerts the flight crew when a risk of collision with another aircraft is detected.	Aircraft certification. Supported by AIR-OPS Regulation [RD-3] and CS-ACNS [RD-4].
	ASSUMP.7	Aircraft Operator uses a navigation data base which satisfies the requirements of EU regulation in order to meet standards of integrity that are adequate for the intended use of the electronic navigation data. This assumption also considers that Instrument Flight Procedures are correctly loaded in the FMS (Database Installation) in compliance with applicable ICAO SARP, EU and/or National Regulation.	Aircraft certification. Aircraft Operator certification. Supported by AIR-OPS Regulation [RD-3] and CS-ACNS [RD-4].
	ASSUMP.8	The RNAV/RNP systems based on GNSS and/or SBAS are certified in accordance with EU regulation and approved for the RNP APCH procedure.	Aircraft certification. Supported by AIR-OPS Regulation [RD-3] and CS-ACNS [RD-4].
FPD	ASSUMP.9	Airspace structures and Instrument Flight Procedures are designed in compliance with applicable ICAO SARP, EU and/or National Regulation.	FPD Service Provider certificate.
	ASSUMP.10	FPD service is provided by a certified service provider according to EU regulation.	FPD Service Provider certificate.
	ASSUMP.11	Flight Procedure Design ensures maximum separation between IAP and any other existing procedure or airspace constraint in the environment.	Separation between new IAP and any other existing procedure/airspace constraint shall be an initial requirement of the Airspace Change Initiator before starting the FPD activities.
AIS	ASSUMP.12	AIS service is provided by a certified service provider according to EU regulation.	AIS Service Provider certificate.

FUNCTION / SERVICE	ID	ASSUMPTIONS	EVIDENCE TO PROVE ASSUMPTION
	ASSUMP.13	Airspace structures and Instrument Flight Procedures are published in compliance with applicable ICAO SARP, EU and/or National Regulation.	AIS Service Provider certificate.
	ASSUMP.14	EGNOS NOTAM is provided for the aerodrome according to applicable ICAO SARP, EU and/or National Regulation.	EWA with Airspace Change Initiator or other organization operationally responsible of the use of the IAP.
	ASSUMP.15	There is a local communications failure procedure published in the national AIP which will be applied by flight crew in case of on-board radio communication failure.	Current local procedures for VFR operations (published in the AIP).
DAT	ASSUMP.16	DAT service is provided by a pan-European service provider with an EASA certificate.	DAT Service Provider certificate.
	ASSUMP.17	Instrument Flight Procedures are processed by DAT Service Provider (Database Production) in compliance with applicable ICAO SARP, EU and/or National Regulation.	DAT Service Provider certificate.
NAV	ASSUMP.18	GNSS and EGNOS SiS comply with the performance requirements specified in ICAO Annex 10 Vol I.	Service Definition Document (SDD) [RD-11].
	ASSUMP.19	Aerodrome location is within the EGNOS service area (LPV-200 or APV-I)	Service Definition Document (SDD) [RD-11]
	ASSUMP.20	EGNOS service is provided by a pan-European service provider with an EASA certificate.	EGNOS Service Provider certificate.
	ASSUMP.21	An EWA with the Airspace Change Initiator or other organization operationally responsible of the use of the IAP is established (including EGNOS NOTAM proposals information).	EGNOS Working Agreement (EWA)
ADR	ASSUMP.22	Aerodrome is certified or licensed based on the applicable National Regulation.	Aerodrome license or certificate.
	ASSUMP.23	Existing type of runway and ground equipment allows the implementation of an IAP for the expected traffic in compliance with applicable ICAO SARP, EU and/or National Regulation.	Aerodrome license or certificate.
AFIS	ASSUMP.24	AFIS service (if available) is provided by a certified service provider according to EU regulation.	AFIS Service Provider certificate.
MET	ASSUMP.25	MET service (if available) is provided by a certified service provider according to EU regulation.	MET Service Provider certificate.

FUNCTION / SERVICE	ID	ASSUMPTIONS	EVIDENCE TO PROVE ASSUMPTION
FPD **AIS** **DAT** **NAV** **MET**[19] **AFIS**[20]	ASSUMP.26	Every existing ANS Service Providers at the scenario have established the necessary internal working arrangements and procedures to ensure the service provision even when there is a failure in the infrastructure, according to EU regulation.	Every ANS Service Provider certificate.

[19] Presence of a MET service provider will directly depend on ATS level at the aerodrome.
[20] Presence of an AFIS service provider may depend on each General Aviation scenario.

6.2 *Hazards*

Hazard identification focuses on conditions that could cause or contribute to the unsafe operation of aircraft or aviation safety-related equipment, products and services (guidance on distinguishing hazards that are directly pertinent to aviation safety from other general/industrial hazards is addressed in subsequent paragraphs).

In any case, the following methodologies are commonly applied for hazard identification:

- **Analysis of past outcomes/events/incidents.** Hazards can be derived from previous experiences such as safety occurrences. Incidents and accidents are an indication of system deficiencies and therefore can be used to determine which hazard(s) contributed to the event, if any.

- **Experts' judgement.** Experts will capitalize on their experience in order to contribute to the Hazard identification process. They will analyse the proposed operating environment to anticipate failure modes, and identify potential hazards.

- **Analysis of failure modes which cannot be fully mitigated by assumptions.**

All personnel involved in the safety assessment activities will participate in a brainstorming or experts' judgement session, in order to establish the set of Hazards for the analysed scenario. The methodologies described previously are the most suitable tools for Hazard identification in General Aviation scenarios, but any other techniques for identification of hazards could be used to complement the assessment.

Taking the previous information into account, the following table contains a generic set of hazards to be considered when implementing an EGNOS based approach procedure at a General Aviation aerodrome, for all the elements described in the Concept of Operations (Section 5). It should also be highlighted that this generic set of hazards shall be assessed, verified and completed by the Airspace Change Initiator when developing the local safety assessment, according to both the particular characteristics of the General Aviation environment and requirements stated by the NCA.

Hazard identification has been carried out based on the assumptions declared in the previous section and considering only the hazards associated with the implementation of an IAP at a VFR-only General Aviation aerodrome.

In this context, **Hazard identification will only refer to the services affected by the airspace change**:

- **NAV**: new EGNOS approach procedure introduced in the scenario.

- **ATS:** new instrument approach procedure introduced in the environment, for both scenarios: AFIS being provided at the aerodrome, and no provision of ATS services (non-ATS aeronautical stations: UNICOM). In AFIS aerodromes, only hazards outside the FIZ airspace volume have been considered, because it is assumed that the AFIS service provider will correctly execute its functions (ASSUMP.24).

- **MET**: meteorological information is necessary for IFR operations. Hazards are only identified when no local MET service is provided at the aerodrome; that is, for the scenario with no ATS services at the aerodrome (non-ATS aeronautical stations: UNICOM).

On the other hand, there are other hazards which have not been considered in this section because they are not directly affected by the change or because they have been covered by assumptions in the previous section:

- **COM:** current communication facilities are not expected to be modified with the introduction of a new instrument approach (depending on the ATS level).

- **SUR:** surveillance capabilities (ATS surveillance services) have not been considered in the Concept of Operations.

- **Aircraft Operator**: a new PBN IFR procedure will be published and pilots shall be capable of correctly executing the EGNOS approach procedure. Hazards are covered by assumptions (from ASSUMP.1 to ASSUMP.8).

- **FPD:** hazards are covered by assumptions (ASSUMP.9, ASSUMP.10 and ASSUMP.11).

- **AIS:** hazards are covered by assumptions (from ASSUMP.12 to ASSUMP.15).

- **DAT:** hazards are covered by assumptions (ASSUMP.16 and ASSUMP.17).

- **ADR:** hazards are covered by assumptions (ASSUMP.22 and ASSUMP.23).

Table 3: Guidance for Hazard Identification by the Airspace Change Initiator

HAZARD IDENTIFICATION					
FUNCTION / SERVICE	**ID**	**HAZARD**	***EXPLANATION***	***OCURRENCE***	
NAV	**HZD.1**	**Unnoticed degradation of the GNSS/EGNOS signal.**	There is a degradation in the GNSS/EGNOS signal not noticed by the pilot (e.g. because the degradation occurs after the departure of the flight). If aircraft follow the erroneous indications they may deviate from the expected instrument approach trajectory towards terrain or another aircraft.	CFIT	Collision of aircraft with terrain/obstacle following lateral or vertical deviation of GNSS/EGNOS signal.
				MAC	Collision of aircraft with other aircraft following lateral or vertical deviation of GNSS/EGNOS signal.
ATS (AFIS)	**HZD.2**	**Conflict between an IFR approach and VFR traffic, outside FIZ in class G airspace.**	Outside the FIZ in class G airspace (FIS service only), aircraft does not receive traffic information and may collide with other VFR traffic.	MAC	Collision of aircraft with other aircraft following the current path.
	HZD.3	**Conflict between two IFR approaches, outside FIZ in class G airspace.**	Outside the FIZ in class G airspace (FIS service only), IFR aircraft does not receive traffic information and may collide with other IFR traffic.	MAC	Collision of aircraft with other aircraft following the current path.
	HZD.4	**VFR traffic unaware of IFR operation, outside FIZ in class G airspace.**	Outside the FIZ in class G airspace (FIS service only), VFR traffic (aircraft, ULM, paragliders, gliders or balloons) do not receive traffic information and may collide with IFR traffic.	MAC	Collision of VFR traffic with IFR aircraft following the current path.
ATS (no ATS services)	**HZD.5**	**Uncoordinated IFR departure and approach procedures.**	Arriving / departing flight may be in conflict with other traffic departing / arriving from the aerodrome.	MAC	Collision of aircraft with other aircraft following the current path.

HAZARD IDENTIFICATION					
FUNCTION / SERVICE	**ID**	**HAZARD**	***EXPLANATION***	***OCURRENCE***	
	HZD.6	**Uncoordinated runway movements during an IFR operation.**	An aircraft, vehicle or person is on or crosses the runway unexpectedly during an IFR approach or departure operation.	RI-VAP	Collision of aircraft with another aircraft, a vehicle or a person on the runway.
	HZD.7	**Conflict between an IFR approach and VFR traffic in class G airspace.**	Within class G airspace, IFR aircraft does not receive traffic information from FIS and may collide with other VFR traffic.	MAC	Collision of aircraft with other aircraft following the current path.
	HZD.8	**Conflict between two IFR approaches in class G airspace.**	Within class G airspace, IFR aircraft does not receive traffic information from FIS and may collide with other IFR traffic.	MAC	Collision of aircraft with other aircraft following the current path.
	HZD.9	**VFR traffic unaware of IFR operation in class G airspace.**	Within class G airspace, VFR traffic (aircraft, ULM, paragliders, gliders or balloons) does not receive traffic information from FIS and may collide with IFR traffic.	MAC	Collision of VFR traffic with IFR aircraft following the current path.
MET (no local MET service)	**HZD.10**	**Unnoticed degradation in MET information before starting the IFR approach.**	Unnoticed incorrect MET information is transmitted to IFR airspace users. Before starting the instrument approach, aircraft receives incorrect MET information and deviates from the expected instrument approach towards terrain/obstacle.	CFIT	Collision of aircraft with terrain/obstacle due to degraded or incorrect MET information.

HAZARD IDENTIFICATION					
FUNCTION / SERVICE	**ID**	**HAZARD**	***EXPLANATION***	***OCURRENCE***	
	HZD.11	**Unnoticed degradation in MET information transmitted during the IFR approach.**	Unnoticed incorrect MET information is transmitted to IFR airspace users. During the instrument approach, aircraft receives incorrect MET information update and deviates from the expected instrument approach towards terrain/obstacle.	CFIT	Collision of aircraft with terrain/obstacle due to degraded or incorrect MET information.

7 Mitigating Measures Identification

Mitigation is the process considered for incorporating defences or preventive controls (mitigating measures) to reduce the severity and/or likelihood of a hazard's projected consequence.

Table 4 below provides as a guidance example the mitigating measures for the hazards identified in Section 6.2 for the implementation of an EGNOS based approach procedure in a General Aviation aerodrome.

In order to provide more guidance in the mitigation phase, each proposed mitigating measure has been coded within the table as GDM#X/FLM#X depending on its nature (Ground/Flight), and will be described in further detail in the following subsections.

It should also be highlighted that this generic set of mitigating measures shall be assessed, verified and completed by the Airspace Change Initiator when developing the local safety assessment, according to both the particular characteristics of the General Aviation environment and requirements stated by the NCA.

Table 4: Guidance for Mitigation strategies by the Airspace Change Initiator

HAZARD			MITIGATION					
			GROUND MITIGATION			FLIGHT MITIGATION		
FUNCTION / SERVICE	ID	DESCRIPTION	ATS / Airspace	AIP / Awareness	Technology (ground)	Operational Flight Procedure	Flight crew resolution	Technology (on-board)
NAV	**HZD.1**	**Unnoticed degradation of the GNSS/EGNOS signal.**	- Coordination with FIS unit (GDM#1).	- EGNOS NOTAM (GDM#9)	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- RNP (FLM#1). - TAWS (FLM#4). - ACAS (FLM#5).
ATS (AFIS)	**HZD.2**	**Conflict between an IFR approach and VFR traffic, outside FIZ in class G airspace.**	- Coordination with FIS unit (GDM#1). - LoA between AFIS and FIS units (GDM#4). - Flight Plan (GDM#5). - RMZ (GDM#10).	- AIC (GDM#2).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
	HZD.3	**Conflict between two IFR approaches, outside FIZ in class G airspace.**	- Coordination with FIS unit (GDM#1). - LoA between AFIS and FIS units (GDM#4). - Flight Plan (GDM#5). - RMZ (GDM#10).	- AIC (GDM#2).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
	HZD.4	**VFR traffic unaware of IFR operation, outside FIZ in class G airspace.**	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - RMZ (GDM#10).	- AIC (GDM#2). - Awareness sessions for pilots (GDM#3).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
ATS (no ATS services)	**HZD.5**	**Uncoordinated IFR departure and approach procedures.**	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - AFIS (GDM#7). - RMZ (GDM#10).	- AIC (GDM#2). - Establishment of local procedures (GDM#6).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).

HAZARD			MITIGATION					
			GROUND MITIGATION			FLIGHT MITIGATION		
FUNCTION / SERVICE	ID	DESCRIPTION	ATS / Airspace	AIP / Awareness	Technology (ground)	Operational Flight Procedure	Flight crew resolution	Technology (on-board)
	HZD.6	Uncoordinated runway movements during an IFR operation.	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - AFIS (GDM#7). - RMZ (GDM#10).	- AIC (GDM#2). - Establishment of local procedures (GDM#6).	---	- Missed approach procedure (FLM#6).	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- iConspicuity (FLM#7).
	HZD.7	Conflict between an IFR approach and VFR traffic in class G airspace.	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - AFIS (GDM#7). - RMZ (GDM#10).	- AIC (GDM#2). - Establishment of local procedures (GDM#6).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
	HZD.8	Conflict between two IFR approaches in class G airspace.	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - AFIS (GDM#7). - RMZ (GDM#10).	- AIC (GDM#2). - Establishment of local procedures (GDM#6).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
	HZD.9	VFR traffic unaware of IFR operation in class G airspace.	- Coordination with FIS unit (GDM#1). - Flight Plan (GDM#5). - AFIS (GDM#7). - RMZ (GDM#10).	- AIC (GDM#2). - Awareness sessions for pilots (GDM#3).	---	---	- See and Avoid (FLM#2). - Conflict resolution on-board (FLM#3).	- ACAS (FLM#5). - iConspicuity (FLM#7).
MET (no local MET service)	HZD.10	Unnoticed degradation in MET information before starting the IFR approach.	---	---	- AutoMET station (GDM#8).	- Missed approach procedure (FLM#6).	- See and Avoid (FLM#2).	- TAWS (FLM#4).

HAZARD			MITIGATION					
			GROUND MITIGATION			FLIGHT MITIGATION		
FUNCTION / SERVICE	ID	DESCRIPTION	ATS / Airspace	AIP / Awareness	Technology (ground)	Operational Flight Procedure	Flight crew resolution	Technology (on-board)
	HZD.11	Unnoticed degradation in MET information transmitted during the IFR approach.	---	---	- AutoMET station (GDM#8).	- Missed approach procedure (FLM#6).	- See and Avoid (FLM#2).	- TAWS (FLM#4).

7.1 *Ground Mitigation (GDM)*

7.1.1 Ground Mitigation 1: Coordination with FIS unit (GDM#1)

FIS services are expected to be present in most class G airspace to inform airspace users upon request. Both for VFR and IFR flights, FIS service is always provided by the appropriate ATS unit to all aircraft which are likely to be affected by the information.

The existence of FIS service is considered a means of mitigation for reducing the risk of MAC in uncontrolled airspace when implementing IFR flights in General Aviation environments. The expected associated functions to the ATS certificate are (according to Regulation 2017/373 [RD-6]):

- FIS unit will notify the presence of other IFR/VFR traffic in the airspace.

- FIS unit will inform airspace users about the status or any identified malfunction of the ground and/or space navaids (if available). This information would be obtained through notification from other IFR traffic or an EGNOS NOTAM issued by an AIS provider (coming from an existing EWA with the Airspace Change Initiator or the FIS service provider: ASSUMP.21).

- FIS unit will notify airspace users of any anomaly regarding loss of any capability (PBN or communications among others) by any IFR aircraft.

- Any other appropriate information for the safe execution of the flights.

Prior to the implementation of an IAP, radio coverage by FIS unit might be also assessed in order to ensure that the two-way communications during the approach procedure.

Finally, in order to monitor all traffic entering or leaving a particular aerodrome, contact with the corresponding FIS unit may be considered as mandatory for both VFR/IFR, instead of upon request from pilots. In this way, transmission by the FIS unit of all traffic information in the vicinity of the aerodrome will be ensured.

7.1.2 Ground Mitigation 2: AIC published within the IAIP (GDM#2)

The introduction of a new IFP in a particular environment will introduce some changes in the operational procedures at the aerodrome, as mentioned in the Concept of Operations section.

For this reason, an AIC can be published within the IAIP in order to explain to airspace users the integration of new IFP procedures in a previously VFR-only environment:

- Description of GNSS IAP procedure.

- Changes in the existing airspace structures (if necessary).
- Communication and coordination procedures within Class G airspace between airspace users and FIS unit.

- Departure, arrival and ground communication procedures between airspace users (only for environments with no ATS service).

- Departure and arrival communication procedures with FIS unit (only for environments with no ATS service).

- Other relevant contextual information.

7.1.3 Ground Mitigation 3: Awareness sessions for pilots (GDM#3)

Complementing "Ground Mitigation 2: AIC published within the IAIP", awareness sessions can take place before implementing an airspace change at the General Aviation aerodrome in order to support and help pilots (and other interested parties) with practical examples and useful tips. This, in addition to the AIC, AIP and NOTAM publications, would contribute to airspace safety.

These awareness sessions would be organized by the Airspace Change initiator, in coordination with the NCA and the General Aviation community.

7.1.4 Ground Mitigation 4: LoA between AFIS and FIS units (GDM#4)

This mitigation strategy would only be applicable when there is an operational AFIS provider at the aerodrome.

According to Regulation 2017/373 [RD-6], all ATS units should establish the necessary coordination procedures with adjacent ATS services (LoA). In this respect, when there is an AFIS provider at the aerodrome, AFIS should establish a LoA with the FIS unit responsible for surrounding class G airspace to coordinate IFR and VFR flights entering and leaving the FIZ.

In order to reduce, "separate" and "control" the traffic within the FIZ under responsibility of the AFIS unit, the following measures could be put in place:

- Only ONE IFR AIRCRAFT will be flying within the FIZ. No other instrument approach will be "authorized" to start the IAP until the previous IFR aircraft has correctly landed.

- This notification will be made by the AFIS service provider to the FIS unit. In this type of situations, the execution of a holding pattern on the corresponding IAF is highly expected by new IFR arriving traffic.

- No instrument approach will be "authorized" to start the IAP until a previous IFR departure has left the FIZ and correctly contacted the FIS unit. This notification will be made by the FIS unit to the AFIS provider.

Although both AFIS and FIS services do not provide clearance and do not have responsibility for traffic separation, the coordination activities resulting from the LoA should be understood as a recommended local procedure to be followed by General Aviation pilots. The operational arrangements between FIS and AFIS providers should be made known to pilots through an AIC publication (GDM#2) and/or an awareness session (GDM#3) to ensure coordination of VFR and IFR traffic.

7.1.5 Ground Mitigation 5: Flight Plan (GDM#5)

The presentation of a flight plan is not strictly required for IFR/VFR operations if these flights are to take place within Class G airspace.

In order to mitigate MAC risk, presentation of a flight plan could be made mandatory for any IFR/VFR operation departing from or arriving at the General Aviation aerodrome.

Workload of the FIS unit will be increased in the affected airspace volume. Nevertheless, with this mitigation strategy, the FIS unit will be aware of all IFR/VFR traffic, ensuring a correct reporting to airspace users within class G airspace.

7.1.6 Ground Mitigation 6: Establishment of local procedures (GDM#6)

For aerodromes without ATS services, some local aerodrome procedures will need to be established in coordination with the FIS unit. In this respect, in order to reduce, "separate" and "control" traffic, the following measures could be put in place:

- Only ONE IFR AIRCRAFT will be flying the IAP. No other instrument approach will start the IAP until the previous IFR aircraft has correctly landed and reported "Runway free" on the established UNICOM frequency.

- No instrument approach will start the IAP until a previous instrument departure has correctly contacted the FIS unit (or left the designed airspace structure if any).

- Only one aircraft at a time is given a departure "approval" (kind of clearance) by the FIS unit, and no approach clearances will be given until the departing aircraft's position is known by the corresponding FIS unit.

Furthermore, in order to ensure coordination between IFR and VFR traffic, some additional local procedures may be established to define clear rules for pilots at the aerodrome, following principles stated in SERA Regulation [RD-7]. As guidance, some of these rules are listed below:

- Instrument approaches have no preference over other VFR traffic.

- Depending on the existing traffic, instrument approaches may continue the instrumental approach and correctly land at the runway or join the aerodrome traffic circuit.
- A missed approach should also be expected (depending on other restrictions).

- If there is other VFR aircraft landing or in the final stages of an approach to land, aircraft at the higher level shall give way to aircraft at the lower level (respecting SERA.3210 Right-of-way rules) meaning that IFR traffic may need to interrupt the IAP and join the traffic circuit.

All these rules would ensure that only ONE IFR AIRCRAFT (departure or arrival) will be "approved" by the FIS unit to fly or start the IAP. All local operational procedures should be made known to pilots through an AIC publication (GDM#2) and/or an awareness session (GDM#3).

7.1.7 Ground Mitigation 7: AFIS (GDM#7)

In order to reduce MAC risk in General Aviation environments where there is only a UNICOM station, AFIS service may be provided at the aerodrome as a mitigating measure.

According to Article 3a from Regulation (EU) 2017/373 as last amended [RD-6], Member States shall determine the need for the provision of air traffic services at each aerodrome based on the types of air traffic involved, the density of air traffic, the meteorological conditions, among other relevant factors.

If the implementation of an IFR procedure rapidly increases traffic at the aerodrome, each State is responsible for assessing if a new ATS level is needed at the aerodrome or if there is a need to include limitations to traffic.

For General Aviation aerodromes with no ATS services provided, AFIS units may be established to provide flight information service and alerting service at AFIS aerodromes and within the airspace associated (FIZ or ATZ).

7.1.8 Ground Mitigation 8: AUTOMET (GDM#8)

In order to reduce CFIT risk in General Aviation environments without a MET service provider at the aerodrome (where only remote meteorological information is available), an AutoMET station (AWOS/ASOS) may be installed.

AutoMET stations are aerodrome weather systems that provide continuous, real time information and reports on aerodrome weather conditions. AutoMET stations offer a wide variety of capabilities and progressively broader weather reports.

It is important to highlight that AutoMET stations are not considered MET service providers. Basic stations include only altimeter setting, wind speed, wind direction, temperature, and dew point information. More advanced stations are able to provide additional information, such as wind speed, wind gust, wind direction, variable wind direction, temperature, dew point, altimeter setting, and density altitude.
There are several types of AutoMET stations using different physical principles. So improvements in performance and capacity can be expected. However, automatic systems are not currently capable of reporting all types of present weather.

In addition it should be noted that, according to ICAO Doc 9837 Manual [RD-12], the process of validating the performance of an AutoMET stations system is complex because:

- The human observer, often considered a reference, is fallible.

- Some phenomena are very rare, so it is difficult to adjust the sensor and to establish statistics on its performance. Fortunately, the most intense present weather phenomena are the easiest to identify and are often the most important as far as operations are concerned.

7.1.9 Ground Mitigation 9: EGNOS NOTAM (GDM#9)

Pre-flight briefing is considered a key activity to be carried out by pilots before starting a RNP APCH (LPV) procedure. Within this briefing, there should be information regarding the EGNOS signal status. Currently, there is no other EGNOS operational status information provided apart from the EGNOS NOTAM. Current European regulation requires that an EGNOS NOTAM scheme is provided to airspace users when new EGNOS based procedures are implemented. An EWA between the Airspace Change Initiator and the ESP (ASSUMP.21) is the key element to ensure the distribution of the EGNOS availability information to airspace users through an EGNOS NOTAM (ASSUMP.14).

Taking into account all this information, from an operational perspective, EGNOS NOTAM is also considered as a strategy to improve pilot awareness under the control of the Airspace Change Initiator, based on the EWA signed with the ESP, but only in the pre-flight phase.

7.1.10 Ground Mitigation 10: Radio Mandatory Zone (RMZ) (GDM#10)

In an aerodrome with no ATC service, the only way to ensure two-way communication between pilots (and ground stations if available) is the establishment of a Radio Mandatory Zone (RMZ) in the immediate vicinity of the aerodrome.

A RMZ is a defined airspace wherein the carriage and operation of radio equipment is mandatory for airspace users contained in it. According to SERA Regulation [RD-7], a RMZ may be established for IFR flights operating in parts of Classes F or G airspace in order to ensure two-way communication:

(a) Radio mandatory zone (RMZ)
(1) VFR flights operating in parts of Classes E, F or G airspace and ***IFR flights operating in parts of Classes F or G airspace designated as a radio mandatory zone (RMZ)*** *by the competent authority*

shall maintain continuous air-ground voice communication watch and establish two-way communication, as necessary, on the appropriate communication channel, unless in compliance with alternative provisions prescribed for that particular airspace by the ANSP.

When introducing an IFR procedure in a scenario with no ATS services at the aerodrome (UNICOM) or (A)FIS service, an RMZ (Class G) can be established as a mitigating measure in order to ensure two-way communication between airspace users.

According to SERA Regulation [RD-7], a RMZ airspace structure can be established only in conjunction with (A)FIS or UNICOM, because by definition RMZ requires to maintain continuous air-ground voice communication watch.

7.2 *Flight Mitigation (FLM)*

7.2.1 Flight Mitigation 1: RNP (FLM#1)

GNSS-based instrumental approaches within PBN operations are covered by AIR-OPS [RD-3]. In order to benefit from GNSS/EGNOS technologies, aircraft are required to be equipped with GNSS navigation systems allowing them to perform PBN operations.

For RNP APCH procedures, according to AIR-OPS [RD-3] and PBN Manual [RD-14], aircraft are required to be properly equipped with RNP systems, which are characterized by on-board performance monitoring and alerting functionality.

On-board performance monitoring and alerting is the main element that determines if the navigation system complies with the necessary safety level associated to an RNP application; it relates to both lateral and longitudinal navigation performance, and it allows the aircrew to detect that the navigation system is not achieving the navigation performance required for the operation.
This RNP functionally also mitigate the identification of any possible malfunction in the GNSS/EGNOS signal undetected by flight crew after the pre-flight information phase. In this regard, this mitigation is also supported by assumptions declaration (ASSUMP.8).

7.2.2 Flight Mitigation 2: See and Avoid (FLM#2)

This mitigation makes reference to the capability of General Aviation pilots to identify and avoid terrain, another aircraft or any other object, for which visibility is essential. In this sense, visibility is defined as the pilot's capability to continue the approach visually if VMC are met in the scenario or crew on-board have identified the required visual references according to EASA AIR OPS [RD-3].

In this respect, it is important to highlight that flying an instrument approach in VMC conditions will not introduce any changes with regard to the current VFR-only operations and, therefore, no new risks would be added on top of those already present at the environment.

If VMC are not met, VFR flights would not be expected (or would be very limited) in the airspace, considerably reducing the MAC and CFIT risks of introducing a new instrument approach in a particular environment.

Two associated actions can be derived from this mitigation in the scenario:

- **Interrupt the approach procedure and continue it in visual conditions (VMC).** Once the pilot has established the necessary external visual references during the instrument approach, to reduce risk of CFIT, it is possible to continue the flight and land at the aerodrome. Only as guidance, SERA Regulation [RD-7] requires flight visibility of around 5 km to meet, VMC conditions.

- **See and Avoid principle.** Commonly used for General Aviation operations developed within uncontrolled airspace in VMC conditions. The key element of "see and avoid" is to look outside for potential traffic. If VMC conditions are met in the scenario, the pilot will be able to look for other IFR or VFR traffic, reducing the risk of MAC in uncontrolled airspace.

Finally, it should be noted that See and Avoid is not a mitigation strategy under the control of the Airspace Change Initiator. In addition, weather conditions may contribute to reduce or increase both CFIT and MAC risks. In any case, the effectiveness of this mitigation should be assessed at a local level, depending on the historic and expected forecast weather information of the aerodrome where IFR operations are planned to be implemented.

7.2.3 Flight Mitigation 3: Conflict resolution on-board (FLM#3)

An aircraft may deviate from the expected path of the RNP APCH procedure for several reasons without being detected by the crew. As a result of this deviation, an air or a ground conflict may occur (MAC or CFIT respectively).

Taking into account pilot licensing and aircraft on-board capabilities, the flight crew may be able to detect and solve any type of air or ground conflict. In this respect, some assumptions have been made in order to support this mitigation:

- Flight crew will continuously search for conflict (ASSUMP.1).
- Flight crew has the proper training to identify and solve any conflict during the IFR flight (ASSUMP.4).
- On board equipment required for the PBN approach procedure is adequately certified (ASSUMP.8).

7.2.4 Flight Mitigation 4: TAWS (FLM#4)

A Terrain Avoidance and Warning System (TAWS) is a safety net that automatically provides a distinctive warning to pilots when aircraft is in potentially hazardous proximity to terrain, reducing CFIT risk (ASSUMP.5).

According to regulatory requirements stated in AIR-OPS [RD-3] and CS-ACNS [RD-4], it is highly expected that General Aviation traffic flying a RNP APCH down to LPV minima will be equipped with a TAWS system in order to mitigate CFIT risk, in case of deviation from the published path.

Both direct and indirect costs of implementing additional technology for General Aviation users should be carefully evaluated at a local level by NCA and Airspace Change Initiators.

7.2.5 Flight Mitigation 5: ACAS (FLM#5)

The Airborne Collision Avoidance System (ACAS) is an airborne safety net and an ICAO standard which provides pilots with a system independent of air traffic control to detect the presence of other aircraft which may present a threat of collision. Where the risk of collision is established, the system provides an indication of a vertical manoeuvre that will reduce the risk of collision. It is often used by the flight crew to improve their situational awareness (ASSUMP.6).

According to AIR-OPS [RD-3], NCC operations21 with an MCTOM of more than 5 700 kg or an MOPSC of more than 19 shall be equipped with ACAS II system. Nevertheless, there is no such requirement for NCO operations.

[21] ACAS provisions from NCC operations are also applicable to CAT operations.

Consequently, the effectiveness of ACAS as a possible mitigation for MAC risk should be assessed at each local level by the Airspace Change Initiator. Based on existing ACAS requirements for General Aviation, it is expected that many of the General Aviation aircraft (NCO/NCC), intending to fly the RNP APCH down to LPV minima, may not be equipped with an ACAS system. In this sense, iConspicuity concept has been proposed as a better solution to mitigate MAC risk in General Aviation scenarios (see Section 7.2.7).

Nevertheless and in a similar way as for the TAWS system, both direct and indirect costs of implementing additional technology for General Aviation users should be carefully evaluated at a local level by NCA and Airspace Change Initiators.

7.2.6 Flight Mitigation 6: Missed approach operation (FLM#6)

A missed approach operation will be followed if an approach cannot be continued after the DH. It specifies a point where the missed approach begins (DH or above), and a point or an altitude/height where it ends. On the other hand, a balked landing occurs when a pilot decides to abort or interrupt the approach below DH.

Missed approach and balked landing are considered as a mitigation strategy to reduce CFIT, MAC and/or RI-VAP in some situations. The main reasons for discontinuing an approach include the following reasons, among others:

- The required visual references have not been established by the DA/DH or are acquired but are subsequently lost.
- Aircraft has deviated from the published path and the approach cannot be continued.
- The aircraft is not positioned so as to allow a controlled touch down within the designated runway touchdown zone.
- The runway is obstructed or occupied by an unexpected vehicle, aircraft or person.
- Any other reason which prevents the safe execution of the approach procedure.

When a missed approach procedure is executed, for any of the above reasons, it should be appropriately reported to the AFIS provider (if available at the aerodrome) or in the established UNICOM frequency (in the absence of an ATS service provider at the aerodrome).

7.2.7 Flight Mitigation 7: iConspicuity (FLM#7)

There are several technological developments in the area of non-certified anti-collision and traffic awareness devices/systems that could significantly reduce the airborne collision risk involving uncontrolled traffic, which might be implemented in General Aviation environments. In this sense, following EASA strategy, **the iConspicuity concept has been included as a possible mitigation to reduce the airborne collision risk.**

iConspicuity (or in-flight electronic conspicuity plus) means in-flight capability to transmit position of aircraft and/or to receive, process and display positions of other aircraft in real time with the objective of enhancing pilots' situational awareness about surrounding traffic. iConspicuity is an umbrella term for a range of technologies and solutions, whether airborne or ground based, that can help airspace users and other affected stakeholders to be more aware of other aircraft in their vicinity or in a given airspace.

Contrary to ACAS (FLM#5), iConspicuity does not provide support for the threat resolution and aims to enhance visual scanning at a more affordable cost. However, the iConspicuity concept is expected to

evolve in time through the integration of new functionalities and sharing of additional aeronautical information in real time (such as weather or airspace related factors).

Finally, it is important to highlight that the implementation of the iConspicuity concept in a particular environment should also encompass an assessment of ADS-B equipment. Additionally, both direct and indirect costs of implementing additional technology for General Aviation users should be carefully evaluated at a local level.

8 Summary

General Aviation operations (NCC & NCO only) are mainly conducted in the absence of an ATS provider, in an aerodrome with a non-instrument runway and with an aerodrome operator licensed under a national certification scheme. This type of scenarios will be one of the most important beneficiaries of the EGNOS technology, which allows pilots to rely on safer instrument approach procedures at places where previously it was not possible and with no investments or maintenance costs for ground infrastructure.

This Safety Assessment Guidelines for General Aviation document (containing a Concept of Operations and a list of expected Assumptions, Hazards and Mitigating Measures) is intended as the first input to help in the undertaking of the safety assessment related activities and ensure safe and proportionate provisions for EGNOS based approaches at aerodromes serving General Aviation.

It should be noted that the list of Assumptions, Hazards and Mitigating Measures of these guidelines should be assessed, verified and completed if necessary in each local safety assessment by the Airspace Change Initiator, according to both the particular characteristics of the environment and requirements stated by the NCA.

Taking into account the guidelines developed throughout the document, the following elements are be highlighted in relation to the implementation of EGNOS based approach procedures at aerodromes serving General Aviation:

- **Airspace Change Initiator.** EU safety regulatory framework has opened the door for any type of organization involved in the process to lead the IFP implementation.

- **Instrument Approach Procedure.** Implementation of EGNOS approach procedures at non-instrument runways is possible (without the need of additional infrastructure), if the approach procedure is restricted to circling minima.

- **Non-ATC environment.** AFIS or UNICOM have been described as the most common ATS service level at the considered aerodromes. In these scenarios, MAC and CFIT risks have been mitigated by: ATS services at the aerodrome (scenarios with AFIS), pilot reporting (scenarios with UNICOM) and iConspicuity concept (in both scenarios), amongst others.

- **EGNOS Service Provider.** An agreement (EWA) will be required at General Aviation aerodromes between the organization operationally responsible of the EGNOS based procedure (normally the Airspace Change Initiator) and the ESP, to ensure the EGNOS Service provision scheme (including EGNOS NOTAM proposals information).

Finally, in order to support and enhance this type of implementation, new pilot cases should validate all the concepts in order to increase and extend such implementations and to support safer General Aviation operations.

Appendix A: Acronyms

ACAS	Airborne Collision Avoidance System
ADR	Aerodrome
ADS-B	Automatic Dependent Surveillance-Broadcast
AFIS	Aerodrome Flight Information Service
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
AMC	Acceptable Means of Compliance
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
APCH	Approach
APV	Approach Procedures with Vertical guidance
ASOS	Automated Surface Observing System
ASSUMP	Assumption
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Service
AWOS	Automated Weather Observing System
BIR	Basic Instrument Rating
CAT	Commercial Air Transport
CFIT	Controlled Flight into Terrain
CNS	Communication, Navigation and Surveillance
COM	Communications
CTR	Controlled Traffic Region
DA/H	Decision Altitude/Height
DAT	Aeronautical Database Suppliers
EASA	European Aviation Safety Agency
EGNOS	European Geostationary Navigation Overlay Service
ESP	EGNOS Service Provider
ESSP	European Satellite Services Provider
ETSO	European Technical Standard Order
EU	European Union
EUSPA	European Union Agency for the Space Programme
EWA	EGNOS Working Agreement
FAS	Final Approach Segment
FCL	Flight Crew Licensing
FIR	Flight Information Region
FIS	Flight Information Service
FIZ	Flight Information Zone
FMS	Flight Management System
FPD	Flight Procedure Design
GA	General Aviation
GM	Guidance Material
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HZD	Hazard
IAC	Instrument Approach Chart
IAF	Initial Approach Fix
IAP	Instrument Approach Procedure

ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
LOA	Letters of Acceptance
LoA	Letter of Agreement
LPV	Localizer Performance with Vertical guidance
MAC	Mid-Air Collision
MCTOM	Maximum Certified Take-Off Mass
MDA/H	Minimum Descent Altitude/Height
MET	Meteorological
MOPSC	Maximum Operational Passenger Seating Configuration
NAV	Navigation
NCA	National Competent Authority
NCC	Non-Commercial operations with Complex motor-powered aircraft
NCO	Non-Commercial operations with Other than complex-motor-powered aircraft
NM	Nautical Mile
NOTAM	Notice to Airmen
OCA/H	Obstacle Clearance Altitude/Height
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
PBN	Performance Based Navigation
PSR	Primary Surveillance Radar
QNH	Atmospheric Pressure
RI-VAP	Runway Incursion - Vehicle, Aircraft or Person
RFI	Radio Frequency Interference
RMZ	Radio Mandatory Zone
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP APCH	Required Navigation Performance Approach (NAV Spec)
RWY	Runway
SDD	Service Definition Document
SERA	Standardised European Rules of the Air
SES	Single European Sky
SMS	Safety Management System
SSR	Secondary Surveillance Radar
SUR	Surveillance
TAWS	Terrain Awareness and Warning System
UNICOM	Universal Communications
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions

Appendix B: Reference Documents

RD	Title
[RD-1]	GNSS-based Instrument Flight Procedures implementation for General Aviation, Uncontrolled Aerodromes and Non-Instrument Runways[22]
[RD-2]	EASA Easy Access Rules[23] for the Basic Regulation (Regulation (EU) 2018/1139 + AMC/GM)
[RD-3]	EASA Easy Access Rules[23] AIR OPS (Regulation (EU) No 965/212 + AMC/GM)
[RD-4]	CS-ACNS Issue 2 - 26 April 2019. Certification Specifications and Acceptable Means of Compliance For Airborne Communications, Navigation and Surveillance
[RD-5]	EASA Easy Access Rules[23] for Aerodromes (Regulation (EU) No 139/2014 + AMC/GM)
[RD-6]	EASA Easy Access Rules[23] for Air Traffic Management/Air Navigation Services (Regulation (EU) 2017/373 + AMC/GM)
[RD-7]	EASA Easy Access Rules[23] for Standardised European Rules of the Air (SERA)
[RD-8]	EASA Easy Access Rules[23] for Flight Crew Licencing (Part-FCL)
[RD-9]	Commission Implementing Regulation (EU) 2020/469 of 14 February 2020 amending Regulation (EU) No 923/2012, Regulation (EU) No 139/2014 and Regulation (EU) 2017/373 as regards requirements for air traffic management/air navigation services, design of airspace structures and data quality, runway safety and repealing Regulation (EC) No 73/2010
[RD-10]	Regulation (EC) 2150/2005 laying down common rules for the flexible use of airspace
[RD-11]	EGNOS Safety of Life (SoL) Service Definition Document (EGNOS SoL SDD) Issue 3.4
[RD-12]	ICAO DOC 9837 Manual on Automatic Meteorological Observing Systems at Aerodromes
[RD-13]	ICAO Doc 8168 Procedures for Air Navigation Services Aircraft Operations
[RD-14]	ICAO Doc 9613 PBN Manual
[RD-15]	ICAO Annex 6 - Part II International General Aviation - Aeroplanes
[RD-16]	ICAO Annex 10 - Volume I Aeronautical Telecommunications - Radio Navigation Aids
[RD-17]	ICAO Annex 15 Aeronautical Information Services

[22] https://www.EUSPA.europa.eu/newsroom/news/instrument-flying-supported-egnos-general-aviation
https://www.easa.europa.eu/taking-advantage-technology-%E2%80%93-developing-ifr-procedures-ga-community
https://egnos-user-support.essp-sas.eu/new_egnos_ops/resources-tools/guidance-material

[23] Although Easy Access Rules are not an official publication by EASA, they have been considered in the reference documentation as they contain the officially published regulations; the related AMC & GM (including the amendments) adopted so far, certification specifications and guidance material.

Appendix C: Example of a General Aviation scenario

As described throughout this document, a Concept of Operations should contain all information necessary to reach a detailed understanding of how, where and under which limitations or conditions the IFR operation will be carried out. Relevant charts and any other information helpful for visualising and understanding the intended operation should be considered in this phase of the process.

In accordance with the information contained in Section 5, the proposed example scenario is based on a National Licensed Aerodrome Operator with a non-instrument runway, intending to implement a LPV procedure (restricted to circling minima). The RNP APCH is expected to be published in the national AIP together with the information about the services available at its location, including NOTAM information and a EWA with the EGNOS Service Provider.

In this scenario, it is assumed that ATS services are not provided within the aerodrome vicinity. To protect the airspace in the vicinity of the aerodrome and ensure radio communications, a RMZ has been established. Separation within the RMZ will not be provided; this will increase the workload of the pilot in charge of determining an aircraft trajectory which does not enter into conflict with other airspace users.

For communication purposes, the aerodrome operator shall enable a UNICOM station to ensure radio communications between pilots. On the other hand, MET info needed for the approach shall be obtained from UNICOM station, FIS information and/or a remote aerodrome.

The items which are expected to be described within the concept of operations are identified below in a non-exhaustive list, together with a simple description of the expected scenario:

- **Scenario (Meteorological information, Topography)** → Aerodrome located within a valley with good meteorological conditions.

- **Draft chart/Type of proposed operation** → GNSS approach down to LPV (restricted to circling minima).

- **Airspace structure and boundaries** → RMZ in the surrounding area of the aerodrome.

- **Runway characteristics** → Physical characteristics (length, width, strip), category (Non-instrument runway), available lighting.

- **Traffic sample (Traffic Characteristics, Aircraft PBN equipage)** → VFR only with GNSS capabilities (only NCC & NCO operations).

- **Existing Air Navigation Services:**
    - **ATS** → None (only FIS information within class G airspace).
    - **Meteorological Service** → None (remote meteorological information).
    - **CNS capabilities:**
        - **Communication** → UNICOM station.
        - **Navigation** → EGNOS and GNSS signals. EWA between ESP and Airspace Change Initiator is required.
        - **Surveillance** → No provision of Surveillance service.
    - **FPD** → GNSS approach down to LPV (restricted to circling minima) according to PANS-OPS criteria.
    - **AIS** → EGNOS NOTAMs are provided / AD information and IAC are published in the AIP.
    - **DAT** → DAT will accordingly code AIP information for PBN operations for the NCO/NCC aircraft operator.

Finally, a schematic description of the concept of operations example included in this appendix is shown in the following figure:

EXAMPLE OF CONCEPT OF OPERATIONS IN A GENERAL AVIATION AERODROME:
IMPLEMENTATION OF LPV APPROACH PROCEDURE

ON BOARD EQUIPMENT:

Aircraft have the proper certified equipment for flying EGNOS approach procedures (on-board EGNOS receivers shall be ETSO compliant). The existing ETSOs related to the hardware required for EGNOS operations are:

ETSO-C144a
ETSO-C145c
ETSO-C146c
ETSO-C190

PILOT LICENSE:

Pilot is holding a BIR, which enables pilots to fly to a DH/MDH which shall be at least 200 ft greater than what would otherwise be calculated according to AIR-OPS**.**

AIRSPACE STRUCTURE:

An airspace volume where radio equipment is mandatory RMZ (Class G) has been proposed around the aerodrome.

FLIGHT PROCEDURE DESIGN (INSTRUMENT APPROACH PROCEDURE):

An approach with vertical and lateral guidance LPV restricted to circling minima is designed and approved according to PANS-OPS criteria.

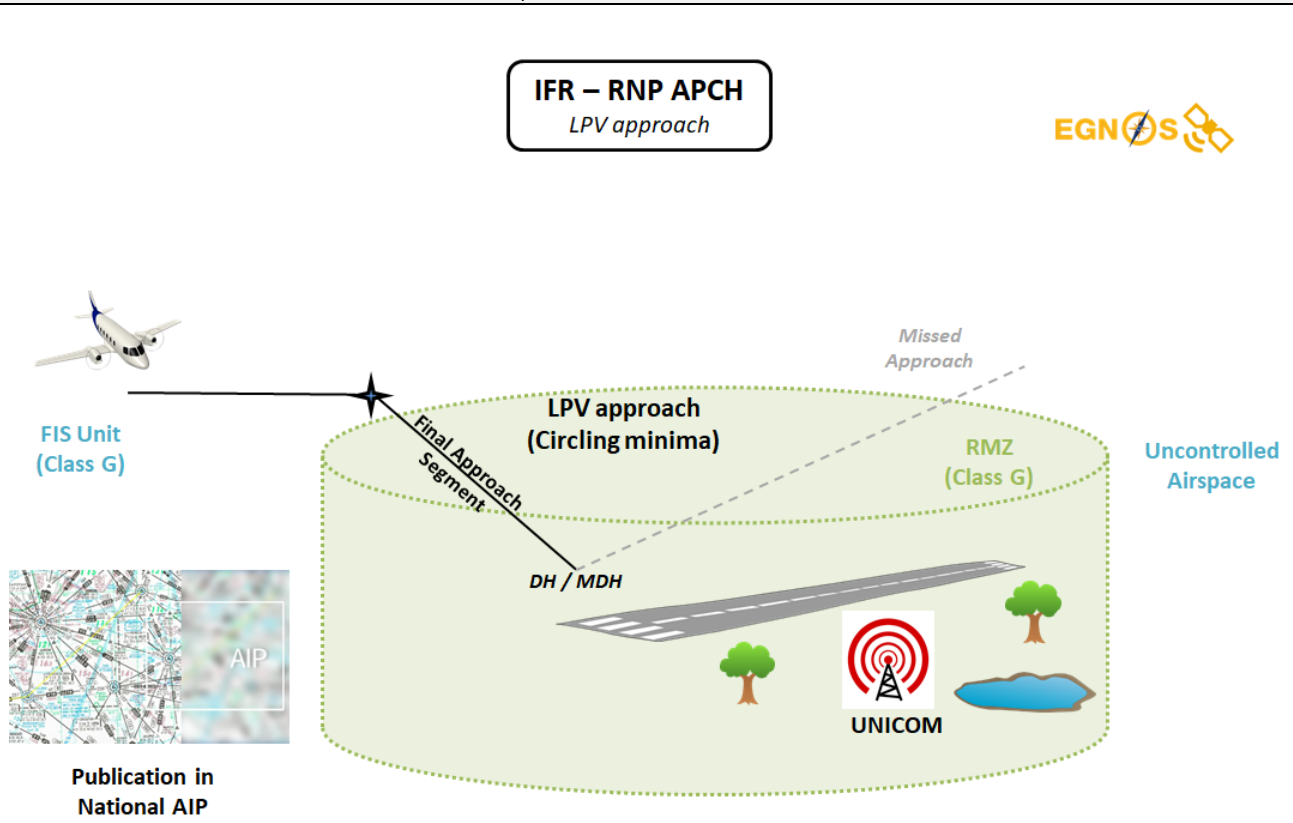
ATS INFORMATION:

FIS information (including meteorological information, traffic information or any other information) is provided in Class G airspace by the responsible FIS unit.

AERODROME REQUIREMENTS:

The aerodrome has a non-instrument runway where only VFR operations take place.

If the aerodrome falls under national regulation a further assessment of the is necessary at national level to consider specific national requirements stated by the National Competent Authorities. According to regulatory framework no upgrade to the runway is necessary for implementing new IFR procedures at the aerodrome.



NAVIGATION SERVICES:

EGNOS is a certified Navigation Service which provides SBAS signal for flying SBAS procedures (down to LPV minima).

An EWA between the EGNOS Service Provider and the Airspace Change initiator will be required by EASA (including EGNOS NOTAM related information).

COMMUNICATION SERVICES:

In the absence of ATS services in the aerodrome, a UNICOM station has been implemented to facilitate communications between airspace users.

MET SERVICES:

No MET information is available at the aerodrome.

Remote meteorological information (QNH, Temperature, and Wind) shall be used by airspace users in the scenario. General Aviation pilots are responsible for obtaining the necessary meteorological information before staring the IFR flight.

AIS SERVICES:

The Instrument approach procedure is published in the national AIP together with the proposed Airspace structure (RMZ).

Additionally, aerodrome data and information regarding navigation services is also published in the AIP.

DAT:

Based on the information and chart published in the AIP, DAT will provide the aeronautical data and information for General Aviation users (NCC and NCO aircraft operators).

Figure 16: Example of Concept of Operations in a General Aviation aerodrome (RNP APCH - LPV)