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PREPARATORY ACTION ON HIGHER AIRSPACE OPERATIONS (HAO)

SUBTASK 1.3 - GUIDANCE ON REGULATORY SANDBOXES FOR HAO

EASA Guidance on Innovation Testing Frameworks for Higher Airspace and Emerging Aviation Operations

An Agency of the European Union

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DELIVERABLE NUMBER AND TITLE:	**Task 1.3** - EASA Guidance on Regulatory Sandboxes for Higher Airspace and Emerging Aviation Operations
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EXECUTIVE SUMMARY

PROBLEM AREA

Aviation is entering a period of rapid technological change. New entrants, advanced automation, novel propulsion systems, and unconventional operational models are reshaping the sector.

Higher Airspace Operations (HAO)[1], generally understood as operations above conventional commercial traffic levels and below outer space, including High-Altitude Platform Systems (HAPS), stratospheric balloons, and supersonic or hypersonic flights, illustrate this transformation.

Many of these activities challenge assumptions embedded in existing regulatory frameworks. They introduce novel airworthiness architectures, emerging propulsion technologies, high levels of automation, and new approaches to airspace integration. While the EU aviation safety framework remains robust for conventional operations, it was not designed with all emerging concepts in mind. At the same time, innovation cycles are accelerating, creating a need for regulatory approaches that enable safe experimentation while maintaining established safety standards.

The work underpinning this document was originally conceived as guidance on Regulatory Sandboxes for Higher Airspace and emerging aviation operations. In parallel, legislative proposals to introduce regulatory sandboxes into Regulation (EU) 2018/1139 are being considered as part of the EU military mobility package. As these proposals had not been adopted at the time of drafting, this guidance remains fully aligned with the current legal framework.

Accordingly, the guidance uses the term **Innovation Testing Framework (ITF)** independently of any future regulatory definition of regulatory sandboxes. An ITF is a time-limited, structured, and coordinated application of existing regulatory instruments that enables innovative technologies and operational concepts to be tested progressively within the applicable legal framework.

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[1] The terminology and operational boundaries associated with Higher Airspace Operations (HAO), including suborbital and orbital flight regimes, remain subject to ongoing international discussions and are not formally defined within this guidance. Accordingly, the term “Higher Airspace Operations” is used for operational purposes only and should not be interpreted as establishing a legal or regulatory categorisation of higher airspace or space transportation activities.

Depending on system maturity and risk, testing may occur in simulated environments, controlled conditions, or, where appropriate, real-world operational settings. In all cases, safety remains the overriding priority, and experimental activities are expected to achieve a level of safety equivalent to other aviation operations through proportionate, risk-based means.

DESCRIPTION OF WORK

This document was developed under a Contribution Agreement between the European Commission and the European Union Aviation Safety Agency (EASA). Although originally tasked with developing guidance on Regulatory Sandboxes, the document has been adapted to provide guidance on ITFs while remaining fully grounded in the current regulatory framework.

The document supports the preparation of a future EU framework for Higher Airspace Operations and provides practical guidance to National Competent Authorities (NCAs), EASA, air navigation service providers (ANSPs), innovators, research organisations, emerging aviation businesses, and other stakeholders on establishing, conducting, and evaluating ITF activities.

Specifically, the guidance material:

- establishes criteria for determining when an ITF approach is appropriate;
- defines a structured ITF lifecycle (application, assessment, authorisation, establishment, execution, evaluation, and exit);
- clarifies institutional roles and responsibilities;
- explains how existing instruments, such as Permits to Fly, SORA-based operational authorisations, exemptions, and dedicated airspace arrangements, can be applied in a coordinated manner;
- provides guidance on risk assessment, oversight, monitoring, and data collection; and
- includes practical templates and annexes tailored to Higher Airspace Operations.

The guidance material does not create new legal powers. Rather, it demonstrates how existing mechanisms within the EU aviation safety framework can be applied in a coordinated and proportionate manner to support controlled experimentation and regulatory learning.

RESULTS AND APPLICATION

This document provides non-binding guidance intended to facilitate harmonised ITFs across the European Union and promote consistent, transparent approaches among Member States.

Through ITFs, authorities and innovators can:

- test novel airworthiness and operational concepts under controlled conditions;
- explore new models of airspace integration;
- gather safety, performance, environmental, and societal data;
- identify regulatory gaps and inform future rulemaking; and
- establish early and structured dialogue between innovators and regulators.

Experience gained through ITF implementation will support EASA's certification policies, guidance material, and future rulemaking activities. National Competent Authorities are encouraged to use this framework to facilitate innovation while maintaining high levels of safety, security, interoperability, and environmental protection.

Recognising that ITFs remain an evolving practice in aviation, the framework is intended to mature through practical experience and stakeholder engagement. In doing so, it supports evidence-based regulatory evolution, accelerates the safe integration of Higher Airspace Operations, strengthens public trust, and enhances the competitiveness and sustainability of the European aviation sector.

Legal Status of this Document

This Document is non-binding guidance. It does not create new legal obligations or alter existing regulatory responsibilities under Regulation (EU) 2018/1139 and its implementing rules.

The provisions described herein reflect recommended practices for the establishment and conduct of ITFs within the existing EU aviation safety framework.

National Competent Authorities retain discretion in their application, provided that applicable Union law is respected.

Contents

ABBREVIATIONS

ACRONYM	DESCRIPTION
AMC	Acceptable Means of Compliance
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
AIP	Aeronautical Information Publication
ARC	Air Risk Class
ATM	Air Traffic Management
ATS	Air Traffic Services
AltMoC	Alternative Means of Compliance
BR	Basic Regulation
BVLOS	Beyond Visual Line of Sight
CAA	Civil Aviation Authority
CE	Conformité Européenne
ConOps	Concept of Operations
CRI	Certification Review Item
CS	Certification Specifications
CS-23	Certification Specifications for Normal Category Aeroplanes
CS-25	Certification Specifications for Large (Transport) Aeroplanes
DOA	Design Organisation Approval
EASA	European Union Aviation Safety Agency
EC	European Commission
ELOS	Equivalent Level of Safety

ESF	Equivalent Safety Finding
EU	European Union
FIR	Flight Information Region
GM	Guidance Material
GRC	Ground Risk Class
HAO	Higher Airspace Operations
HAPS	High-Altitude Platform System
ICAO	International Civil Aviation Organization
IPC	Innovation Partnership Contract
ITF	Innovation Testing Framework
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
MoC	Means of Compliance
MoU	Memorandum of Understanding
NCA	National Competent Authority
NOTAM	Notice to Airmen (also referred to as Notice to Air Missions in evolving terminology)
PAC	Pre-Application Contract
POA	Production Organisation Approval
PtF	Permit to Fly
SAIL	Specific Assurance and Integrity Level
SARPs	Standards and Recommended Practices
SC	Special Condition
SERA	Standardised European Rules of the Air
SORA	Specific Operations Risk Assessment
TC	Type Certificate

TAC	Technical Advice Contract
UAV	Unmanned Aerial Vehicle
UAS	Unmanned Aircraft System
VLOS	Visual Line of Sight
VTOL	Vertical Take-Off and Landing

1. Introduction

1.1 Background

Note: This document uses the term *Innovation Testing Framework (ITF)* to describe structured experimentation using existing regulatory instruments. Further details are provided in the Executive Summary.

Aviation is undergoing rapid technological transformation, driven by new entrants, novel propulsion and automation technologies, and emerging operational concepts that extend beyond the boundaries of traditional civil aviation.

Higher Airspace Operations (HAO), including operations involving High-Altitude Platform Systems (HAPS), stratospheric balloons, higher airspace unmanned aircraft systems, and advanced supersonic or hypersonic demonstrators, illustrate this evolution particularly clearly. Such activities often challenge existing regulatory frameworks because they do not fit established certification or operational categories, may operate in environments with limited historical operational experience, rely on novel technologies and automation architectures, and require new approaches to oversight, airspace integration, and risk management.

Ground testing, simulation, and analytical methods remain essential for the development of innovative aviation systems. However, they may be insufficient to validate operational behaviour, system interactions, and safety assumptions for highly novel concepts operating in complex and dynamic environments. As a result, access to controlled real-world testing is increasingly important for both innovators and authorities.

To support the safe and proportionate integration of innovation into the aviation system, authorities increasingly rely on Innovation Testing Frameworks (ITFs). An ITF provides a structured and supervised approach for testing innovative technologies, products, services, or operational concepts under real or representative operating conditions, within clearly defined boundaries and through the coordinated application of existing regulatory instruments.

ITFs enable authorities and innovators to gather operational evidence, validate mitigation measures, identify regulatory gaps, and build confidence in emerging technologies before broader deployment. Their value is particularly significant in areas where both regulatory maturity and operational experience remain limited, including many Higher Airspace Operations.

This guidance supports the coordinated and consistent use of ITFs within the European aviation system, with a particular focus on Higher Airspace Operations and other emerging aviation activities.

Unless otherwise specified under the applicable regulatory framework, the involvement of National Competent Authorities and EASA in ITF activities remains subject to the applicable provisions concerning fees and charges.

For the purposes of this guidance, Higher Airspace Operations (HAO) is used as a broad operational concept encompassing a range of emerging higher airspace aviation activities and platform types operating in, or transiting through, higher airspace environments. The term is used for operational purposes only and does not establish a legal or regulatory categorisation of such activities.

Depending on the operational context, this may include High-Altitude Platform Systems (HAPS), stratospheric balloons, pseudo-satellites, super- or hypersonic aircraft and other emerging higher airspace concepts.

Certain activities occurring near the interface between aviation and space domains may involve operational, regulatory, or safety considerations beyond the scope of this guidance and may require separate assessment under applicable aviation, space, or national regulatory frameworks.

1.2 Purpose of this Guidance

The purpose of this guidance is to provide practical guidance on the coordinated and proportionate application of the existing European aviation regulatory framework to Innovation Testing Framework (ITF) activities. They support National Competent Authorities (NCAs), EASA, innovators, operators, air navigation service providers, research organisations, and other stakeholders involved in the preparation, assessment, authorisation, execution, and evaluation of controlled testing activities involving innovative technologies and operational concepts.

In particular, the guidance:

- explain the role and objectives of ITFs within the aviation regulatory framework;
- establish the principles that should govern safe and proportionate experimentation;
- describe the regulatory instruments and mechanisms that may be used to support ITF activities;
- define a structured lifecycle for the application, assessment, authorisation, execution, evaluation, and closure of ITF activities; and
- promote a consistent approach to innovation testing across the European aviation system.

An ITF is not a standalone regulatory authorisation regime and does not create new legal powers, exemptions, or approval pathways. Rather, it provides a structured framework for coordinating and applying existing regulatory mechanisms to innovative and experimental activities, while supporting evidence-based regulatory development and organisational learning.

1.3 Scope and Applicability

This guidance was developed under a contribution agreement between the European Commission and the European Union Aviation Safety Agency (EASA) supporting the development of a future EU framework for Higher Airspace Operations (HAO).

While that initiative provides the primary policy context, the principles, processes, and regulatory mechanisms described in this guidance are not limited to Higher Airspace Operations. They may be applied to Innovation Testing Framework (ITF) activities involving any innovative aviation technology, product, service, or operational concept falling within the scope of European Union aviation safety regulation.

The guidance applies to ITF activities falling within the respective responsibilities of EASA and the Member States under the applicable European aviation regulatory framework. They are relevant to National Competent Authorities (NCAs), EASA, innovators, operators, air navigation service providers, research organisations, and other stakeholders involved in innovation testing activities.

In particular, the guidance may be relevant to innovation testing activities involving operational or regulatory challenges such as:

- Higher Airspace Operations, including very high speed or airspace or long-endurance operations;
- the integration of unmanned aircraft into controlled airspace or operations conducted under instrument flight rules;
- cross-border or multi-authority operations requiring coordinated regulatory and airspace arrangements;
- the integration of novel aircraft, technologies, services, or operational concepts into existing aviation and air traffic management systems; and
- operations whose novelty, complexity, or scale is not yet fully addressed by existing regulatory provisions or routine approval and oversight processes.

The need for an Innovation Testing Framework should be determined primarily by the nature of the innovation and the operational or regulatory challenge to be addressed.

Depending on the activity concerned, existing regulatory and operational instruments or mechanisms, such as a Permit to Fly, a SORA-based operational authorisation, specific airspace arrangements, exemptions, or other approvals, may be used and coordinated within the ITF to enable controlled real-world testing. These instruments and mechanisms remain subject to their respective legal requirements and do not, in themselves, constitute a reason for establishing an ITF.

The guidance is intended for projects in which the novelty, complexity, or cross-cutting nature of the proposed operation requires coordinated and controlled real-world testing beyond what can reasonably be addressed through routine certification, operational approval, simulation, laboratory testing, or standard oversight processes.

This guidance does not replace certification processes, operational regulations, airspace management requirements, or the statutory responsibilities of National Competent Authorities and EASA. Rather, they describe how existing regulatory instruments and oversight mechanisms may be coordinated and applied to support safe experimentation within the existing regulatory framework.

1.4 How to Use This Document

This document is designed as a practical guidance for both applicants and authorities.

- Section 2 explains the role and purpose of ITFs in aviation.
- Section 3 describes the regulatory instruments most relevant to ITF activities.
- Section 4 sets out the core principles that should guide all ITF activities.
- Section 5 provides a detailed, step-by-step description of the ITF lifecycle, including responsibilities, deliverables and decision points.
- The annexes contain reference material, practical templates, as well as application pathways tailored to specific categories of operations and technologies, in particular for Higher Airspace Operations.

Applicants should begin by reviewing the principles and lifecycle described in Sections 4 and 5 before preparing an ITF proposal using the relevant annexes. Authorities should use the same lifecycle and templates to support consistent evaluation, authorisation and oversight of ITF activities.

2. Innovation Testing Frameworks in Aviation

2.1 Purpose of an Innovation Testing Framework in Aviation

Innovation in aviation increasingly challenges the assumptions and processes underpinning existing regulatory frameworks. New vehicle types, novel propulsion systems, advanced automation, and unconventional operational concepts may not fit readily within regulatory approaches developed for conventional aircraft and established operational models.

An Innovation Testing Framework (ITF) provides a structured and supervised means for authorities and innovators to evaluate such innovations under real or representative operating conditions while maintaining an appropriate level of safety oversight. Through the coordinated and proportionate application of existing regulatory instruments, an ITF enables testing activities that may not be practicable within routine certification, approval, or operational processes.

By facilitating controlled experimentation, ITFs support the generation of operational evidence, the validation of assumptions and mitigation measures, and the identification of issues requiring further technical, operational, or regulatory consideration. They also provide authorities with early insight into emerging technologies and operational concepts, supporting informed decision-making and future regulatory development.

Depending on the nature of the activity and subject to agreement by the competent authority, an ITF may encompass a single testing activity or a series of related activities conducted within a common framework.

The implementation of ITF activities should follow a proportionate and risk-based approach. The extent of coordination, assessment, and oversight should be commensurate with the nature, complexity, and operational implications of the activity being tested.

2.2 Concept of an Innovation Testing Framework

An Innovation Testing Framework (ITF) is a supervised, time-limited framework established by a Member State or EASA to enable the testing of innovative technologies, products, services, operational concepts, or business models under real or representative operating conditions within clearly defined boundaries and under the oversight of the competent authority.

An ITF is established through the coordinated and proportionate application of existing regulatory instruments, operational restrictions, oversight measures, and, where necessary, dedicated airspace or operational arrangements. The specific configuration of an ITF depends on the nature of the activity being tested, the applicable regulatory framework, and the associated risks.

The framework is defined through a set of predetermined parameters that may include geographical boundaries, airspace arrangements, operational limitations, technical configurations, reporting requirements, and temporal constraints. These parameters establish the conditions under which testing may be conducted and provide the basis for oversight and risk management throughout the testing activity.

An ITF is not intended to bypass or replace established regulatory processes, nor does it constitute an alternative route to certification or operational approval. Rather, it provides a structured environment in which innovative concepts can be evaluated, uncertainties can be addressed, and operational evidence can be generated before transition to established regulatory pathways.

For unmanned aircraft operations, the Specific Operations Risk Assessment (SORA) remains the primary methodology for operational authorisation within its area of applicability. Where highly novel technologies or operational concepts present characteristics not fully addressed by existing methodologies, complementary assessment approaches may be required. In such cases, the ITF provides a framework for coordinating the testing activity and associated oversight arrangements; it does not replace the underlying regulatory assessment process.

Depending on the characteristics of the activity, implementation of an ITF may require coordination with a range of stakeholders beyond the applicant and competent authority. This may include multiple competent authorities, EASA, air navigation service providers, ATM/ANS organisations, data or digital-service providers, cybersecurity stakeholders, infrastructure operators, or other entities whose systems or services may be affected by, or contribute to, the testing activity. Such dependencies should be identified at an early stage to support appropriate planning, coordination, and oversight.

Where the nature of the testing activity requires it, an ITF may involve multiple competent authorities, EASA, air navigation service providers and other relevant stakeholders, coordinated through appropriate governance arrangements.

2.3 Key Characteristics of Aviation Innovation Testing Frameworks

Although individual ITF projects may vary significantly in scale, maturity, and technical complexity, all aviation ITFs share a number of common characteristics.

Temporary

ITF activities are authorised for a defined period and for specific testing objectives. Any continuation beyond the agreed period requires a deliberate and justified decision by the competent authority. This ensures that the framework remains linked to clearly defined experimental purposes and does not evolve into a mechanism for routine operations.

Controlled

Testing activities are conducted within predefined operational, technical, and geographical boundaries established as part of the authorisation framework. These may include limitations relating to operating areas, airspace volumes, altitude ranges, technical configurations, operational procedures, or other conditions necessary to ensure that risks remain appropriately managed.

Supervised

ITF activities are conducted under the oversight of the competent authorities. The nature and extent of oversight should be proportionate to the characteristics and risk profile of the activity and may include reporting requirements, operational monitoring, inspections, audits, safety reviews, or the modification, suspension, or termination of testing activities where necessary.

Risk-informed

The assessment and oversight of an ITF are based on the nature of the technology, the operational concept, and the associated risks. Depending on the applicable regulatory framework, this may involve, for example, a safety case supporting Flight Conditions under a Permit to Fly, a SORA-based operational risk assessment, or other appropriate assessment methodologies. In all cases, the level of scrutiny and oversight should be proportionate to the level of risk exposure.

The level of assessment and oversight may evolve throughout the ITF lifecycle as operational experience is gained, testing objectives expand, or the risk profile of the activity changes.

Data-driven

A core objective of an ITF is the generation of evidence to support future certification activities, operational approvals, and regulatory decision-making. Data collection, monitoring, analysis, and reporting are therefore integral elements of every ITF and should be defined as part of the testing framework from the outset.

2.4 The Role of ITFs in Higher Airspace Operations (HAO)

Higher Airspace Operations (HAO) represent an area of aviation activity for which Innovation Testing Frameworks may be particularly valuable. Such activities often involve limited operational experience, evolving regulatory approaches, and interactions across multiple operational and institutional domains.

In addition, HAO activities may require coordination among operators, air navigation service providers, National Competent Authorities, EASA, and, where relevant, military or other public authorities. Some activities may also involve cross-border operations or interactions between different airspace environments and regulatory frameworks.

ITFs provide a structured mechanism for coordinating such activities, enabling the progressive validation of operational concepts, safety assumptions, and mitigation measures under appropriate regulatory oversight. In doing so, they support the safe integration of emerging higher airspace activities into the European aviation system

2.5 Typical Innovation Testing Framework Use Cases in Aviation

Innovation Testing Frameworks are flexible instruments that can be adapted to a wide range of aviation activities. While each project is unique, several recurring categories of use cases can be identified.

One common use case involves the development and validation of novel aircraft, platforms, and propulsion technologies. Examples include High-Altitude Platform Systems (HAPS), stratospheric balloons, advanced unmanned aircraft systems, aircraft employing alternative propulsion technologies, and supersonic or hypersonic demonstrators. In such cases, an ITF can support the progressive evaluation of technical performance, operational behaviour, and associated safety assumptions under controlled conditions.

A second category relates to innovative operational concepts. Examples include persistent higher airspace operations, highly automated or autonomous operations, and the integration of new categories of aircraft into shared or complex airspace environments. Such activities may require the validation of new operational procedures, coordination mechanisms, and risk mitigations before broader deployment.

ITFs may also support the testing of ATM/ANS and CNS innovations. Examples include alternative separation concepts, novel communication, navigation, or surveillance solutions, detect-and-avoid capabilities, and other technologies intended to facilitate the safe integration of emerging aviation activities into existing airspace structures.

Another important application concerns the validation of integrated system-of-systems concepts, where multiple technologies, operational elements, and stakeholders interact simultaneously. Such activities may involve aircraft, operators, air navigation service providers, digital-service providers, infrastructure operators, and competent authorities working within a common testing framework.

In all cases, the suitability of an ITF depends on the nature of the innovation, the need for controlled operational testing, and the ability to establish appropriate oversight and risk-management arrangements within the applicable regulatory framework.

2.6 Indicative Eligibility Considerations for an Innovation Testing Framework

An ITF approach may be appropriate where one or more of the following characteristics apply:

- the activity involves significant technical, operational, or regulatory novelty;
- real-world testing is necessary to validate safety, operational, or performance assumptions;
- existing certification, approval, or oversight processes do not fully address the proposed activity;
- progressive validation under controlled operational conditions is required; or
- the activity can be conducted within a clearly defined, supervised, and time-limited framework.

The decision to establish or use an ITF remains subject to assessment by the competent authority, taking into account the nature, complexity, maturity, and operational implications of the proposed activity.

2.7 Benefits and Limitations

Innovation Testing Frameworks offer benefits for both innovators and authorities. They enable operational testing at an early stage of development, support the validation of technologies and operational concepts under representative conditions, and facilitate the generation of evidence to support future certification, operational approvals, and regulatory decision-making.

For authorities, ITFs provide early insight into emerging technologies, operational models, and associated risks, supporting informed oversight and the identification of areas where additional guidance, policy development, or regulatory adaptation may be beneficial.

At the same time, ITFs are subject to important limitations. Activities conducted within an ITF remain limited in scope, duration, and operational conditions. Authorisations apply only to the specific activities and circumstances assessed by the competent authority and do not create any entitlement to broader operational privileges, certification, or future approvals.

Testing activities may be subject to reporting, monitoring, and oversight requirements that reflect their experimental nature and risk profile. Competent authorities retain the ability to modify conditions, impose additional limitations, suspend activities, or terminate an ITF where necessary to maintain safety or address emerging concerns.

These limitations are essential safeguards that enable innovative technologies and operational concepts to be evaluated responsibly within the European aviation safety system.

3. Regulatory Tools Supporting Innovation and Testing

3.1 Purpose of This Section

This section explains which existing regulatory instruments can be used to enable and support innovation testing in aviation and how they should be applied in an ITF context.

It focuses exclusively on those tools that are directly relevant to controlled experimentation and early-stage operational trials, and on the practical role they play in authorising, containing and supervising ITF activities. It does not seek to reproduce or interpret the full legal framework.

The objective is to clarify, for both authorities and applicants, what the current regulatory system already allows, what its boundaries are, and how different instruments can be combined in a coherent manner to support safe and proportionate testing. In doing so, this section aims to reduce uncertainty and inconsistent practices when assessing ITF proposals and designing appropriate authorisation pathways.

Detailed legal references and background explanations are provided separately in Annex A.

3.2 Overview of Applicable Regulatory Tools

Note: Terms such as “prototype”, “demonstrator” or “experimental” are used in this document in a descriptive, non-regulatory sense. Their regulatory treatment depends on whether the aircraft falls within the scope of Regulation (EU) 2018/1139 or is excluded under Annex I.

ITF activities do not rely on a single regulatory instrument. In practice, they are enabled through a coordinated use of several existing airworthiness, operational and airspace tools, applied in a proportionate and project-specific manner.

Depending on the nature of the technology and the operational concept, ITF testing may typically be supported by one or more of the following instruments:

Permit to Fly and approved Flight Conditions

A Permit to Fly (PtF), issued in accordance with Part-21 and based on approved Flight Conditions, enables the operation of aircraft that do not yet fully comply with the applicable airworthiness requirements for the issue of a Certificate of Airworthiness. It is the principal airworthiness instrument for ITF activities involving aircraft subject to Part-21, including developmental aircraft and certain test or demonstrator configurations, such as higher-airspace platforms and advanced vehicles.

A PtF occupies a distinct position within the EU aviation safety framework when compared to airworthiness certificates such as a Certificate of Airworthiness or a Restricted Certificate of Airworthiness. While the latter benefit from automatic recognition across Member States under the Basic Regulation, a Permit to Fly does not confer the same level of mutual recognition.

This difference reflects the fundamentally different purpose and assurance level associated with a PtF. A Certificate of Airworthiness is issued on the basis that the aircraft fully complies with the applicable airworthiness requirements and is therefore considered to meet a harmonised and stable level of safety across the Union. In contrast, a Permit to Fly is specifically intended to enable the operation of aircraft that do not yet, or no longer, fully comply with those requirements.

Such operations are conducted under defined limitations and for specific purposes, such as development, testing, demonstration or ferry flights, and are supported by approved Flight Conditions tailored to the individual case and the specific phase of development (e.g. prototype or demonstration stage).

Because the safety justification underpinning a PtF is inherently case-specific and may involve uncertainties or deviations from standard certification requirements, other Member States retain the prerogative to assess whether, and under which conditions, such operations may take place within their airspace. As a result, a PtF is generally valid in the State of registry, and operations in other States are subject to acceptance or additional authorisation by the competent authorities concerned.

Within this context, the role of Part-21 remains nevertheless significant. Although it does not establish automatic mutual recognition for Permits to Fly, it provides a harmonised framework for the development and approval of Flight Conditions and for the issuance of the PtF. In particular, the involvement of EASA in the approval of Flight Conditions in many cases ensures a consistent technical approach across Member States. This harmonisation facilitates a common understanding of the safety case and can support, in practice, the assessment and acceptance of PtF-based operations by other authorities, even if such acceptance is not automatic.

This distinction is of particular relevance for innovation and testing activities. While the PtF is the primary airworthiness tool enabling such activities within the Part-21 framework, the absence of automatic mutual recognition means that cross-border testing campaigns may still require additional coordination between authorities. This highlights the importance of structured approaches, such as an ITF, to support coherent and efficient authorisation processes across jurisdictions while maintaining the required level of safety oversight.

Operational authorisations[2] based on a risk assessment

[2] The dedicated term "Operational Authorisation" in UAS regulation reflects the distinct characteristics of drone operations, including the absence of an onboard pilot, highly variable operational environments and the lack of a traditional AOC-based oversight structure.

ITF activities may involve both unmanned and manned aircraft. For manned aircraft, the ITF may support testing of new operational capabilities or procedures under controlled conditions. Such activities may, where appropriate and authorised, include the conduct of operational missions, provided that they remain within the defined scope and limitations of the ITF. The ITF does not replace existing operational approval frameworks. Activities are expected to transition to standard regulatory pathways once the concept has reached sufficient maturity.

For operations not subject to airworthiness certification under Part-21, including many unmanned aircraft systems and certain hybrid or non-traditional operations, National Competent Authorities may issue operational authorisations based on a risk assessment methodology, in particular the Specific Operations Risk Assessment (SORA). These authorisations allow defined operational scenarios to be conducted within controlled and limited environments and are an important enabler for ITF trials that do not require a full airworthiness approval under Part-21.

It is important to note that the Permit to Fly under Part-21 and the SORA-based Operational Authorisation are alternative primary pathways. Where a PtF applies, a SORA-based authorisation is not required. Conversely, where operations are authorised through SORA, no PtF applies. Additional operational or airspace measures may complement either pathway but do not constitute a separate authorisation.

Determining the Applicable Authorisation Pathway for ITF Activities

The selection of the appropriate regulatory instrument for an ITF activity depends primarily on whether the aircraft is subject to airworthiness certification under Regulation (EU) 2018/1139 and its implementing rules.

This determination requires assessing whether the aircraft falls within the scope of Regulation (EU) 2018/1139 or, in the case of manned aircraft, is excluded under Annex I of that Regulation and therefore subject to national oversight rather than the Part-21 airworthiness framework. Unmanned aircraft systems (UAS) are regulated under a separate framework and are not covered by Annex I.

The ITF does not create a separate regulatory pathway. Rather, it relies on the coordinated application of existing airworthiness, operational and airspace instruments within the applicable European aviation framework.

Accordingly, EU law introduced a risk-assessed, mission-based authorisation mechanism. Manned aviation evolved differently. Aircraft certification, pilot licensing and operator certification were developed first, with operational capability approvals layered onto this framework. As a result, operational authorisation in manned aviation is embedded across the AOC system, specific approvals and high-risk SPO authorisations, rather than consolidated in a single instrument.

Step 1 – Determine Whether the Aircraft Falls Within the Part-21 Airworthiness Framework

This includes aircraft that:

- require a type certificate or restricted type certificate;
- are subject to EASA design oversight under Part-21; or
- fall within categories of unmanned aircraft requiring certification in accordance with Regulation (EU) 2019/945 and the applicable implementing rules, including, where relevant, certification outputs such as a Design Verification Report (DVR).

The applicable ITF pathway is determined by the regulatory classification of the aircraft and operation. It is not determined solely by operational risk level, SAIL classification or aircraft size.

Depending on the characteristics of the aircraft and operation, ITF activities involving UAS may follow either:

- an operational-authorisation pathway, including SORA-based authorisations within the specific category; or
- an airworthiness-based pathway where certification or airworthiness approval requirements apply.

For novel or atypical systems where the applicable classification is not immediately evident, early coordination with the competent authority and, where appropriate, EASA is recommended.

Aircraft Subject to Part-21

Where the aircraft falls within the Part-21 framework:

- a Permit to Fly (PtF) may be issued for development, test or demonstration activities based on approved Flight Conditions;
- the manned or unmanned status of the aircraft does not affect the applicability of the PtF; and
- operational limitations and dedicated airspace arrangements may be applied where necessary to ensure containment and safe integration.

In such cases, the ITF activity proceeds through the airworthiness-based pathway, complemented by any necessary operational or airspace measures.

Aircraft Not Subject to Part-21

Where the aircraft does not fall within the Part-21 framework:

- the activity is authorised primarily through an operational authorisation, typically supported by a risk assessment methodology such as the Specific Operations Risk Assessment (SORA), in accordance with Regulation (EU) 2019/947; and
- no Permit to Fly is required.

In such cases, the ITF activity proceeds through the operational-authorisation pathway.

Annex I Aircraft

Aircraft falling under Annex I of Regulation (EU) 2018/1139 are excluded from the EASA airworthiness framework and remain under the responsibility of the National Competent Authority.

For such aircraft, including experimental or developmental manned aircraft, approvals are granted in accordance with applicable national legislation. This may include both airworthiness and operational approvals, as defined by the State of registry or operation.

The ITF does not alter this allocation of responsibilities. Activities involving Annex I aircraft shall therefore be conducted under the applicable national regulatory framework.

Transitional and Novel Aircraft Concepts

For certain innovative or developmental aircraft concepts, the boundary between activities falling outside the scope of Union aviation legislation and those subject to Part-21 requirements may not always be immediately apparent during early development phases. This may apply, for example, to certain free balloons, partially controllable High-Altitude Platform System (HAPS) concepts, or other unconventional higher airspace systems.

While certain controllable lighter-than-air systems or powered HAPS concepts may be subject to Part-21 airworthiness requirements, other balloon categories, including free gas balloons, free hot-air balloons, tethered balloons or other non-powered balloon concepts, may fall outside the scope of those requirements. Depending on the aircraft classification and the applicable regulatory framework, such activities may remain subject to national oversight arrangements or require case-by-case determination of the applicable regulatory basis and allocation of responsibilities.

In such circumstances, early coordination with the competent authority and, where appropriate, EASA is recommended to determine the applicable framework, approval basis and responsibilities.

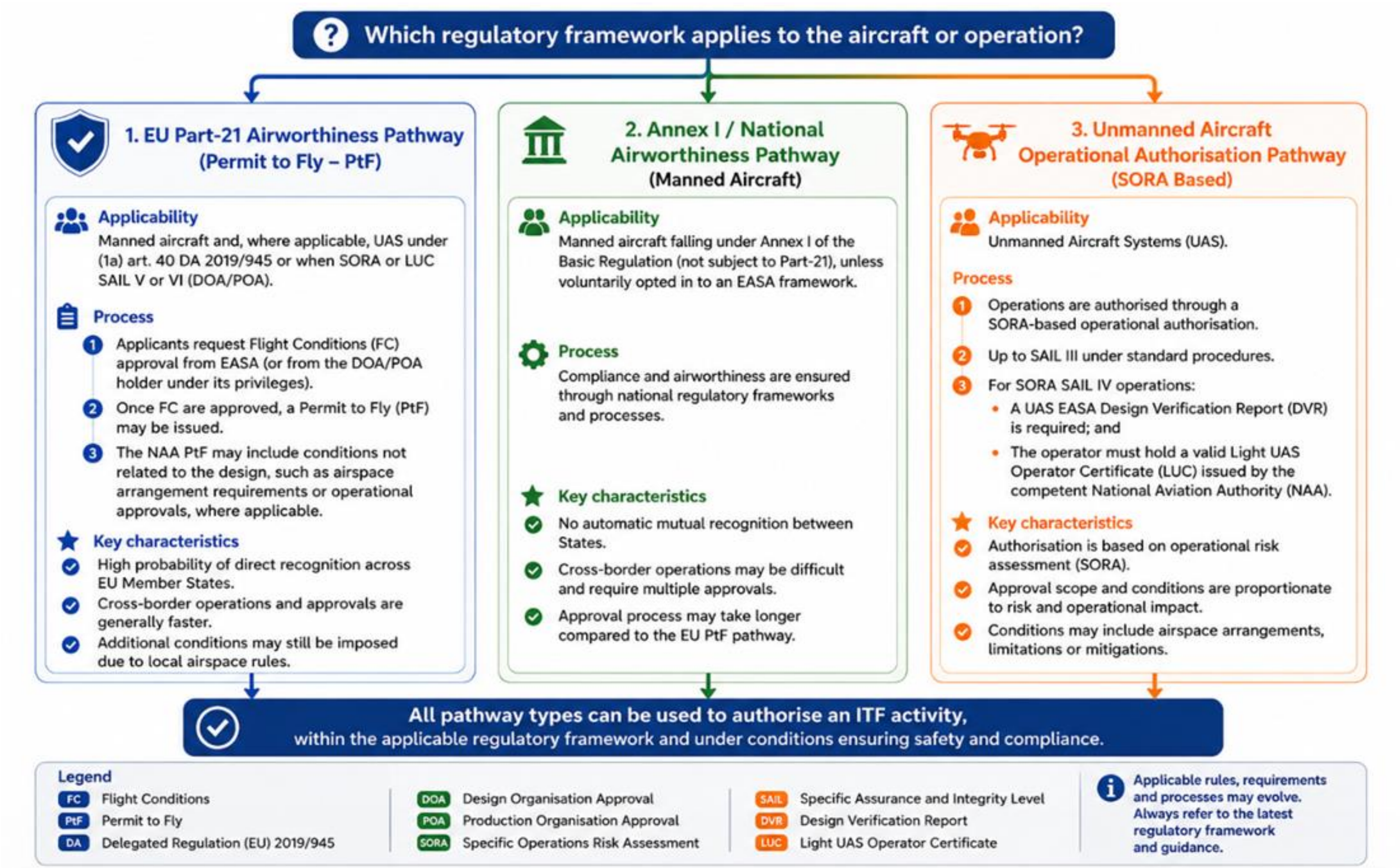

Figure 1 provides a simplified illustration of the principal ITF authorisation pathways addressed in this guidance.

Figure 1: Authorisation Pathway Decision Tree for Innovation Testing Framework (ITF) Activities

The determination of whether an aircraft or operation is subject to Part-21 airworthiness requirements or follows an operational-authorisation pathway depends on the applicable provisions of Regulation (EU) 2018/1139 and its associated delegated and implementing rules, including, where applicable, Regulations (EU) 2019/945 and 2019/947.

Applicants should consult the relevant regulatory provisions and coordinate with the competent authority in cases where the applicable classification or pathway remains uncertain.

Step 2 – Airspace Arrangements and Containment Measures

Regardless of whether an ITF activity proceeds through the airworthiness-based pathway or the operational-authorisation pathway, additional airspace arrangements may be required to ensure effective risk containment and safe integration with other airspace users while minimising disruption to existing operations where practicable.

Depending on the nature of the activity and the applicable national framework, such arrangements may include temporary segregated areas, reserved airspace volumes, danger areas, prohibited areas or other dynamically managed airspace structures established through the relevant airspace management processes.

Airspace measures supporting ITF activities may therefore include:

- segregated or reserved airspace areas established and activated through appropriate airspace management processes and notified through aeronautical information services (e.g. NOTAM);
- defined altitude blocks or vertical corridors;
- temporary climb and descent corridors;
- coordinated activation and deactivation procedures;
- publication and dissemination of relevant aeronautical information through NOTAM, AIP Supplements or other appropriate means;
- procedures ensuring timely activation and deactivation of airspace structures, including early release where the associated hazard has ceased; and
- coordination with military authorities or neighbouring airspace users, where applicable.

Airspace measures are established in accordance with applicable national airspace management processes and may involve one or more competent authorities, the Air Navigation Service Provider (ANSP), and other relevant stakeholders.

Such arrangements:

- complement, but do not replace, airworthiness or operational authorisations;
- limit exposure of uninvolved third parties, including persons and activities on the ground and, where relevant, other airspace users;
- support safe interaction with air traffic services; and
- provide containment of operational uncertainties during testing.

For higher-altitude, beyond-visual-line-of-sight (BVLOS), or cross-border ITF activities, structured airspace coordination will typically form a critical element of the authorisation framework.

Where activities may affect network capacity, traffic flows or airspace availability, coordination may also involve EUROCONTROL, particularly in its role as Network Manager.

Flexibility in operational procedures and competencies
Where innovative operations introduce new roles, novel levels of automation or non-standard operational concepts, National Competent Authorities may define project-specific operating conditions and competency requirements, provided that the applicable safety objectives are met. This may include tailored procedures, temporary limitations and competency-based approvals for personnel involved in ITF activities.

Exemptions under Article 76(4) of the Basic Regulation

In highly exceptional circumstances, exemptions granted by EASA to holders of EASA certificates under Article 76(4) of Regulation (EU) 2018/1139 may support specific ITF-related activities. Such exemptions are subject to strict conditions and are not intended to serve as a routine mechanism for enabling innovation trials.

Not all flexibility mechanisms provided in the EU aviation framework are suitable for ITF activities. In particular, instruments designed for system-level regulatory adaptation or for urgent and unforeseeable operational situations are not appropriate for the planned and structured nature of ITF testing. These boundaries are further clarified in Section 3.7.

The following table gives an overview on a combination of the mechanisms ITF testing can typically rely on:

Table 1: Overview of Regulatory Instruments Supporting ITF Activities

Tool	What it Enables	Competent Authority	Typical ITF Relevance
Permit to Fly (PtF) + Approved Flight Conditions[3]	Development, test, or demonstration flights of aircraft subject to Part-21 that do not yet fully comply with applicable airworthiness requirements	EASA (approval of Flight Conditions, where applicable) + NCA (issuance of PtF)	Primary airworthiness instrument for ITF activities involving Part-21 aircraft, including higher airspace platforms (HAPS, certain balloons[4], novel aircraft), whether manned or unmanned
Operational Authorisation (risk-based, e.g. SORA)	Authorisation of operations not subject to Part-21 airworthiness certification, based on a structured operational risk assessment	NCA	Enables controlled ITF activities for aircraft and operational concepts not subject to certification, across a range of operational contexts and risk levels

[3] The use of Flight Conditions and Permits to Fly for experimental or developmental aircraft is an established mechanism within the existing regulatory framework. The ITF does not replace or modify this approach. Instead, it provides a structured context in which such existing instruments can be applied in a coordinated manner, particularly where activities involve multiple stakeholders, novel concepts or increased operational complexity. The ITF should therefore be understood as an organisational and coordination framework, rather than a new regulatory instrument.

[4] The relevance of Part-21, Flight Conditions and Permit to Fly pathways depends on the characteristics and regulatory classification of the aircraft concerned. While certain controllable lighter-than-air systems or powered HAPS concepts may fall within Part-21 applicability, other balloon categories, including free gas balloons, free hot-air balloons, tethered balloons or other non-powered balloon concepts, may remain outside the Part-21 framework and may be subject to national oversight arrangements or other applicable regulatory provisions

Tool	What it Enables	Competent Authority	Typical ITF Relevance
Airspace Arrangements (segregated, reserved, temporary structures)	Containment of operational risk and safe integration with other airspace users through coordinated airspace allocation	NCA + ANSP	May apply under different regulatory pathways and is particularly relevant for advanced operations, including higher airspace activities, BVLOS operations and cross-border testing. Implementation is carried out in accordance with applicable national processes and the principles of Flexible Use of Airspace (FUA) and Advanced Flexible Use of Airspace (AFUA).
Training and Competency Arrangements	Tailored competency frameworks and operational conditions for novel operator roles or automation concepts	NCA	Applied where existing licensing or competency frameworks do not fully reflect ITF roles
Article 76(4) Exemptions	Targeted and temporary exemptions for certificate holders in highly exceptional and justified cases	EASA	Not a routine ITF tool; may only apply in exceptional cases subject to strict legal conditions and safeguards

Note: The relevance of Part-21, Flight Conditions and Permit to Fly pathways depends on the characteristics and regulatory classification of the aircraft concerned.

3.3 Permit to Fly and Flight Conditions (Primary ITF Tool)

3.3.1 Purpose

A Permit to Fly (PtF) is an airworthiness authorisation that allows an aircraft to operate when it does not yet meet, or no longer meets, the applicable airworthiness requirements for the issue of a Certificate of Airworthiness.

In an ITF context, the Permit to Fly is the principal instrument enabling the flight testing of aircraft that are still in development or that are being operated in configurations not yet eligible for a full certificate. This typically includes, in particular:

- aircraft in development or test configurations (often referred to in industry as “prototypes” or “demonstrators”), provided they are subject to Part-21,
- higher airspace platforms and stratospheric vehicles,
- aircraft integrating novel propulsion systems or energy concepts,
- aircraft incorporating new levels of automation or innovative system architectures, and
- supersonic or hypersonic demonstrator vehicles.

It is noted that manned aircraft classified as “experimental” under Annex I of Regulation (EU) 2018/1139 fall outside the Part-21 framework and are therefore not eligible for a Permit to Fly under that Regulation. Such aircraft are subject to national regulatory oversight, which may vary between Member States.

In the context of an ITF, particular attention should therefore be given to ensuring an appropriate level of safety and coordination, taking into account the specific national framework and the characteristics of the activity.

The Permit to Fly enables such aircraft to be operated for clearly defined purposes and within a limited operating envelope, while ensuring that an adequate level of safety is demonstrated for the intended flights.

The use of a Permit to Fly within an ITF does not modify its legal nature under Part-21; it remains an airworthiness instrument applied within its existing regulatory framework.

3.3.2 Allocation of Responsibilities

For aircraft falling under EASA design oversight, the responsibilities related to the Permit to Fly are clearly split between EASA and the National Competent Authorities. EASA is responsible for the approval of the Flight Conditions, including the associated limitations and safety provisions, for aircraft under its design responsibility.

The National Competent Authority of the State of registry is responsible for issuing the Permit to Fly on the basis of the approved Flight Conditions and for ensuring that the operational and administrative conditions attached to the permit are fulfilled.

For aircraft falling under national competence (Annex I aircraft), the National Competent Authority is responsible for the applicable approvals in accordance with national regulatory frameworks, including, where relevant, the approval of Flight Conditions and the issuance of Permits to Fly or equivalent authorisations.

As these frameworks may differ between Member States, particular attention should be given to the implications for cross-border activities and for the potential transition towards certification or broader deployment.

This allocation of responsibilities applies equally when a Permit to Fly is used in the context of ITF activities.

3.3.3 Specific Considerations for Innovation Testing Frameworks

The Permit to Fly issued in accordance with Part-21 is particularly well suited for ITF activities because it is specifically designed to support controlled and progressive flight testing of non-standard or immature aircraft configurations.

In an ITF context, the Flight Conditions associated with a Permit to Fly typically define:

- the approved aircraft configuration and system status,
- the permitted purpose of flight testing,
- limitations on altitude, speed, geographical area and environmental conditions,
- crew or operator requirements, including any specific experience or training needs,
- maintenance, inspection and configuration control requirements, and
- any additional safety measures necessary to mitigate identified risks.

These limitations and conditions enable the authority to contain the operational exposure and to authorise testing in a phased manner, allowing the operating envelope to be progressively expanded as experience and evidence are gathered.

Operational restrictions associated with a Permit to Fly should therefore not be regarded as a drawback for ITF activities. On the contrary, they constitute an essential safeguard that enables real-world experimentation to be conducted in a controlled and proportionate manner.

3.3.4 Typical Use of a Permit to Fly within an Innovation Testing Framework

Within an ITF, a Permit to Fly issued in accordance with Part-21 is typically used to support, among others:

- first flights and initial envelope expansion of a novel aircraft or platform,
- testing at progressively higher altitudes or under new environmental conditions,
- integration and validation of new propulsion, energy storage or control systems,
- introduction and assessment of new automated or autonomous functions,
- demonstration campaigns intended to generate evidence for future certification specifications or regulatory development.
- enabling operations of aircraft under approved Flight Conditions in situations where full compliance with the applicable airworthiness requirements has not been demonstrated, provided that an adequate level of safety is ensured.

The Permit to Fly provides the airworthiness framework within which these activities can be conducted safely. It is normally complemented by operational authorisations and appropriate airspace arrangements, as described in Sections 3.4 and 3.5.

The Permit to Fly, together with the approved Flight Conditions, provides the airworthiness framework within which these activities may be conducted safely. Depending on the applicable operational category, the characteristics of the proposed operation, and any privileges held by the operator, it may need to be complemented by an operational authorisation, declaration, or other applicable operational approval, as well as by appropriate airspace arrangements, as described in Sections 3.4 and 3.5.

For UAS specifically designed or modified for research, experimental, or scientific purposes and likely to be produced in very limited numbers, the applicable EU regulatory framework provides for operation under a Permit to Fly issued in accordance with Part-21. The issuance of such a Permit to Fly does not, in itself, determine whether a separate operational authorisation is required. Where the operation falls within the specific category, the applicable requirements of Regulation (EU) 2019/947 remain relevant.

A recommended structure for the safety case supporting Flight Conditions in an ITF context is provided in Annex G.

3.4 Operational Tools for Innovation Testing Framework Activities

While the Permit to Fly is the primary airworthiness instrument for ITF activities involving prototype or aircraft in development or test configurations subject to Part-21, many ITF projects rely primarily on operational approvals rather than on airworthiness approvals alone. This is particularly the case for unmanned aircraft systems and for innovative operational concepts where the main risks arise from the way the operation is conducted. In an ITF context, operational tools may be used to manage and mitigate risks, including, where appropriate, the use of constrained or low-risk environments, progressive envelope expansion, and other risk mitigation measures.

ITF activities involving unmanned aircraft systems should address both air risk and ground risk considerations in accordance with the applicable operational risk-assessment framework and the characteristics of the operational environment.

3.4.1 Operational Authorisation (SORA based) or Operations under LUC privileges

For unmanned aircraft operations falling within the specific category, the National Competent Authority may issue an operational authorisation based on an operational risk assessment conducted using the Specific Operations Risk Assessment (SORA) methodology. Where a UAS operator holds a Light UAS Operator Certificate (LUC) with the appropriate privileges, the operator may authorise the operation under those privileges, subject to the scope and conditions of the LUC.

The ITF does not replace SORA as an operational risk assessment methodology, nor does it create a separate operational authorisation. Rather, it provides a structured context in which a SORA-based authorisation, or an operation conducted under LUC privileges, may be coordinated with other regulatory instruments, authorities, stakeholders, and testing activities.

Operational characteristics such as automation or autonomy functions, unconventional command-and-control architectures, beyond-visual-line-of-sight operations, or operations in segregated or otherwise managed airspace do not, in themselves, create a need for an ITF. Such characteristics may normally be assessed using the applicable SORA methodology.

An ITF may provide additional value where, for example:

- the operation requires coordination between the operational authorisation and other approvals, such as airworthiness, airspace, environmental, or spectrum-related approvals;
- several competent authorities, Member States, or air navigation service providers are involved;
- the proposed operating concept requires progressive testing to generate evidence needed to substantiate SORA assumptions, mitigations, or operational safety objectives;
- the operating envelope is expected to evolve materially during the testing programme;
- the operation raises regulatory or operational interfaces that are not adequately addressed through the routine authorisation process alone; or
- the testing is intended to support the development of future regulatory provisions, acceptable means of compliance, standards, or operational procedures.

Within an ITF, the SORA process may define safety objectives and mitigation measures proportionate to the actual operational risks and the characteristics of the test environment. These may include appropriately managed airspace, ground-risk containment measures, procedures for monitoring and recovering command-and-control links, detect-and-avoid performance requirements, or limitations on the use of particular functions during initial test phases.

Where appropriate, the operational authorisation or the operation approved under LUC privileges may incorporate staged limitations and conditions, allowing the operating envelope to be progressively expanded as compliance is demonstrated and supporting safety evidence is accumulated. Any significant change to an operation conducted under an operational authorisation remains subject to the applicable requirements for amendment of that authorisation.

A SORA-based operational authorisation, or an operation conducted under appropriate LUC privileges, may therefore constitute one of the regulatory instruments used within an ITF to enable controlled trials of unmanned-aircraft operational concepts.

Certain Higher Airspace Operations, including some HAPS concepts, may involve characteristics requiring particular consideration when applying existing operational risk assessment methodologies. These may include:

- extended overland trajectories;
- large potential ground-risk footprints;
- long-endurance operations;
- operations across different airspace environments; and
- very-high-altitude operating environments.

Where the standard application of the methodology does not adequately address all relevant aspects of the proposed operation, additional safety assessments, mitigation measures, evidence, or coordination with the competent authorities may be necessary.

3.4.2 Airspace Arrangements

Most ITF trials require dedicated airspace arrangements in order to ensure effective risk containment and safe integration with other airspace users. Such arrangements are typically complemented by additional technical and operational mitigation measures, recognising that airspace segregation alone may not fully address all risk scenarios.

Depending on the nature of the activity and the applicable national framework, airspace arrangements supporting ITF activities may include temporary segregated areas, reserved airspace volumes, taking into account traffic density and the need to minimise risks and impacts on other airspace users, prohibited areas, danger areas or other dynamically managed airspace structures established through the applicable airspace management processes, including arrangements established in accordance with Flexible Use of Airspace (FUA) principles where applicable. Where relevant, coordination with military airspace users may also be required.

Airspace arrangements are established at State level in accordance with national airspace management processes. Depending on the State of operation, this may involve the National Competent Authority(ies), the Air Navigation Service Provider (ANSP), and other relevant stakeholders, with coordination mechanisms varying depending on the national framework and the nature of the activity.

In an ITF context, these arrangements serve to limit the exposure of uninvolved third parties, to create predictable interfaces with air traffic services, and to support monitoring and, where necessary, timely intervention by the authority or the ANSP.

Airspace arrangements should be defined and agreed before the issuance of the relevant flight or operational authorisations and need to be fully reflected in the applicant's operational procedures.

Where relevant, coordination between the applicant, ANSP(s) and other stakeholders should support the identification and implementation of appropriate mitigation measures, including adjustments to airspace configuration or operational planning where practicable.

Depending on the complexity of the proposed activity, the establishment of airspace arrangements may require significant preparation and coordination activities, including airspace design, operational assessments, staffing considerations and aeronautical information publication processes.

Applicants should therefore engage with the relevant authorities and ANSP(s) sufficiently early to allow adequate planning and implementation timelines.

3.4.3 Flexibility on Operational Rules and Procedures

Within the boundaries of the applicable EU operational regulations, National Competent Authorities may apply tailored operational conditions and procedures in order to enable ITF testing.

Such flexibility may concern, for example, specific procedures for experimental or developmental flights, adapted visual or beyond-visual-line-of-sight arrangements in controlled test environments, dedicated communication and coordination procedures with air traffic services, project-specific contingency and recovery procedures, or operating limitations linked to the maturity of the system under test.

The flexibility described in this section does not modify the safety objectives or assurance levels associated with the applicable SORA framework and SAIL classification.

Any tailored operational procedures, testing arrangements or mitigation strategies used within an ITF context should continue to ensure that the required level of safety associated with the applicable SAIL level is adequately achieved.

Any such flexibility should remain consistent with the essential requirements and should be justified by the specific needs of the ITF project. It should be explicitly documented in the applicable operational authorisation and associated conditions.

Operational flexibility in an ITF does not remove the obligation of the operator to comply with safety management, occurrence reporting and oversight requirements. It allows those requirements to be applied in a proportionate manner that reflects the experimental nature and controlled scope of the activity.

3.5 Exemptions under Article 76(4) (Note: of limited relevance for ITF activities)

Article 76(4) of Regulation (EU) 2018/1139 allows EASA to grant exemptions to organisations holding an EASA certificate, subject to strict legal conditions and procedural safeguards defined in the Basic Regulation.

This mechanism is designed to address exceptional situations where urgent and unforeseeable circumstances or urgent operational needs require a temporary deviation from otherwise applicable requirements. It is therefore not intended as a general flexibility instrument for innovation or experimental testing. In the context of ITFs, the use of Article 76(4) exemptions is expected to remain very limited. ITF activities are, by their nature, planned and structured testing campaigns, with clearly defined objectives and timelines. As a result, they normally do not meet the legal criteria of urgency or unforeseeability required for the application of Article 71(1).

Article 76(4) should therefore not be considered a standard ITF enabler. It may only be relevant in highly exceptional cases, for example where an unforeseen safety concern or an urgent operational issue affecting a certificated organisation requires a short-term and carefully controlled deviation in order to allow specific testing or validation activities to take place.

Where Article 76(4) is used in connection with an ITF-related activity, its application remains subject to all applicable legal safeguards, including transparency obligations, notification of the European Commission and other Member States, and strict time limitations.

For the avoidance of doubt, ITFs should primarily rely on the established airworthiness and operational tools described in Sections 3.3 and 3.4. Article 76(4) exemptions are a measure of last resort and should not be used to compensate for the absence of an appropriate testing or approval pathway within the normal regulatory framework.

3.6 Licensing, Competency and Crew Tailored Competency Arrangements for ITF Activities

While existing regulatory frameworks already provide mechanisms for experimental aircraft, the ITF extends this approach to the testing of operational concepts in a structured and coordinated manner. This may include the progressive development and validation of operational procedures under controlled conditions. Such activities remain subject to defined limitations, appropriate oversight and an acceptable level of safety. The ITF does not replace or remove the requirement for an operational framework, nor does it allow unrestricted or undefined operations.

Many innovative aviation concepts, and in particular higher airspace operations and highly automated or remotely supervised systems, do not fit neatly within existing crew licensing and qualification frameworks. In some cases, the operational concept introduces new roles or combinations of responsibilities that are not addressed by current licence categories or ratings. In an ITF context, this may create a practical barrier to conducting controlled testing, even where the airworthiness and operational risks of the activity can be appropriately managed.

Within their national oversight responsibilities, National Competent Authorities may therefore apply a competency-based approach for personnel involved in ITF operations, where no suitable licensing framework exists or where existing licences do not adequately reflect the actual tasks and responsibilities associated with the experimental operation.

Such an approach should focus on the demonstrated ability of the individuals concerned to perform their assigned functions safely in the specific ITF environment. This typically includes, but is not limited to, familiarity with the prototype or experimental system, understanding of its operating limitations and failure modes, proficiency in normal and abnormal procedures, and the ability to coordinate effectively with air traffic services and with the authority’s monitoring arrangements.

Demonstration of competency within an ITF context may be supported by objective evidence appropriate to the nature of the activity. Depending on the operational context, this may include documented training programmes, simulation or practical training activities, assessments of normal and abnormal procedures, operational demonstrations, or evidence of familiarity with system limitations and operational constraints. The competent authority should assess whether the proposed competency arrangements are appropriate for the intended activity and associated operational risks.

Any competency or training arrangements established for an ITF should be clearly linked to the approved operational concept and the associated safety case or operational risk assessment. They should be documented as part of the applicable authorisation and remain limited to the scope and duration of the ITF activity.

The use of competency-based arrangements in an ITF does not constitute the creation of a new licence or rating, nor does it prejudge future regulatory solutions for licensing of novel operations. One of the objectives of ITF testing is precisely to generate evidence that can support the future development of appropriate licensing and qualification frameworks where regulatory gaps are identified.

3.7 Regulatory Tools not Applicable in Innovation Testing Frameworks

Not all regulatory mechanisms provided by the EU aviation framework are suitable for supporting ITF activities. Some instruments are designed to address system-level regulatory adaptations or exceptional operational situations and should not be used to authorise or facilitate planned experimental testing.

For clarity and to avoid misinterpretation, the following tools should not be considered applicable for the establishment or operation of an ITF.

3.7.1 Article 18 - Delegated Acts

Article 18 of Regulation (EU) 2018/1139 empowers the European Commission to adopt delegated acts to amend or supplement certain non-essential elements of the regulatory framework. This provision is a legislative and regulatory mechanism. It enables the evolution of the regulatory system itself and does not constitute an operational or authorisation tool that can be used by authorities or applicants for individual projects.

Article 18 of Regulation (EU) 2018/1139 primarily concerns delegated acts applicable to manned aviation, while unmanned aircraft systems are addressed under separate provisions, notably Articles 55 to 58 BR.

Article 18 cannot be used to grant case-specific flexibility, to authorise experimental flights, or to enable ITF activities. All flexibility relevant for ITF testing should instead be achieved through the existing airworthiness and operational instruments, such as Permits to Fly, SORA-based operational authorisations and national airspace management arrangements.

3.7.2 Article 71 - Exemptions in Urgent and Unforeseeable Circumstances

Article 71 of Regulation (EU) 2018/1139 allows Member States, and in certain cases the European Commission, to grant temporary exemptions from applicable requirements where urgent and unforeseeable operational circumstances arise.

This mechanism is intended to address exceptional and time-critical situations, such as unforeseen operational disruptions or urgent safety-related needs.

Because ITF activities are planned, structured and pre-defined testing campaigns, Article 71 is, as it stands today, not suitable for their authorisation. It should not be used to support developmental testing, experimental projects or innovation programmes that can be anticipated and planned in advance.

Article 71 exemptions can therefore today not be considered an ITF tool and should only be used in genuinely exceptional situations falling within their intended legal scope.

3.8 Responsibilities of EASA and Member States in ITF testing

ITF activities rely on close cooperation between EASA, National Competent Authorities and, where relevant, Air Navigation Service Providers. The responsibilities described in this section derive from the existing EU aviation regulatory framework and are not created, modified or extended by the use of an ITF.

They are restated here to provide clarity on the allocation of responsibilities within innovation-testing activities, particularly where airworthiness, operational authorisation, airspace management and oversight processes need to be coordinated. The added value of the ITF lies in supporting that coordination rather than in establishing new approval responsibilities or regulatory privileges.

EASA:

EASA's involvement in an ITF depends on the regulatory domains engaged by the proposed activity and on the allocation of competences under the applicable Union framework. In the airworthiness domain, EASA is responsible for the approval of Flight Conditions for aircraft falling under its design oversight, except where the relevant privileges have been granted to an approved design organisation.

Approved Design Organisations may, within the scope of their existing Part-21 privileges, approve Flight Conditions and, where specifically authorised, issue Permits to Fly. These responsibilities and privileges are not specific to an ITF; they may, however, form part of the wider set of regulatory instruments coordinated within an ITF testing activity.

EASA may also support the consistent application of certification-related requirements and provide technical expertise where a project involves novel technologies, complex regulatory interfaces or matters falling within its areas of competence. Information and experience gathered through ITF activities may also contribute to regulatory learning, future rulemaking, certification specifications and guidance material.

National Competent Authorities (NCAs):

NCAs remain the competent bodies for the authorisation and oversight of ITF operations within their respective States. This includes the issuance of Permits to Fly on the basis of approved Flight Conditions (by EASA or, where applicable, by an approved design organisation), the issuance of operational authorisations, including those based on SORA, the approval of operational procedures and limitations, and the supervision of operators participating in ITF activities. NCAs are also responsible for monitoring compliance, conducting inspections or audits where appropriate, and for taking corrective or enforcement actions if safety concerns arise.

Where ITF activities involve aircraft registered in a third country or operating under foreign experimental or non-standard airworthiness approvals, the competent authority of the Member State concerned may need to assess the extent to which such approvals can be accepted for the intended activity within the applicable Union framework.

Depending on the nature of the activity and associated risks, this may involve complementary assessment activities related to operational limitations, airworthiness assumptions, operational procedures or safety mitigations relevant to the proposed ITF activity. Such activities should remain proportionate to the characteristics and risk profile of the operation and may involve coordination with the State of Registry and EASA where relevant.

The applicability of the ITF depends on the objectives of the activity. While certain experimental aircraft under Annex I may not fall within the typical scope of innovation-oriented development, such aircraft may still be considered where they support relevant testing objectives.

Air Navigation Service Providers (ANSPs):

ANSPs play a central role in enabling and supporting ITF activities from an airspace and traffic management perspective. They are responsible for the design, activation and management of the airspace structures required for ITF trials, for the provision of air traffic services where applicable, and for operational coordination with ITF operators and the competent authority to ensure safe integration with other airspace users.

An ITF therefore requires structured coordination between EASA, the relevant NAAs and the involved ANSP throughout all phases of the ITF lifecycle, from initial scoping and preparation to execution, monitoring and final evaluation.

Participation in ITF activities does not modify or extend the established responsibilities of Air Navigation Service Providers (ANSPs) under the applicable ATM/ANS framework, nor should ITF activities be interpreted as creating additional ATM/ANS service-provision obligations beyond those formally established for the activity.

Within the ITF framework, the role of ANSPs should remain limited to ATM/ANS, airspace-management and operational coordination functions falling within their established responsibilities under the applicable framework. ANSP involvement does not imply responsibility for technical validation, certification, performance assessment or testing of the innovative system or concept itself.

Where applicable, ANSP support activities may include:

- airspace activation and management;
- operational and traffic-management coordination;
- communication and contingency arrangements; and
- other operational support functions associated with the approved activity.

The nature and extent of ANSP involvement should remain proportionate to the operational characteristics, complexity and airspace impact of the activity.

Cross-Border ITF Activities:

Innovation testing framework activities may extend beyond the territory or airspace of a single Member State or involve aircraft registered in third countries. This is particularly relevant for Higher Airspace Operations, long-endurance platforms, supersonic or hypersonic demonstrators, and activities involving cross-border climb, descent or transit corridors. Operations conducted in upper airspace or affecting multiple Flight Information Regions (FIRs) may therefore require coordinated arrangements across national boundaries and regulatory frameworks.

Where ITF activities involve more than one Member State, structured coordination between the affected authorities is necessary to support legal clarity, effective oversight and consistent safety management. While ITF arrangements do not modify the allocation of competences established under Union law or international obligations under the Chicago Convention, they require early and transparent cooperation between the relevant actors. The ITF is intended to support such coordination through a structured and proportionate approach, particularly for cross-border or multi-location testing activities.

In cross-border cases, a Lead Authority approach is recommended. The Lead Authority should normally be:

- the National Competent Authority of the State of Registry where the aircraft is subject to Part-21 airworthiness certification;
- EASA, where applicable; or
- the authority issuing the primary operational authorisation where the activity follows an operational rather than airworthiness-based pathway.

The Lead Authority serves as the principal point of contact for the applicant and facilitates coordination between the relevant authorities involved in the ITF. This role is limited to coordination between authorities and does not replace or limit the competences of other Member States, each of which retains responsibility for activities conducted within its territory and airspace.

For aircraft operated under a Permit to Fly, validity and oversight of the PtF remain linked to the competent authority of the State of Registry or, where applicable, to the authority responsible for prescribing identification marks for an unregistered aircraft. Aircraft should hold a valid registration or other legally recognised identification arrangement in accordance with applicable ICAO and national requirements.

Where ITF activities extend into the airspace of other Member States, operational acceptance requires prior coordination with the affected authorities. Additional operational limitations or airspace conditions may be imposed where necessary to ensure safe integration with other airspace users. Early coordination between the State of Registry, affected Member States and EASA, where applicable, is strongly recommended to avoid fragmented or sequential approvals and to support appropriate planning of oversight resources and operational arrangements.

For ITF activities authorised under an operational pathway, including activities based on Regulation (EU) 2019/947 and associated risk-assessment methodologies, each Member State retains competence for operations conducted within its territory. Mutual recognition of authorisations is not automatic unless explicitly provided for in applicable legislation. Cross-border operations may therefore require coordinated or parallel authorisations supported by shared safety assessments and harmonised operating conditions.

Cross-border ITF activities may also require coordination with the relevant Air Navigation Service Providers (ANSPs), particularly where activities affect multiple FIRs or ATM/ANS environments. Depending on the nature and operational impact of the activity, such coordination may address:

- allocation and activation of airspace structures;
- traffic-management procedures;
- operational handover arrangements;
- communication and escalation procedures;
- contingency coordination;
- frequency-management considerations; and
- Letters of Agreement (LoA) or equivalent operational coordination arrangements where appropriate.

Particular attention should be given to activities involving dynamic or evolving trajectories, prolonged operations or operations crossing multiple FIR boundaries. Where military airspace users are affected, appropriate consultation mechanisms should be established at an early stage.

Where relevant, coordination may also involve EUROCONTROL, in particular in its role as Network Manager (NM), where the activity may affect network capacity, traffic flows, ATFM measures, route structures or airspace availability. Such coordination may support consistent operational arrangements, situational awareness and network-level impact assessment where appropriate.

ITF activities may also involve aircraft registered in third countries, including aircraft holding a Certificate of Airworthiness, Permit to Fly or equivalent approval issued by a non-EU State of Registry. Under international aviation law, the State of Registry retains primary responsibility for airworthiness oversight of the aircraft. In accordance with Article 33 of the Chicago Convention, Certificates of Airworthiness issued by a contracting State are recognised as valid by other contracting States provided that the standards under which they were issued meet or exceed ICAO minimum standards.

For aircraft holding a standard Certificate of Airworthiness issued in accordance with ICAO provisions, this principle supports recognition of airworthiness validity. However, recognition of airworthiness validity does not in itself constitute automatic operational approval. States retain sovereignty over their airspace and may require compliance with applicable operational rules, airspace coordination procedures and specific national conditions before permitting operations within their territory.

Additional considerations arise where the aircraft operates under an experimental certificate, special flight permit, Permit to Fly or other non-standard airworthiness approval. Such approvals may not fall within the automatic recognition framework envisaged by Article 33. In these cases, prior coordination with the competent authority of the Member State(s) concerned is required before conducting ITF activities within EU airspace. The affected Member State(s) may request additional documentation, impose operational limitations or require specific containment measures.

For ITF activities involving unmanned aircraft registered in third countries, the regulatory situation differs. ICAO standards for remotely piloted aircraft systems continue to evolve and do not yet provide a comprehensive mutual-recognition framework equivalent to that applicable to conventionally certificated manned aircraft. Where operations are conducted within EU airspace, Regulation (EU) 2019/947 and other applicable provisions apply. Where operations extend beyond EU airspace, appropriate coordination and consideration of applicable international and national frameworks may also be required.

Depending on the nature and risk profile of the activity, operational approval by the competent authority of the Member State(s) concerned may therefore be required irrespective of the airworthiness status granted by the State of Registry. Even where airworthiness documentation is recognised, ITF activities may require:

- confirmation of operational compliance with applicable Union rules;
- definition of airspace containment measures;
- coordination with the relevant ANSP(s); and
- agreement on reporting and oversight arrangements.

Early coordination between the applicant, the State of Registry, the competent authority of the Member State(s) concerned and EASA, where applicable, is strongly recommended. In complex cases, particularly those involving Higher Airspace Operations, cross-border trajectories or developmental aircraft, structured documentation of roles and responsibilities may support legal certainty, transparency and efficient oversight coordination.

Participating authorities are encouraged to document coordination arrangements in writing. This may include allocation of oversight responsibilities, agreed reporting mechanisms and, where appropriate, adapted reporting approaches reflecting the characteristics of innovative or emerging operations. Such documentation supports transparency, traceability and legal certainty, particularly for multi-phase testing campaigns or progressive envelope expansion activities.

In all cases, ITF arrangements involving cross-border activities or third-country aircraft should clearly identify:

- the allocation of airworthiness oversight responsibilities;
- the allocation of operational oversight responsibilities;
- applicable coordination and reporting arrangements; and
- mechanisms for safety information exchange and occurrence reporting.

By addressing cross-border coordination explicitly within the ITF framework, Member States can support innovation while maintaining clarity of responsibility, effective oversight and a high and uniform level of aviation safety.

Cross-Border ITF Activities/Cross-border coordination package

For cross-border ITF activities, participating authorities and organisations may establish a coordinated operational and governance framework appropriate to the nature, complexity and risk profile of the activity.

Depending on the characteristics of the operation, such coordination arrangements may include:

- identification of the lead coordinating authority where applicable;
- allocation of responsibilities between participating authorities and organisations;
- identification of involved ANSPs, airspace-management entities and operational stakeholders;
- definition of communication and escalation arrangements;
- agreed operational coordination procedures;
- minimum operational, technical and safety information to be exchanged;
- coordination milestones and decision gates; and
- arrangements for contingency management and operational changes.

The level of formality and detail associated with such coordination arrangements should remain proportionate to the scope and complexity of the activity.

Use of external operational evidence

Operational experience and flight-test evidence generated outside the immediate ITF activity, including evidence originating from third-country testing campaigns or previous experimental programmes, may be considered as part of the ITF assessment and oversight process where relevant.

Such evidence may support the reduction of technical and operational uncertainty, the validation of operational assumptions and mitigation measures, the definition of testing limitations and progression criteria, phased envelope expansion decisions, and proportionality in oversight and monitoring arrangements.

The extent to which external operational evidence may be relied upon should be assessed on a case-by-case basis, taking into account:

- traceability and integrity of the data;
- comparability of the tested configuration and operational concept;
- relevance to the proposed ITF activity;
- quality and completeness of the evidence; and
- confidence in the underlying testing and oversight environment.

Use of such evidence does not constitute automatic recognition of foreign approvals or certifications under the applicable regulatory framework.

4. Key Principles for Innovation Testing Frameworks

This chapter sets out the fundamental principles that guide the design, authorisation and execution of ITF activities, irrespective of the technology involved or the type of operation being tested. These principles provide a common foundation for competent authorities and applicants and support safe innovation within the existing EU aviation safety framework.

ITF activities remain subject to applicable Union law. The principles described below do not create new legal obligations but outline recommended practices for structuring controlled experimentation in a manner consistent with safety objectives and regulatory coherence.

4.1 Controlled Environment

Innovation Testing Framework activities should take place within a clearly defined and contained operational environment. The controlled character of an ITF is reflected in the geographical areas or airspace volumes used, the operational envelope within which testing is permitted, and the duration of the authorisation.

Where appropriate, the operating envelope may be expanded progressively, provided that predefined safety criteria and performance indicators are met. Such progressive expansion allows experience and data to inform subsequent phases of testing.

For SORA-based operations, progressive expansion of the operational envelope may be addressed through a phased authorisation approach including predefined assumptions, limitations, progression criteria and mitigation measures.

Additional assessment activities or amendments to the operational authorisation may become necessary where changes to the operating envelope result in material changes to the operational risk profile, including changes affecting air risk, ground risk, operational mitigations or SAIL determination.

Containment is a core element of safe experimentation. It limits exposure to uncertainty associated with novel technologies and ensures that potential impacts on uninvolved airspace users, persons on the ground and the environment remain proportionate and manageable.

4.2 Risk-based Approach

Innovation Testing Framework activities should be supported by a structured and proportionate risk assessment. The methodology applied depends on the regulatory pathway identified in Chapter 3.

For aircraft operated under a Permit to Fly, this will normally take the form of a safety case supporting the approval of Flight Conditions. For operations not subject to Part-21 certification, it will typically involve a SORA-based or equivalent operational risk assessment. In cases involving highly novel or complex systems, complementary analyses may be appropriate.

The purpose of the risk assessment is not to replicate full certification or operational approval processes. Rather, it is to demonstrate in a structured and transparent manner that risks are identified, mitigated and acceptable within the defined ITF environment.

The depth of analysis and level of oversight should be proportionate to the complexity and potential impact of the activity.

4.3 Defined Testing Parameters

Before ITF operations commence, the testing parameters should be clearly defined and agreed between the applicant and the competent authority.

These parameters typically include the authorised system configuration, operational limitations, environmental and performance constraints, contingency procedures, staffing and competency requirements, and reporting arrangements. Conditions governing modifications to the system or operational concept during the ITF should also be specified.

Clear definition of testing parameters supports transparency, predictability and effective oversight. It ensures that both the authority and the operator share a common understanding of the scope and boundaries of the authorised activity.

4.4 Proportionate Application of Regulatory Instruments

Within an ITF the application of such measures remains limited in scope and duration and proportionate to the objectives of the testing activity.

Regulatory objectives may be achieved through the proportionate application of existing instruments, such as Permits to Fly, operational authorisations or tailored operational conditions, where necessary to enable experimentation. Such flexibility should be explicitly linked to defined testing objectives and limited in duration and scope.

ITF arrangements are not intended to create long-term deviations from regulatory requirements. Any flexibility should remain reversible and subject to review as experience is gained.

4.5 Supervision and Compliance Monitoring

Innovation Testing Framework activities should be subject to proportionate and appropriate oversight by the competent authority. Oversight may include monitoring of operations, review of technical and operational data, inspections or audits where appropriate, and participation in test reviews or envelope expansion decisions.

Authorities should retain the ability to adjust operational limitations, require additional mitigation measures or suspend testing if safety considerations warrant intervention.

Operators participating in ITF activities are expected to maintain transparent communication with the competent authority and to report deviations, anomalies and occurrences in accordance with applicable requirements.

Preparatory and oversight activities associated with an ITF should remain proportionate to the nature, maturity and risk profile of the proposed activity.

Prior to authorisation, the focus should remain on establishing the operational, technical and regulatory conditions necessary to support safe and legally compliant testing within clearly defined boundaries.

Regulatory learning activities, including the identification of potential regulatory gaps, future standardisation needs or broader regulatory implications, may evolve progressively throughout the execution and evaluation phases of the ITF and should not normally constitute a standalone prerequisite delaying the initiation of testing activities unless directly relevant to immediate safety or legal compliance considerations.

Oversight activities should avoid unnecessary duplication with existing approval, certification or operational authorisation processes and should remain aligned with the applicable allocation of responsibilities between competent authorities and EASA.

4.6 Data Collection, Reporting and Transparency

The generation of reliable operational and technical evidence is one of the central purposes of an ITF. Data collection, reporting and information-sharing arrangements should therefore be defined as part of the ITF authorisation framework.

Data-sharing arrangements within an ITF activity should balance:

- safety oversight and operational coordination needs;
- regulatory learning objectives;
- protection of commercially sensitive information;
- cybersecurity considerations; and
- applicable confidentiality and data-protection requirements.

Safety performance indicators (SPIs), reliability metrics and other data collection parameters should be defined in a manner appropriate to the characteristics, objectives and risk profile of the specific ITF activity.

The applicant or operator should identify the proposed indicators, performance criteria and data collection methods relevant to the activity, while the competent authority should assess whether these elements are appropriate to support safety oversight, operational evaluation and testing progression where applicable.

Depending on the nature of the activity, additional coordination with EASA or other relevant stakeholders may also be appropriate.

Depending on the nature and complexity of the activity, the ITF framework may define different categories of information sharing, for example:

- authority-only information;
- limited-distribution operational coordination information; and
- non-confidential or anonymised information intended to support broader regulatory learning.

The categories, recipients, handling arrangements and confidentiality expectations associated with operational data should be agreed as part of the ITF coordination and authorisation process.

Depending on the objectives and complexity of the activity, operators may also provide concise post-test reporting or lessons-learned summaries to support operational coordination, iterative safety assessment and regulatory learning. Such reporting may include, where relevant:

- summary of the activity performed;
- operational anomalies or occurrences;
- mitigation measures applied;
- quality or completeness of collected data;
- deviations from expected behaviour; and
- recommended operational or procedural adjustments.

The level of detail and distribution of such information should remain proportionate to the activity and subject to agreed confidentiality and access arrangements.

Relevant data may include, where appropriate, safety performance indicators, system reliability metrics, automation behaviour, environmental observations and human performance aspects.

Where consistent with confidentiality, data protection and security requirements, non-confidential findings should be shared at national or European level to support harmonisation and regulatory learning.

Certain ITF activities may involve the use of artificial intelligence, machine-learning functions or adaptive automation systems. Where relevant, applicants should consider aspects such as:

- transparency of operational behaviour;
- traceability of decision logic;
- human oversight;
- validation of operational performance; and
- management of software evolution throughout the testing lifecycle.

Such considerations should be addressed proportionately to the nature and safety relevance of the system concerned.

4.7 Stakeholder Collaboration

Effective ITF implementation depends on structured collaboration between the relevant actors. This typically includes the National Competent Authority, EASA where applicable, the operator, the relevant Air Navigation Service Provider, and, where appropriate, research institutions or other stakeholders. Depending on the nature of the activity, ITF operations may also require involvement of aerodromes, vertiports, communication or surveillance infrastructure providers, and other operational support entities.

The availability, suitability and operational constraints associated with such infrastructure should be considered during the planning and coordination phases of the ITF activity.

Roles and responsibilities should be clearly defined before operations commence. Communication channels and escalation procedures should be agreed to ensure efficient coordination during testing.

Regular coordination meetings support shared situational awareness, allow early identification of emerging risks and facilitate timely adaptation of testing parameters where justified.

4.8 Competency and Training

Innovation Testing Framework activities frequently involve novel technologies, operational concepts or levels of automation that are not fully reflected in existing licensing frameworks.

Where appropriate, competent authorities may apply competency-based approaches tailored to the specific ITF context. Such arrangements should ensure that personnel involved possess adequate understanding of system limitations, failure modes, contingency procedures and coordination requirements.

Any tailored competency arrangements should remain limited to the scope and duration of the ITF and should not be interpreted as the creation of new licence categories. Experience gained may inform future regulatory development where gaps are identified.

4.9 Accountability and Safety Culture

Participation in an ITF does not reduce regulatory accountability. All actors remain responsible for compliance with applicable authorisations, operational limitations and safety management obligations.

ITF activities should be conducted within a culture that encourages transparent reporting, open dialogue and continuous learning. An ITF is a structured environment for experimentation within defined boundaries, while ensuring adequate safety levels.

By maintaining clear accountability and a strong safety culture, ITF activities can support innovation while preserving public confidence in the European aviation system.

In an ITF context, accountability and safety culture may be demonstrated through elements such as:

- clear allocation of roles and responsibilities;
- effective occurrence and anomaly reporting processes;
- transparent communication with the competent authority and relevant stakeholders;
- documented decision-making and change-management processes;
- evidence of personnel competency and safety awareness; and
- the ability to learn from operational experience and adapt procedures or mitigations where appropriate.

The level of formality associated with such elements should remain proportionate to the nature, scale and risk profile of the activity.

4.10 - Environmental and Societal Considerations

Certain ITF activities may involve environmental or societal considerations relevant to the planning and execution of the activity.

Depending on the nature of the activity, this may include aspects such as:

- noise;
- emissions;
- debris recovery considerations;
- airspace disruption effects;
- visual impact; or
- public perception and local stakeholder engagement.

The ITF framework does not replace any environmental or societal regulatory processes that may apply under the relevant legal framework. However, early consideration of such aspects may support informed decision-making, operational planning and public trust in innovative aviation activities.

5. Innovation Testing Framework Implementation Guidance

This chapter sets out a structured framework for establishing, authorising, conducting and concluding ITF activities. It is intended to provide applicants and competent authorities with a transparent and predictable process for moving from an innovative concept to controlled real-world testing and, ultimately, to regulatory learning and potential transition toward certification or routine operational approval.

The process described in this chapter is scalable and may be adapted to the size, complexity and risk profile of individual ITF projects. While the level of detail and oversight intensity may vary, the overall sequence of phases and the underlying decision logic should be preserved in order to ensure traceability, consistency and effective risk management.

The lifecycle described below applies to ITF activities involving aircraft, systems or operations falling within the scope of EU aviation regulation. This includes activities involving multiple authorities, cross-border coordination or third-country aircraft, where applicable.

ITF implementation does not create a separate regulatory pathway. Each phase relies on the coordinated application of existing airworthiness, operational and airspace instruments, as described in Chapter 3, and is guided by the principles set out in Chapter 4.

Each phase of the ITF lifecycle concludes with a defined outcome or decision point. Progression to the next phase is based on the competent authority's assessment that the objectives and documentation requirements of the preceding phase have been met. This structured approach supports transparency, proportionality and traceability without creating a separate regulatory regime.

5.1 Overview of the Innovation Testing Framework Lifecycle

An ITF typically follows a structured lifecycle composed of six sequential phases:

1. Application and project definition
2. Assessment and preparatory activities
3. Authorisation
4. Establishment of the ITF
5. Execution and monitoring of testing activities
6. Evaluation, exit and transition

Each phase builds on the outcomes of the preceding phase and is associated with specific responsibilities, documentation elements and decision points.

The lifecycle is designed to ensure that:

- the objectives and scope of the ITF are clearly defined from the outset;
- risks are identified and mitigated before real-world testing begins;
- appropriate regulatory instruments are selected and applied coherently;
- oversight and data collection arrangements are established prior to execution; and
- the results of the ITF are systematically evaluated and, where appropriate, fed into future certification, operational approvals or regulatory development.

Progression from one phase to the next normally involves an explicit decision by the competent authority[5] confirming that the conditions for continuation have been met. This staged approach supports proportionality, transparency and controlled envelope expansion.

[5] For the purposes of this guidance material, the term "competent authority" refers to the authority designated under the applicable national framework to perform the relevant regulatory functions, irrespective of whether responsibilities are organised at national or regional level within the Member State concerned. For complex, novel or higher-risk ITF activities, the competent authority may involve additional expertise, coordinate with other authorities or seek support from EASA where appropriate.

Although presented sequentially, the lifecycle allows for iterative refinement. For complex or long-duration ITF activities, certain assessment or coordination elements may be revisited as testing progresses, provided that changes remain within the authorised framework or are formally approved where required.

It is important to keep in mind that the implementation of ITF activities should remain proportionate to the scale, complexity and maturity of the activity concerned.

Depending on the characteristics of the project, proportionality may be supported through:

- phased or incremental testing approaches;
- progressive operational envelope expansion;
- use of constrained operational environments;
- reliance on existing operational evidence where appropriate; and
- tailoring of oversight, monitoring and coordination arrangements to the associated risk profile.

The objective of the ITF is to support controlled experimentation while avoiding unnecessary duplication of regulatory or operational activities.

Indicative timelines

The duration of individual ITF phases may vary significantly depending on the characteristics, maturity and complexity of the activity concerned.

Factors potentially influencing timelines include:

- novelty of the technology or operational concept;
- complexity of the operational environment;
- need for cross-border or multi-authority coordination;
- involvement of ATM/ANS stakeholders;
- availability of supporting operational evidence; and
- progressive envelope expansion approaches.

While this guidance does not establish mandatory timelines, applicants and authorities may consider indicative planning assumptions appropriate to the scale and complexity of the activity.

5.2 Roles and Responsibilities

This section builds on the allocation of competences described in Section 3.8 and focuses on their practical application within the ITF lifecycle.

Clear allocation of roles and responsibilities is essential for the safe and effective conduct of ITF activities. The establishment of an ITF does not modify the legal distribution of competences under the EU aviation regulatory framework. Rather, it provides a structured context in which existing responsibilities are exercised in a coordinated and transparent manner.

Although an ITF application is normally submitted to the competent authority responsible under the applicable regulatory framework, the implementation of an ITF may require the coordinated participation of several competent authorities and other organisations. Depending on the nature and scope of the testing activity, this may include EASA, other National Competent Authorities, air navigation service providers, military authorities or other public bodies.

Where multiple organisations are involved, including, for example, cross-border activities or operations involving third-country aircraft, appropriate governance arrangements should be established to identify the participating organisations, define their respective roles and responsibilities, and facilitate effective coordination throughout the ITF lifecycle. These arrangements do not alter the underlying legal allocation of competences but provide a practical framework for cooperation. Where appropriate, the participating organisations are encouraged to formalise these arrangements through a cooperation agreement, such as a Memorandum of Understanding (MoU) (see also Chapter 3)

5.2.1 National Competent Authority (NCA)

The National Competent Authority (NCA) of the Member State in which the ITF activity is initiated typically acts as the lead authority for its establishment and supervision.

The NCA receives and assesses ITF proposals and determines whether the proposed activity is suitable for an ITF approach, taking into account its novelty, maturity, and risk profile. Where relevant, the NCA coordinates with other affected authorities, including other Member States and EASA.

The NCA remains responsible for the issuance of operational authorisations and, where applicable, for issuing a Permit to Fly on the basis of approved Flight Conditions. It also approves operational procedures, defines any necessary operational limitations, and coordinates required airspace arrangements with the relevant Air Navigation Service Provider.

Throughout the ITF lifecycle, the NCA oversees compliance with the applicable authorisations and conditions. This may include review of safety data, inspections, monitoring activities and participation in key project milestones. Where safety concerns arise, the NCA retains the authority to adjust limitations, require additional mitigation measures, or suspend testing.

In cross-border cases, the NCA may act as Lead Authority, facilitating structured coordination with other affected Member States while respecting their sovereign competences.

5.2.2 European Union Aviation Safety Agency (EASA)

EASA contributes to ITF activities within the scope of its responsibilities under Regulation (EU) 2018/1139.

For aircraft subject to EASA design oversight, EASA is responsible for approving Flight Conditions associated with a Permit to Fly. In such cases, EASA assesses the safety case supporting those Flight Conditions in accordance with applicable Part-21 provisions.

Beyond its certification role, EASA may provide technical expertise or advisory support in cases involving novel technologies, complex certification questions or cross-border coordination challenges. Experience and data generated through ITF activities may also inform EASA's future rulemaking, guidance development and certification specifications.

EASA's involvement in an ITF does not replace the oversight role of the National Competent Authority but complements it within the Agency's legally defined competences.

5.2.3 Applicant or Operator

The applicant or operator is responsible for preparing and submitting a complete ITF proposal, including the concept of operations, safety assessment documentation, and data collection plan appropriate to the selected regulatory pathway.

ITF proposals should build, to the extent possible, on the existing regulatory documentation and approval processes applicable to the selected regulatory pathway.

For UAS-based activities, applicants should normally rely on the applicable framework established under Regulations (EU) 2019/947 and 2019/945, including the associated Easy Access Rules, AMC/GM material and, where relevant, the SORA methodology, for the preparation of operational and safety-related documentation.

The ITF guidance and associated templates are intended to complement these existing frameworks by introducing elements specific to innovation testing activities, such as phased testing approaches, testing progression criteria, coordination arrangements, and data collection or reporting activities.

During the execution phase, the operator conducts ITF activities in accordance with the applicable authorisations, limitations and procedures. This includes implementing agreed mitigation measures, maintaining configuration control, and ensuring that personnel involved possess the competencies appropriate to the activity.

The operator is also responsible for collecting, documenting and reporting operational and safety data as defined in the ITF framework. Any deviations, anomalies or occurrences should be reported in accordance with applicable occurrence reporting requirements and the agreed ITF arrangements.

The ITF framework does not introduce a standalone requirement for a formal Safety Management System (SMS) beyond those already applicable under the relevant regulatory framework.

Where an SMS is required under the applicable regulations, it continues to apply to the ITF activity. In other cases, operators should nevertheless implement safety-management practices proportionate to the nature, complexity and risk profile of the activity.

Depending on the characteristics of the activity, such practices may include:

- hazard identification and risk monitoring;
- occurrence and anomaly reporting;
- management of deviations and corrective actions;
- internal coordination and communication processes; and
- monitoring of operational limitations and mitigation measures.

Active and transparent engagement with the competent authority is an essential element of successful ITF participation.

5.2.4 Air Navigation Service Provider

The relevant Air Navigation Service Provider (ANSP) plays a central role in supporting ITF activities from an airspace and traffic-management perspective.

The ANSP may contribute to the design, activation and management of airspace structures required for the activity, including, where appropriate, segregated or reserved airspace areas, altitude blocks, corridors or specific coordination procedures. Where applicable, the ANSP provides air traffic services in accordance with established procedures and coordinates with the operator and competent authority to support safe integration with other airspace users.

Depending on the nature, operational complexity and airspace impact of the activity, implementation of an ITF operation may require early coordination with the affected ANSP(s) regarding:

- airspace activation and management arrangements;
- operational coordination procedures;
- traffic-management considerations;
- communication and escalation arrangements;
- contingency-management responsibilities during abnormal situations;
- loss-of-communication arrangements;
- flight termination or recovery procedures where applicable; and
- impacts on ATM/ANS systems, interfaces or supporting operational environments.

Where relevant, contingency and emergency procedures should be clearly defined and appropriately coordinated between the operator, the relevant ANSP(s) and competent authorities. Such arrangements should be established sufficiently in advance of the operational activity to support safe operational integration and effective management of abnormal situations.

Such coordination should take place sufficiently early during the planning phase to support operational feasibility assessments, identification of operational constraints and establishment of appropriate operational and airspace-management arrangements.

Depending on the operational characteristics and ATM/ANS impact of the proposed activity, implementation of an ITF operation may also require operational, technical or safety-related assessment activities by the relevant ANSP(s) in accordance with the applicable ATM/ANS and airspace-management framework.

Such activities may include, where appropriate:

- operational impact assessments;
- safety assessments related to changes in operational procedures, airspace structures or traffic patterns;
- assessment of impacts on ATM/ANS system interfaces or supporting operational systems;
- operational resource and monitoring implications associated with the activity;
- coordination arrangements necessary to support safe operational integration; and
- operational coordination activities associated with ATM/ANS procedures or airspace arrangements.

The existence of a SORA-based operational authorisation, Permit to Fly or other ITF-related approval does not automatically replace such activities where they are required under the applicable framework.

The competent authority should take into account the relevant operational assessments and coordination activities performed with the affected ANSP(s) as part of the evaluation of the proposed ITF activity.

For cross-FIR ITF activities, coordination between the affected authorities and ANSPs should ensure consistent operational arrangements, including agreed procedures for communication, traffic management and contingency handling across boundaries. Where relevant, such coordination may also involve EUROCONTROL, in particular in its role as Network Manager (NM), where the activity may affect network capacity, traffic flows, ATFM measures, route structures or airspace availability.

The ITF guidance does not establish a formal ANSP approval or co-authorisation mechanism. Approval responsibilities remain with the competent authority in accordance with the applicable regulatory framework, and the ITF does not create additional ATM/ANS service-provision obligations beyond those already established under the applicable operational and regulatory framework.

5.3 Phase 1 - Application and Project Definition

Phase 1 initiates the ITF process. Its purpose is to establish a shared understanding of the innovative concept to be tested, the objectives of the proposed activity, and the reasons why an ITF approach may be appropriate. During this phase, the applicant engages with the lead competent authority and, where appropriate, identifies other competent authorities and organisations expected to participate in the ITF.

An ITF is not an automatic entitlement. The competent authority retains discretion to determine whether a proposed activity is suitable for structured experimentation within an ITF framework. The use of an ITF is generally appropriate where the activity involves a degree of novelty, technical uncertainty or regulatory complexity that cannot reasonably be addressed through standard certification or operational approval pathways alone. It may also be appropriate in cases where the real-world impact of a new technology, operational concept or regulatory approach cannot be fully assessed through analysis or simulation alone and therefore requires controlled testing in an operational environment to enable a holistic assessment.

The process typically begins with the submission of an initial proposal to the National Competent Authority. The level of detail required at this stage should be proportionate to the maturity and complexity of the concept. Early engagement and pre-application dialogue are encouraged in order to clarify expectations and identify potential constraints at an early stage.

The initial proposal would normally describe:

- the innovative technology, system or operational concept to be tested;
- the intended objectives and expected outcomes of the testing campaign;
- the anticipated operational context, including geographical scope and duration;
- the preliminary identification of the applicable regulatory pathway (airworthiness-based or operational); and
- the elements that justify consideration of an ITF approach.

The applicant should explain why the activity cannot be adequately accommodated within routine approval mechanisms or why structured experimentation under enhanced oversight is necessary.

Upon receipt of the proposal, the competent authority may acknowledge the application and designate a focal point for coordination. An initial scoping meeting is typically advisable. Depending on the characteristics of the project, EASA, the relevant Air Navigation Service Provider, or other affected authorities may be invited to participate.

The need for an ITF approach should be assessed primarily on the basis of the novelty, technical uncertainty, operational complexity or experimental nature of the proposed activity, rather than solely on the size or category of the aircraft involved.

In particular, ITF activities may support phased testing approaches and progressive envelope expansion for innovative or complex unmanned aircraft systems where existing approval mechanisms may not be fully adapted to early-stage experimentation or evolving operational assumptions.

The ITF framework does not replace the applicable regulatory pathways or associated safety objectives, but may support more structured coordination, testing progression and operational learning within the boundaries of the existing framework.

Depending on the nature of the activity, ITF applications may need to address communication, navigation and surveillance (CNS) arrangements relevant to the proposed operation.

This may include:

- communication capabilities and procedures;
- aircraft tracking or surveillance arrangements;
- interfaces with ANSP systems or operational coordination mechanisms;

- navigation performance assumptions or operational limitations relevant to the activity; and
- contingency arrangements related to CNS degradation or loss.

Where relevant, early coordination with the relevant ANSP(s) should be initiated already during the definition project phase, particularly for activities involving novel airspace structures or higher airspace operations, to support the assessment of potential impacts on other airspace users and allow refinement of_the proposed airspace arrangements to address identified operational impacts.

The purpose of this initial engagement is to:

- clarify the level of novelty and technical maturity of the concept;
- identify the applicable regulatory instruments under Chapter 3;
- assess, at a preliminary level, the feasibility of conducting the activity within a controlled environment; and
- identify any significant regulatory, operational or airspace constraints, including potential cross-border or third-country implications.

Phase 1 concludes with the development of a preliminary Project Definition. This document captures the shared understanding of:

- the scope and objectives of the ITF;
- the intended testing phases and operational boundaries;
- the anticipated regulatory instruments to be used; and
- the expected documentation and assessment work required in Phase 2.

The Project Definition does not constitute an authorisation. Rather, it provides a structured basis for progressing to the assessment and preparatory phase.

5.3.1. Outcome of Phase 1

Phase 1 may be considered complete when a preliminary Project Definition has been established and the competent authority has determined that the proposed activity may, in principle, be suitable for an ITF approach.

At this stage, the following elements should normally be clarified:

- the innovative concept and its intended testing objectives;
- the preliminary scope, duration and operational context of the activity;
- the likely regulatory pathway (airworthiness-based or operational);
- any significant airspace, cross-border or third-country implications; and
- the documentation and assessment work expected in Phase 2.

Completion of Phase 1 does not constitute approval of the ITF activity. It confirms only that the project may proceed to detailed assessment and preparatory work

5.4 Phase 2 - Assessment, Simulation and Preparatory Work

Phase 2 establishes the technical and operational basis on which ITF activities can be authorised. Its purpose is to confirm that the proposed testing campaign can be conducted safely within a controlled environment and that the necessary regulatory, operational and airspace arrangements can be put in place.

During this phase, the applicant develops the detailed safety and operational documentation required to support authorisation, and the competent authority performs the corresponding technical and regulatory assessments.

5.4.1 Risk Assessment and Safety Justification

Based on the nature of the system and the operational concept, the applicant should prepare an appropriate risk assessment and safety justification.

- For aircraft operated under a Permit to Fly, this normally takes the form of a safety case supporting the proposed Flight Conditions.
- For unmanned or hybrid operations, this normally consists of a SORA-based operational risk assessment.
- For highly novel or complex concepts, a combined or adapted methodology may be required

The ITF framework does not modify the applicable safety objectives, robustness requirements or SAIL determinations established under the SORA methodology and the relevant UAS regulatory framework.

Where an activity ultimately involves operations corresponding to higher SAIL levels, the associated safety objectives and operational mitigations continue to apply. The added value of the ITF lies in enabling structured and phased experimentation, including:

- constrained or controlled testing environments;
- progressive envelope expansion;
- incremental validation of assumptions and mitigations; and
- coordinated oversight and data collection activities.

In this context, the ITF complements the existing SORA-based approach by supporting progressive evidence generation and operational learning, rather than replacing the underlying risk assessment methodology or required level of safety.

The safety assessment should identify the main system, operational, human and organisational hazards, describe the mitigation measures to be applied and justify the acceptability of the residual risks within the proposed ITF environment. The competent authority should verify that the identified risks can be adequately mitigated through operational limitations, technical measures, procedures and airspace arrangements, and that the proposed testing objectives are compatible with the level of maturity of the system.

Where relevant to the safe conduct of the activity, the risk assessment should also identify cybersecurity and information-security dependencies associated with the aircraft, payload, command-and-control functions, ground infrastructure, data links and supporting digital services.

The assessment should consider whether loss of availability, loss of integrity, unauthorised access, manipulation or disruption could affect:

- command-and-control functions;
- navigation, tracking or telemetry;
- safety-critical decision-making or automation;
- flight-termination, contingency or recovery functions;
- communication with competent authorities or air navigation service providers; or
- operational continuity.

Any resulting controls should be proportionate to the nature of the activity and should identify relevant responsibilities, protective measures, monitoring arrangements and response procedures. Cybersecurity issues without a credible relationship to aviation safety or the controlled execution of the ITF need not be addressed in the safety case, but may remain subject to other applicable security, data-protection or sectoral requirements.

Where relevant to the operational characteristics of the activity, the evaluation phase may include coordination with the relevant ANSP(s) regarding ATM/ANS operational considerations, airspace interactions and operational feasibility aspects associated with the proposed activity.

This may support the assessment of operational viability, air-risk considerations and the identification of operational constraints or mitigation measures where applicable.

5.4.2 Airspace Assessment and Coordination

The establishment and approval of airspace arrangements may require the completion of operational, technical and safety-related assessments by the relevant ANSP(s) and competent authorities, as applicable under the national framework.

The scope and depth of such assessments and coordination activities should remain proportionate to the nature, complexity and risk profile of the ITF activity and should be completed sufficiently in advance of operational implementation.

In coordination with the relevant Air Navigation Service Provider(s), the competent authority should assess the airspace implications of the proposed ITF activity. This assessment should consider:

- the suitability of the proposed geographical areas and altitude bands;
- interaction with other airspace users;
- the possible need for segregated or reserved airspace structures; and
- required coordination, communication, contingency and emergency-management procedures.

Where relevant, the assessment should also consider contingency and emergency arrangements associated with abnormal situations, loss of communication or other operational disruptions affecting the proposed activity.

Where operations may affect neighbouring Flight Information Regions (FIRs) or involve cross-border implications, early coordination with the relevant authorities and ANSPs should be initiated.

The impact of ITF activities on other airspace users should be assessed and minimised where reasonably practicable. Appropriate communication and notification arrangements should be established to ensure timely and transparent information sharing with affected stakeholders.

5.4.3 Simulation, Modelling and Preparatory Testing

Depending on the novelty and complexity of the system or operational concept, the competent authority may require additional preparatory activities before authorisation. This may include simulation of flight profiles and operational scenarios, modelling of system behaviour or trajectories, validation of contingency and recovery procedures, or ground and bench testing of critical subsystems. Such preparatory activities support the verification of assumptions made in the safety assessment and help to reduce uncertainties before real-world testing is authorised.

5.4.4 Definition of Testing Parameters and Oversight Arrangements

Based on the results of the assessments and preparatory work, the applicant and the competent authority should agree on a clear and coherent set of testing parameters forming the operational framework of the ITF. These testing parameters define, in particular:

- the approved airspace volumes and operating windows;
- the authorised system configuration and operational envelope;
- environmental and performance limitations;
- competency and staffing requirements;
- communication, coordination and contingency procedures; and
- data collection, reporting and monitoring obligations.

In parallel, the competent authority should define the applicable oversight arrangements for the execution phase. These include reporting timelines, review mechanisms, inspection or monitoring measures and, where necessary, notification thresholds requiring authority intervention.

The outcome of Phase 2 is a consolidated set of testing parameters, operational limitations, mitigation measures and oversight arrangements reviewed and accepted by the competent authority, forming the basis for the issuance of the relevant ITF authorisations in Phase 3.

These elements are normally developed through iterative coordination between the applicant and the competent authority during the assessment phase, taking into account the characteristics, objectives and risk profile of the proposed activity.

5.4.5 Outcome of Phase 2

Phase 2 may be considered complete when the competent authority has sufficient structured information to determine whether formal authorisation can be prepared.

At this stage, the following elements should normally be available:

- Identification of participating authorities and other stakeholders and any preliminary governance arrangements, where appropriate.
- a documented safety assessment appropriate to the selected regulatory pathway (e.g. safety case supporting proposed Flight Conditions, or SORA-based operational risk assessment);
- identification of the proposed aircraft or system configuration and its intended operational envelope;
- Where phased or progressive envelope expansion is envisaged, the proposed operational envelope should include:
    - the baseline operating conditions;
    - the planned progression stages;
    - the associated assumptions and limitations; and
    - the criteria governing transition between testing phases.
- The associated risk assessment should address how changes to the operational envelope may affect the operational risk profile, including potential impacts on ground risk, air risk or SAIL determination where applicable.
- Where incremental expansion results in material changes to the assessed risk profile or applicable operational assumptions, updates to the risk assessment and, where necessary, amendments to the operational authorisation may be required.
- preliminary confirmation that the proposed activity can be accommodated within a defined and controllable airspace environment;
- a coherent set of proposed testing parameters, including operational limitations, contingency procedures and phased envelope expansion criteria;
- an outline of the oversight and reporting framework applicable during execution; and
- identification of any cross-border, third-country, or multi-authority coordination requirements.

Completion of Phase 2 does not constitute authorisation to conduct real-world testing. Rather, it confirms that the proposed ITF activity has reached a level of definition and maturity sufficient to proceed to the formal authorisation phase.

The competent authority retains discretion to request further clarification or refinement where necessary before progressing to Phase 3.

5.5 Phase 3 - Authorisation

Phase 3 formalises the regulatory framework within which ITF testing may take place. Its purpose is to issue the applicable authorisations and approvals that define the legal and operational boundaries of the ITF activity.

Authorisation may be granted only where the competent authority is satisfied that the risks identified during Phase 2 have been appropriately assessed and that suitable mitigation measures, operational limitations and oversight arrangements have been defined.

The ITF does not constitute a separate legal regime. Rather, Phase 3 involves the coordinated use of existing regulatory instruments described in Chapter 3. Depending on the nature of the activity, one or more of these instruments may be required.

5.5.1 Permit to Fly and Flight Conditions

Where the ITF activity involves an aircraft subject to Part-21 certification and requiring a Permit to Fly, the approval of Flight Conditions is performed in accordance with the applicable allocation of responsibilities.

For aircraft under EASA design oversight, Flight Conditions are approved either by EASA or, where applicable, by an Approved Design Organisation (DOA) within the scope of its privileges. The National Competent Authority of the State of Registry issues the Permit to Fly on that basis.

The Permit to Fly defines the approved aircraft configuration, the purpose of the flights and the associated limitations under which the aircraft may be operated during the ITF activity.

5.5.2 Operational Authorisation

Where the ITF activity proceeds under an operational pathway, including activities not subject to Part-21 certification, the National Competent Authority issues an operational authorisation based on the relevant risk assessment methodology.

Such authorisation specifies the approved operational scenario, the applicable mitigation measures, performance requirements, operational limitations, contingency procedures and reporting obligations.

For activities involving unmanned aircraft, the authorisation is issued in accordance with Regulation (EU) 2019/947 and any applicable national provisions.

Within the SORA framework, SAIL levels are determined by the characteristics of the operational scenario and associated mitigations and are not predefined incremental stages selected independently from the operational context.

In an ITF context, phased progression may nevertheless be achieved through the progressive evolution of the operational scenario, for example by:

- expanding the operational envelope;
- modifying operational environments or population exposure;
- increasing operational complexity; or
- adapting airspace or mitigation arrangements.

Such changes may result in corresponding evolution of the applicable SAIL level and associated safety objectives.

Where the operational risk profile changes materially, updates to the risk assessment and, where necessary, amendments to the operational authorisation may be required.

5.5.3 Airspace Arrangements

Where dedicated airspace structures or containment measures are required, the competent authority approves the necessary arrangements, taking into account the operational assessments and coordination activities performed with the relevant ANSP(s), where applicable.

These arrangements may define geographical and vertical boundaries, activation and deactivation procedures, coordination requirements with air traffic services, and conditions applicable to other airspace users during ITF operations.

Airspace arrangements complement, but do not replace, airworthiness or operational authorisations.

5.5.4 Pre-event and Contingency Planning

For activities involving discrete operational events, such as launches or time-critical missions, effective pre-event and contingency planning is essential to ensure that the activity can be conducted safely and in a coordinated manner. Such planning should be proportionate to the nature and risk of the activity and should involve the operator, the Air Navigation Service Provider and the relevant authorities, as appropriate.

Pre-event and contingency planning should include, among other aspects, the following considerations:

a) the definition of milestones, responsibilities and decision points leading up to the operation, based on established operational practices;

b) communication arrangements between the operator and air traffic services to ensure continuous, reliable and timely exchange of information;
c) clearly defined procedures for escalation and contingency handling, including in the event of loss of communication;
d) a clear chain of command and decision-making authority for contingency actions, including flight termination where applicable;
e) for operations dependent on environmental conditions, such as wind-driven trajectories, procedures to manage deviations from predicted behaviour, including predefined triggers for action, coordination with air traffic services, and clearly identified decision-making responsibilities.
f) appropriate procedures to manage coordination with airspace users, including communication of delays, updates to airspace status, and minimisation of operational impacts, where operations may involve repeated attempts or extended oper*ational windows.*

5.5.5 Additional Approvals and Coordination

Depending on the characteristics of the ITF activity, additional approvals or coordination mechanisms may be necessary. These may include environmental considerations, coordination with military authorities, cross-border arrangements, or procedures relating to third-country aircraft.

Such elements should be identified and addressed prior to commencement of testing.

5.5.5 Outcome of Phase 3 - Innovation Testing Framework Authorisation Package

Phase 3 may be considered complete when the applicable regulatory instruments have been formally issued and the legal basis for ITF execution has been clearly established.

At this stage, the following elements should normally be in place:

- issuance of a Permit to Fly and approved Flight Conditions, where applicable;
- issuance of an operational authorisation, where applicable;
- confirmation of any required airspace arrangements;
- documentation of oversight and reporting requirements; and
- clarification of any cross-border or third-country coordination arrangements.

Completion of Phase 3 constitutes formal authorisation to proceed to the establishment and execution phases, subject to compliance with the conditions defined in the authorisation package.

5.6 Phase 4 - Establishment

Phase 4 ensures that the authorised ITF framework is fully operational before testing activities begin. While Phase 3 establishes the legal basis for the activity, Phase 4 focuses on practical implementation, activation of governance arrangements and operational readiness.

No flight or operational testing should commence until the arrangements defined for this phase have been appropriately established and verified.

Depending on the nature, scale and complexity of the activity, implementation may require interaction with ATM/ANS systems, digital infrastructure, operational data environments or supporting software platforms. Where relevant, applicants should identify:

- expected impacts on ATM/ANS operations or supporting systems;
- required coordination with ANSPs or other operational stakeholders;
- anticipated software or configuration changes;
- cybersecurity, data-governance and operational continuity considerations; and
- operational and technical resource implications associated with the activity.

Such aspects should be considered sufficiently early during the planning and coordination phases to support safe, secure and proportionate implementation of the ITF activity.

Depending on the characteristics of the activity, participating organisations may also establish proportionate resource and coordination arrangements covering, where appropriate:

- operational staffing assumptions;
- ANSP coordination activities;
- monitoring and reporting responsibilities;
- contingency-management arrangements
- airspace-management support; and
- availability of required operational and technical expertise.

The level of detail associated with such arrangements should remain proportionate to the characteristics and risk profile of the ITF activity and may be adjusted throughout the ITF lifecycle as operational experience and testing needs evolve.

5.6.1 Governance and Communication Framework

At this stage, the applicant. the lead competent authority and, where applicable, other participating organisations confirm the governance arrangements for the ITF.

This includes identification of designated points of contact, communication channels for routine coordination, and escalation procedures in the event of safety-relevant developments. Reporting formats, timelines and documentation standards should be aligned with the authorisation package. Depending on the complexity of the activity, competent authorities may organise assessment and oversight functions across different specialist domains, such as:

- operational approvals;
- safety and risk assessment;
- airworthiness;
- ATM/ANS coordination; and
- operational execution support.

Where multiple authorities are involved, including cross-border activities or operations involving third-country aircraft, coordination mechanisms should be clarified and documented. Where appropriate, these may be formalised through a cooperation arrangement, such as a Memorandum of Understanding, or supported by structured information-sharing procedures. Such arrangements do not replace regulatory authorisations but enhance transparency, predictability and effective cooperation.

The objective is to ensure that once execution begins, roles, communication pathways and decision-making processes are clearly understood by all participants.

5.6.2 Oversight and Monitoring Arrangements

During this phase, the competent authority confirms how oversight and monitoring will be exercised during execution. While the authorisation issued in Phase 3 defines the legal framework, Phase 4 ensures that the supervisory mechanisms necessary to maintain safety during testing are clearly understood and operational.

Oversight arrangements should reflect the scale, novelty and risk profile of the ITF activity. They are not intended to replicate full certification oversight but to provide proportionate supervision consistent with the experimental nature of the activity.

The oversight framework may include:

- defined reporting intervals for operational and technical data;
- milestone or phase-gate reviews linked to envelope expansion or progression criteria;
- identification of safety indicators or performance thresholds requiring notification or review;
- inspection, observation or audit activities, where appropriate; and
- agreed procedures for temporary suspension, limitation adjustment or modification of testing parameters.

These elements should be aligned with the safety assessment and testing objectives defined in Phase 2 and reflected in the authorisation package issued in Phase 3.

The competent authority retains the ability to adjust oversight intensity if operational experience, safety performance or emerging risks so require. Oversight within an ITF is therefore dynamic and may evolve over time, particularly where phased expansion of the operational envelope is foreseen.

The monitoring framework ensures that once testing begins, safety performance can be observed, evaluated and, where necessary, corrected in a structured and transparent manner.

Safety performance monitoring within an ITF context should be based on indicators, metrics and reporting arrangements appropriate to the nature, complexity and risk profile of the activity.

Depending on the characteristics of the operation, this may include:

- safety performance indicators (SPIs);
- occurrence and anomaly reporting;
- system reliability or availability metrics;
- monitoring of operational limitations and mitigation effectiveness; and
- comparison of observed performance against predefined acceptance or progression criteria.

The operator should document and maintain the relevant monitoring data and provide it to the competent authority in accordance with the agreed ITF arrangements.

The competent authority should use this information to support oversight activities, progression decisions and, where necessary, corrective or mitigation actions during the execution of the ITF activity.

5.6.3 Readiness Verification

Before operational testing begins under real-world conditions, the competent authority may verify that the ITF framework is operationally ready and that the practical arrangements defined during the authorisation process have been appropriately implemented. The objective of this verification is to confirm that testing can commence within the approved operational boundaries and under controlled conditions.

Prior to operational execution, the relevant stakeholders should ensure that the coordination and preparedness activities necessary for the proposed activity have been completed. Depending on the nature and operational characteristics of the activity, this may include confirmation of:

- airspace coordination arrangements;communication and escalation procedures;
- operational coordination or staffing arrangements;
- contingency and recovery procedures; and
- operational readiness activities associated with ATM/ANS support functions where applicable.

Operational readiness verification by the competent authority may also include confirmation that:

- the aircraft or system configuration corresponds to the approved authorisation and associated limitations;
- operational procedures have been finalised and communicated to relevant personnel;
- personnel assigned to ITF activities possess competencies appropriate to their roles; and
- required coordination measures with the relevant Air Navigation Service Provider(s) have been established.

The extent and depth of readiness verification should remain proportionate to the complexity, novelty and risk profile of the ITF activity. For lower-risk or technically mature projects, verification may primarily involve documentation review and coordination checks. For higher-risk or highly innovative activities, the competent authority may consider additional briefings, simulations or demonstration exercises where appropriate.

Readiness verification does not reopen the authorisation decision. Rather, it provides assurance that the authorised framework has been translated into an operationally functional environment and that execution may proceed safely and in a controlled manner.

To support implementation and operational readiness activities, applicants and relevant stakeholders may use structured verification, or checklist approaches to confirm that key aspects of the activity have been appropriately addressed.

Depending on the nature of the activity, this may include:

- configuration control arrangements;
- personnel competency and training;
- airspace coordination activities;
- communication procedures;
- contingency and emergency arrangements; and
- operational coordination responsibilities.

Such tools are intended to support consistency and completeness and do not replace the applicable regulatory or operational approval processes.

5.6.4 Outcome of Phase 4

Phase 4 may be considered complete when the authorised ITF framework has been translated into an operationally functional environment and the competent authority is satisfied that testing may commence within the defined conditions.

At this stage, it should be clear that:

- governance and communication arrangements are operational and understood by all relevant actors;
- oversight and monitoring arrangements are operational and proportionate to the activity;

- operational procedures and contingency measures are implemented; and
- any required airspace coordination measures are ready for activation.

Completion of Phase 4 does not create new legal authorisations. It confirms that the authorisations issued in Phase 3 have been effectively implemented and that the ITF may transition to execution.

5.7 Phase 5 - Execution and Monitoring

Phase 5 is the operational phase of the ITF. During this phase, authorised testing activities are conducted within the defined parameters and under the oversight arrangements established in earlier phases.

The purpose of this phase is twofold: to enable controlled operational testing activities conducted under real-world conditions and to generate reliable operational evidence, while ensuring that safety remains contained within the approved boundaries.

Execution takes place strictly within the scope of the authorisation package defined in Phase 3 and operationalised in Phase 4.

5.7.1 Conduct of Operations

The applicant or operator should conduct all ITF activities within the scope of the approved authorisation package. Operations are expected to remain within the approved operational envelope, system configuration and airspace limitations.

Any modification to the system, software, operational procedures or testing profile that could affect safety should be appropriately assessed and, where required, approved prior to implementation.

The management of changes during ITF execution should follow the allocation of responsibilities established under the applicable regulatory framework and the agreed ITF arrangements.

The operator should assess proposed modifications to determine whether they remain within the approved scope and assumptions of the activity.

Changes that could materially affect the safety case, operational envelope, system configuration, mitigation measures or authorisation basis should be reviewed and, where required, approved by the competent authority before implementation.

Where relevant to airworthiness or certification-related aspects, coordination with EASA or other involved authorities may also be necessary.

The operator is responsible for maintaining accurate operational records, including flight logs, configuration changes, deviations from planned operational profiles and abnormal events. Communication with the competent authority and, where applicable, the relevant Air Navigation Service Provider(s), should be maintained in accordance with the agreed coordination and reporting procedures.

Any anomaly, exceedance of limitations or safety-relevant occurrence should be reported without delay in accordance with the applicable reporting requirements and the ITF-specific reporting arrangements agreed as part of the authorisation package.

Reporting obligations may derive from applicable Union occurrence reporting requirements, national requirements where relevant, and project-specific reporting arrangements established between the applicant or operator and the competent authority.

The ITF authorisation package should clearly identify the applicable reporting channels, timelines, responsibilities and escalation criteria before operational testing begins.

The operational framework for the ITF activity should clearly identify the roles, responsibilities and coordination arrangements applicable during abnormal or contingency situations. Depending on the operational context, this may include clarification of:

- operator responsibilities related to aircraft or system operation;
- ATM/ANS responsibilities related to airspace management and traffic-management measures;
- communication and escalation procedures;
- contingency decision-making arrangements; and
- coordination procedures applicable during operational anomalies or emergencies.

Where relevant, ATM/ANS-related actions may include airspace-management measures, traffic-management actions, activation or deactivation of airspace structures, communication procedures or dissemination of aeronautical information.

5.7.2 Data Collection and Analysis

Systematic data collection is a core element of ITF execution. It is essential for regulatory learning. The operator should collect operational, technical and safety-related data in accordance with the approved data collection and reporting plan. This may include performance parameters, system reliability metrics, telemetry logs, anomaly reports, environmental observations and human performance aspects, depending on the nature of the activity.

Data should be analysed to assess compliance with the approved safety case or risk assessment, to validate modelling assumptions and to identify emerging trends or unexpected behaviours.

Periodic review meetings between the operator and the competent authority should be held to evaluate progress, assess safety performance and determine whether progression to subsequent testing phases or expansion of the operational envelope is justified.

5.7.3 Outcome of Phase 5

Phase 5 may be considered complete when the authorised testing activities have been conducted within the approved framework and sufficient operational evidence has been generated to support structured evaluation.

At this stage, it should be possible to demonstrate that:

- testing was conducted within defined operational and airspace boundaries;
- safety performance was monitored in accordance with the agreed oversight arrangements;
- relevant operational and technical data have been collected and documented; and
- deviations or safety-relevant events have been appropriately addressed.

Completion of Phase 5 does not in itself imply successful validation of the innovative concept. It marks the conclusion of the authorised execution period and enables progression to the evaluation and transition phase.

5.8 Phase 6 - Evaluation, Exit and Transition

Phase 6 concludes the ITF lifecycle. Its purpose is to assess the outcomes of the testing activities, determine whether the objectives of the ITF have been achieved and decide on the appropriate next steps.

Evaluation is not merely an administrative closure step. It is a structured assessment intended to capture lessons learned, validate safety assumptions and identify implications for future certification, operational approvals or regulatory development.

ITF activities may support multiple forms of learning and capability development, including:

- regulatory learning;
- operational learning;
- technical and system-performance learning;
- development of safety assessment methodologies;
- organisational and coordination learning; and
- competence development within authorities and involved organisations.

Regulatory learning within the ITF framework should be understood as a collaborative process involving EASA, National Competent Authorities and, where relevant, other stakeholders participating in the activity.

5.8.1 Final Evaluation

At the end of the authorised ITF period, the operator should submit a consolidated evaluation report in accordance with the agreed reporting plan. This report should summarise the activities conducted, the number and nature of tests performed, any deviations from the initial plan, safety performance outcomes, anomalies encountered and the effectiveness of mitigation measures. It should also assess the extent to which the original ITF objectives were achieved and whether the data collected supports the intended regulatory or technical conclusions.

The National Competent Authority reviews the report and, where appropriate, conducts a joint evaluation meeting with the operator and other involved stakeholders, including EASA or the relevant Air Navigation Service Provider. The evaluation considers, in particular:

– compliance with the approved testing parameters and authorisations;
– observed safety performance and residual risks;
– system behaviour compared to modelling assumptions;
– effectiveness of operational procedures and oversight arrangements; and
– the relevance and quality of collected data for regulatory purposes.

Where relevant, the evaluation may also identify gaps in existing regulatory frameworks or areas requiring further clarification or rulemaking.

5.8.2 Exit Pathways

Following the evaluation, the competent authority determines the appropriate exit pathway for the ITF.

Where appropriate, lessons learned from ITF activities may support:

- future certification methodologies;
- development of AMC/GM material;
- operational guidance;
- standardisation activities; and
- future regulatory evolution at national or European level.

The extent of such regulatory learning should remain proportionate to the maturity, novelty and relevance of the activity concerned.

Possible outcomes include:

- formal closure of the ITF where objectives have been met and no further testing is required;
- extension of the ITF for additional testing within the same framework;
- modification or expansion of the ITF to explore additional scenarios; or
- transition towards more formal regulatory processes, such as type certification, supplemental approvals, broader operational authorisations or initiation of rulemaking activities

The decision should be documented and communicated clearly to the operator, together with any conditions applicable to subsequent activities.

For UAS operations conducted under Regulation (EU) 2019/947, transition from an ITF activity to routine operational authorisation does not necessarily imply a change of methodology, as the SORA framework may already have been used during the ITF phases.

The distinction lies primarily in the operational context and maturity of the activity. During the ITF phase, the operation may involve:

- phased or adaptive testing approaches;
- constrained or segregated operational environments;
- progressive envelope expansion;
- evolving operational assumptions or mitigation measures; and
- enhanced monitoring or oversight arrangements.

Transition to routine operational authorisation normally occurs once the operational concept, mitigation measures and safety assumptions have reached sufficient maturity and stability to support standard operational approval without reliance on experimental testing conditions or ITF-specific arrangements.

5.8.3 Knowledge Sharing and Regulatory Learning

One of the core objectives of an ITF is to support regulatory learning. Where consistent with confidentiality, data protection and security considerations, non-confidential findings may be shared at national or European level.

Such sharing may contribute to:

- harmonisation among Member States;
- development of certification specifications or guidance material;
- rulemaking initiatives;
- improved airspace integration practices; and
- broader understanding of innovative technologies and operational concepts.

In this way, ITF activities can contribute not only to individual project development but also to the evolution of the European aviation safety framework.

Data, operational experience and evidence generated during ITF activities may, where relevant and acceptable under the applicable framework, support subsequent certification, operational approval or rulemaking activities.

To facilitate potential future use, ITF activities should ensure appropriate traceability, configuration control, documentation and data integrity proportional to the intended objectives of the activity.

Participation in an ITF does not itself constitute certification or approval, nor does it guarantee acceptance of generated evidence for subsequent regulatory processes.

5.8.4 Outcome of Phase 6

Phase 6 may be considered complete when the ITF activity has been formally concluded and the competent authority has determined the appropriate regulatory follow-up.

At this stage:

- a structured evaluation of results has been completed;
- the exit pathway has been defined and documented; and
- relevant lessons learned have been identified for future application.

The ITF lifecycle is thereby closed, ensuring that experimentation translates into structured knowledge and, where appropriate, into regulatory development.

5.9 Innovation Testing Framework Lifecycle Overview

For ease of reference, the ITF lifecycle can be summarised as a structured sequence of six phases, each building on the previous one and leading to a defined deliverable.

The process begins with **Application and project definition (Phase 1)**, where the innovative concept is presented and the suitability of an ITF approach is confirmed.

It continues with **Assessment and preparatory work (Phase 2)**, during which the safety case or risk assessment is developed, airspace implications are evaluated, and testing parameters are defined.

In **Authorisation (Phase 3)**, the competent authority issues the necessary regulatory instruments, such as a Permit to Fly, operational authorisation and approved airspace arrangements.

Establishment (Phase 4) ensures that governance, oversight, communication and monitoring arrangements are fully implemented and that operational readiness is verified before testing begins.

During **Execution and monitoring (Phase 5)**, the authorised activities are conducted within the defined safety envelope under proportionate and adequate supervision, with systematic data collection and review.

Finally, **Evaluation, exit and transition (Phase 6)** concludes the ITF by assessing outcomes, documenting lessons learned and determining the appropriate next steps.

The lifecycle can therefore be represented as:

Each transition between phases constitutes a decision point for the competent authority, ensuring that ITF activities remain controlled, proportionate and aligned with safety objectives throughout their duration.

Annex A: Regulatory Background Relevant to Innovation Testing Frameworks

A.1 Purpose and Approach of Annex A

This annex provides a structured and concise overview of the European Union aviation regulatory framework as it relates to ITF activities. Its purpose is not to restate the entirety of EU aviation legislation, nor to provide a comprehensive legal commentary. Instead, it highlights those elements of the regulatory system that are most relevant to the design, authorisation and supervision of ITF testing.

In particular, this annex:

- identifies the legal foundations that enable supervised experimentation within the existing framework;
- clarifies the allocation of responsibilities between EASA and the Member States;
- describes the principal regulatory tools that may support ITF activities; and
- outlines the legal boundaries that are to be respected when applying regulatory flexibility.

This annex should be read as a reference document complementing the practical implementation guidance set out in Sections 3 to 5 of the main text. Where simplifications are made for clarity, the underlying legal acts remain authoritative.

A.2 The EU Aviation Regulatory Framework

Civil aviation within the European Union operates under a harmonised and multilayered legal framework designed to ensure a high and uniform level of safety, environmental protection and interoperability across all Member States. The regulatory structure relevant to ITF activities consists of four principal layers as explained in the following. Within this regulatory structure, EASA is responsible primarily for design approvals, certification activities and rulemaking, while Member States are responsible for operational approvals, airspace management, licensing and on-site oversight. The establishment of an ITF does not create new regulatory powers. It requires the coordinated use of existing instruments within this framework.

A.2.1 Basic Regulation (Regulation (EU) 2018/1139)

Regulation (EU) 2018/1139, commonly referred to as the "Basic Regulation," establishes the European Union Aviation Safety Agency, defines the scope of EU aviation competence and sets out the essential requirements applicable to aviation products, personnel and organisations.

The Basic Regulation:

- defines which activities fall under EU competence and which remain under national competence;
- establishes the responsibilities of EASA and of Member States;
- sets out essential requirements for airworthiness, operations, ATM/ANS, licensing and environmental protection; and
- provides the legal basis for the adoption of implementing and delegated acts.

All ITF activities are expected to operate within the framework established by the Basic Regulation.

A.2.2 Implementing Rules (IRs)

Implementing Rules are legally binding regulations adopted by the European Commission to give detailed effect to the Basic Regulation. They cover, among others:

- airworthiness and environmental certification (e.g. Part-21),
- air operations (Part-OPS),
- aircrew licensing (Part-FCL),
- continuing airworthiness (Part-CAMO / Part-M),
- aerodromes,
- ATM/ANS, and
- unmanned aircraft operations.

These rules establish the concrete approval and oversight mechanisms used to authorise aircraft, operations and personnel. At the time of the publication of this report, ITF activities rely on the flexibility embedded within these Implementing Rules rather than on any separate legal regime.

A.2.3 Delegated Acts (DAs)

Delegated Acts are adopted by the European Commission to amend or supplement certain non-essential elements of the Basic Regulation. They are legislative instruments and serve to adapt the regulatory framework at system level. They do not constitute case-by-case authorisation tools and cannot be used to approve individual ITF activities.

A.2.4 Certification Specifications, AMC and Guidance Material

EASA adopts Certification Specifications (CS), Acceptable Means of Compliance (AMC) and Guidance Material (GM) to support the implementation of the Basic Regulation and the Implementing Rules. These documents are not binding in themselves, but they provide recognised means of demonstrating compliance. Applicants may propose alternative means of compliance where appropriate and justified. While these instruments belong primarily to the certification and compliance domain, experience gained in ITF activities may inform their future development.

A.3 Relevant Provisions of the Basic Regulation

Certain provisions of Regulation (EU) 2018/1139 are particularly relevant to the establishment and operation of ITFs. This section clarifies their scope and limits in the context of supervised experimentation.

A.3.1 Article 1 — Scope

Article 1 defines the subject matter and objectives of the Basic Regulation and establishes its scope of application. In principle, the Regulation applies to civil aviation activities within the territory of the European Union, including the design, production, maintenance and operation of aircraft, as well as personnel licensing and airspace-related services.

Emerging aviation activities, including operations at very high altitudes or involving unconventional technologies, fall within the scope of the Basic Regulation where they meet the criteria set out in Article 2.

Certain aircraft listed in Annex I remain under national competence. Where such aircraft participate in ITF activities, they do so under national law, subject to the overarching safety objectives of the Union legal framework.

An ITF cannot alter the allocation of competences established under the Basic Regulation.

A.3.2 Essential Requirements (Annexes to the Basic Regulation)

The Basic Regulation establishes Essential Requirements for airworthiness, operations, ATM/ANS, personnel and environmental protection. These requirements define the fundamental safety objectives that are to be met, irrespective of the specific approval pathway used.

When applying flexibility tools such as Permits to Fly, operational authorisations or tailored competency arrangements, the applicant should demonstrate that the relevant Essential Requirements are satisfied. ITF arrangements may adjust how compliance is demonstrated, but they cannot reduce or waive the underlying safety objectives.

A.3.3 Article 18 — Delegated Acts

Article 18 empowers the European Commission to adopt delegated acts in order to amend or supplement certain non-essential elements of the regulatory framework. This provision operates at the legislative level and is not available as a case-by-case flexibility tool for ITF activities. It cannot be used to authorise experimental flights, prototype testing or innovative operations. All operational flexibility relevant to ITF activities need instead to derive from the Implementing Rules and the oversight powers of competent authorities.

A.3.4 Article 71 — Exemptions in Urgent Circumstances

Article 71 allows Member States, and in certain cases the Commission, to grant temporary exemptions from applicable rules in situations involving urgent and unforeseeable operational needs. This mechanism is designed for exceptional and time-critical circumstances. Because ITF activities are planned and structured experimental programmes, Article 71 is not normally applicable to ITF authorisations.

It may only be relevant in genuinely exceptional cases that meet the strict legal criteria of urgency and unforeseeability.

A.3.5 Article 76 — Exemptions for Certificate Holders

Article 76(4) allows EASA to grant exemptions to holders of EASA-issued certificates, subject to the conditions laid down in Article 71(1). While this provision could, in theory, be used to support specific ITF-related testing activities involving certificated organisations, its use is constrained by strict legal preconditions and transparency requirements. It should therefore be regarded as an exceptional instrument and not as a routine tool for enabling ITF experimentation.

A.4 Part-21 — Airworthiness Approval Framework

Part-21 (Commission Regulation (EU) No 748/2012 and its Annex I) establishes the EU framework for the certification of aircraft and related products, parts and appliances. It defines the processes for type certification, production approval, design approval and the issuance of airworthiness documents.

For ITF activities involving prototype, experimental or developmental aircraft, Part-21 is the central legal framework. It provides the structured airworthiness pathways that make controlled prototype and developmental testing legally possible within the EU regulatory framework.

A.4.1 Permit to Fly (PtF) and Flight Conditions

A Permit to Fly allows an aircraft to operate when it does not yet fully comply with, or has not yet demonstrated compliance with, the applicable certification basis for the issue of a Certificate of Airworthiness.

In an ITF context, the Permit to Fly is the primary airworthiness instrument enabling prototype testing and early operational demonstrations.

Under Part-21 Subpart P:

- Flight Conditions are approved for aircraft under EASA design oversight in accordance with 21.A.710;
- The National Competent Authority issues the Permit to Fly on the basis of those approved Flight Conditions in accordance with 21.A.711;
- The operator is expected to demonstrate that the aircraft can perform safe flight within the defined operating envelope.

Flight Conditions define the approved configuration, operational limitations and safety mitigations applicable to the testing campaign. They typically include restrictions on altitude, speed, geographic area, system configuration, crew qualifications and environmental conditions.

The restrictive and conditional nature of a Permit to Fly is what makes it particularly suitable for ITF activities. It allows real-world testing within a contained and progressively expandable envelope, under regulatory supervision.

A.4.2 Alternative Means of Compliance (AltMoC)

Alternative Means of Compliance (AltMoCs) are a mechanism available only in the operational and organisational domains of EU aviation regulation (e.g. air operations (Reg. 965/2012), aircrew licensing and training (Reg. 1178/2011), continuing airworthiness (Reg. 1321/2014), aerodromes (Reg. 139/2014), ATM/ANS, and certain UAS operational rules). In these domains, organisations or competent authorities may propose an AltMoC when they wish to use a method other than the one described in the published Acceptable Means of Compliance (AMC), provided they demonstrate that the applicable regulatory requirements and safety objectives are fully met.

It is important to note that AltMoCs do not apply to initial airworthiness or product certification under Part 21. For products, parts, and appliances, including experimental and innovative designs, flexibility is instead provided through mechanisms such as Special Conditions (SC) and Equivalent Safety Findings (ESF). AltMoCs therefore cannot be used to deviate from Certification Specifications (CS) or to support experimental flights authorised under Part 21.

A.4.3 Special Conditions (SC)

Special Conditions are established and applied by EASA in certification processes when an aircraft's design includes novel or unconventional features, or in emerging domains such as drones and eVTOL aircraft. They form part of the product's certification basis under Part-21.

EASA often uses an objective-oriented approach for SCs, rather than prescribing detailed solutions, as seen in SC-VTOL. This approach is particularly suitable for experimental and rapidly evolving technologies, ensuring safety while allowing flexibility for diverse design concepts.

A.4.4 Equivalent Safety Findings (ESF)

Equivalent Safety Findings (ESF) may be issued in cases where an applicant cannot demonstrate literal compliance with a Certification Specification (CS) for justified technical reasons but can show that the proposed alternative ensures an equivalent level of safety to full compliance. The supporting demonstration may rely on quantitative, qualitative, or combined analyses, depending on the nature of the requirement and the design aspect involved.

Provisions allowing for demonstrations of an equivalent level of safety are explicitly recognised in several EU aviation regulations (e.g. Regulation (EU) No 139/2014 on aerodromes, Regulation (EU) No 965/2012 on air operations, and Regulation (EU) No 1178/2011 on aircrew) where applicants may deviate from the applicable Certification Specifications (CS), Acceptable Means of Compliance (AMC), or implementing provisions, provided that a documented safety assessment demonstrates that the applicable safety objectives of the regulation are fully met. In the domain of initial airworthiness certification, this concept is addressed through Equivalent

Safety Findings (ESF) under Part 21, which allow the Agency to accept alternative means of showing compliance with a CS when an equivalent level of safety has been rigorously demonstrated.

Developers of innovative products, operators, and service providers may use the flexibility provisions available in the relevant EU aviation regulations when full compliance with specific requirements cannot be demonstrated. The applicable mechanisms differ by regulatory domain: for example, Equivalent Safety Findings (ESF) and Special Conditions (SC) may be used in initial airworthiness to address novel design features or justified cases of non-literal compliance with Certification Specifications; Equivalent Level of Safety (ELOS) provisions under Regulation (EU) 139/2014 for aerodromes and similar clauses in Regulations (EU) 965/2012 and 1178/2011 allow deviations from certain requirements when an equivalent level of safety is demonstrated. In all cases, applicants must perform the necessary safety assessment to show that the applicable safety objectives are met, thereby enabling flexibility without compromising safety.

A.5 Operational Regulatory Framework

In addition to airworthiness approvals under Part-21, most ITF activities require an operational authorisation framework. This is particularly relevant where the risks associated with the innovation arise primarily from how the aircraft is used, the environment in which it operates, or the interaction with other airspace users. Operational flexibility within an ITF therefore needs to be anchored in the applicable EU operational regulations and in the oversight responsibilities of the National Competent Authorities. Operational authorisations, when combined with airworthiness measures and airspace arrangements, form a core component of the regulatory framework enabling ITF activities.

A.5.1 SORA-based operational authorisations (Unmanned Aircraft)

For unmanned aircraft systems (UAS), Regulation (EU) 2019/947 establishes a risk-based operational framework. Within this framework, the "Specific" category allows operations to be authorised on the basis of a Specific Operations Risk Assessment (SORA). SORA is a structured methodology used to assess both ground risk and air risk and to determine appropriate mitigation measures proportionate to the operational context.

In an ITF environment, SORA-based authorisations can be tailored to reflect:

- controlled or segregated airspace environments,
- limited duration testing campaigns,
- enhanced oversight and monitoring arrangements, and
- progressive envelope expansion linked to demonstrated safety performance.

SORA therefore provides a flexible and structured mechanism for authorising experimental unmanned operations while ensuring that safety objectives are explicitly defined and monitored.

For operations falling under the "Certified" category, Part-21 airworthiness processes apply in parallel, and operational authorisation will follow the applicable implementing rules for certified UAS operations.

A.5.2 Air Operations Regulation (Part-OPS)

For manned aviation, Commission Regulation (EU) No 965/2012 (Air OPS) establishes the operational requirements applicable to commercial and non-commercial air transport operations.

ITF testing involving manned aircraft typically takes place outside the scope of routine commercial air transport and may rely on:

- restricted or experimental operations conducted under a Permit to Fly;
- operational limitations defined in the approved Flight Conditions;
- specific procedures for test flights; and
- oversight by the National Competent Authority.

Where innovative operational concepts challenge existing operational categories, the competent authority may define tailored operational conditions within the limits of the applicable regulation, provided that the Essential Requirements are respected.

ITF activities do not exempt operators from safety management system obligations, occurrence reporting requirements or oversight provisions established under Air OPS.

A.5.3 Crew Licensing (Part-FCL)

Commission Regulation (EU) No 1178/2011 (Part-FCL) governs the licensing of flight crew for manned aviation.

Innovative aviation concepts, including higher airspace operations, remote supervision roles or high degrees of automation, may not yet be fully reflected in existing licence categories or ratings. Within an ITF context, National Competent Authorities may apply competency-based arrangements tailored to the specific operational role, provided that:

- the functions and responsibilities are clearly defined;
- the competency requirements are documented and justified by the safety assessment; and
- the arrangements remain limited to the scope and duration of the ITF activity.

Such arrangements do not create new licence categories and do not replace the existing licensing framework. Rather, they provide a temporary and controlled solution while regulatory gaps are assessed and, where appropriate, addressed through future rulemaking.

A.6 ATM/ANS and Airspace Regulation

ATM/ANS and airspace-related considerations are important elements of ITF activities involving dedicated airspace arrangements, Higher Airspace Operations, unmanned aircraft systems or activities with significant interaction with other airspace users.

Depending on the operational characteristics of the activity, relevant aspects may include:

- airspace-management and Flexible Use of Airspace (FUA) processes;
- operational coordination with ANSPs and other stakeholders;
- surveillance, tracking or telemetry arrangements;
- communication and coordination procedures;
- aeronautical information management considerations, including, where applicable, NOTAMs, AIP Supplements or other AIM products;
- interaction with U-space or UTM environments;
- contingency and emergency coordination procedures; and
- operational interfaces associated with ATM/ANS systems or procedures.

The level of detail and coordination required should remain proportionate to the operational complexity and airspace impact of the activity.

Airspace and ATM/ANS considerations are often central to the feasibility and safety of ITF activities. Even where airworthiness and operational risks are appropriately mitigated, testing cannot proceed unless integration into the airspace system is adequately addressed.

Within the EU regulatory framework, Member States retain responsibility for airspace management, subject to Union law and applicable international obligations under the Chicago Convention. Air Navigation Service Providers are responsible for the provision of air traffic services and the management of safe and orderly traffic flows.

ITF activities should therefore be coordinated not only from an airworthiness and operational perspective, but also from an airspace and ATM/ANS perspective, in order to support safe integration and minimise unnecessary disruption to the wider aviation system.

A.6.1 Airspace design and allocation

Member States manage and structure their national airspace and may create temporary or permanent structures to accommodate specific operational needs.

Depending on the nature of the activity and the applicable national framework, airspace arrangements supporting ITF activities may include the use of:

- Temporary Segregated Areas (TSA);
- Temporary Reserved Areas (TRA);
- Prohibited areas;
- Danger or restricted areas;
- dedicated altitude blocks; or
- temporarily activated corridors

- other dynamically managed airspace structures established through the applicable airspace-management processes.

Such airspace structures allow experimental operations to be conducted in a contained and predictable environment, reducing exposure to uninvolved airspace users and facilitating safe coordination with air traffic services. The creation or activation of these structures need to follow national airspace management procedures and, where relevant, coordination mechanisms under the Flexible Use of Airspace (FUA) concept.

A.6.2 ANSP responsibilities and coordination

Air Navigation Service Providers play an essential role in the preparation and execution of ITF activities.

Their responsibilities typically include coordinating the activation and deactivation of airspace structures, publishing relevant aeronautical information such as NOTAMs or AUP/UUP notifications, managing traffic separation where required, and assessing the operational impact of ITF activities on other airspace users.

ANSP involvement is particularly important where ITF operations involve higher airspace platforms, unconventional climb or descent profiles, integration into controlled airspace, or cross-border trajectories.

Depending on the operational characteristics and ATM/ANS impact of the proposed activity, the relevant ANSP(s) may need to perform operational or safety-related assessment activities in accordance with the applicable ATM/ANS and airspace-management framework. Such activities may include operational impact assessments, coordination activities or safety assessments associated with changes affecting ATM/ANS operations, procedures or airspace arrangements where applicable.

Early and structured coordination between the applicant, the National Competent Authority and the ANSP is therefore indispensable for ensuring that ITF activities are compatible with existing traffic flows and airspace structures.

A.7 Interaction of Legal Tools in an Innovation Testing Framework Context

ITF activities rarely rely on a single regulatory instrument. In most cases, several legal tools operate in parallel, each addressing a different dimension of safety and oversight. Understanding how these tools interact is essential to ensuring that ITF activities remain coherent, legally sound and proportionate.

A.7.1 Complementary functions of regulatory instruments

In a typical ITF involving a prototype or innovative aircraft, the regulatory framework may consist of:

- a Permit to Fly, which defines the airworthiness envelope and the conditions under which the aircraft may safely operate;

- an operational authorisation, which defines how and under what operational constraints the aircraft may be used;
- airspace arrangements, which define where the activity may take place and how it is separated or coordinated with other traffic; and
- an oversight and monitoring framework, which defines how the competent authority supervises ongoing safety performance.

Each instrument addresses a distinct safety dimension:

- airworthiness controls the technical integrity of the aircraft;
- operational approval governs the conduct of the operation;
- airspace management ensures containment and separation;
- oversight ensures compliance and the ability to intervene if necessary.

None of these instruments replaces the others. Together, they form an integrated framework enabling innovation while preserving the essential safety objectives of the regulatory system.

A.7.2 No creation of a parallel legal regime

An ITF does not create a new legal regime. It does not suspend existing legislation, nor does it consolidate multiple approvals into a single "ITF authorisation".

Instead, the ITF acts as a coordination mechanism that aligns existing approvals and flexibility tools under a unified project framework. The legal effect of ITF testing derives exclusively from the underlying regulatory instruments issued by the competent authorities. The ITF framework itself provides structure and governance, but it does not confer independent legal authority.

A.7.3 Proportionality and phased progression

Effective ITF implementation depends not only on the availability of regulatory flexibility tools, but on their coordinated and proportionate application within the boundaries of the existing legal framework. In practice, ITF projects often follow a phased progression, with gradual expansion of the operational envelope as evidence is gathered.

This phased approach may involve:

- initial testing under highly restrictive Flight Conditions;
- limited operational scenarios authorised through a SORA;
- incremental airspace access; and
- progressive refinement of procedures and mitigations.

The interaction of legal tools should therefore remain dynamic and adaptable, while ensuring that each change is formally assessed and approved where required.

A.8 Summary

The EU aviation regulatory framework already contains the legal instruments necessary to support controlled experimentation and innovation. ITFs do not create new legal authorities or alternative regulatory regimes; they rely on the coordinated and proportionate application of existing tools.

Part-21, in particular the Permit to Fly and approved Flight Conditions, provides the foundational mechanism for prototype and developmental testing of aircraft under EASA design oversight. Its restrictive and conditional structure makes it well suited to ITF environments, where containment and progressive envelope expansion are essential.

For unmanned operations, SORA-based operational authorisations under Regulation (EU) 2019/947 enable proportionate risk mitigation and structured flexibility. When combined with tailored operational conditions and oversight arrangements, they allow innovative concepts to be tested without compromising safety objectives.

Airspace structures and ATM/ANS coordination ensure that ITF activities remain contained, predictable and safely integrated into the broader aviation system. These arrangements are a prerequisite for many experimental operations, particularly those involving higher altitudes or unconventional flight profiles.

At the same time, certain provisions of the Basic Regulation are not ITF tools. Article 18 (delegated acts) operates at legislative level and cannot be used to authorise individual experimental operations. Article 71 (urgent exemptions) is intended for unforeseeable circumstances and is not generally applicable to planned ITF activities. Article 76(4) exemptions may, in theory, support specific cases involving certificated organisations, but they remain exceptional and subject to strict conditions.

In conclusion, ITFs function as a structured coordination framework that brings together airworthiness approvals, operational authorisations, airspace arrangements and oversight mechanisms. They enable innovation within the existing legal boundaries of EU aviation regulation while preserving the core safety and environmental objectives of the system.

This annex supports, but does not replace, the operational guidance provided in the main body of the document.

Annex B: Application Pathway for UAS Innovation Testing Framework Activities

B.1 Purpose and Scope of This Annex

This annex provides detailed guidance for applicants and authorities on how to design, prepare, and execute UAS-related testing within an ITF. It translates the general lifecycle and regulatory principles set out in Sections 3 and 5 into a pathway tailored specifically to unmanned aircraft systems.

The annex applies primarily to operations falling within the *Specific Category* under Regulation (EU) 2019/947, particularly where the proposed activity:

- involves prototype or pre-market systems,
- introduces novel automation, autonomy, or system architectures, or
- approaches operational environments not yet fully addressed by existing guidance, including higher airspace.

While the annex was developed with emerging and complex UAS operations in mind, including those potentially linked to Higher Airspace Operations (HAO, its structure is equally applicable to other innovative unmanned projects requiring structured experimentation under supervision.

This annex should be read in conjunction with:

- Section 3 (Regulatory Flexibility Tools),
- Section 5 (ITF Lifecycle), and
- Annex E (Application Template).

It focuses on practical expectations: what applicants should prepare, how authorities will assess readiness, and how UAS ITF operations can be structured in a legally sound and safety-consistent manner.

B.2 UAS in the ITF Context

Unmanned Aircraft Systems are particularly well suited to ITF environments due to the pace and diversity of innovation in the sector. Compared to traditional aviation domains, UAS technologies evolve rapidly and often combine software-intensive architectures, new propulsion concepts, advanced communication links, and varying degrees of autonomy.

While the EU regulatory framework for UAS is designed to support innovation, some activities exceed what can be authorised under standard risk assessment methodologies. ITFs provide an environment in which such operations can be trialled under supervision with appropriate flexibility.

Key characteristics that make UAS operations natural candidates for ITF treatment include:

- rapid technological iteration cycles,
- frequent updates to software and control logic,
- emerging autonomy and AI-based decision functions,
- diverse operational models (e.g., logistics, inspection, communications platforms),
- and integration challenges in shared or controlled airspace.

The existing EU UAS framework, centred on a risk-based approach and the Specific Operations Risk Assessment (SORA), already provides significant flexibility. However, certain innovative activities may stretch or exceed the boundaries of established methodologies. Examples include very higher airspace transitions, persistent operations beyond typical BVLOS assumptions, non-standard command-and-control architectures, or system-of-systems coordination across multiple domains.

In such cases, an ITF provides a structured environment where:

- risks can be assessed with enhanced oversight,
- mitigations can be validated progressively,
- airspace can be tailored for containment,
- and data can be collected systematically to inform both the operator's development pathway and future regulatory evolution.

Importantly, the ITF does not replace the UAS regulatory framework. Rather, it coordinates existing tools, including operational authorisations, airspace arrangements, and oversight mechanisms, into a supervised testing regime designed for activities that cannot yet be accommodated within routine approval pathways.

B.3 When Is an ITF Needed for UAS Operations?

Not all innovative UAS activities require an ITF. Many operations, even advanced BVLOS missions, can be authorised through the standard Specific Category process. By contrast, certain high-airspace or highly novel operations may require structured ITF coordination due to airspace integration, endurance, or certification uncertainties. An ITF becomes appropriate only where the proposed activity introduces uncertainty, novelty, or operational complexity that cannot be adequately addressed within routine pathways.

An ITF may be justified in particular where the proposed UAS operation:

- introduces new levels of automation or autonomy that go beyond established operational experience,

- relies on non-standard command and control (C2) architectures, including satellite-based or hybrid communication systems,
- involves higher airspace flight profiles or transition into upper airspace layers not traditionally used by UAS,
- requires detect-and-avoid concepts not yet validated through operational use,
- combines multiple UAS or integrates with other systems in coordinated, system-of-systems scenarios,
- seeks to validate new operational concepts for persistent or large-scale BVLOS operations, or
- requires the development, validation, or coordinated implementation of novel airspace-integration arrangements that cannot be adequately addressed through established SORA and routine airspace-management processes.

An ITF is also appropriate where prototype systems are not yet mature enough to demonstrate compliance using standard assumptions, but where controlled real-world testing is necessary to validate safety claims.

The ITF framework does not replace the SORA methodology or reduce the applicable safety objectives and operational risk assessment requirements established under Regulation (EU) 2019/947.

The added value of the ITF lies in enabling a phased and controlled approach to testing, particularly for prototype or immature systems where full operational maturity may not yet be achievable at the initial stages of development.

In this context, the ITF may support:

- phased transition from constrained or segregated testing environments towards operation in integrated or more complex airspace;
- progressive expansion of the operating envelope against predefined evidence and decision criteria;
- operational validation of detect-and-avoid capabilities, airspace-integration procedures, and associated tactical mitigations;
- incremental validation of mitigation measures and operational assumptions that cannot yet be substantiated through existing evidence;
- coordinated testing across different airspace environments, Flight Information Regions, or Member States where several competent authorities, air navigation service providers, or other stakeholders are involved;
- phased data collection and evidence generation to support future authorisations, standards, or regulatory development; and
- structured coordination between the applicant, competent authorities, air navigation service providers, and other relevant actors during experimental activities.

The use of a constrained or segregated test environment does not, in itself, justify the establishment of an ITF, since such an environment can normally be addressed within the SORA methodology and the ordinary Specific Category authorisation process. An ITF may provide added value where segregated testing forms part of a progressive programme intended to demonstrate safe airspace integration, validate novel detect-and-avoid or traffic-management arrangements, or support coordinated operations involving several authorities or Member States.

B.4 Application Pathway for UAS ITF Activities

The UAS ITF application pathway follows the general lifecycle described in Section 5, but with additional technical depth reflecting the characteristics of unmanned systems. It is structured around progressive engagement, thorough preparation, and clear documentation of risk and mitigation.

B.4.1 Initial Engagement and Scoping

Before submitting a formal application, the applicant should engage in an early consultation with the National Competent Authority. This step is particularly important for UAS projects involving novel architectures or higher airspace concepts. The purpose of this initial engagement is to:

- clarify the operational concept and technical scope of the project,
- determine whether an ITF is the appropriate mechanism,
- identify the regulatory tools likely to be required (e.g. SORA-based authorisation, airspace arrangements, potential interaction with airworthiness considerations), and
- agree on the expected level of detail for the application package.

Where operations approach higher airspace or raise airworthiness-related questions, the NCA may indicate the need for early consultation with EASA.

This scoping phase reduces uncertainty for both sides and ensures that the subsequent application is targeted, proportionate, and aligned with regulatory expectations.

B.4.2 Preparing the ITF Application

A complete UAS ITF application should provide a coherent and structured description of the system, the operation, and the associated risks. The following elements are essential.

Concept of Operations (ConOps)
The ConOps should provide a detailed narrative of the intended operation, including:

- operational objectives and test scenarios,
- mission phases and flight profiles, including altitude layers,
- command and control arrangements and communication links,
- automation levels and decision logic (where applicable),
- ground infrastructure and support systems, and
- contingency and emergency procedures.

The ConOps should enable the authority to clearly understand how the system will behave in all phases of operation.

For UAS-based ITF activities, applicants may also refer to the guidance material provided in Annex A to AMC1 to Article 11 of the Easy Access Rules for Unmanned Aircraft Systems (ED Decision 2019/021/R), which provides additional guidance regarding the expected structure and content of ConOps.

The level of detail and scope of the ConOps should remain proportionate to the nature, complexity and risk profile of the specific ITF activity.

Applicants may also use recognised sectoral or industry ConOps formats, provided that the resulting document addresses all information required by the applicable regulatory framework and by this guidance. The use of a particular template does not replace the applicant's responsibility to ensure that the ConOps is complete, internally consistent, proportionate to the operation, and suitable for supporting the associated safety assessment.

Technological Maturity
Applicants should describe the current maturity level of the UAS and its subsystems, including:

- prototype status and configuration control,
- prior ground or flight testing,
- software and hardware versioning,
- validation and verification activities already performed, and
- known limitations or areas of uncertainty.

This section allows the authority to assess readiness for real-world testing.

Risk Assessment (SORA-Based or Equivalent)
The risk assessment should follow the SORA methodology where applicable. It should reflect:

- mitigations achievable within the ITF's controlled environment,
- technical and operational measures tailored to the specific innovation, and
- residual risks requiring enhanced oversight or operational limitations.

Where the proposed activity exceeds the boundaries of established SORA guidance, such as advanced autonomous decision loops or unconventional altitude profiles, the applicant is expected to provide a structured and transparent equivalent methodology or justification.

Experience and evidence generated through ITF activities may support the future development of additional guidance, predefined risk assessments, standard scenarios or other standardised assessment approaches for sufficiently mature and repeatable higher-airspace UAS operations. Such future standardisation is outside the scope of the individual ITF authorisation and should not be assumed before an appropriate regulatory development and validation process has been completed.

Airspace Requirements
If dedicated or modified airspace is required, the application should clearly describe:

- the geographical and vertical dimensions of the requested airspace,
- activation and deactivation procedures,
- expected frequency and duration of use, and
- anticipated interaction with other airspace users.

Early alignment with the ANSP is strongly recommended.

Data Collection and Reporting Plan
Given the learning-oriented nature of the ITF, the applicant is expected to specify:

- what performance and safety data will be collected,
- how the data supports validation of assumptions or models,
- reporting formats and frequency, and
- any proposed real-time monitoring arrangements.

The completeness and coherence of these elements form the basis for the authority's assessment in Phase 2 of the ITF lifecycle.

B.4.3 Assessment by the Competent Authority

Once the application has been submitted, the NCA conducts a structured assessment to determine whether the proposed UAS activity can be safely conducted within an ITF environment and under what conditions. The assessment focuses on both the technical robustness of the proposal and the suitability of the ITF as a regulatory tool. In particular, the NCA evaluates:

- the clarity, internal consistency, and operational realism of the ConOps;
- the adequacy and proportionality of the SORA or equivalent risk assessment;
- the effectiveness of proposed mitigations and containment measures;
- the maturity of the system and evidence supporting readiness for real-world testing;
- the suitability of proposed airspace structures and their interaction with existing traffic;
- the organisational capability and competency framework of the operator; and
- the adequacy of monitoring and reporting arrangements.

For activities involving significant ATM/ANS interaction or airspace-management considerations, the competent authority may coordinate with the relevant ANSP(s) during the assessment of air-risk-related aspects associated with the proposed SORA-based operation.

Such coordination may support the identification of operational constraints, traffic interaction considerations, airspace implications and relevant mitigation measures associated with the proposed activity.

Where operations approach higher airspace layers, involve unusually large UAS, or raise questions linked to design or configuration integrity, the NCA may coordinate with EASA where the matter falls within EASA's competence. This is particularly relevant where elements of the system are subject to design-verification or airworthiness requirements.

If uncertainties remain significant, the authority may request additional evidence or further substantiation before granting the operational authorisation. Depending on the nature of the uncertainty, the applicant may use:

- simulation campaigns to validate trajectory or automation behaviour;
- ground or bench testing of critical subsystems;
- flight testing in a lower-risk environment; or
- phased validation with progressively expanding operational envelopes.

These activities are intended to provide evidence supporting the operational safety assessment. They do not imply that the NCA conducts or supervises a separate design investigation. Where formal design verification or airworthiness assessment is required, this remains subject to the applicable regulatory process and allocation of responsibilities.

The objective of the assessment phase is not to eliminate all uncertainty, but to ensure that uncertainty relevant to the proposed operation is understood, bounded and manageable within a controlled testing framework.

B.4.4 Definition of Testing Parameters and Oversight Arrangements

Following completion of the assessment, the NCA and the applicant define a consolidated set of testing parameters and oversight arrangements that will govern the ITF activity. These parameters translate the findings of the assessment into clear, enforceable conditions. They typically address:

- the approved operational envelope (geographical area, altitude limits, time windows, weather constraints);
- the system configuration permitted during testing, including any restrictions on software or hardware modifications;
- required mitigation measures and technical performance criteria;
- airspace structures and coordination procedures with the ANSP;
- competency and staffing requirements;
- contingency and emergency arrangements; and
- data collection and reporting obligations.

Particular attention is given to envelope expansion. Where progressive expansion is foreseen, clear criteria and decision points should be defined in advance. Progression from one phase to another should be based on demonstrated performance and safety evidence.

In parallel, the NCA establishes the oversight framework applicable during execution. This includes reporting timelines, review meetings, inspection rights, real-time monitoring requirements (where appropriate), and notification thresholds for anomalies or deviations.

The outcome of this stage is a coherent set of testing parameters and supervisory arrangements that form the basis for the formal authorisations issued in Phase 3 of the ITF lifecycle.

B.5 Authorisation Framework for UAS in an ITF

Once the testing parameters and oversight arrangements have been defined, the ITF moves into the authorisation phase. For UAS activities, this phase typically results in a combination of operational approval and airspace measures tailored to the specific project.

Unlike prototype aircraft operating under Part-21, most UAS in the Specific Category do not require a Permit to Fly. The primary regulatory instrument is therefore an Operational Authorisation issued by the National Competent Authority (NCA), complemented by appropriate airspace arrangements and coordination mechanisms.

Where certain elements of the UAS design or configuration fall within EASA's airworthiness remit, particularly in the case of very large UAS, HAPS, or hybrid systems, additional technical consultation or approval may be required. However, this will depend on the characteristics of the system and the applicable regulatory framework.

B.5.1 Operational Authorisation Based on SORA

The core legal instrument for UAS ITF testing is an Operational Authorisation issued under the Specific Category, based on a SORA or an equivalent structured risk assessment. The authorisation defines the binding conditions under which the UAS may operate during the ITF period. It typically specifies:

- the approved operational scenarios and mission profiles;
- the geographical and vertical limits of operation;
- required technical and operational mitigation measures;
- system performance requirements, including detect-and-avoid or C2 reliability thresholds where relevant;
- any restrictions on automation or autonomy functions;
- contingency and emergency procedures; and
- reporting and oversight obligations.

Where the ITF foresees progressive envelope expansion, the authorisation may incorporate phased conditions. For example, initial flights may be restricted to lower altitudes or limited automation modes, with expansion subject to review of performance data and safety outcomes.

The Operational Authorisation remains time-limited and project-specific. It does not constitute a general approval of the system for broader commercial deployment.

B.5.2 Airspace Considerations

UAS ITF operations may depend on dedicated or specially structured airspace arrangements, particularly for:

- complex BVLOS operations in controlled airspace;
- very high-altitude or long-endurance missions;
- operations near FIR boundaries; or
- testing of novel separation or integration concepts.

Depending on the characteristics of the activity, the ITF may require Temporary Segregated Areas (TSAs), Temporary Reserved Areas (TRAs), restricted airspace volumes, dedicated climb or descent corridors, or other flexible-use airspace arrangements supported, where appropriate, by NOTAM publication.

Close coordination with the relevant Air Navigation Service Provider(s) (ANSPs) is essential to support safe integration with existing traffic flows and minimise operational impacts on other airspace users. Depending on the activity, ANSP coordination may include:

- assessment of impacts on other airspace users;
- activation and deactivation procedures for airspace structures;
- operational coordination and communication procedures; and
- contingency-management arrangements.

Airspace arrangements should be considered integral elements of the operational risk-mitigation framework associated with the ITF activity.

Where ITF activities involve operations within or interacting with U-space airspace, appropriate coordination may also be required between the relevant U-space Service Provider(s) (USSPs), ANSPs and competent authorities in accordance with the applicable regulatory framework, including Commission Implementing Regulation (EU) 2021/664.

Depending on the operational characteristics of the activity, such coordination may include:

- information-sharing arrangements;
- communication and contingency-coordination mechanisms;
- operational interfaces between U-space and ATM/ANS environments; and
- clarification of operational responsibilities between involved entities.

B.5.3 Competency Requirements

Taken together, the Operational Authorisation, airspace arrangements, and competency framework constitute the formal regulatory basis for conducting UAS ITF activities. They define the boundaries within which innovation may be tested while preserving safety, transparency, and regulatory integrity.

UAS ITF operations frequently involve roles and responsibilities that extend beyond standard remote pilot functions. This may include supervision of highly automated systems, management of multi-UAS coordination, or monitoring of long-endurance operations at high altitude. Where existing licensing schemes do not fully capture these roles, the NCA may define competency-based requirements tailored to the ITF activity. These may include:

- specific training on prototype system behaviour and limitations;
- proficiency in abnormal and contingency procedures;
- understanding of automation logic and system failure modes; and
- communication and coordination procedures with ATC and the NCA.

Competency requirements should be clearly documented and linked to the risk assessment and operational complexity of the project. They form an integral part of the authorisation package and are subject to oversight during execution.

B.6 Execution and Monitoring

Once the ITF authorisations have entered into force and readiness has been confirmed, UAS operations may commence within the defined parameters. The execution phase is not merely an operational stage; it is a structured and closely supervised learning phase in which safety performance, system behaviour, and regulatory assumptions are evaluated.

During this phase, the operator is required to conduct all flights strictly within the authorised operational envelope. This includes adherence to geographical and vertical limits, activation windows for segregated or reserved airspace, system configuration constraints, and any phased progression conditions defined in the authorisation. Continuous situational awareness needs to be maintained throughout all phases of flight. This typically includes:

- reliable tracking of the UAS position and altitude;
- monitoring of command and control (C2) link integrity;
- real-time awareness of surrounding airspace activity, where applicable; and
- Adequate supervision of automation or autonomous functions.

For higher airspace or complex BVLOS operations, telemetry systems should provide sufficient performance and health data to enable timely identification of abnormal behaviour. Where required by the authorisation, selected telemetry parameters may be shared with the NCA or ANSP in near real time.

The operator should maintain comprehensive operational records. These records should include flight logs, system configuration status, deviations from planned profiles, anomalies encountered, contingency activations, and corrective actions taken. Logs form part of the evidentiary basis for evaluating ITF performance and may be reviewed during oversight activities.

Any anomaly, deviation from authorised conditions, loss of containment, or safety-relevant event should be notified to the competent authority in accordance with the defined reporting timelines. The notification process should distinguish between:

- minor deviations that remain within acceptable safety margins;
- events requiring immediate mitigation or intervention; and
- occurrences that may trigger suspension or reassessment of the ITF.

Authorities and ANSPs oversee compliance and operational performance trends throughout the ITF period. This oversight may include review meetings at defined milestones, analysis of submitted datasets, and, where appropriate, remote or on-site monitoring during live operations. If safety indicators suggest elevated risk, the authority may impose additional mitigations, restrict the operating envelope, or temporarily suspend testing pending further assessment.

For ITF projects involving advanced automation, machine learning systems, or adaptive control logic, enhanced monitoring provisions may apply. These can include:

- additional logging of algorithmic decisions;
- validation of software version control and configuration management;
- performance benchmarking against predefined safety thresholds; and
- restrictions on autonomous decision-making modes during early testing phases.

Execution within an ITF is therefore dynamic rather than static. The operating envelope may expand progressively based on demonstrated performance, or it may be constrained if evidence suggests that risk assumptions require adjustment. Adequate dialogue between the operator, the NCA, and the ANSP is essential to ensure that innovation proceeds in a controlled and transparent manner. The monitoring and reporting framework defined at authorisation stage thus becomes the central mechanism through which safety is preserved, and regulatory learning is achieved.

B.7 Evaluation and Transition

At the conclusion of the ITF period, or at defined milestones within a phased testing programme, the results of the UAS activities should be formally evaluated. The evaluation phase serves two complementary purposes. First, it determines whether the specific testing objectives have been achieved safely and effectively. Second, it extracts lessons that may inform future operational approvals, certification pathways, or regulatory development.

The evaluation should be conducted jointly by the operator and the competent authority, with input from the ANSP where airspace integration has played a significant role. In projects involving higher airspace or elements under EASA's remit, consultation with EASA may also be appropriate.

The evaluation process should address, at a minimum, the following elements:

Achievement of objectives
The authority assesses whether the technical and operational goals defined at the outset of the ITF have been met. This includes validation of performance assumptions, verification of system behaviour under real-world conditions, and confirmation that the proposed mitigations functioned as intended.

Safety performance
All reported occurrences, anomalies, deviations, and contingency activations are reviewed. Particular attention should be paid to:

- the effectiveness of risk mitigation measures defined in the SORA or safety case;
- the reliability of command-and-control links;
- containment performance in geographical and vertical terms;
- behaviour of automated or autonomous functions;
- interaction with other airspace users.

The authority evaluates whether residual risks remained within the accepted safety margins throughout the testing campaign.

Operational and organisational performance
The evaluation also considers the operator's procedures, communication protocols, staffing arrangements, and reporting discipline. This includes assessing whether:

- operational procedures were followed consistently;
- escalation and notification thresholds were respected;
- coordination with ATC or the ANSP functioned as planned;
- internal safety management processes were effective.

Quality and usefulness of data provided by operator
The ITF's value depends significantly on the quality of data generated. The authority assesses whether the data provided by operator were complete, accurate, and sufficient to support regulatory learning or further technical development. Any data gaps or methodological limitations should be documented.

Possible Outcomes

Following evaluation, several pathways may be considered:

1. Conclusion of the ITF
   If objectives have been met and no further experimental activity is required; the ITF may be formally closed. A final evaluation report summarises the outcomes and lessons learned.

2. Extension or envelope expansion
   If results demonstrate satisfactory safety performance but additional data is required, the ITF may be extended. This may involve progressive expansion of operational parameters such as altitude, endurance, or automation level, subject to updated risk assessments and amended authorisations.

3. Transition to broader operational approval
   Where the testing demonstrates sufficient maturity, the operator may transition toward a standard operational authorisation outside the ITF framework. This could include an expanded SORA-based approval or, where applicable, progression toward design or type certification processes.

4. Contribution to regulatory development
   For novel UAS concepts, particularly those involving higher airspace, advanced autonomy, or non-standard command and control architectures, ITF results may inform guidance material, acceptable means of compliance, or future implementing rules at national or European level.

The evaluation phase should conclude with a documented summary of findings agreed by the authority and the operator. This documentation forms part of the broader regulatory learning cycle and ensures that the ITF experience contributes to safer and more predictable integration of innovative UAS operations into the European aviation system.

Annex C: Application Pathway for Higher-Airspace Balloon/Lighter-Than-Air Operations

Note on Proportionality

The guidance set out in this annex should be applied in a proportionate manner. It is not intended to introduce unnecessary administrative burden or procedural rigidity.

The level of documentation, modelling depth, telemetry redundancy, containment measures, and oversight intensity should reflect the specific risk profile of the proposed activity. Factors such as operational complexity, duration, altitude, system maturity, geographic scope, and potential cross-border implications should guide the depth of assessment and monitoring.

Not all ITF projects will require the full range of measures described in this annex. Authorities and applicants are expected to apply professional judgement to ensure that the ITF remains a structured but enabling framework, tailored to the scale and novelty of the operation.

C.1 Classification considerations for higher airspace balloon/Lighter-than-air operations

Higher airspace and stratospheric balloon operations may involve a wide range of platform types with differing technical characteristics and levels of controllability. These may include, for example, manned or unmanned balloons, free or controlled platforms, powered or unpowered systems, and airships or hybrid configurations.

From a regulatory perspective, these distinctions are significant, as they may result in different classification outcomes and, consequently, different applicable regulatory pathways. In particular, depending on their design and operational characteristics, such platforms may fall within the scope of Part-21 airworthiness certification, be subject to the unmanned aircraft regulatory framework, or be excluded under Annex I of Regulation (EU) 2018/1139 and therefore fall under national oversight. Where the platform qualifies as a manned balloon within the scope of Regulation (EU) 2018/395, the applicable operational and flight-crew requirements of that Regulation should be identified. However, in accordance with Article 3(1) of Regulation (EU) 2018/395, the requirements of Subpart BAS of Part-BOP do not apply to design or production organisations that comply with Articles 8 and 9, respectively, of Regulation (EU) No 748/2012 and operate the balloon, within the scope of their privileges, for the purposes of the introduction or modification of balloon types.

Accordingly, for innovative development and testing activities conducted under approved Flight Conditions and a Permit to Fly, the applicable regulatory basis should be determined by reference to the specific platform, the organisation conducting the flight, the purpose of the activity and the scope of the relevant Part-21 privileges. The existence of approved Flight Conditions and a Permit to Fly does not, in itself, determine whether Regulation (EU) 2018/395 applies. Regulation (EU) 2018/395 does not apply to unmanned balloon systems.

The determination of the applicable pathway should therefore be based on the specific characteristics of the platform and its intended operation, rather than on general terminology such as "balloon" or "high-altitude platform system". Applicants are encouraged to engage early with the competent authority to clarify the classification and the corresponding regulatory framework. The following table shows an indicative classification and regulatory pathways for higher airspace and balloon-based platforms:

Platform Type	Typical Characteristics	Likely Regulatory Regime	Typical Authorisation Pathway	Notes
Crewed balloon or airship (test or non-standard configuration)	Manned, may carry crew or passengers, operated in development or non-standard conditions	Part-21 or national (depending on classification)	Permit to Fly (PtF)	Includes stratospheric crewed flights or novel operational concepts
Uncontrolled (free) unmanned balloon	Passive drift, no navigation capability	SERA Appendix 2 as AMC under Art. 11, Regulation (EU) 2019/947	National authorisation	Limited controllability; simpler regulatory treatment
Controlled unmanned balloon / high-altitude platform system	Navigation or control capability, possibly powered or persistent	UAS framework or Part-21 (case-dependent)	SORA-based Operational Authorisation or PtF	Includes HAPS-type or pseudo-satellite concepts
Hybrid / experimental buoyant aircraft systems	Combination of buoyancy and propulsion, partial controllability	Case-by-case (Part-21 or national)	PtF or national authorisation	Typical ITF use case with novel configurations

Table C.1: Indicative classification and regulatory pathways for higher-airspace and balloon-based platforms

The considerations described in this Annex apply to a range of higher airspace and balloon-based platforms with differing characteristics. Not all elements will be applicable in all cases.

The applicable regulatory pathway, operational constraints, and authorisation process depend on the classification of the platform, in particular its level of controllability, propulsion, and whether it is crewed or uncrewed.

The following sections should therefore be applied in a proportionate and case-by-case manner, taking into account the specific characteristics of the platform and the selected regulatory pathway.

C.2 Purpose and Scope of This Annex

This annex provides practical and structured guidance for preparing, assessing, and conducting ITF activities involving stratospheric balloons, long-duration lighter-than-air systems, scientific research platforms, and comparable Higher Airspace Operations (HAO).

Such systems frequently operate at altitudes and in atmospheric regions where conventional aviation assumptions, traffic patterns, and oversight practices are limited or evolving. Unlike traditional aircraft operations, balloon-based systems may remain aloft for extended periods, traverse large geographic areas, or rely on atmospheric dynamics for movement. These characteristics create regulatory and operational questions that cannot always be resolved through modelling, simulation, or ground testing alone.

The ITF enables these concepts to be validated under real-world conditions in a controlled, time-limited, and supervised environment. It provides a mechanism for:

- progressive envelope expansion;
- structured validation of trajectory and behaviour models;
- verification of safety functions such as termination systems;
- evaluation of airspace integration strategies;
- sharing of data relevant to future regulatory development.

This annex complements:

- Section 3, which describes the regulatory tools available;
- Section 5, which sets out the ITF lifecycle; and
- Annex E, which provides the general application template.

The present annex focuses specifically on balloon-based HAO and the technical and operational considerations unique to such systems.

C.3 Stratospheric Balloons in the Innovation Testing Framework Context

Stratospheric and higher airspace balloons differ fundamentally from conventional aircraft. Their behaviour is largely governed by atmospheric conditions, buoyancy principles, and limited or passive control mechanisms. While some advanced systems incorporate propulsion or limited station-keeping capabilities, most are subject to wind patterns that vary by altitude, time, and meteorological conditions.

This results in several distinctive operational characteristics:

- ascent profiles that may traverse multiple airspace layers;
- lateral drift that may span significant geographic distances;

- long endurance at high altitude;
- complex or dynamic descent trajectories;
- dependence on accurate meteorological modelling;
- reliance on reliable tracking and telemetry for situational awareness.

Because balloons cannot manoeuvre actively in the same manner as powered aircraft, containment strategies differ from traditional aviation models. Risk mitigation often relies on:

- accurate trajectory prediction and monitoring;
- clearly defined airspace structures during ascent and descent;
- reliable cut-down or flight termination systems;
- communication redundancy;
- recovery planning for descent and landing phases.

The predictability of drift and the reliability of termination systems are central safety considerations. While atmospheric models can provide reasonable forecasts, real-world validation is frequently required to confirm their accuracy and to understand deviations under varying environmental conditions.

These characteristics make an ITF particularly appropriate for balloon-based HAO. Within an ITF, authorities and operators can:

- validate modelling assumptions against actual flight behaviour;
- refine ascent and descent procedures;
- test and verify termination or recovery mechanisms;
- evaluate telemetry reliability and tracking coverage;
- assess cross-border drift implications;
- develop evidence for future operational or regulatory frameworks.

The ITF environment provides a structured way to manage uncertainties while maintaining safety. It allows gradual expansion of altitude bands, endurance duration, or geographic scope as operational knowledge increases.

In contrast, routine meteorological balloon launches or standard short-duration scientific releases that follow established procedures do not require ITF treatment. The ITF mechanism is intended for innovative, complex, or higher-risk balloon operations that introduce new technologies, new operational concepts, or new regulatory questions.

C.4 When an Innovation Testing Framework is Appropriate for Balloon-Based HAO

An ITF becomes appropriate when a proposed stratospheric or higher airspace balloon operation introduces technological, operational, or regulatory elements that cannot be adequately accommodated within established procedures.

Balloon activities vary significantly in complexity. While routine meteorological or short-duration research launches are typically managed through existing notification and airspace coordination processes, innovative HAO concepts may raise uncertainties that require a structured and supervised testing environment.

An ITF is particularly relevant where one or more of the following conditions apply.

<u>Novel ascent or descent strategies</u>
If the balloon employs new methods of controlled ascent, variable buoyancy systems, guided descent, or unconventional termination mechanisms, the safety performance of these systems may need validation through progressive real-world testing.

<u>Station-keeping or propulsion-assisted systems</u>
Advanced stratospheric platforms that incorporate propulsion, aerodynamic control surfaces, or active station-keeping introduce behaviours closer to those of aircraft. These hybrid characteristics may not fit clearly within traditional balloon frameworks and may require tailored oversight.

<u>Uncertain trajectory modelling</u>
Where atmospheric modelling presents significant variability or uncertainty, especially for long-duration flights or operations above conventional airspace, ITF testing allows validation of predictive models and refinement of drift forecasts.

<u>Extended endurance or wide geographic coverage</u>
Long-duration flights that may cross multiple airspace sectors, or that could realistically approach FIR boundaries, require coordinated airspace planning and real-time monitoring strategies that benefit from ITF structuring.

<u>Complex payload or mission profiles</u>
Scientific, communications, surveillance, or experimental payloads that require precise positioning, altitude stability, or active control mechanisms may introduce operational risks not covered by standard procedures.

<u>Cross-border or multi-State implications</u>
Where drift trajectories create a realistic possibility of entering adjacent airspace, coordination requirements may exceed routine arrangements. An ITF provides a structured mechanism to manage such coordination and oversight.

In contrast, ITF treatment is not required where:

- the balloon operation is routine and well established;
- ascent, drift, and descent profiles are predictable and within known safety margins;
- airspace interaction is minimal and adequately managed through existing processes;
- no novel system behaviours are introduced.

The determining factor is not altitude alone, but the presence of technical or operational uncertainty that requires structured experimentation under enhanced oversight.

In summary, an ITF is appropriate when real-world validation is necessary to reduce uncertainty, confirm safety assumptions, or develop regulatory understanding of innovative balloon-based HAO concepts**.**

C.5 Application Pathway for Stratospheric Balloon Innovation Testing Framework Activities

The application pathway for stratospheric balloon ITF activities follows the general lifecycle described in Section 5 of the guidance. However, balloon-based Higher-Airspace Operations introduce specific technical, operational, and airspace considerations that require tailored documentation and assessment.

This section sets out the additional elements that should be addressed when preparing and evaluating ITF applications involving balloon-based systems.

C.5.1 Initial Engagement and Scoping

Before submitting a formal ITF application, the operator should engage in early discussions with the National Competent Authority. Where operations may affect controlled airspace or involve complex coordination, the ANSP should also be involved at this stage.

The purpose of this early engagement is to:

- clarify whether the proposed activity requires ITF treatment;
- identify the regulatory tools that may be applicable;
- discuss expected airspace structures and coordination requirements;
- identify cross-border implications at an early stage;
- agree on the expected depth of modelling and safety documentation.

Discussions should address the intended mission profile, including launch location, expected altitude bands, duration aloft, modelling assumptions, descent strategy, and recovery plan. If cross-border drift is possible, early dialogue with neighbouring States may be advisable. This initial scoping phase reduces later uncertainty and ensures that the formal application is proportionate and complete.

Use of prior national experience

Authorities and applicants may draw on experience from previously authorised stratospheric-balloon or higher-airspace missions when defining the approval pathway, expected safety documentation and coordination arrangements for an ITF activity. Relevant experience may include national practices concerning launch approval, airspace reservation, trajectory prediction, telemetry and tracking, flight termination, descent and recovery, cross-border coordination and post-flight reporting.

Such examples are illustrative only. They do not establish a harmonised approval pathway, replace the applicable Union or national regulatory framework, or remove the need for a case-specific assessment of the platform and operation.

C.5.2 Preparing the Innovation Testing Framework Application

The formal ITF application should provide a coherent and structured description of the balloon system, its operational concept, and the measures intended to manage risks. It should align with the general template in Annex E while incorporating balloon-specific considerations as set out below.

1. Concept of Operations (ConOps)

The ConOps should describe the complete operational lifecycle in a clear and structured narrative. It should include:

- launch preparation and ground safety arrangements;
- ascent profile and expected rate of climb;
- airspace layers to be crossed and associated coordination requirements;
- intended higher airspace operating band and expected duration;
- modelling of lateral drift and, where applicable, station-keeping behaviour;
- method, triggers, and criteria for flight termination or controlled descent;
- landing or recovery strategy;
- contingency actions for reasonably foreseeable off-nominal scenarios.

The ConOps should demonstrate that the operator understands each flight phase, the transitions between phases, and the operational dependencies associated with each.

2. System Description and Maturity

The application should provide a sufficiently detailed description of the system to enable a technical and safety assessment. This should include:

- balloon envelope materials and structural characteristics;
- payload mass, configuration, and attachment mechanisms;
- communication and telemetry architecture;
- tracking systems and redundancy arrangements;
- termination or cut-down system design, activation logic, and reliability assumptions;
- power sources and endurance characteristics;
- for long-duration missions, degradation assumptions, energy margins, maintenance or health-monitoring strategy, and the ability of safety-critical functions to remain available throughout the intended mission duration;
- propulsion or limited control systems, where applicable.

For long-duration or persistent operations, the applicant should identify time-dependent failure mechanisms and operational dependencies that may not be significant during short-duration testing. These may include degradation of energy systems, communication availability, navigation or tracking performance, environmental exposure, software or configuration stability, ground-segment continuity and availability of operational personnel.

The applicant should also provide evidence of system maturity, such as laboratory validation, structural testing, subsystem verification, environmental qualification, or prior flight demonstrations at smaller scale.

3. Safety Assessment

The safety assessment should be structured by flight phase. As a minimum, it should address:

- launch and ground operations;
- ascent through lower and controlled airspace;
- higher airspace cruise or station-keeping phase;
- termination and descent phase;
- landing or recovery phase.

For each phase, the applicant should:

- identify relevant hazards;
- assess the likelihood and severity of associated risks;
- describe implemented mitigation measures;
- explain the resulting residual risk;
- demonstrate that risk remains within acceptable safety objectives.

Particular attention should be given to:

- loss of telemetry or tracking capability;
- malfunction or non-activation of termination systems;
- unexpected drift outside predicted corridors;
- uncontrolled or off-target descent into populated or restricted areas;
- meteorological variability and forecast uncertainty;
- interaction with controlled airspace and IFR traffic during ascent or descent.

The assessment should demonstrate that containment strategies are technically credible, operationally feasible, and proportionate to the identified risks.

4. Airspace Requirements

The application should clearly define the airspace structures and coordination mechanisms required for the ITF activity. This may include:

- protected launch windows;

- temporary or conditional ascent corridors through controlled airspace;
- defined altitude blocks for higher airspace operations;
- contingency descent or termination areas;
- procedures for activation, monitoring, and deactivation of reserved airspace.

Where cross-border drift is reasonably foreseeable, the application should identify affected Flight Information Regions (FIRs) and outline the proposed coordination framework with the relevant authorities and ANSPs.

The applicant should demonstrate that the proposed airspace arrangements ensure predictability, containment, and safe integration with other airspace users.

5. Data and Reporting Plan

Given that balloon-based High Altitude Operations (HAO) frequently contribute to regulatory learning, the application should include a structured data and reporting plan specifying:

- trajectory and position data to be recorded;
- telemetry and system health parameters;
- environmental or atmospheric measurements, where relevant;
- anomaly detection and reporting procedures;
- post-flight analysis methodology.

The applicant should explain:

- how operational data will be shared with the competent authority;
- how lessons learned will be documented;
- how findings contribute to safety evaluation and future regulatory development.

Outcome of Phases 1 and 2

The outcome of Phases 1 and 2 for balloon-based HAO should be:

- a clearly defined operational envelope;
- an agreed containment and termination strategy;
- established airspace coordination arrangements;
- a structured oversight and reporting framework.

These elements should form the basis for authorisation under Phase 3.

C.6 Assessment by the Authority

When assessing an ITF application for stratospheric or higher airspace balloon operations, the competent authority should determine whether the proposed activity can be conducted safely within a controlled and supervised environment, and whether the uncertainties identified by the applicant are appropriately managed.

The assessment focuses not only on the technical design of the balloon system, but also on the credibility of the modelling, operational procedures, and containment strategies proposed.

Technical robustness and system maturity
The authority reviews the system description and prior testing evidence to determine whether the balloon and its subsystems are sufficiently mature for real-world trials. Particular attention is given to:

- structural integrity of the envelope and payload attachment;
- redundancy and reliability of telemetry and tracking systems;
- robustness of communication links;
- performance and reliability of termination or cut-down devices;
- power systems for long-duration missions.
- evidence that safety-critical functions, ground support and operational monitoring can be sustained for the proposed duration, including appropriate margins and degradation assumptions.

Ground testing, environmental testing, or small-scale demonstration flights may be required to substantiate readiness.

Trajectory prediction and modelling methodology
Trajectory modelling is a central element of balloon-based HAO. The authority evaluates:

- the meteorological data sources used;
- modelling tools and assumptions;
- sensitivity analyses addressing worst-case drift scenarios;
- the operator's strategy for updating predictions during ascent;
- contingency planning for deviations from predicted tracks.

The authority should be satisfied that trajectory forecasts are sufficiently reliable to support containment within defined airspace structures and that real-time monitoring allows timely intervention if necessary.

Risk assessment and mitigation strategy
The authority reviews the safety assessment to ensure that hazards are identified separately for ascent, higher airspace operation, and descent phases. Key considerations include:

- loss of telemetry or communication;
- uncontrolled drift into controlled airspace;
- malfunction of termination systems;

- descent into populated or sensitive areas;
- payload release or structural failure.

Mitigation measures should be credible, proportionate, and supported by evidence where possible.

Airspace integration and coordination

The authority evaluates the suitability of proposed airspace arrangements in coordination with the ANSP. This includes:

- adequacy of ascent corridors and altitude blocks;
- protection of other airspace users;
- clarity of activation and deactivation procedures;
- communication protocols during ascent and descent;
- cross-border coordination arrangements, where applicable.

Airspace containment strategies should align with predicted trajectories and contingency scenarios.

Organisational readiness

Beyond technical considerations, the authority assesses whether the operator has the organisational capability to conduct the ITF safely. This includes:

- defined roles and responsibilities;
- clear operational procedures;
- monitoring and decision-making structures;
- escalation protocols for anomalies;
- defined communication channels with authorities and ANSPs.

If uncertainties remain significant, the authority may limit the initial scope of the ITF, impose additional monitoring requirements, require phased progression, or request further validation activities before authorisation.

The objective of the assessment phase is not to eliminate all uncertainty, but to ensure that uncertainties are understood, contained, and managed within clearly defined and supervised parameters.

Note: Certain Higher Airspace Operations, including some HAPS concepts operating at very high altitudes, may involve operational characteristics that are not fully reflected in conventional ground-risk assessment methodologies.Depending on the nature of the activity, this may include considerations related to:

- large potential debris dispersion areas;
- extended duration trajectories;
- operations above conventional ATM environments; and
- higher airspace operational profiles.

Where appropriate, alternative or adapted assessment approaches may be considered to ensure that the overall safety objectives of the activity are adequately addressed.

Evidence collected during such operations should, where relevant, document limitations encountered in applying existing assessment methodologies, any adaptations used, and the observed effectiveness of those adaptations. Such information may support future refinement or standardisation of risk-assessment approaches for higher-airspace operations.

C.7 Authorisation Framework for Balloon Operations

The authorisation framework for balloon-based ITF activities is multi-layered. It combines operational approval, airspace structuring, contingency planning, and coordination mechanisms into a coherent and legally robust structure. The objective is to enable real-world validation of innovative HAO concepts while ensuring that ascent, drift, and descent remain predictable, contained, and safely integrated within the wider aviation system. The layers are further explained in the following.

Once the assessment phase has been completed and testing parameters agreed, balloon-based ITF activities require a formal authorisation framework. Unlike routine meteorological balloon launches, innovative stratospheric or long-duration platforms typically require a structured combination of operational approval, airspace arrangements, and coordinated oversight measures.

Authorisation for balloon-based ITF operations normally consists of several complementary elements.

1. **Operational Authorisation**

The National Competent Authority issues a formal operational authorisation defining the conditions under which the balloon activity may take place. This authorisation establishes the legally binding operational envelope for the ITF period.

The operational authorisation typically specifies:

- the approved launch site and launch window limitations;
- the ascent profile and maximum rate of climb;
- altitude bands authorised for higher airspace operation;
- duration limits, where applicable;
- the permitted payload configuration and mass limitations;
- required safety mitigations, including termination system readiness;
- telemetry and tracking performance requirements;
- contingency procedures and notification thresholds;
- reporting obligations and review milestones.

Where phased testing is foreseen, the authorisation may limit the initial campaign to conservative parameters, with expansion subject to review of performance data and demonstrated reliability.

The operational authorisation does not create a general approval for future missions. It remains time-limited and project-specific within the ITF framework.

2. Airspace Approval and Coordination

Airspace approval is a central element of balloon ITF authorisation. Given the vertical profile of ascent and the potential for lateral drift, clearly defined airspace structures are essential for containment and predictability.

Airspace arrangements may include:

- protected launch windows;
- defined ascent corridors through controlled airspace;
- temporary altitude blocks reserved for higher airspace operation;
- contingency descent zones;
- temporary segregated or reserved areas where required.

These arrangements are established in coordination with the ANSP and may require publication through NOTAM or other aeronautical information systems.

For ascent through controlled airspace, real-time coordination procedures with ATC should be defined clearly. This includes communication protocols, tracking visibility, and clear decision-making authority in case of deviations.

Where high-altitude drift could affect adjacent sectors or FIRs, coordination between ANSPs should be addressed prior to authorisation.

3. Environmental and Recovery Permissions

Depending on the nature of the payload, the launch location, and the recovery plan, additional permits may be required. These can include:

- environmental or land-use permissions;
- permissions for recovery operations in specific geographic areas;
- maritime coordination if recovery at sea is possible;
- compliance with national rules concerning hazardous materials or debris management.

The ITF authorisation does not replace such external legal requirements. The operator remains responsible for ensuring that all applicable non-aviation permissions are secured.

4. Cross-Border Coordination

If trajectory modelling indicates a realistic possibility that the balloon may drift across national boundaries, the authorisation framework should address cross-border implications.

This may include:

- prior notification to neighbouring States;
- coordination between relevant ANSPs;
- agreement on monitoring and contingency procedures;
- clarification of responsibility for recovery in the event of descent outside national territory.

Where drift into another FIR cannot be excluded, cross-border coordination should be treated as a prerequisite for authorisation rather than as a post-launch contingency.

5. Interaction with EASA Competence

Most balloon operations fall primarily under national operational and airspace oversight. However, where the balloon system incorporates innovative propulsion, active control systems, or hybrid characteristics that resemble aircraft behaviour, elements of the design may fall within EASA's competence.

In such cases, the NCA may consult EASA during the assessment and authorisation phase. This ensures consistency with the broader EU regulatory framework and avoids regulatory fragmentation where novel system architectures blur the boundaries between traditional balloon operations and aircraft-like systems.

C.8 Execution and Monitoring

Execution within a balloon-based ITF requires disciplined adherence to approved parameters, continuous situational awareness, robust communication with airspace authorities, and systematic documentation. These elements ensure that innovative higher airspace concepts can be tested responsibly while maintaining containment, transparency, and public safety.

Once authorisation has been granted, balloon-based ITF operations should be conducted strictly within the operational envelope and conditions defined in the approval package. The ITF does not provide discretionary flexibility during execution. All deviations from approved parameters should be managed in accordance with the agreed contingency procedures and reporting obligations.

Execution and monitoring are particularly critical in balloon-based HAO because atmospheric behaviour can evolve dynamically during ascent and higher airspace phases. Continuous situational awareness is therefore essential.

<u>Operational Discipline and Compliance</u>

The operator should ensure that:

- the balloon configuration corresponds to the approved configuration;
- launch occurs within the authorised window and meteorological criteria;

- ascent profile and rate of climb remain within approved limits;
- higher airspace operation remains within the authorised altitude band;
- termination or descent criteria are applied exactly as defined;
- no unauthorised payload, system, or configuration changes are introduced.

Where phased envelope expansion has been approved, progression to the next phase should occur only after the authority has confirmed that prior performance was satisfactory.

Continuous Tracking and Telemetry

Continuous tracking and telemetry are fundamental safety elements in balloon ITF operations. The operator should maintain real-time or near-real-time visibility of:

- geographic position;
- altitude;
- drift rate and direction;
- system health indicators;
- communication link status.

Redundancy in tracking or communication systems should be used where defined in the authorisation. If telemetry degradation occurs, the operator should follow predefined decision logic, which may include immediate termination or controlled descent depending on the severity of the loss.

Atmospheric data should be monitored continuously during ascent and higher airspace phases. Updated trajectory predictions should be generated at agreed intervals to verify continued compliance with containment assumptions.

Contingency and Deviation Management

If the balloon deviates from predicted trajectories beyond agreed thresholds, or if system anomalies occur, the operator should initiate contingency procedures without delay.

Such procedures may include:

- activation of termination mechanisms;
- controlled descent;
- notification to the NCA and ANSP;
- implementation of predefined recovery actions;
- temporary suspension of further launches pending investigation.

Clear notification timelines should be respected. Where deviation thresholds involve proximity to controlled airspace or international boundaries, escalation should need to be immediate and coordinated with the relevant airspace authorities.

Airspace Coordination During Execution

During ascent through controlled airspace and during any phase requiring ATC coordination, communication procedures need to be strictly followed. This includes:

- timely activation and deactivation of reserved airspace;
- confirmation of climb clearance and vertical separation;
- reporting of altitude and position as required;
- coordination in case of abnormal drift or emergency descent.

If the balloon approaches sensitive airspace sectors or FIR boundaries, early notification to the relevant service providers is essential to avoid operational disruption or safety concerns.

Certain ITF activities involving long-duration balloon or HAPS operations may require sustained operational coordination and situational awareness arrangements between the operator, ANSP(s) and relevant authorities over extended periods of time.

Depending on the nature and complexity of the activity, this may include:

- periodic operational coordination activities;
- updated trajectory or operational status information;
- telemetry or automated information-sharing interfaces supporting operational awareness;
- contingency coordination arrangements; and
- procedures supporting operational monitoring during the activity.

The scope and complexity of such arrangements should remain proportionate to the operational characteristics and risk profile of the activity.

Authority Oversight

The competent authority may implement oversight measures proportionate to the risk and complexity of the operation. This may include:

- real-time monitoring of telemetry feeds;
- presence of authority observers at the launch site;
- periodic operational review meetings during long-duration missions;
- direct communication channels for anomaly escalation.

Where the ITF involves significant novelty or cross-border implications, enhanced monitoring requirements may be imposed.

Data Sharing and Documentation

All operational data should be recorded by the operator and preserved in accordance with the monitoring and reporting plan defined during authorisation. This includes:

- trajectory and altitude data;
- meteorological observations;
- telemetry performance;
- anomalies and system alerts;
- contingency activations;
- communication logs with ATC and authorities.

Post-flight analysis should compare predicted and actual trajectories, assess system performance, and document any deviations from modelling assumptions.

Accurate and structured data collection is essential not only for operational safety but also for the broader purpose of regulatory learning within the ITF framework.

C.9 Evaluation and Transition

At the conclusion of the ITF period, or at predefined milestones in the case of phased testing, the authority and the operator should conduct a structured evaluation of the balloon activity. The objective of this evaluation is twofold. First, it determines whether the operational and safety objectives defined at the outset have been achieved. Second, it extracts lessons that may inform future operations and regulatory development.

The evaluation should compare predicted behaviour with actual operational outcomes. Particular attention should be given to:

- the accuracy of trajectory modelling during ascent, higher airspace operation, and descent;
- the reliability and continuity of tracking and telemetry systems;
- the performance of communication links throughout all flight phases;
- the effectiveness and reliability of termination or controlled descent mechanisms;
- the adequacy of contingency procedures when deviations occurred;
- any unexpected technical or operational behaviours observed during flight.

Where drift modelling formed a central safety assumption, deviations between predicted and actual trajectories should be analysed carefully. The causes of discrepancies, such as meteorological variability or modelling limitations, should be documented and assessed for their regulatory implications.

The evaluation should also consider organisational and coordination aspects. This includes the effectiveness of communication with ATC or ANSPs, the clarity of decision-making processes during anomalies, and the adequacy of cross-border coordination where applicable.

Based on the findings, several outcomes are possible.

1. If the objectives have been met and safety performance has been satisfactory, the ITF may be formally concluded with a final evaluation report.
2. If additional data is required or progressive envelope expansion was foreseen, the ITF may be extended under amended conditions.
3. If the activity demonstrates sufficient maturity and predictable behaviour, it may transition toward more formal approval pathways under the applicable regulatory framework.

In cases where modelling uncertainties or system limitations remain significant, further restricted testing phases may be defined before broader operational approval is considered.

The final evaluation report should summarise operational performance, safety findings, deviations, lessons learned, and recommendations for future regulatory treatment. Where relevant, findings may contribute to national or European regulatory discussions on higher airspace operations.

The evaluation phase therefore closes the ITF loop. It ensures that experimental activity produces structured knowledge, strengthens safety understanding, and supports the gradual integration of innovative balloon-based HAO into the wider aviation system.

Annex D: Application Pathway for Supersonic and Hypersonic Demonstrators

D.1 Purpose and Scope of This Annex

This annex provides practical guidance for ITF activities involving supersonic and hypersonic flight demonstrators. These vehicles frequently combine prototype airframes, advanced propulsion systems, novel materials, and experimental control architectures operating in flight regimes that exceed the assumptions embedded in current certification specifications and operational rules.

High-speed demonstrators often explore aerodynamic, structural, thermal, and propulsion phenomena that cannot be fully validated through ground testing, wind tunnel campaigns, or simulation alone. Certain behaviours only manifest under real atmospheric conditions and dynamic pressures encountered during flight. For this reason, an ITF can provide a structured and supervised environment in which controlled real-world testing may take place before a formal certification basis is fully established.

This annex builds on:

- Section 3, which explains the regulatory flexibility tools available; and
- Section 5, which describes the ITF lifecycle.

It adds considerations specific to high-speed flight regimes and is intended to support both applicants and authorities in designing proportionate and safe ITF programmes.

As with other annexes, the measures described here should be applied proportionately to the risk profile and technical maturity of the demonstrator.

D.2 Supersonic and Hypersonic Demonstrators in the Innovation Testing Framework Context

Demonstrator aircraft operating in supersonic or hypersonic regimes introduce technical and operational challenges that differ significantly from conventional flight testing. At high Mach numbers of aerodynamic characteristics shift rapidly across flight regimes; shockwave interactions influence stability and control; structural loads and thermal effects increase substantially; propulsion systems may transition between different operating modes; control system authority and response characteristics may vary dynamically.

Hypersonic systems, in particular, may experience extreme aerodynamic heating, rapid energy changes, and limited margins for recovery if anomalies occur. Even supersonic demonstrators may require careful management of transonic transitions, where aerodynamic behaviour can be highly nonlinear.

Operationally, ascent profiles typically involve passing through conventional controlled airspace before reaching designated test altitudes. Test segments may cover significant ground distances within short timeframes. Descent and recovery phases may involve high energy management considerations and require carefully pre-defined abort corridors. These factors mean that many high-speed demonstrators do not yet have an established certification basis, rely on progressive validation of safety margins, require specialised airspace arrangements, and demand close technical oversight during early flights.

An ITF provides an environment in which these constraints can be managed systematically. It allows temporary, proportionate regulatory flexibility to be combined with defined operational containment and structured data collection, ensuring that the knowledge required for future certification and rulemaking can be generated safely.

D.3 When an Innovation Testing Framework is Appropriate for High-Speed Demonstrators

An ITF becomes appropriate when the proposed testing activity falls outside established regulatory pathways or involves uncertainties that cannot be sufficiently mitigated through existing approval mechanisms. This may be the case when the demonstrator:

- relies on novel propulsion architectures such as combined-cycle engines, rocket-augmented systems, or unconventional fuel concepts;
- incorporates thermal protection systems or structural concepts that should be validated under real aerodynamic heating conditions;
- employs adaptive or autonomous flight control logic in transonic, supersonic, or hypersonic regimes;
- involves flight envelopes for which no applicable certification specifications currently exist;
- requires large, segregated airspace structures, high-altitude corridors, or coordinated climb and descent profiles;
- presents significant uncertainty in trajectory prediction, controllability, or energy management at high dynamic pressure.

An ITF is particularly useful where a phased expansion of the flight envelope is required, beginning with subsonic validation and progressively advancing into higher Mach regimes under controlled oversight.

By contrast, routine prototype testing within conventional subsonic envelopes and well-understood regulatory frameworks does not normally require ITF treatment unless additional operational or airspace complexities arise.

D.4 Application Pathway for Supersonic and Hypersonic Innovation Testing Framework Activities

The application pathway for high-speed demonstrators follows the general ITF lifecycle described in Section 5. However, due to the technical complexity and elevated energy states involved, applications for supersonic and hypersonic demonstrators require a higher degree of technical substantiation and clarity regarding envelope limitations. Early engagement, progressive validation, and structured oversight are particularly important.

D.4.1 Initial Engagement and Scoping

Before submitting a formal ITF application, the operator should engage in proportionate initial discussions with the National Competent Authority or other identified lead authority. Where the proposed activity raises airworthiness, design or certification matters falling within EASA's competence, early involvement of EASA may be appropriate. The timing and extent of such involvement should reflect the maturity, complexity and intended flight envelope of the project.

Where the demonstrator is also intended for space operations or is subject to the responsibilities of other authorities, the scoping process should take account of existing regulatory interactions and seek to avoid duplication of assessments and information requests.

The initial engagement should clarify, as relevant:

- the overall development roadmap of the demonstrator;
- the planned sequence of flight phases, including subsonic validation, transonic transitions, supersonic expansion, and, where applicable, hypersonic segments;
- the propulsion architecture and any multi-mode transitions;
- expected Mach ranges and altitude bands;
- principal safety concerns, including loss-of-control scenarios and propulsion failure modes;
- initial airspace concepts and containment strategies.

The purpose of this scoping phase is to identify the relevant authorities and regulatory interfaces, clarify the applicable regulatory tools, and determine whether ITF treatment would provide added value for the intended envelope expansion.

Where relevant and sufficiently mature for discussion, the scoping phase may also identify whether Special Conditions, Equivalent Safety Findings or other certification instruments could eventually be required.

D.4.2 Preparing the Innovation Testing Framework Application

A complete ITF application for a high-speed demonstrator should provide a technically coherent and operationally transparent description of how the aircraft will behave, how risks are mitigated, and how containment is ensured. Because high-speed flight involves rapid changes in aerodynamic and thermal conditions, clarity and internal consistency of the documentation are critical.

<u>Concept of Operations (ConOps)</u>

The ConOps should describe the full mission profile in sequential detail, including:

- ground procedures and pre-flight configuration control;
- take-off and initial climb phase;
- acceleration segments;

- transition into and out of supersonic regimes;
- high-speed cruise or test manoeuvre segments;
- deceleration and descent phases;
- landing or recovery procedures.
- The ConOps should explain:
- how flight regimes are entered progressively;
- what conditions should be met before accelerating into higher Mach numbers;
- how envelope exceedance is prevented;
- how abort logic functions in each flight segment;
- how safe return to a subsonic regime is ensured in case of anomaly.

If multiple propulsion modes exist, the ConOps should describe the transition logic and any safeguards preventing unstable regime switching.

System Description and Technical Maturity

The system description should give authorities confidence that the demonstrator is ready for real-world exposure. This includes, e.g.:

- aerodynamic configuration and expected behaviour across flight regimes;
- structural design philosophy and load management strategy;
- propulsion architecture, including operating envelopes and transition thresholds;
- control system architecture, including stability augmentation and fault tolerance;
- thermal protection systems and material behaviour under expected heating conditions;
- onboard instrumentation and telemetry architecture.
- Applicants should provide a summary of ground-based validation evidence, such as:
- wind tunnel test results;
- computational fluid dynamics validation;
- structural analysis and load-case modelling;
- propulsion bench testing;
- thermal simulation results;
- hardware-in-the-loop testing for control systems.

The objective is not full certification-level evidence, but sufficient substantiation to justify progression to controlled flight testing.

Safety Considerations and Interface with Flight Conditions

High-speed flight testing may involve hazards associated with the aircraft design, the intended flight envelope and the conduct of the operation. Relevant considerations may include, for example:

- propulsion malfunction or uncommanded thrust behaviour;
- instability during transonic acceleration;
- structural or thermal exceedance;
- control-surface failure or actuator malfunction;
- guidance-system anomalies;
- loss of control at high dynamic pressure; and
- safe deceleration and recovery capability.

Where these matters relate to the safety of the aircraft design, they should be addressed through the applicable airworthiness process and the approval of Flight Conditions in accordance with Part-21. The ITF does not establish an additional design-review or certification process and should not duplicate assessments performed by EASA or by an appropriately privileged design organisation.

This does not imply that full type-certification compliance must be demonstrated before a Permit to Fly can be issued. A Permit to Fly enables an aircraft that has not demonstrated compliance with all applicable airworthiness requirements to fly safely under defined conditions.

Approved Flight Conditions may include relevant aircraft configurations, operating limitations, technical conditions, flight-test procedures and envelope-protection measures. Depending on the aircraft and the intended test activity, these may include Mach or load-factor limitations, temperature-monitoring thresholds, flight-termination provisions or geographically defined abort arrangements.

The relevant limitations and conditions should be reflected in the ITF documentation to the extent necessary for operational planning, airspace coordination, emergency arrangements and oversight of the testing activity.

Where a phased flight-test programme is used, it may involve:

- subsonic envelope validation;
- limited supersonic penetration;
- progressive expansion towards higher Mach values; and
- where applicable, hypersonic segments following satisfactory intermediate validation.

The definition and substantiation of the flight-test envelope and its progression remain part of the applicable Flight Conditions and airworthiness processes. The role of the ITF is to coordinate the associated operational, airspace and oversight arrangements and to ensure that any progression criteria relevant to those arrangements are clearly understood by the participating parties.

<u>Airspace Requirements</u>

High-speed demonstrators can traverse significant horizontal distances in short timeframes and may climb rapidly to high altitudes. The application should clearly define:

- ascent routes and altitude profiles;

- high-altitude test corridors;
- required segregated or reserved airspace volumes;
- expected ground tracks at different Mach ranges;
- descent and recovery corridors;
- potential cross-border proximity.

Airspace containment strategies should account for worst-case scenarios, including propulsion failure or early deceleration. The application should explain how separation from other airspace users is ensured, particularly during acceleration and high-speed cruise segments. Coordination with ANSPs and, where relevant, military authorities may be required.

Depending on the nature and location of the activity, civil-military coordination mechanisms may also be relevant for the establishment and management of airspace arrangements associated with ITF activities.

This may include, where applicable, coordination through Airspace Management Cells (AMCs) and the application of Flexible Use of Airspace (FUA) processes in accordance with the national airspace management framework, including, where applicable, Advanced Flexible Use of Airspace (AFUA) arrangements.

The extent of such coordination should remain proportionate to the operational characteristics and airspace implications of the activity.

Data and Reporting Plan

Because high-speed testing informs future certification standards, data collection is a central objective of the ITF. The operator should identify:

- aerodynamic performance parameters;
- structural strain and load measurements;
- propulsion metrics;
- thermal protection system performance;
- control system stability metrics;
- anomaly logging protocols.

Authorities may request defined telemetry streams during critical phases, particularly Mach transitions or propulsion mode changes. Data integrity and traceability should be ensured to support later regulatory analysis.

D.5 Assessment by the Authority

The authority's assessment of a supersonic or hypersonic ITF application focuses on whether the proposed demonstrator can be operated safely within a defined and controlled testing environment, and whether the progression into high-speed regimes is justified by sufficient technical maturity.

Given the elevated energy states and reduced recovery margins typical of high-speed flight, the assessment should be both technically rigorous and proportionate to the phase of testing.

Technical Maturity and Substantiation

Authorities will first evaluate whether the demonstrator's design maturity supports real-world testing. This involves reviewing:

- the consistency between modelling results and ground test evidence;
- the credibility of aerodynamic and thermal predictions;
- the robustness of propulsion validation;
- the reliability and fault tolerance of control systems;
- the adequacy of structural and thermal margins.

The authority will not expect full certification-level compliance at this stage, but it should be satisfied that progression to flight testing does not expose the public, other airspace users, or the crew to unacceptable risk. Where technical uncertainties remain significant, the authority may:

- limit the initial flight envelope;
- require additional subsystem validation;
- mandate lower-speed validation flights before authorising supersonic penetration;
- impose tighter operational containment conditions.

Evaluation of the Safety Case

The authority will examine whether hazards have been systematically identified and whether mitigation strategies are credible and enforceable. Particular attention will be given to:

- propulsion failure scenarios during acceleration;
- loss-of-control risks at transonic or high-Mach transitions;
- structural or thermal exceedance protections;
- recovery and abort procedures;
- flight termination or containment mechanisms, where applicable.

Authorities may require clearly defined phase gates. Each flight phase may need predefined criteria that should be met before progression to a higher Mach regime is permitted.

The robustness of envelope protection systems, including automated limiters and monitoring logic, will be carefully assessed.

Airspace and Operational Containment

Because high-speed demonstrators can traverse significant distances rapidly, containment strategy is a central element of the assessment. The authority will evaluate:

- whether the proposed airspace structures provide adequate separation from other traffic;
- whether ascent and descent profiles minimise interaction with controlled airspace users;
- whether worst-case trajectories remain within predictable and manageable bounds;
- whether coordination with ANSPs and, where relevant, military stakeholders is sufficient.

If modelling uncertainties remain large, the authority may require more conservative airspace volumes during early test phases.

Organisational Capability and Competency

High-speed testing requires a high level of organisational discipline and technical expertise.

The authority will assess:

- the operator's test organisation structure;
- configuration control procedures;
- decision-making chains during anomalies;
- qualifications and experience of test pilots and flight test engineers;
- telemetry monitoring capability;
- emergency response planning.

For highly automated or partially autonomous demonstrators, the authority may examine the human-machine interface and decision thresholds for intervention.

Progressive Envelope Expansion

In many cases, the authority will authorise testing in stages.

Initial authorisation may be restricted to:

- subsonic validation;
- limited supersonic penetration;
- reduced altitude bands;
- conservative MACH caps.

Expansion of the authorised envelope will typically depend on satisfactory performance data from earlier phases. This progressive approach ensures that risk remains contained while allowing innovation to proceed incrementally.

Consultation with EASA

Where the demonstrator falls under EASA's airworthiness remit, close coordination between the NCA and EASA is essential. EASA may be involved in reviewing Flight Conditions, evaluating novel design elements, or advising on the development of Special Conditions or future certification pathways. This coordination ensures that ITF learning can feed directly into subsequent certification activities.

D.6 Authorisation Framework for High-Speed Demonstrators

High-speed demonstrators typically fall within EASA's airworthiness competence. As a result, ITF authorisation for supersonic and hypersonic vehicles normally involves a coordinated set of regulatory instruments rather than a single approval.

The ITF framework does not replace existing regulatory tools. Instead, it aligns them under a structured testing programme.

Airworthiness Authorisation: Permit to Fly and Flight Conditions

For prototype or non-certificated high-speed demonstrators, the central airworthiness instrument is the Permit to Fly under Part-21 Subpart P. The process generally involves:

- approval of Flight Conditions by EASA, where the design falls under its competence;
- issuance of the Permit to Fly by the National Competent Authority based on those approved Flight Conditions.

The Flight Conditions define:

- the approved configuration of the aircraft;
- the authorised Mach ranges and altitude bands;
- structural, thermal, and propulsion limitations;
- required instrumentation and telemetry;
- envelope protection measures;
- operational restrictions and special instructions to crew.

Because high-speed flight may involve elevated energy states and limited recovery margins, the Flight Conditions often impose progressive limitations. These may restrict initial flights to lower Mach numbers or specific atmospheric conditions until performance data supports further expansion.

The Permit to Fly is inherently restrictive. Under the current regulatory framework, it does not authorise commercial operations and applies only within the defined configuration and mission envelope.

Operational Authorisation

In addition to the airworthiness authorisation, the NCA typically issues an operational authorisation defining:

- the mission profile and sequencing of test phases;
- airspace usage windows;
- coordination procedures with ANSPs;
- telemetry and reporting obligations;
- oversight and monitoring arrangements;
- notification requirements in case of anomaly.

This operational layer ensures that the testing campaign remains aligned with airspace safety, public protection, and containment objectives.

Airspace Approval

Given the speed and altitude profiles involved, high-speed demonstrators frequently require dedicated airspace structures. Airspace approvals may include:

- temporary segregated or reserved areas;
- defined climb and descent corridors;
- altitude blocks for high-speed cruise segments;
- activation windows coordinated through AUP/UUP processes;
- restrictions designed to protect other airspace users and populated areas.

If flight profiles approach FIR boundaries or international airspace, coordination with neighbouring States is necessary. Depending on national arrangements, military authorities may also be involved where airspace overlap exists.

Airspace containment should account for credible worst-case trajectories, including propulsion failure during acceleration or early deceleration scenarios.

Integrated Authorisation Structure

In practice, ITF authorisation for a high-speed demonstrator may involve a combination of coordinated approvals, conditions and operational arrangements, depending on the applicable regulatory framework and the characteristics of the proposed activity. These may include:

1. Approved Flight Conditions defining the aircraft configuration and the conditions and limitations necessary for safe flight.

2. A Permit to Fly authorising the flights for the stated purpose and subject to the approved conditions and restrictions.
3. Where required, additional operational approvals or conditions that are not already addressed through the Flight Conditions or Permit to Fly.
4. Appropriate airspace approvals and coordination arrangements specifying where and when the test flights may take place.

These instruments and arrangements remain legally distinct where separate approvals are required. However, certain operational or airspace-related conditions may be incorporated into, or referenced by, the Permit to Fly. The ITF does not create a separate legal regime; it provides a structured framework for coordinating the applicable approvals, conditions and arrangements.

Progressive Expansion and Amendment

High-speed ITF campaigns are often phased.

Authorisations may initially limit:

- Mach number,
- altitude,
- duration of high-speed segments,
- atmospheric conditions,
- geographic area.

Expansion beyond these limits typically requires:

- submission of performance data,
- review by EASA and/or the NCA,
- amendment of Flight Conditions and, where necessary, the Permit to Fly and operational authorisation.

This progressive model balances innovation with containment and ensures that testing evolves in line with demonstrated safety performance.

D.7 Execution and Monitoring

Once authorisations have been issued, high-speed demonstrator flights should be conducted strictly within the defined Flight Conditions, operational limitations, and airspace approvals established for the ITF.

Given the energy levels and dynamic transitions involved in supersonic and hypersonic flight, execution discipline and real-time awareness are critical elements of safe testing.

Adherence to the Approved Envelope

The operator should ensure that:

- the aircraft configuration matches the approved Flight Conditions;
- propulsion modes are engaged only within authorised parameters;
- Mach, altitude, load, and thermal limits are continuously monitored;
- transitions between flight regimes occur only when predefined criteria are satisfied.

Envelope protection systems, whether automated or procedural, should remain active throughout all phases where they are required.

Where progressive flight expansion has been authorised, each phase should be conducted only after confirmation that previous flight data has been reviewed and accepted in accordance with the agreed oversight plan.

Telemetry and Situational Awareness

Continuous telemetry and communication capability is expected during ITF operations involving high-speed demonstrators. Telemetry systems should enable monitoring of:

- aerodynamic performance parameters;
- propulsion behaviour;
- structural loads;
- thermal indicators;
- flight control system performance.

During critical phases such as transonic acceleration, propulsion mode transitions, or entry into high-supersonic regimes, authorities may require enhanced real-time monitoring.

Communication channels between the flight crew, ground test teams, and the supervising authority should be clearly defined and available during test windows as appropriate.

Airspace Coordination

Strict compliance with the approved airspace structure is required.

The operator should:

- adhere to authorised ascent and descent corridors;
- respect activation windows and altitude blocks;

- maintain coordination with the ANSP throughout all controlled airspace phases;
- execute pre-defined contingency routing in case of anomaly.

If real-time deviations from the planned trajectory occur, the operator should notify the relevant authority and ANSP in accordance with the agreed procedures.

For cross-border or network-relevant activities, coordination may also involve EUROCONTROL, in particular in its role as Network Manager, where the activity may have an impact on network capacity, traffic flows or airspace availability.

Anomaly Management and Suspension Criteria

The ITF framework should define clear notification thresholds for anomalies. These may include:

- propulsion irregularities;
- control instability;
- unexpected thermal exceedance;
- structural load anomalies;
- navigation or guidance system faults

Where a significant anomaly occurs, the operator should follow predefined abort or recovery procedures and inform the authority without delay. Depending on the severity and nature of the anomaly, the authority may:

- suspend further flights pending technical analysis;
- restrict subsequent flights to lower Mach regimes;
- require corrective measures before resumption

This mechanism ensures that safety remains dynamic and responsive rather than static.

Documentation and Data Logging

All flights conducted under the ITF should be comprehensively documented.

This includes:

- flight data recordings;
- telemetry logs;
- deviations from predicted performance;
- environmental conditions;
- crew observations;
- corrective actions taken.

Data should be preserved in a form suitable for post-flight technical analysis and regulatory review.

<u>Proportionality in Monitoring</u>

While high-speed testing requires enhanced technical oversight, monitoring intensity should remain proportionate to the phase and risk profile of the activity.

Early subsonic validation flights may require less intensive oversight than high-Mach penetration segments. Monitoring requirements should scale with demonstrated maturity and performance stability.

The execution and monitoring phase is therefore not merely procedural. It is a controlled environment in which technical learning, containment, and progressive expansion occur simultaneously.

D.8 Evaluation and Transition

At the conclusion of the ITF activities, the operator and the competent authorities should conduct a structured evaluation of the testing campaign. The purpose of this evaluation is threefold:

- to assess whether the technical and operational objectives of the ITF were achieved;
- to determine whether the safety assumptions and mitigations were validated in practice;
- to identify implications for further testing, certification pathways, or regulatory development.

The evaluation should be evidence-based and grounded in the data collected during execution.

<u>Technical Performance Assessment</u>

The review should examine how the demonstrator performed relative to predictions and design assumptions. This includes:

- aerodynamic behaviour across the tested Mach regimes;
- propulsion stability and performance margins;
- thermal loads and protection system effectiveness;
- structural load behaviour and fatigue indicators;
- flight control performance during regime transitions.

Particular attention should be given to discrepancies between modelled and observed behaviour. Where deviations occurred, the analysis should determine whether they fall within acceptable margins or require design refinement.

If the ITF followed a phased envelope expansion approach, the evaluation should confirm whether each phase justified progression to the next.

Safety Performance and Risk Validation

The authority should assess:

- whether identified hazards materialised during testing;
- whether mitigation measures proved effective;
- whether any new hazards emerged;
- whether contingency procedures were adequate and timely.

This analysis should confirm that residual risk remained within the bounds accepted at authorisation stage. If unexpected safety-relevant behaviours were observed, these should be documented and addressed before any transition to expanded testing or certification.

Airspace and Operational Integration

High-speed demonstrators often rely on complex airspace arrangements. The evaluation should therefore assess:

- the adequacy of segregated or reserved airspace structures;
- coordination effectiveness with ANSPs and, where applicable, military authorities;
- whether trajectory containment functioned as intended;
- whether cross-border coordination mechanisms were sufficient.

Lessons learned in this area may inform future airspace models for high-speed civil operations.

Organisational and Oversight Effectiveness

The ITF evaluation should also examine the effectiveness of governance arrangements, including:

- clarity of communication channels;
- responsiveness to anomalies;
- efficiency of decision-making processes;
- proportionality of oversight measures.

This ensures that both the operator's processes and the authority's supervisory model evolve alongside technical maturity.

Transition Pathways

Based on the findings, several outcomes are possible:

1. Progression toward certification activities, including:

- refinement of the certification basis;
- development of Special Conditions;
- formal type certification work under Part-21.

2. Extension of ITF activities, if:

    - additional data is required;
    - envelope expansion is planned;
    - mitigation strategies require validation.

3. Modification of the operational scope, where:

    - new limitations are necessary;
    - airspace models require adjustment;
    - propulsion or structural refinements should be incorporated.

4. Conclusion of the ITF, where:

    - objectives have been achieved;
    - the project is paused or terminated;
    - or findings sufficiently inform future regulatory work.

Success within the ITF does not constitute certification or operational approval. However, it may significantly reduce uncertainty and accelerate subsequent approval pathways by providing validated evidence.

Contribution to Regulatory Learning

High-speed demonstrators often operate in areas where existing regulatory frameworks are limited or under development. Where appropriate and without compromising confidentiality or proprietary information, authorities should consider how ITF findings may:

- inform development of certification specifications;
- support the drafting of Special Conditions;
- contribute to EASA research or rulemaking tasks;
- feed into international discussions at ICAO level.

In this way, ITF activities become part of a broader ecosystem of regulatory evolution.

Closing Statement

The ITF concludes with a documented evaluation summarising:

- the scope of activities performed;
- safety and technical outcomes;
- deviations and corrective actions;
- recommendations for next steps.

This formal closure ensures traceability, transparency, and a clear transition either toward further development or toward completion.

Annex E: Innovation Testing Framework Application Template

This template provides a structured format for applying to conduct testing within an ITF.

Its purpose is not to create additional bureaucracy, but to ensure that the competent authority receives a coherent, safety-focused description of the proposed activity. A well-prepared application will accelerate review, clarify expectations early, and reduce the need for iterative clarification.

Applicants should adapt the level of detail to the complexity and risk profile of the project. Small-scale or low-risk projects do not require the same depth as higher airspace, high-speed, or cross-border operations. However, each section should be considered and addressed where relevant.
The guiding principles are clarity, proportionality, and transparency.

Applicants may use or adapt documentation prepared for other regulatory processes, including certification, operational authorisation, SORA assessments, Permit to Fly applications, or similar activities, where such material is relevant to the proposed ITF activity. Existing documentation should be adapted as necessary to reflect the specific objectives, operational characteristics, limitations, testing arrangements and risk-management measures associated with the ITF.

For UAS-based activities, applicants may also draw upon the guidance provided in Annex A to AMC1 to Article 11 of the Easy Access Rules for Unmanned Aircraft Systems regarding the expected structure and content of a Concept of Operations (ConOps).

Applicants may use other ConOps structures or sectoral templates where appropriate. This guidance does not prescribe a mandatory ConOps format. The competent authority should determine whether the proposed format and level of detail are suitable for the activity and whether the information provided is sufficient to support assessment under the applicable regulatory framework.**Lead competent authority**

This application is submitted to the competent authority responsible for coordinating the ITF application under the applicable regulatory framework. Depending on the nature of the proposed activity, additional competent authorities and organisations may participate in the ITF. These should be identified in the relevant sections of this application.

E.1 Applicant Information
Applicants should provide the following information:

<u>Organisation name</u>

<u>Registered address</u>

State of registry / State of operation

Points of contact
At least one primary and one secondary contact should be provided. These individuals should be able to respond to technical and operational questions during assessment and execution phases.

Type of organisation
For example: manufacturer, operator, research institution, start-up, consortium, public body.

Brief organisational profile
Provide a short narrative describing:

- your experience with the technology or operational concept concerned;
- your organisational structure and key technical capabilities;
- your safety management approach;
- prior flight or ground testing campaigns;
- previous interactions with aviation authorities, if relevant.

The objective is not to provide corporate marketing material, but to demonstrate technical credibility and organisational readiness to conduct structured testing.

E.2 Summary of the Proposed ITF Activity
This section should provide a concise but informative overview of the proposed activity.
Address clearly:

- what you intend to test;
- why real-world testing is necessary;
- what uncertainty or innovation the ITF is intended to address;
- why existing regulatory pathways are insufficient at this stage.

Describe the expected scope of operations in plain language. For example, indicate whether the activity involves higher airspace flights, supersonic transitions, autonomous decision-making, novel propulsion, or integration into controlled airspace.

The authority should be able to understand the overall intent, scale, and purpose of the ITF from this section alone.

E.3 Concept of Operations (ConOps)
The Concept of Operations should describe how the system will actually be operated.
This is one of the most important parts of the application.
Provide a narrative description that covers:

- preparation and ground operations;
- launch or take-off procedures;
- climb or ascent profile;
- main testing phase;
- descent and recovery;
- post-flight procedures.

Explain how operational decisions are made and by whom. Clarify:

- who has operational authority during flight;
- how anomalies are identified and escalated;
- how coordination with ATC or ANSP will occur.

For UAS or highly automated systems, describe the command-and-control architecture and the role of automation versus human supervision.

If the operation includes unusual behaviours, such as long-duration drift, Mach transitions, or autonomous rerouting, explain how these behaviours are expected to occur and how they are monitored and constrained.

The ConOps should allow the authority to visualise the entire mission cycle and understand where risks arise.

E.4 Description of the System or Operation

E.4.1 Technical Characteristics

Describe the technical features relevant to safety and performance. This may include:

- airframe or envelope characteristics;
- propulsion systems and operating modes;
- structural limits;
- energy systems;
- flight control architecture;
- autonomy logic;
- tracking and telemetry systems;
- redundancy provisions.

- safety-relevant cybersecurity and information-security dependencies, incl. dependencies[6] on data links, ground infrastructure, external digital services or payload systems.

Focus on elements that influence risk exposure, controllability, or containment.
Avoid excessive technical detail that does not contribute to safety understanding.

E.4.2 Maturity and Prior Testing
Summarise the development status of the system.
Describe:

- ground testing completed;
- subsystem validation;
- simulation or modelling results;
- prior flight tests, if any;
- known technical limitations.

Authorities should understand whether the proposed ITF represents a first experimental exposure or a progressive step in a broader development programme. If significant uncertainties remain, acknowledge them openly and explain how the ITF will address them.

E.5 Rationale for ITF Use
This section should explain why an ITF is the appropriate mechanism.
Possible reasons may include:

- absence of an established certification basis;
- novel propulsion or materials;
- innovative operational models;
- lack of defined licensing categories;
- need for progressive envelope expansion;
- requirement for dedicated airspace structures;
- validation of modelling assumptions in real-world conditions.

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[6] Where such dependencies exist, describe the potential safety or operational consequences of loss of availability, loss of integrity, unauthorised access or disruption, together with the principal protective and response measures.

Explain how the ITF contributes to regulatory learning and how it supports eventual integration into the aviation system. A clear and well-argued rationale will facilitate acceptance of the ITF concept.

E.6 Applicable Regulatory Tools

Identify which regulatory tools will be used and how they interact.
For example:

- Permit to Fly with approved Flight Conditions;
- SORA-based operational authorisation;
- segregated or reserved airspace;
- competency-based approvals;
- specific oversight protocols.

Explain briefly why each tool is necessary and how it contributes to safety and containment.
The authority should be able to understand the legal architecture supporting the ITF.

E.7 Preliminary ATM/ANS and Airspace Coordination

Where relevant to the proposed activity, applicants should provide information regarding preliminary coordination with the relevant Air Navigation Service Provider(s) (ANSPs).
This may include:

- identification of the relevant ANSP(s);
- status of preliminary coordination activities;
- preliminary assessment of airspace or ATM/ANS implications;
- expected operational constraints or interactions with other airspace users; and
- indicative planning or coordination timelines.

The level of detail provided should remain proportionate to the operational complexity and airspace impact of the proposed activity.

E.8 Risk Assessment

Provide a structured and proportionate risk assessment.
This may take the form of:

- a safety case;
- a SORA;
- or a hybrid methodology.

The assessment should:

- identify main hazards;
- explain credible failure modes;
- describe mitigation measures;
- demonstrate that residual risk is acceptable within the ITF environment.

Where testing will occur in stages, explain how risk will be reassessed between phases and how envelope expansion decisions will be made.
This section should demonstrate disciplined safety reasoning rather than simply listing hazards.

E.9 Airspace Needs and Integration
Describe the airspace required and explain why it is appropriate.
Clarify:

- the geographical area;
- altitude bands;
- activation periods;
- contingency areas;
- potential cross-border implications.

Explain how the proposed airspace arrangement contributes to containment and deconfliction.
Describe coordination mechanisms with ANSP and other stakeholders. Airspace design should reflect the principle of proportional containment.

E.10 Operational Procedures
Provide an overview of the procedures that govern the activity.
Describe:

- standard operating procedures;
- abnormal and emergency procedures;
- flight termination or recovery mechanisms;
- escalation and notification processes;
- configuration control and change management.

Authorities should be confident that safety does not depend solely on design features, but also on disciplined operational management.

E.11 Contingency and Emergency Procedures
Applicants should describe the contingency and emergency procedures relevant to the proposed activity, including where applicable:

- communication and escalation procedures;
- loss-of-communication arrangements;
- abnormal situation handling;
- flight termination or recovery procedures;
- coordination arrangements with ANSPs and relevant authorities; and
- decision-making responsibilities during contingency situations.

The information provided should be sufficient to support operational coordination and situational awareness for affected stakeholders.

E.12 Personnel Competency and Organisational Readiness
Describe:

- key operational roles;
- required qualifications or experience;
- training specific to the system;
- internal oversight and decision-making structure.

If formal licensing frameworks do not cover a role, describe the competency-based qualification approach and how competence will be assessed and maintained.
Also summarise how your organisation ensures safety oversight, including internal review processes and reporting culture.

E.13 Data Collection and Reporting
Explain what data will be collected and why it matters.
Describe:

- performance data;
- safety indicators;
- anomaly tracking;
- telemetry records;
- comparison between predicted and observed behaviour.

Explain how and when data will be shared with the authority.
Real-time access should be included only where necessary due to risk level.
The data plan should be practical and meaningful, not exhaustive for its own sake.

E.14 Duration and Phasing of the ITF
Indicate:

- the proposed timeframe;
- number of flights or test events;
- phased progression plan;
- review milestones.

Explain how progression decisions will be taken and documented.
A clear phasing concept helps align expectations between operator and authority.

E.15 Expected Outcomes
Describe the intended outcomes of the ITF.
These may include:

- validation of performance models;
- confirmation of mitigation effectiveness;
- refinement of system design;
- development of a future certification basis;
- identification of regulatory gaps.

Explain how the ITF contributes to long-term integration into the aviation framework.

E.16 Additional Documents
List relevant supporting documents.
Only include material that supports understanding of safety, technical maturity, or operational feasibility.
Avoid over-documentation.

E.17 Applicant Declaration
Provide a formal statement confirming:

- accuracy of information;
- understanding that ITF approval does not waive safety obligations;
- commitment to comply with all authorisation conditions.

Include signature, name, title, and date.

Annex F: Memorandum of Understanding (MoU) / Cooperation Agreement Template

This Memorandum of Understanding (MoU) establishes the cooperation framework between the National Competent Authority (NCA), the Operator and, where appropriate, other participating organisations (such as EASA, air navigation service providers (ANSPs), EUROCONTROL, military authorities or other competent authorities). It sets out the governance arrangements, roles and responsibilities, and coordination mechanisms necessary for the safe and effective implementation of an Innovation Testing Framework (ITF).

Depending on the nature and complexity of the ITF activity, additional operational stakeholders may participate in the coordination arrangements. Their involvement may be reflected either in this MoU or through separate operational coordination arrangements, as appropriate under the applicable legal and national framework. The level of participation should remain proportionate to the characteristics, complexity and airspace implications of the activity.

This MoU is not a regulatory authorisation. Formal approvals, such as Permits to Fly, operational authorisations or airspace approvals, are issued separately in accordance with applicable Union and national legislation.

This template is provided as guidance and may be adapted to reflect the scale, complexity and governance needs of the specific ITF.

This Memorandum of Understanding (MoU) establishes the cooperation framework between the National Competent Authority (NCA), the Operator, and, where applicable, other participating organisations, such as EASA, the Air Navigation Service Provider (ANSP), EUROCONTROL or other competent authorities. It sets out shared expectations, roles, and coordination mechanisms that enable safe and structured execution of an ITF.

Depending on the nature and complexity of the activity, relevant operational stakeholders, may also participate in coordination arrangements associated with the ITF activity. Such involvement may be reflected either within the coordination framework itself or through separate operational coordination arrangements, where appropriate under the applicable national framework. The level of involvement should remain proportionate to the operational characteristics and airspace implications of the activity.

The MoU is not a regulatory authorisation. Formal approvals such as Permits to Fly, operational authorisations, or airspace approvals are issued separately in accordance with applicable EU and national regulations. The text below serves as guidance and may be adapted proportionately to the scale and complexity of the ITF project.

F.1 Purpose of the MoU

The purpose of this Memorandum of Understanding is to define the framework for cooperation between the parties in support of the ITF for [Project Name].

The ITF concerns the supervised testing of an innovative aviation system or operational concept that requires structured real-world validation under regulatory oversight.

This MoU:

- establishes a shared understanding of objectives;
- clarifies roles and responsibilities;
- defines communication and governance arrangements;
- outlines principles for data sharing and evaluation.

The ITF provides a controlled environment in which safety assumptions can be validated, technical uncertainties addressed, and operational experience gained. The MoU ensures that this cooperation takes place transparently, predictably, and in alignment with safety objectives.

F.2 Parties to the Agreement
This MoU is concluded between:

National Competent Authority (NCA)
Represented by: [Name, Title]
Address: [Address]

Operator / Project Lead
Represented by: [Name, Title]
Address: [Address]

Where applicable:
Air Navigation Service Provider (ANSP)
Represented by: [Name, Title]

European Union Aviation Safety Agency (EASA)
Represented by: [Name, Title]

The parties agree to cooperate within the scope of the ITF to ensure safe planning, execution, monitoring, and evaluation of the proposed activities.

F.3 Background
The Operator is developing [brief description of technology or concept], which requires real-world testing under controlled conditions.

Given that the activity cannot be fully accommodated within routine regulatory pathways at its current stage of maturity, the parties have agreed to implement an ITF framework.

Preliminary discussions and technical exchanges have identified key uncertainties and development objectives, including:

- [example: propulsion validation];
- [example: higher airspace trajectory modelling];
- [example: autonomous system behaviour];
- [example: Mach regime transitions].

The ITF aims to address these elements in a structured and supervised manner while maintaining an appropriate level of safety and regulatory control.

This MoU builds upon the application submitted under Annex E and any subsequent technical clarifications.

F.4 Objectives of the ITF Cooperation

The parties share a commitment to enabling innovation while preserving public safety and the integrity of the aviation system. The objectives of this cooperation are to:

- enable controlled, time-limited real-world testing within clearly defined safety boundaries;
- ensure that hazards are identified, mitigated, and monitored;
- gather meaningful technical and operational data;
- support progressive and evidence-based envelope expansion, where appropriate;
- promote transparent and timely communication between all involved entities;
- contribute to regulatory learning at national and, where relevant, European level.

The ITF is understood as a learning environment, not as an alternative regulatory regime.

F.5 Scope of Cooperation

This MoU applies to all activities related to the planning, authorisation, execution, monitoring, and evaluation of the ITF project. The scope of cooperation may include:

- joint review of safety assessments or SORA;
- coordination of Flight Conditions and Permit to Fly processes;
- development and activation of airspace arrangements;
- establishment of operational oversight mechanisms;
- structured data exchange and reporting;

- coordination of contingency procedures;
- evaluation and final reporting.

Activities outside the ITF remain subject to standard regulatory procedures.

F.6 Responsibilities of the Parties

F.6.1 Responsibilities of the NCA

The NCA retains regulatory oversight responsibility during the ITF period.
In this role, the NCA will:

- review the ITF application and supporting documentation;
- issue relevant authorisations and define operational limitations;
- coordinate with EASA, ANSPs, or other authorities as necessary;
- establish proportionate monitoring and oversight measures;
- review operational data and safety performance;
- take corrective action where safety concerns arise.

The NCA ensures that ITF activities remain within a defined and acceptable safety envelope.

F.6.2 Responsibilities of the Operator

The Operator remains fully responsible for the safe conduct of all activities.
The Operator will:

- comply with all conditions set out in the ITF authorisations;
- implement agreed safety mitigations and operational procedures;
- maintain configuration control of the tested system;
- ensure that all personnel are competent and properly briefed;
- maintain ongoing communication with the NCA and ANSP;
- report anomalies, deviations, or incidents without delay;
- provide agreed data and documentation in a timely manner.

The Operator acknowledges that ITF participation does not reduce or transfer safety responsibility.

F.6.3 Responsibilities of the ANSP (if applicable)
Where involved, the ANSP supports safe integration of ITF activities into the airspace system.
Its role may include:

- assess relevant operational, airspace and coordination aspects, including where applicable consultation with all relevant stakeholders;
- assisting in the design and activation of segregated or reserved airspace;
- issuing operational notifications such as NOTAMs or equivalent publications;
- managing traffic separation and deconfliction;
- informing the NCA and Operator of airspace constraints or emerging conflicts.

The ANSP's involvement ensures that ITF activities do not adversely affect other airspace users.

F.6.4 Responsibilities of EASA (where applicable)
Where the activity falls under EASA's remit, EASA may participate in accordance with its responsibilities under the applicable regulatory framework. Its involvement may include:

- approval of Flight Conditions or other airworthiness-related activities falling within its competence;
- provision of technical advice on airworthiness, certification or other regulatory matters;
- participation in technical or regulatory coordination where the activity raises interfaces between airworthiness, operational and airspace considerations;
- support for the consistent application of relevant Union requirements; and
- contribution to regulatory learning, guidance development and rulemaking processes.

The availability of established flexibility within the airworthiness framework does not, in itself, create a need for an ITF. The added value of the ITF may lie primarily in coordinating the operational, airspace and cross-authority aspects of the activity with any applicable airworthiness processes.

EASA's role remains distinct from that of the NCA and the relevant ANSPs. Operational authorisation and oversight, as well as airspace and ATM/ANS responsibilities, remain with the competent bodies identified under the applicable regulatory framework.

F.7 Governance and Communication
Effective coordination is essential for ITF success.
The parties will:

- designate operational, technical, and regulatory points of contact;
- establish agreed communication channels for routine operations and urgent matters;
- hold coordination meetings at key milestones, such as pre-flight reviews and phase evaluations;
- define escalation procedures in case of anomalies or safety concerns.

Where appropriate, an ITF Steering Group may be established. This group may review progress, address emerging issues, and ensure alignment with ITF objectives.

Governance arrangements should remain proportionate to the scale and risk of the project.

F.8 Data Sharing and Confidentiality

Data collected during ITF operations supports both safety oversight and regulatory learning.
The Operator agrees to collect and provide data as defined in the authorisation and reporting plan.
The parties will agree on:

- categories of data to be shared;
- reporting format and frequency;
- conditions for real-time access, where justified;
- secure handling and storage arrangements;
- confidentiality protections for proprietary information.

All data exchange should comply with applicable data protection, confidentiality, and intellectual property legislation.

ITF data may be used for regulatory analysis and policy development, subject to agreed confidentiality safeguards.

F.9 Oversight, Compliance, and Corrective Measures

The NCA will conduct oversight proportionate to the risk profile of the ITF.
Oversight activities may include:

- review of flight data and reports;
- inspections or audits;
- participation in technical briefings;
- observation of selected operations.

If safety concerns arise, the NCA may:

- require additional mitigations;
- restrict the approved operating envelope;
- suspend activities pending further analysis;
- terminate the ITF if necessary.

The Operator commits to full cooperation in any corrective or investigative measures.

F.10 Duration, Amendments, and Termination

This MoU enters into force on the date of the final signature and remains valid for the agreed duration of the ITF. The MoU should specify:

- start date;
- planned duration;
- conditions for extension;
- circumstances allowing early termination.

Amendments should be agreed in writing by all parties.

Upon termination, the Operator should provide any outstanding data and documentation required for evaluation and closure.

F.11 Evaluation and Final Reporting

At the conclusion of the ITF, the parties will conduct a structured evaluation.

The evaluation will consider:

- whether objectives were achieved;
- safety and performance outcomes;
- effectiveness of operational and oversight arrangements;
- lessons learned for future projects.

A final report may be prepared summarising findings and identifying implications for certification, operational approval, or rulemaking.

Where appropriate, anonymised findings may contribute to broader regulatory learning at national or European level.

F.12 Signatures

By signing below, the parties confirm their commitment to the principles and cooperation framework set out in this MoU.

For the National Competent Authority Name: Title: Signature: Date:	For the Operator Name: Title: Signature: Date:
For the ANSP/EUROCONTROL (if applicable) Name: Title: Signature: Date:	For EASA (if applicable) Name: Title: Signature: Date:

Annex G: Safety Case Structure

This annex provides a recommended structure for a Safety Case supporting ITF operations.
The Safety Case is the core document demonstrating that the proposed activity can be conducted within an acceptable level of risk under the controlled conditions of an ITF.
The level of detail should be proportionate to:

- the novelty of the system;
- the operational complexity;

the exposure to third parties;

- the energy state of the vehicle;
- the maturity of the design.

An ITF Safety Case is not equivalent to a full certification compliance demonstration. However, it should present a coherent, evidence-based safety argument.

G.1 Introduction and Purpose of the Safety Case
This section should explain:

- the purpose of the Safety Case;
- the scope of the proposed operation;
- how the Safety Case supports ITF authorisation.

Clarify:

- what phases of operation are covered;
- what configurations are included;
- what regulatory tools apply (e.g. Permit to Fly, SORA-based authorisation).

The introduction should state clearly that the Safety Case aims to demonstrate that risks are identified, mitigated, and managed within defined operational boundaries.

G.2 System Overview
Provide a concise but technically meaningful description of the system.
Include:

- overall system architecture;
- key subsystems;
- propulsion systems;
- flight control systems;
- energy systems;
- tracking and telemetry;
- automation logic where applicable.

Identify novel or innovative features that may introduce new risk pathways.
Explicitly describe:
- known technical limitations;
- areas of uncertainty;
- assumptions that underpin modelling or performance predictions.

The authority should understand how the system functions and where safety-relevant dependencies exist.

G.3 Operational Overview
Describe how the system will be operated.

Include:

- mission phases;
- transition points between phases;
- airspace environment;
- ground infrastructure dependencies;
- interaction with ATC or ANSP;
- automation and human oversight arrangements.

Explain how operational conditions influence risk exposure. For example:

- weather sensitivity;
- reliance on communication links;
- performance variations at altitude or speed;
- ground footprint or debris risk.

This section links the technical system to real-world exposure.

G.4 Hazard Identification and Risk Assessment
This section explains how hazards were identified and evaluated.

Describe:

- the methodology used (e.g. FMEA, FHA, SORA logic, bow-tie analysis, system safety assessment);
- how hazards were categorised; and
- how likelihood and severity were estimated.

Identify:

- system-level hazards (e.g. propulsion failure, structural exceedance);
- operational hazards (e.g. airspace conflict, loss of communication);
- human factors hazards (e.g. misinterpretation of telemetry); and
- organisational hazards (e.g. configuration drift).
- safety-relevant cybersecurity and information-security hazards[7], including compromise or disruption of command-and-control functions, navigation, tracking, telemetry, automation, ground infrastructure or safety-relevant payload interfaces.

Depending on the operational environment, the assessment may also consider ATM/ANS-related operational aspects such as:

- interaction with other airspace users;
- separation or traffic-interaction considerations;
- operational complexity and controller workload aspects;
- communication or coordination failures;
- impacts on airspace capacity or traffic flows; and
- contingency arrangements associated with ATM/ANS interactions.

For each hazard category, describe the initial, unmitigated risk level using a consistent risk framework. Clarity and traceability are more important than mathematical complexity.

G.5 Mitigation Measures and Risk Controls
Describe how identified hazards are controlled.

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[7] Cyber-related hazards should be included where they can credibly affect aviation safety, operational containment, contingency management or the continued controlled execution of the ITF. The assessment should distinguish such safety-relevant dependencies from broader information-security matters governed under other applicable frameworks.

Mitigations may include:

- design redundancy;
- envelope protection systems;
- software safeguards;
- structural margins;
- termination systems;
- operational procedures;
- airspace containment;

• crew training and supervision.

Explain how each mitigation reduces likelihood or severity.
Demonstrate how different mitigation layers interact. Avoid reliance on a single barrier where credible alternatives exist.

Conclude this section with the resulting residual risk level for each significant hazard.

G.6 Verification of Mitigations and Evidence of Maturity
Mitigations should be supported by evidence.
Summarise:

- ground test results;
- subsystem validation;
- simulation outcomes;
- stress or thermal analyses;
- prior flight test data;
- validation of autonomy algorithms, where applicable.

Explain how modelling assumptions were validated and where uncertainty remains.
The purpose of this section is to show that the safety argument is grounded in evidence rather than expectation.

Where uncertainty persists, describe how the ITF environment limits exposure while further validation occurs.

G.7 Operating Envelope Definition
Clearly define the boundaries within which the operation is authorised.
This may include:

- altitude limits;
- speed or Mach limits;

- dynamic pressure constraints;
- environmental boundaries such as wind or temperature limits;
- permitted manoeuvres;
- system configurations;
- payload restrictions;
- automation modes allowed.

If the ITF follows a phased expansion plan, describe:

- initial envelope limits;
- criteria for expansion;
- decision-making process for progression.

The operating envelope is a central containment tool in ITF safety.

G.8 Contingency and Emergency Procedures
Identify credible abnormal and emergency scenarios.
Describe procedures for:

- propulsion anomalies;
- control instability;
- communication loss;
- unexpected trajectory deviation;
- system overheating;
- structural exceedance.

Explain:

- decision thresholds for abort;
- termination mechanisms;
- recovery procedures;
- communication and notification protocols.

Demonstrate that abnormal scenarios have been anticipated and rehearsed where appropriate.

G.9 Operational Safety Management
Describe how safety is managed at organisational level.
Include:

- roles and responsibilities;
- internal reporting structure;
- configuration management;
- change control procedures;
- decision authority during anomalies;
- safety review boards, if applicable.

Describe training and competency requirements for:

- pilots or operators;
- remote supervisors;
- telemetry engineers;
- safety personnel.

This section demonstrates that safety is embedded in governance, not only in engineering design.

G.10 Residual Risk and Justification of Acceptability

Summarise the final residual risks after mitigation.
Explain:

- why residual risks are acceptable within the ITF context;
- how airspace containment or limited exposure reduces third-party risk;
- how monitoring and oversight further reduce risk during operations.

The justification should be transparent and reasoned, not declarative.
Where residual uncertainty remains, explain how ITF controls compensate for it.

G.11 Monitoring During Operations

Describe how safety will be monitored in real time.
This may include:

- telemetry monitoring arrangements;
- ground-based safety oversight;
- threshold parameters triggering intervention;
- defined escalation chains.

Clarify who has authority to:

- abort a mission;

- restrict operations;
- suspend further flights.

Monitoring arrangements should scale with operational risk.

G.12 Post-Flight Analysis and Reporting

Describe:

- data collected after each operation;
- analysis methodology;
- comparison with predicted performance;
- anomaly tracking;
- corrective action process.

Explain how lessons learned feed into:

- future flight planning;
- envelope expansion decisions;
- updates to the Safety Case.

Post-flight analysis is a key mechanism for progressive safety validation.

G.13 Conclusion

The Safety Case should conclude with:

- a concise summary of the safety argument;
- confirmation that hazards are identified and mitigated;
- confirmation that operations remain within a defined and controlled envelope;
- a formal statement of readiness for ITF testing.

The conclusion should reflect disciplined engineering judgement and a clear understanding of the ITF's temporary and controlled nature.

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