EUROCONTROL

Reference Guide to EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services

(including Service Continuity)

Edition 2.0 Released Issue

EUROCONTROL

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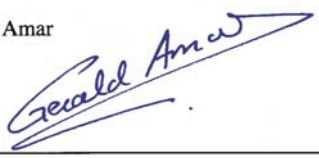
Project Manager CND/COE/PM/SA	Gerald Amar 	31.03.2009
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LIST OF REFERENCE DOCUMENTS

1. ICAO, Annex 11 to the Convention on International Civil Aviation, Air Traffic Services, Chapter 2.30 and Attachment C, Material Relating to Contingency Planning, dated November 2006.
2. Regulation (EC) No 549/2004 of the European Parliament and the Council of 10 March 2004 laying down the framework for the creation of the single European sky ("the Framework regulation").
3. Regulation (EC) No 550/2004 of the European Parliament and the Council of 10 March 2004 on the provision of air navigation services in the single European sky ("the Service provision regulation").
4. Directive 2006/23/EC of the European Parliament and of the Council of 5 April 2006 on a Community air traffic controller licence.
5. Commission Regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services (the "Common requirements regulation").
6. EUROCONTROL, European Convergence Implementation Programme (ECIP) 2008-2012, GEN 01" Implement European ANS contingency measures for Safety Critical Modes of Operation"
7. EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services, EUROCONTROL - GUID-0118, released on April 2009
8. EUROCONTROL, EATM, ATM Security Risk Assessment Methodology, Edition 1.0, May 2008.
9. EUROCONTROL, Safety Case Development Manual, DAP/SSH/091, Version:2.2, 13 November 2006.
10. EUROCONTROL, Generic Safety Argument for ATM Safety Assessment, Version ion 1.1a, , 6 June 2007

EUROCONTROL GUIDELINES DISCLAIMER

These EUROCONTROL Guidelines for Contingency planning of Air Navigation Services are made available to EUROCONTROL and ECAC Member States to provide guidance and support in advising their National Authorities and Air Navigation Service Providers (ANSP) in the development, promulgation and application of contingency plans in compliance with the Convention on International Civil Aviation, Annex 11, Chapter 2.30, on Contingency arrangements and Commission Regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services, Annex 1 § 8.2.

These **EUROCONTROL Guidelines for Contingency planning are non-mandatory** material, that is, general and procedural information developed by EUROCONTROL to support effective and harmonised development of contingency plans by the aforesaid States and/or their concerned ANSPs.

The information assembled in these guidelines reflects the legislation in force on the date of publication of Commission Regulation (EC) No 2096/2005 in the Official Journal of the European Union, as amended by Commission Regulation (EC) No 668/2008 of 15 July 2008; and of Amendment 46 to Annex 11 to the Convention on International Civil Aviation.

The compliance of the Member States, and their ANSPs, with their obligations under international law, the Single European Sky (SES) regulations and national legislation remains entirely their own responsibility. EUROCONTROL does not guarantee a particular outcome of an oversight exercise by the NSA on the compliance of the contingency plans developed by the States and/or their ANSPs nor does EUROCONTROL assume any liability for claims or damages sustained as a result of the implementation of these contingency plans.

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NOTE OF THE AUTHOR

In October 2007, EUROCONTROL, supported by a Contingency Planning Task Force (CTF) of Air Navigation Service Providers (ANSPs) and ATM Regulators, published Edition 1.0 of "EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services" aimed primarily at short-term 'Emergency' contingency scenarios. This document was accompanied by its "Reference Guide"

In early 2008, the Agency also took the first steps to cover longer-term Service Continuity planning by publishing new guidance material to help ANSPs design contingency strategies and operational practices. The "EUROCONTROL Guidance for Design of Contingency Strategies" was made available in February 2008.

However, there was a growing need amongst ANSPs for more in-depth information on Service Continuity issues. In particular, more guidance was needed to help ATM Contingency Planning practitioners and their superiors make more informed decisions on the economic benefits of ATM Contingency Planning. To achieve this, the potential effects of large scale contingency on the European ATM Network needed to be examined.

Therefore, the CTF embarked on a second phase of work with particular emphasis placed on the economic (business) and safety aspects of long-term contingency planning. Further guidance was also gathered on the legal, regulatory and security aspects of ATM contingency planning.

The culmination of the work is the production and release of a second more comprehensive edition of the "EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services" with an improved focus on Service Continuity issues. This second edition of the "Reference Guide" aligns with the updated and revised content of the "Guidelines".

1. BACKGROUND

1.1 OBLIGATIONS UNDER THE CHICAGO CONVENTION AND EUROPEAN COMMUNITY LAW

The Convention on International Civil Aviation (hereafter referred to as the "Chicago Convention"), Annex 11, Air Traffic Services, Chapter 2.30 (Amendment 46) states inter alia that, *"Air Traffic Services authorities shall develop and promulgate contingency plans for implementation in the event of disruption, or potential disruption, of air traffic services and related supporting services in the airspace for which they are responsible for the provision of such services".* Unless they file differences against this standard, States are bound to comply with it.

This provision is further explained at Attachment C to Annex 11, Chapter 2.30 (Amendment 46) which provides inter alia that, "contingency plans are intended to provide alternative facilities and services to those provided for in the regional air navigation plan when those facilities and services are temporarily not available. Contingency arrangements are therefore temporary in nature […]". Attachment C has however only the status of guidance. States are not bound to comply with such material interpretation.

In addition, the Single European Sky (SES) Framework and Service provision regulations paved the way for the Common requirements (CR) regulation . In Annex I, to the CR Regulation,§ 8.2 required that *"At the latest one year after certification, an air navigation service provider shall have in place contingency plans for all the services it provides in the case of events which result in the significant degradation or interruption of its services".* As a result, these plans should be have been completed and ready for possible implementation at the latest by end of 2007 (or by mid- 2008 in cases where an extension of 6 months was granted to the State to complete the ANSP certification process. Furthermore, Annex II, to the CR Regulation ,§ 4 states that a provider of air traffic services shall be able to demonstrate that its working methods and operating procedures are compliant with, in particular, Annex 11 to the Chicago Convention (including all amendments up to No 45).

Both sets of EU legislation mentioned above contain obligations for the development of contingency plans, but none defines what the exact content of these plans should be (e.g. type of measures, capacity levels, etc.). The only indications are provided as guidance in Attachment C to Annex 11 of the Chicago Convention and refer to *"alternative facilities and services".* Therefore, while development of the plans is mandatory, their exact content (structure, description, etc.) is left to the discretion of the States and their certificated and designated ANSPs.

1.2 GEN 01 IMPLEMENTATION

The implementation of contingency measures for ANS, reflecting the Annex I § 8.2 of the Common requirements, is addressed in the European Single Sky Implementation (ESSIP, previously ECIP), via the Pan-European/Agreed objective GEN 01 "Implement European ANS Contingency Measures for Safety Critical Modes of Operation". This objective addresses the safe and orderly degradation of a service in the event of a contingency situation and its eventual safe recovery, in a strictly controlled manner, to the normal capacity operating situation.

1.3 REFERENCE GUIDE - AIMS & PRINCIPLES

This Contingency Planning Reference Guide (RG) describes a contingency planning process and provides a menu of checklists to benchmark existing contingency plans or work in progress.

The document can be used stand-alone for those who are more familiar with Air Traffic Management contingency. References are made to checklists that are provided in the Annex of this document. Introductory or Explanatory text is in blue Italics. When more information is needed, complete explanation and guidance can be found in the referenced section of the Edition 2.0 of the "EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services"- Reference document n° 7.

The Guidelines have been prepared under the direction of the Stakeholder Consultation Group (SCG), with the support of a Contingency Planning Task Force (CTF) composed of ANSPs and regulators from EUROCONTROL member states. CTF was formed to steer development of the guidelines and ensure that they are fit for purpose.

A prime purpose of the Guidelines is to provide information and processes to help States and ANSPs to identify and decide the contingency strategies and concept of operation best suited to meet

[1] Regulation (EC) No 449/2004 of the European Parliament and the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the "Framework regulation"), OJ L 96, 31.03.2004, p.1; Regulation (EC) No 550/2004 of the European Parliament and the Council of 10 March 2004 on the provision of air navigation services in the creation of the single European sky (the "Service provision regulation"), OJ L 96, 31.03.2004, p.10.

[2] Commission regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services (the "Common requirements regulation"), OJ L 335, 21.12.2005, p. 13 as amended by Commission Regulation (EC) No 668/2008 of 15 July 2008, OJ L 188, 16.07.2008, p.5..

their needs in certain circumstances. This edition of the Reference Guide Guidelines has a wider focus and, in addition to the previous edition which looked primarily at "Emergency" and "Degraded modes of operation," in support of ESSIP Objective GEN 01, it now includes more detailed guidance on "Service Continuity" issues.

In particular, it recommends ANSPs to establish an ATM Contingency Planning Policy and Operational Concept. Moreover, it provides enhanced guidance on the economic dimensions of contingency planning as well as more detail on the safety assessment of "Service Continuity" contingency arrangements. Finally, it provides a list of Frequently Asked Questions the answers to which are contained in the main Guidelines.

ANSPs should aim to build a positive contingency planning culture within their organisations. They should be adequately prepared to deal with contingency situations. The main emphasis is put on possible processes and procedures to be followed by the interested parties when developing their contingency plans although some guidance is provided on the execution and post-execution phases.

1.4 APPLICABILITY OF GUIDELINES

The guidance offered covers the roles and responsibilities of ANSPs and NSAs / Regulators (civil and military) in contingency planning. The pivotal role of the CFMU related to the potential network effects of ANS contingency is also addressed.

In accordance with the ICAO and EC obligations the Guidelines cover the complete spectrum of ANS services (with certain caveats). As such, all aspects of Air Traffic Control (En-Route/Area Control Centre (ACC), Approach, Tower etc) are considered. In addition, advice is provided for Airspace Management (ASM) and Air Traffic Flow and Capacity Management (ATFCM). Aeronautical Information Services (AIS) and the effects of disruption of EAD on the availability of information flow are taken into account. Contingency of MET services is limited to the information flow which is necessary to provide the required ATS. Similarly, contingency of Communication Navigation and Surveillance (CNS) services, in the scope of these Guidelines, is limited to the supporting services which are necessary to provide the required ATS. However, information is provided on technical and engineering matters that affect Contingency Planning and advice is also provided on issues related to external suppliers (e.g. contractors and sub-contractors). For airport operations, the scope is limited to direct ATS at airports and directly associated 'airside' infrastructures such as the control tower buildings and CNS. No 'landside' airport aspects (e.g. baggage handling) are considered although it is recognised that there are many issues here that could impact indirectly the ATS operation.

The Guidelines are primarily intended for use by the civil ANSPs and the military ANSPs (in so far as they have been certified). Non-certified military ANSPs servicing GAT, may find the information useful in the context of developing or updating military contingency plans. However, Contingency measures to be taken in the case of a 'failing' ANS military unit are not specifically addressed in the document, but when developing contingency measures for a civil ANSP, ANS military units might be considered as a possible aid to a 'failing' civil ANS unit.

1.5 CONTINGENCY LIFE CYCLE

In the context of the ICAO and EC obligations, the concept of contingency can be organised along a "Contingency Life Cycle" composed of the following phases:

- 'Normal' Operations
- 'Emergency' Situations;
- 'Degraded' Modes of Operation;
- 'Service Continuity';
- 'Recovery to Normal Operations'
- and (back to) 'Normal Operations'.

A diagrammatic presentation of the Contingency Life Cycle is presented on the next page.

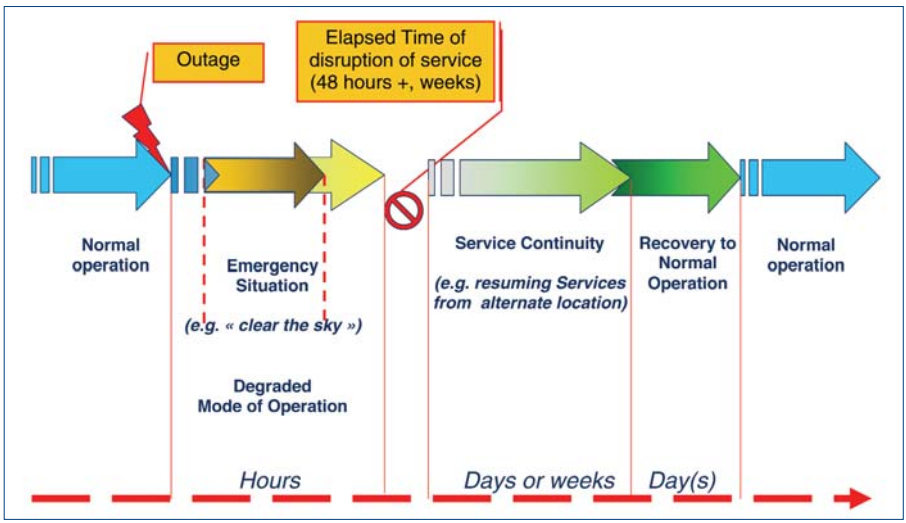


Figure 1: Generic Contingency Life-Cycle

In Figure 1, the horizontal axis shows the time. The durations of the different phases shown are not representative of the length of those phases. They could be very different from one event to another or from one environment to another

This Life Cycle should not necessarily be understood as a sequence of modes of operation. For instance, in certain circumstances depending on the cause/type of disruption:

- A System (Technical, People and Procedures) working in 'Normal' operation can evolve directly into an "Emergency" situation;
- or a System can deteriorate into a "Degraded mode of operation" that further evolves into an "Emergency" situation;
- or an "Emergency situation" can be followed by a 'Service Continuity' mode of operation;
- in some situations, it might be necessary to move straight from 'Normal' operation into a 'Service Continuity' mode of operation.
- or the outage may lead to a disruption whose elapsed time is of days or weeks.

2. ROLES AND RESPONSIBILITIES

Within the context of contingency planning, States (both as rule-makers and oversight authority) and ANSPs have specific roles and responsibilities.

The role of the States stems from Annex 11 to the Chicago Convention, and in particular from its Chapter 2.30 as interpreted by the guidance of Attachment C. These provisions are in line with Article 28 of the Chicago Convention, under which States are responsible for providing air navigation facilities and services in their airspace. This responsibility extends to the situations of crisis and to the necessity to maintain, where possible, the provision of services and a sufficient level of safety.

As a consequence, the State has to prevent, manage and mitigate such situations that would affect the provision of facilities and services by ensuring the prior development of contingency plans by the designated ANSP to whom the services have been delegated. If the ANSP is an institutionally separated entity (with its own legal personality), the responsibility for the contingency planning will be split between the State and the service provider. The service provider will be in charge of the development and when necessary the implementation of the plan; the State will remain responsible for approving and promulgating the plan.

The State can perform the oversight itself or delegate this task to another entity, through proper instruments. In the States where European legislation applies, the entity in charge of verification of compliance with Regulation (EC) No 2096/2005 is the NSA, which has been nominated or established for this purpose. The NSA can also be entrusted, at the discretion of the State, with verification of additional national requirements, e.g. those contained in the designation (for ATS and possibly MET) or in national regulations. Additional requirements related to contingency (for instance capacity levels) as stated in other regulatory documents (for instance in designation act) might therefore be verified.

The ANSPs' first responsibility is the development of the contingency plan, the definition of the measures and alternative services needed in case of degradation or interruption of their services, and their inclusion into a consistent plan, in line with the requirements or targets set by the State. The preparation phase includes the definition of the measures and the coordination with other actors, i.e. the State, the NSA(s), possibly other ANSPs and insurance companies. The ANSP is in particular responsible for developing the list of addressees to be notified in case an outage occurs and the service is discontinued. It should also, in coordination with the regulator, fix the minimal set of information and time of delivery to be given to neighbouring ACCs or States. The ANSP is also responsible for the implementation of the plan in appropriate cases.

Refer to the checklist on *Roles and Responsibilities* in the Annex and *complete guidance in Chapter 5 and Appendix A of the Guidelines.*

3. ORGANISATIONAL ASPECTS OF CONTINGENCY PLANNING

This part of the Guidelines provides more specific advice on the organisational issues that need to be confronted at various working levels within ANSPs to construct and then implement contingency plans. It identifies the individuals or personnel and groups involved in contingency planning and contingency execution phases (these may or may not be the same personnel). In an ANSP, for a given ANS unit (e.g. ACC, APP, and TWR), the organisational aspects may be addressed according to the following process that can be summarised as follows:

Refer to the checklist on *Organisational Aspects* in the Annex and complete guidance in Chapter 6 of the Guidelines.

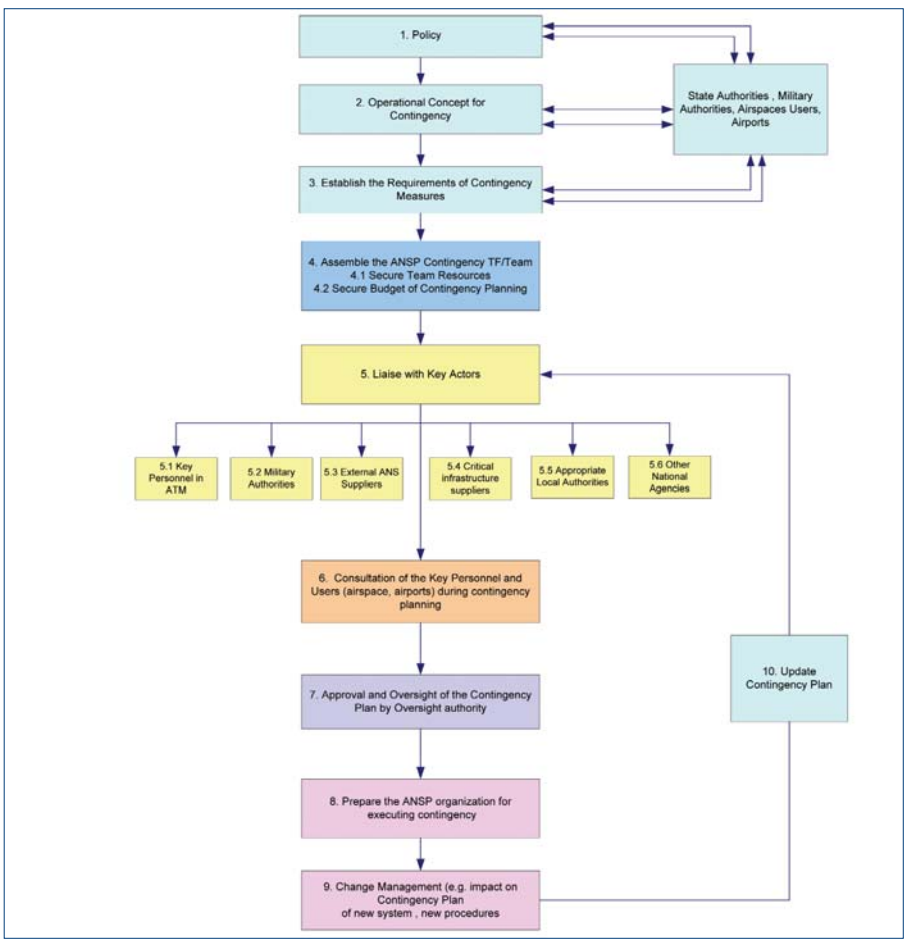


Figure 2: Contingency Organisational Aspects Process

4. CONTINGENCY PLANNING

Traditional practices for contingency planning have been based on the identification of the resources available (systems, procedures and staff) and the exploitation of these resources for contingency operations. While this approach has its merits, it also has its shortcomings (e.g. lack of requirements, incomplete consultation of State authorities and airspace users).

To address these issues, a "Contingency Process" framework is introduced that is derived from a classical Safety Management System (SMS) approach: Policy, Planning, Execution & Achievement, Assurance and Promotion. Advice is given on the key contingency planning considerations and activities according to that framework.

Briefly, these steps are:

- ***Policy***: Sets the ANSP organisation's contingency planning policy, operational concept for contingency and establishes the requirements around which the detailed contingency plans will be built
- ***Plan:*** Plan demonstrates how the aims of the set of Requirements that have evolved from the Policy and Operational Concept will be achieved. It also outlines the strategies/actions and resources required. The products of this step are the contingency plan(s)
- ***Achievement:*** Achievement verifies that the detailed means for translating the plans into reality are effectively in place. It covers testing, exercising, maintaining and reviewing the various contingency plans and raising awareness of contingency within ANSPs
- ***Execution and Assurance:*** This step corresponds to the Execution of the contingency plan. It includes also the monitoring and recording activities to be undertaken to enable the Promotion
- ***Promotion:*** Contingency Planning Promotion ensures communication of the contingency culture, dissemination of lessons learnt and enables the continuous improvement of the process

The arrows forming the loop indicate that ***Assurance*** and ***Promotion*** follow the ***Execution*** of the Contingency Plan and they shall ensure that the Contingency Plan(s) are reviewed and continually improved.

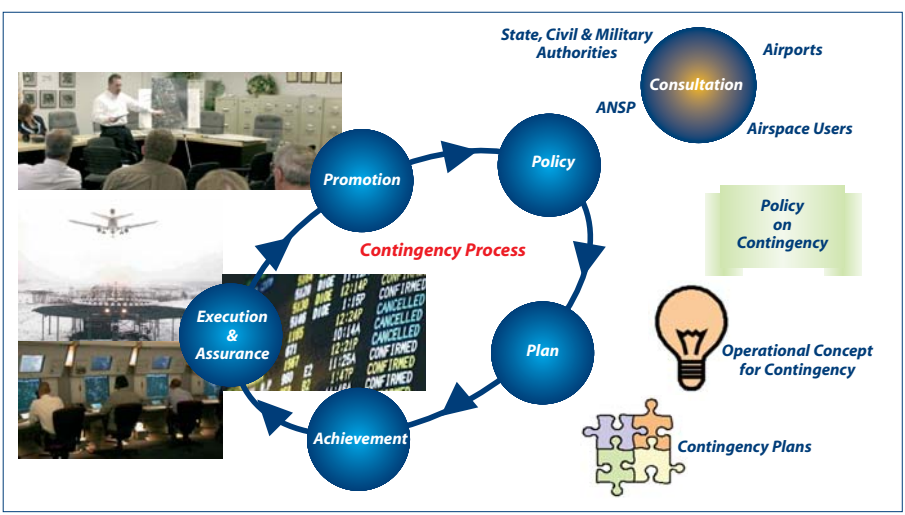


Figure 3: Planning Contingency Measures Approach

5. POLICY

5.1 CONTINGENCY POLICY

It is recommended that ANSPs develop a policy for Contingency in much the same way as they do for Safety and Security.

The Contingency Policy should describe the organisation's attitude towards contingency and set out the internal requirements, goals and objectives. It should also define the scope of Contingency e.g. whether it includes the provision for "Service Continuity" or limits provision to "fail to safe" modes of operation. Economic guidelines *(Appendix H of the Guidelines)* may assist ANSPs and NSAs to form an opinion as to limiting provision to "fail & safe" modes of operations.

The Contingency Policy provides a framework to enable the development of an Operational Concept for Contingency and should be coordinated with the organisation's overall approach to Crisis Management - *see Guidelines Chapter 13*.

More guidance on Policy is provided in the Annex and in *Chapter 7 of the Guidelines*

5.2 OPERATIONAL CONCEPT FOR CONTINGENCY

The development of an Operational Concept for Contingency situations begins with the elaboration of the Contingency Policy.

As presented in the scheme above, the ***"Operational concept of contingency"*** considers and documents the following:

- ***ANSP Contingency Policy:*** It is critical to clearly delineate the scope of the contingency concept including its context, assumptions and limitations as far as they exist.
- ***Key Contingency Events and related Risks:*** A list of the key contingency events, hazards and related risk areas that the organisation has identified and that it wishes to protect itself against. .
- ***Candidate Contingency Strategies:*** The scope, context and criteria of contingency solutions/measures to indicate which contingency strategies are to be further detailed within the contingency plan(s).
  - Co-Located Facilities (National),
  - Multi-Use Facilities (National),
  - Centralised Facilities (National),
  - Shared Common System Solutions (International),

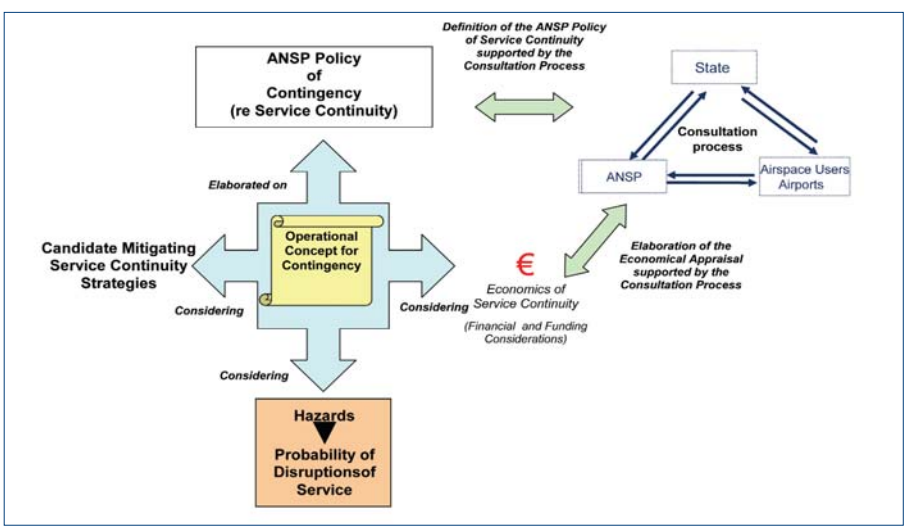


Figure 4: The Operational Concept of Contingency and its interactions

- ATS Delegation (International) - (Cross Border).

- ***Consultation Process:*** The needs of airspace users, regulators, service providers, airports and other stakeholders. A detailed exposition of the Consultation Process is given later in this Chapter.
- ***Economic Aspects:*** Financial and funding considerations. More guidance is provided in the Annex and *Chapter 7 of the Guidelines*.

5.3 CONSULTATION PROCESS

The State authorities (including the Military authorities), the Air Navigation Services Providers and the Users (Airspace Users and Airports) should put in place a process to set the requirements for "Contingency measures".
In this process, the State authorities have primacy in defining the requirements. ANSPs in consultation with Airspace Users and Airports develop the appropriate measures to meet these requirements and any additional local business objectives stated in their Contingency Planning policy

The State authorities (in their rule-maker role) and the ANSPs should establish a dialogue to define the mandatory contingency requirements. The ANSPs will have to fulfil their obligations with regard to contingency planning and by so doing ensure the Safety related elements of providing ANS and associated services, whilst also meeting, as appropriate, the requirements related to Security, Capacity/Flight Efficiency and Environmental Sustainability. States may also consider other wider political, social and macro economic issues.

More guidance on *Consultation Process* and the specific areas to be covered between the various parties are described in the Annex to this document and in *Chapter 7.4 of Guidelines.*

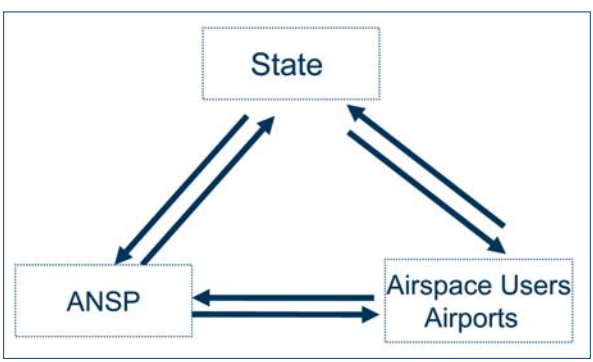


Figure 5: Overall Consultation Process

5.4 LEGAL ASPECTS

The legal aspects to be addressed cover liabilities and insurance especially in the context of cross-border provision of services during contingency. Refer to the checklist on *Legal Aspects* in the Annex and for *complete guidance see Chapter 5.5 of the Guidelines*.

5.5 CROSS-BORDER PROVISION OF SERVICES AND SOVEREIGNTY ISSUES

The cross-border provision of services raises three issues:

- The necessary involvement of the respective States concerned;
- the cooperation between the NSAs; and
- the clear definition of the applicable rules and regulations.

All aspects are discussed for the different steps of contingency (Policy, Plan and Achievement) in *Chapter 5.6 of the Guidelines.*

5.6CONTINGENCY IN MULTI-STATE OPERATIONS

Paragraph 5.4 of Attachment C to Annex 11 to the Chicago Convention recommends that in the case of multi-State ventures, detailed coordination leading to formal agreement of the contingency plan should be undertaken with each State. Similar coordination should also be undertaken with those States whose services will be significantly affected, and with international organisations concerned.

Article 5.4 of Regulation (EC) No 551/2004 provides that a functional airspace block (FAB) shall only be established by mutual

agreement between all Member States. The EC legislation does not contain any explicit provisions on the specific case of contingency in FABs.

In both cases, a written agreement between the States concerned shall, therefore, pre-exist and contain provisions on contingency. The States will likely include a high-level requirement for a contingency plan in such Agreement and allocate the development of the plan to NSAs or other State authorities. This later two-level approach is the most likely to be applied.

Refer Check list *standard contingency agreement between ANSPs* in Appendix and more on this issue can be found in *Chapter 5.7 of the Guidelines.*

5.7 ECONOMIC DIMENSION OF CONTINGENCY

A prime objective in defining contingency plans is to achieve adequate contingency capability at a reasonable cost. Short-term and long-term investment in contingency will be determined by factors such as:

- The existence of possible alternate contingency locations and systems (inventory);
- the investments and operating costs to reach a given capacity;
- the probability of an accident/failure and any costs or losses incurred as a result of any service disruption/unavailability;
- the potential benefits to have contingency measures implemented (e.g. lower insurance premiums).

Decision-making on investments for Contingency should be supported by Economic Analysis as shown in the *overview of Economic Analysis* in the Annex. Methods of economic assessment of contingency plans are addressed *in Chapter 7.5 and Appendix H of the Guidelines.* When and how such methods should be used is detailed in the Planning process.

However economic analysis is only a part of the decision making process in Service Continuity. No decision to invest in Service Continuity depends solely on the results of an economic assessment of possible candidate strategies The final decision to invest in Service Continuity shall take into account other considerations such as availability and priority in the allocation of financial and human resources; opportunity to link decisions together (e.g. waiting for new technology or upgrading of facilities); the binding nature of the legal framework (e.g. SES, ICAO); and political considerations and decisions.

In addition, Safety and Security levels should never be traded-off at the expense of increases in Capacity and/or Flight Efficiency.

6. PLAN

The Planning activities may be organised as follows:

1. ***Inventory of the Units/services/functions of an ANSP*** - it is essential that the process be applied to the whole portfolio of ANS units, services and functions (either provided or supplied). An Inventory of resources (e.g. systems, procedures, and staff) should also be made.

2. ***Identification of "realistic events"*** - For each ANS unit, the "events" that may lead to loss or disruption of service or function should be identified. The likelihood of the events is to be considered to identify which ones are "realistic".

3. ***Check if a Plan exists to manage the consequences*** of the "realistic events". This question is the foundation of the contingency planning process.

4. ***Develop or change contingency measures*** - in this step, an ANSP should ensure first that safety and security requirements are met. Plan(s) should be developed to deal with "Emergency" and "Degraded modes" of operation. In addition, if there is a need to ensure service continuity, and if this is "viable" (in terms of policy/operational concept /economics), "Service Continuity" plan(s) might be developed.

5. ***For all plans, Safety and Security Assessments should be conducted.*** The aim of this step is to ensure that the planned contingency measures meet safety and security requirements set at Policy step.

6. ***For "Service Continuity" measures, an Economic assessment of the viability of the plan would also be required*** since "business" considerations are likely to drive the development of such plan(s).

7. Develop measures for "Recovery back to Normal operations"

8. Document Contingency Plans

More information of specific ANS planning considerations and checklists are provided in the Annex of this document:

- a possible *Planning process* to build contingency plans;
- a checklist of *Planning - Operational* considerations;
- a sub-checklist of *Planning - Operational Alternate Airspace Strategies*
- a sub-checklist of *Planning - Operational Alternate Location Strategies;*
- a checklist of *Planning - Engineering* considerations.
- a checklist of *Planning - Technical* considerations.

For more guidance refer to *Chapter 9* and *Appendices B, C, D, E, G of the Guidelines*.

7. ACHIEVEMENT

The activities to be performed at this phase are:

- Test, exercise and validate that the planned contingency measures could be executed and are efficient.
- Ensure that the Human related aspects (license, training, competence scheme) are in place to provide the required services in contingency situations.
- Check feasibility and acceptance of staff relocation arrangements.
- Check security aspects.
- Maintain preparedness for contingency situations.

Checklist of *Achievement/Implementation Actions* is provided in the Annex.

More guidance is provided in *Chapter 10 of the Guidelines*.

8. EXECUTION AND ASSURANCE

Execution and Assurance includes the incident (Crisis / Contingency) response management, the execution of the contingency plan, the monitoring and recording activities to be undertaken to enable the Promotion step and at convenient time the recovery phase back to normal operations.

A checklist of *Execution and Assurance Actions* is provided in the Annex.

More guidance is provided in *Chapter 11 of the Guidelines.*

9. PROMOTION

Contingency Planning Promotion ensures communication of the contingency culture, dissemination of lessons learnt and enables continuous improvement. ***The aim of the Promotion activities should be to embed contingency planning into ANSPs normal management and operational process;*** it should become part of the culture and not be seen as a separate activity of a specialist few. Training, testing and exercising will increase the profile of Contingency within ANSPs but a targeted awareness campaign can also help to spread the word.

The Promotion step includes:

- Post-event analysis: whenever a contingency plan is exercised whether as a test or live event, it is recommended that there is an immediate debriefing meeting of senior executives and others closely associated with implementation and execution. In view of identifying lessons learned and implementing recommendations, if any.
- Updates of contingency plans and crisis management plans.
  Maintenance of contingency plans should be embedded with ANSPs' normal management processes rather than be a separate structure that can be forgotten.
- Ensure change control mechanism is provided for all contingency planning components;
- Dissemination of information: it is of utmost importance that those who will be affected by the plans remain aware of their responsibilities.

A checklist of Promotion Actions is provided in the Annex. More guidance is given on Promotion in Chapter 12 of the Guidelines.

10. CRISIS MANAGEMENT

Planning for contingency measures should be considered within the larger framework of crisis management. Effective crisis management plans should ensure that a measured response is provided to staff, the media and to stakeholders, and where appropriate should ensure Service Continuity of ANS.

More guidance is given on *Crisis Management Plans in Chapter 13 of the Guidelines.*

11. CONTINGENCY PLANNING FREQUENTLY ASKED QUESTIONS.

During the production of these Guidelines, a number of Frequently Asked Questions have been raised covering Legal/Regulatory, Security and Training/Testing matters.

The questions and detailed answers can be found in the *Guidelines Appendix K*

ANNEX TO REFERENCE GUIDE TO EUROCONTROL GUIDELINES FOR CONTINGENCY PLANNING (INCLUDING SERVICE CONTINUITY)

CHECKLIST OF ROLES AND RESPONSIBILITIES

A checklist of actions to be completed by State authorities/ NSA and ANSP is provided below.

Complete guidance can be found in Chapter 6 and Appendix A of the Guidelines.

STATE

- Have a good understanding of their responsibility with regard to contingency as a result of :
  - The Chicago Convention, Annex 11, Air Traffic Services, Chapter 2.29; Guidance material to Chapter 2.29, Attachment C, material relating to contingency planning;
  - The Commission Regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services, Annex I, Para. 8.2.
- Organise consultation with stakeholders in order to define specific national requirements to be met by contingency plans of respective ANSPs
- Assign national requirements to ANSPs, through regulation, or agreements; these requirements could be part of the obligations attached to designation;
- Entrust, via adequate means, the National Supervisory Authority (NSA) with the verification of contingency plans
- Approve the contingency plans (either directly or through delegation to the NSA),
- Approve the regulations/operational rules and procedures to be applied in case the contingency involves foreign ANSPs
- Approve (separately, or within the contingency plan) the agreements between ATSPs involving delegations of ATS
- Coordinate with other States concerned by the contingency plans, and if necessary conclude State-level agreements
- Coordinate with ICAO and if necessary with other international organisations; plans constituting deviations to the regional air navigation plans need to be communicated to ICAO by the State; State may need to notify differences with Annexes, if foreign regulations and procedures are applied.
- Ensure publication of NOTAMs to Users when the contingency plans are applied and discontinued

NATIONAL SUPERVISORY AUTHORITY (NSA)

- Define, adopt and communicate to the ANSPs concerned, the NSA procedures relating to the oversight of the adequacy and content of contingency plans
- Verify the existence and content of the contingency plans
- Define and request if necessary corrective actions in case of non-conformities
- Make arrangements for close co-operation with other NSAs in cross-border contingency conditions to ensure adequate supervision of the ANSP

AIR NAVIGATION SERVICE PROVIDER (ANSP)

- Develop a contingency plan in accordance with State requirements.
- Coordinate with other ANSPs, and formalise arrangements in writing
- Ensure that the written agreements with other ANSPs include provisions on the allocation of liability and on the applicable regulations and rules (e.g. operational rules),
- Review contracts with suppliers and include contingency aspects refer Guidelines Appendix G - Systems Engineering Perspective on Contingency Strategies 6.3.2, § 2.2 Contractors and Sub-contractors)
- Communicate the contingency plan to the insurance companies
- Facilitate the compliance monitoring by the NSA
- Communicate to the NSA the agreements with other ANSPs (separately or within the contingency plan)
- Obtain the State's approval for agreements containing delegations of ATS (either by the State itself or by the NSA, by delegation)
- Implement/apply and execute the plan when necessary
- Disseminate information when the contingency plans are applied and discontinued

CHECKLIST OF ORGANISATIONAL ASPECTS

A checklist of the Organisational actions to be completed by ANSPs for a given ANS unit (e.g. ACC, APP, and TWR) is provided below. Complete guidance can be found in Chapter 5 of the Guidelines.

ESTABLISH CONTINGENCY PLAN REQUIREMENTS

- Check that a process is in place to set the requirements for "Contingency measures" with the State authorities (including the Military authorities), the Airspace Users and the Airports (if relevant).

ASSEMBLE ANSP CONTINGENCY PLANNING TASK FORCE/TEAM

- Check that all specialists relevant to the ANS unit considered are involved, e.g.:
  - Managers/Supervisors
  - ATCOs
  - Engineers/Technicians
  - Legal
  - Human Resources
  - Finance
  - Facilities Management (e.g. parking, catering)
  - Staff representatives if appropriate
- Convene workshop/brainstorming
  - Consider the "what ifs"
  - Gain greater understanding of contingency planning
- Appoint senior manager to own the process:
  - *Responsible for final sign-off of contingency plan(s)*
- Identify those responsible for maintaining the CP
- Secure resources and budget of the contingency planning team activities
- Secure resources and budget for the actual contingency measures

LIAISON WITH

- ***National***
  - State authorities, other ANS Units (e.g. ACC, APP, TWR), Airports, Airspace Users
- ***International***
  - National key actors plus,
  - CFMU (see below)
  - Adjacent States - ANSPs, State authorities, ANS Units, Airports
- ***CFMU and OCG***
  - See Achievement Checklist for actions before an incident
  - and the Execution and Assurance Checklist for actions during and after an incident
- ***High Level Tactical Management - Crisis Management Group (CMG)***
  - Check co-ordination with the Director CFMU and convening of the CMG[2]
- ***ICAO***
  - Refer ICAO aspect in Roles and Responsibilities Checklist
- ***Military Authorities***
  - Refer Planning Checklists
- ***External Air Navigation Services Suppliers***
  - Consider the possible causes of loss/disruption of services related to a failure in the delivery of external services.
  - Consult with external suppliers as necessary, when developing contingency plans. *More advice on external suppliers can be found in Guidelines Appendix G.*
- ***Critical Infrastructure Suppliers***
  - Consider consequences of critical infrastructures outages such as power supply, IT etc
  - Liaise with specialist planning groups
- ***Local Authorities***
  - Include liaison with Local Authorities (fire, police medical, councils etc)
  - Check mutual awareness of contingency plans
- ***Other National Agencies***
  - Consider need for liaison (possibly through the Regulator) with other national authorities, e.g. National Counter Terrorism etc

CONSULTATION OF KEY ACTORS (DURING PLANNING)

- ***Airspace Users***
  - Check consultation during Planning stages (to discuss potential solutions)
  - and Execution (to be kept informed of latest developments)
- ***CFMU***
- ***Airports*** (if relevant)

APPROVAL AND OVERSIGHT

- Manage approval and oversight of the Contingency plan as per the Roles and Responsibilities Checklist (ANSP and NSA).

PREPARING ANSP ORGANISATION FOR EXECUTION OF CONTINGENCY PLANS

- Check roles and responsibilities are clearly assigned within the organisation
- Check ANSP executive is nominated to have overall responsibility/authority for Contingency Planning

CHANGE MANAGEMENT

- Check relevant contingency plans after all changes (e.g. system changes, procedures changes, organisation changes)
- Update contingency plans as necessary

[2] The Crisis Management Group (CMG) has been created which aims to react quickly and efficiently when unexpected situations seriously disturb air traffic flows in ECAC airspace. This group is chaired by the Director of the CFMU and is composed of nominated representatives of the Directors of Air Navigation.

CHECKLIST OF POLICY FOR CONTINGENCY

- The Contingency Policy should:
  - Set out the organisation's attitude towards Contingency.
  - State the overall Contingency goals and objectives.
  - Detail the scope of Contingency within the organisation:
    - *'Fail to safe' modes of operation.*
      - *Economic guidelines presented in Guidelines assist ANSPs and NSAs to form an opinion as to limiting provision to "fail & safe" modes of operations*
    - *Service Continuity*
  - Define the internal requirements for Contingency
  - Provide a framework to enable the development of an Operational Concept for Contingency
  - Outline the principles that will underpin the detailed contingency planning actions and measures that will be developed later in the Planning process.

- In addition, the Policy should broadly reflect:
  - The performance criteria to be satisfied, e.g. service levels, capacity, environment, efficiency and reaction time.
  - The units covered: is it all or only some?
  - The Contingency Planning testing/exercising regime.
  - The assumptions and limitations related to ANSP Contingency Planning
  - The guiding principles relating to safety, security, continuity of service provision (or not) and adaptability.
  - Senior management commitment to contingency, specifically the need for management to:
    - *Create and maintain awareness of the importance of fulfilling the principles of Contingency Policy.*
    - *Develop, implement and maintain Contingency Plan(s).*
    - *Develop and establish resilience by investing in redundancy.*
    - *Assure the economic stability of the company by implementing Contingency Policy.*
  - Relationships with internal parties (Engineering/technical, safety, security etc).
  - Relationships with external parties such as surrounding ANSPs, airports, NSAs etc.
  - The needs expressed by airspace users, regulators, service providers and any other stakeholders that might be affected by ANS contingency.
    - *Each party involved should know and understand which set of requirements are to be further defined in their own organisation to contribute to a safe and efficient deployment of contingency measures.*
  - Considerations of key risks that the organisation has identified and that it wishes to be protected against.

CHECKLIST OPERATIONAL CONCEPT FOR CONTINGENCY

An Operational Concept for Contingency should provide the following benefits:

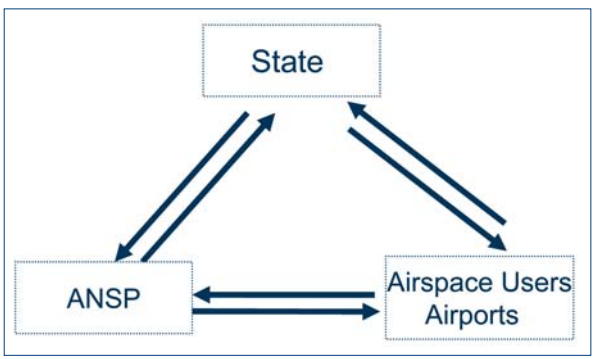
- A common language between all parties involved to capture needs and set-up requirements that avoid misunderstandings.
- A set of clearly defined requirements that will further support the definition and implementation processes.
- A set of safety, security and performance criteria to be satisfied by the future system.
- Consistency with recognised safety and security assessment techniques.
- Provides a setting to undertake the economic assessment of Contingency - *see para 7.5 and Guidelines Appendix H*.

An Operational Concept for Contingency could contain all or some of the following elements:

- Purpose and use
- Policy inputs
  - *Contingency Principles (safety, security, continuity)*
  - *Contingency Criteria*
  - *Contingency Key Events (i.e. foreseen contingency situations) and related Risks*
- Legal requirements
- Candidate Contingency strategies ;
  - *Preferred option(s) - the chosen Contingency Planning strategy*
- Consultation Process
- Economic Aspects
- Current Contingency Arrangements
- Description of the New Environment
- Description of Changes
- Summary of Impacts and Analysis of Changes

CONSULTATION PROCESS

The State authorities (including the Military authorities), the Air Navigation Services Providers and the Users (Airspace Users and Airports) should put in place a process to set the requirements for "Contingency measures".



The checklists below provide guidance on the main consultations that should take place between the various parties to enable the setting of requirements.

STATE / ANSP CONSULTATION

- State authorities (in their rule-maker role) and ANSPs should define the mandatory contingency requirements.
- States may also consider other wider political, social and macro economic issues.
- The ANSPs will have to fulfil their obligations with regard to contingency planning

As appropriate, primarily to Safety and Security, but also to Capacity/Flight Efficiency and Environmental Sustainability.

- ***Safety:***
  - Reference is the safety level when working under normal operating conditions.
    Expectation is that safety should be not be compromised during contingency conditions.
  - (NSA)/Regulators' approval of the Safety documentation is required.
- ***Security:***
  - EC Regulation No 2096/2005 requires ANSPs to implement a Security Management System (Sec MS).
  - Policy making processes that inform both Contingency Planning and Security Management should be linked
    Development of contingency provision should be coordinated with the overall ATM security strategy for the organisation.
  - Alternatively, described in Guidelines Chapter 7, ANSPs could adopt/implement a distinct Contingency Planning Policy which fully encompasses Security related issues and concerns.
  - Decision on how Contingency Planning and ATM Security are managed is a local (ANSP) decision. Nevertheless it is recommended that at a minimum the following principles should apply:
    - Security issues should be considered during planning, procurement, deployment and maintenance of ATM systems including Contingency operations.
    - Under "Degraded modes of operation" (contingency) ensure that the loss of key system functionality has not invalidated any of the assumptions that secure normal operations.
    - Contingency plans might also consider the additional constraints that particular threats might place upon "Service Continuity" operations following the loss of an ANS facility.
    - Security requirements remain valid in Contingency.
  - The reference level of (ATM security) operations is, therefore, the level when working under normal operating conditions.
    Security (airspace, facilities, personnel and data) including unlawful interference with ATM service provision) should not be compromised under contingency conditions.
  - Security is achieved through a mix of measures/controls (Security in depth, layered Security).
    Equivalent level of Security can be achieved by applying a different mix/set of measures. Accordingly, the same level of Security does not necessarily imply the same controls.
  - Contingency planning and measures should be included as a vital element of local Security

Management Systems (SecMS).

- ATM Security covers 2 major areas:
  - Self-protection of the ATM system against threats aiming at the ATM system and its facilities (including network, personnel and information/data).
  - Collaborative security support to relevant civil and military authorities responsible for countering aviation security incidents, crisis and emergency situations.

Further information on these ATM security related issues can be found at § 10.3.

- ***Capacity***
  - The minimum level of capacity to be provided at different time horizons after disruption of services (e.g. 24 hours, 48 hours and longer periods) is subject to policy decisions set by the States and ANSPs.
    However, the cost of creating alternate solutions can be prohibitively expensive; business risks need to be properly evaluated and assessed.
  - A 'one-size fits all' solution is not appropriate or necessary.
    ANSPs and Users need to be fully consulted in the State's process for determining contingency capacity.

- ***Environmental Sustainability:***
  - This parameter should be considered in conjunction with flight efficiency, where possible.
    In this context, contingency operations should be considered against compliance with environmental rules (degree to which environmentally driven traffic rules and constraints imposed on airports and airspace are respected), including atmospheric and noise aspects (e.g. noise generated and its impact on affected population).

ANSP, AIRSPACE USERS AND AIRPORTS CONSULTATION

- The primary concerns between ANSP, Airspace Users and Airports should be Capacity and Flight Efficiency.
  Environmental issues may also be discussed within this context.
- Consultation could take place, in the context of the formal consultation process as per Regulation (EC) No 2096/2005, Annex I, § 8.1..
- The capacity to be provided after disruption of services (e.g. 24 hours, 48 hours, longer periods) depends on existing alternate solutions (now) and future possibilities (at medium and long term) based on investments (supported by Cost Benefits Analysis) and available sources of funding.
- Flight Efficiency parameters should be considered when considering different options.
  CFMU plays a major role in coordination with the State/ANSP.
- Airspace Users should be informed of different contingency scenarios and their effects on ATSP capacity:
  - Consequences of a loss of facility.
  - The operational unit(s) that will be utilised for contingency purposes) (aiding units), or the staff who will provide alternate services;
  - The level of capacity which will be made available by an ATSP at different time horizons after disruptions.
- The Airspace Users should also be consulted on the impact on their operations (e.g. number of aircraft that can be handled by each aircraft operator at the different time horizons after disruptions considered by the ATSP).
- In addition to the consultation process stated above, it is recommended that ANSPs consult with the Airport Operators, at those locations where ATS are provided, in order to discuss and obtain agreement, as necessary, on the planned levels of service to be provided in each of the various contingency situations and timings.

CHECK LIST OF LEGAL ASPECTS

A checklist of legal aspects to be completed by State authorities/ NSA and ANSP is provided below.

Complete guidance can be found in Chapter 5.5 of the Guidelines.

LIABILITIES

STATES / NSAs / ANSPs

- Check the extent of their potential liability, e.g. check applicable national laws to identify the type of damage for which the liability of players can be invoked. (e.g. economic damage suffered by airlines after the closing or restriction of airspace).
- Where possible, clarify and allocate liabilities, as well as possible recourse actions, place of jurisdiction, dispute settlement procedures between the players (e.g. in agreements between States, between NSAs, and between ANSPs).

  This is of particular importance in the context of contingency plans involving several ANSPs and/or cross-border cooperation

STATES

- Verify that the appropriate legal instrument (for instance in designation act, in law or regulation, etc…) includes provisions on the possible negative consequences of the failure by the ANSP to meet requirements set for contingency.
- Include provisions on the allocation of liabilities in agreements related to contingency with another State (see above)

NSAs

- Include provisions on the allocation of liabilities in agreements related to contingency with another NSA (see above)

ANSPs

- Include provisions on allocation of liabilities or recourse actions between themselves vis-à-vis actions by third parties when concluding contracts with suppliers or contingency agreements with other ANSPs

INSURANCE

ANSPs

- Ensure appropriate coverage of the risks involved by the implementation of the contingency plan(s) (e.g. insurance policies or State guarantees) extend to the execution of contingency measures by the ANSP
- Communicate Contingency plans to the insurers once they have been approved by the parties concerned.

CROSS-BORDER PROVISION OF SERVICES AND SOVEREIGNTY ISSUES

STATES

- Determine or agree on which rules and regulations (such as operational procedures) have to be applied should an aiding unit have to provide services in a foreign airspace.
- Check this matter is approved by the respective States concerned and included in the relevant agreements (between States, or between ANSPs as approved by States).
- Approve ANSP contingency plan in its role of aiding unit
- Approve ANSP contingency plan in its role of failing Unit

Two options can be proposed:

- *either the States arrange these issues between themselves and respectively delegate the detailed development of the plans to their ANSPs,*
- *or the ANSPs conclude a contingency plan/agreement between themselves that is submitted by each of them to their respective State for approval.*

NSAs

- Establish cooperation with the NSA(s) concerned in the verification of the compliance of contingency plans
  - *The cooperation with the foreign NSA will be organised through procedures and processes formalised, if necessary, in written agreements.*
- Verify the compliance of the contingency plan of an ANSP involving a foreign ANSP as an aiding Unit

ANSPs

- Conclude a contingency plan/agreement with other ANSP(s)
  - *The elements to be included in a Standard Contingency Agreement between ANSPs are shown overleaf*

STANDARD CONTINGENCY AGREEMENT BETWEEN ANSPs

- Check that contingency agreements between ANSPs contain at least the following elements:
  - Name of the Parties , and of their duly mandated representatives
  - Scope of the Agreement, identification of the services concerned
  - Provisions on financial aspects, if any
  - Identification of the decision taking role/body in both failing and aiding units, also in respect to the declaration of the contingency phases
  - Applicable operational procedures and / or national regulations
  - Identification of the geographical area and level range for which the contingency service is provided
  - Identification of the types of flights for which the contingency service is provided
  - Procedure for the transfer of control
  - Radio-telephony procedures, including transfer of communications
  - Criteria for the use of the CFLAS by the failing and the aiding units
  - Restore [end of contingency] procedures
  - ATFM/AIS measures
  - Identification of the logistic and operational infrastructures/facilities intended to be used or managed by the relocated staff
  - Administrative / security procedures for the relocated staff
  - Contact points for the relocated staff
  - Compliance with Article 10.2 and 10.3 of Regulation (EC) No 550/2004 (notifications and approval)
  - Oversight and supervision
  - Allocation of liabilities
  - Dispute settlement
  - Entry into force, duration and termination

CONTINGENCY IN MULTI-STATE OPERATIONS

MULTI-STATE VENTURES

- States conduct detailed coordination leading to formal agreement of the contingency plan with all participating States.

- States undertake similar coordination with those States whose services will be significantly affected, and with international organisations concerned.

FUNCTIONAL AIRSPACE BLOCKS (FABs)

- States include a high-level requirement for a contingency plan in such Agreement and allocate the development of the plan to NSAs or other State authorities.

- States ensure that a written agreement between the States concerned shall pre-exist and contain provisions on contingency.
  - *The EUROCONTROL FAB Model Agreement of 2007 suggests the following provision: "The Contracting States shall ensure that the ANSPs develop a common Contingency Plan for all the services provided within the FAB establishing the procedures among the Units/Authorities concerned. The Plan shall be developed in compliance with, inter alia, the requirements of Annex 11 to the Chicago Convention. The Contingency Plan shall be developed before the start of the operations of the FAB".*

- States - or their NSA(s) - agree on the mechanisms for coordination between them (e.g. with regard to the common definition of requirements, the joint oversight by the FAB NSA(s) and the approval of the contingency plans).

- States ensure formal coordination with those neighbouring States which might be significantly affected in case of contingency.

- ANSPs ensure joint/coordinated plan in place (through a written agreement) before the start of operations of the FAB.
  - *The principles relating for instance to the applicable operational rules, the respective liabilities, etc. will be determined by the parties and included in the respective agreements (see Section above on cross-border provision of services for more details).*

- ANSPs obtain approval of the contingency plan as a prerequisite to the FAB.

More Guidance is provided in the *Guidelines Chapter 5.7*

PLANNING - PROCESS

The planning process that follows is presented as a stepped or linear approach. In reality, however, it is an iterative process; some of the activities would run in parallel and it may also be necessary to re-trace some steps as the process progresses.

Complete guidance can be found in Chapter 7 and Appendices B, C, D, E & G of the Guidelines.

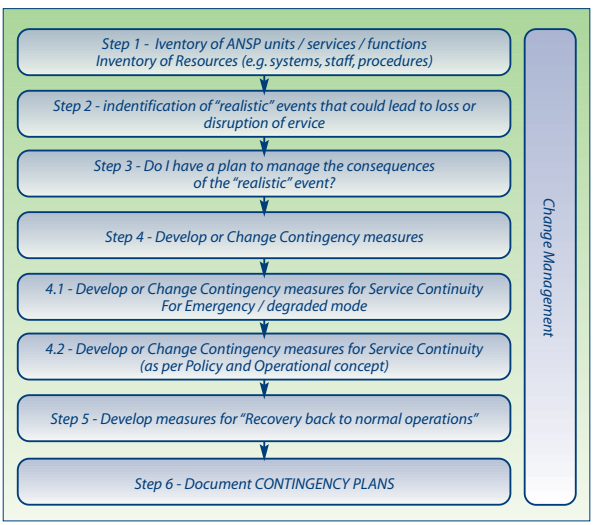


Figure 6: Overall Contingency Planning process

STEP 1 - INVENTORY OF THE UNITS/SERVICES/FUNCTIONS OF AN ANSP

The first step is for an ANSP to identify as extensively as possible the portfolio of the services/functions it provides to all its customers. For example, at a 'service' level an ANSP may provide ATS (en route, approach and tower) which at a 'functional' level will involve provision of VCS, surveillance, FDPS etc. Similarly, ANSPs could list all the suppliers of services and/or products whose failure may impact their delivery of air navigation services/functions:

- List ANS Units (e.g. ACC, APP, TWR)
- List the services (e.g. ATS, AIS) provided
- List the functions (e.g. Communication, Navigation, Surveillance, Data Processing System) provided;
- List the external suppliers
  - of Air Navigation products and services supporting the Unit (e.g. AIS, MET, CNS);
  - of other non-ANS suppliers (e.g. IT, Power supply...)
- Make an Inventory of resources (systems, staff, procedures)

STEP 2 - IDENTIFICATION OF "REALISTIC EVENTS"

Identify the "events" that may lead to loss or disruption of service or function. Then identify which ones are "realistic".

- ***STEP 2.1 - LIST THE EVENTS AND DETERMINE THEIR IMPACT ON "NORMAL OPERATIONS"***

  List the events to determine their impact on the "Normal Operations". Decide if impact alters "normal operations" or leads to loss/disruption of air navigation service/function provided and/or loss or disruption of supplied services/products.

  - ***Step 2.1.1 Events Not Altering Normal Operations***

    Formally identify events that will not alter "normal operations"

    - Review existing safety assessments. *Events not altering normal operations may have been identified during a formal safety assessment of the overall ATM system/service in compliance with ESARR4 (e.g. by applying EUROCONTROL SAM). Or Safety assessment may only have been performed on certain parts of the overall ATM system/service along with the introduction of any changes to the overall ATM System/Service.*
    - Review existing material (e.g. operations manual, part of training or occurrence made known via information notices) in order to assess whether adequate data are provided to draw such a "list" of events for which normal operations are not altered.

      For the legacy part of the ATM System/service (e.g., the part not

changed) for which no safety assessment was conducted, the identification of the events that will not alter "normal operations" may not have been formalized. However, some of these events are either formally identified in the operations manual, or they are made known as part of the training or made known following an occurrence via information notices (sharing lessons learned).

The following is a list of examples events which (routinely) do not trigger an emergency/degraded mode procedure:

- loss of one ODS of a sector:
- loss of a radar site as long as the minimum number of remaining radars available is at least equal to the minimum number of radars required to operate a sector "normally";
- replacement of an ATCO (e.g. feeling sick) by another ATCO licensed on the sector;
- combining existing sectors (not new sectors);
- maintenance intervention on equipment for which the level of redundancy allows maintaining operation (e.g. 3 levels of redundancy have been implemented though only two are necessary to operate in "normal mode"; the third level of redundancy was introduced to allow such "transparent" interventions).

- ***Step 2.1.2 Events Altering Normal Operations***
  - Collect events and conduct 'brainstorming' involving technical and operational departments.
    May be supported by existing lists, "records" or "history" of events: Database of events/incidents (if existing), Benchmarking (exchange with other ANSPs), Systematic analysis (e.g. FHA when already done).

Events may be of different categories:

- ATM related events (e.g. extracted from existing FHA);
- Building/ANSP Infrastructure events (fire, power supply, IT);
- Environmental events (floods, earthquakes, « SEVESO like » chemical plant explosion)
- Events affecting the workforce (food poison, industrial action, pandemics)
- Security related events (terrorism, sabotage, IT hacking)
- Airborne threats (hi-jacking, aircraft crashes)

Two tables of events, not necessarily exhaustive covering "ATM" and "Building" related events are provided in Appendix B of the Guidelines.

- ***STEP 2.2 FILTERING "EVENTS ALTERING NORMAL OPERATIONS" TO KEEP "REALISTIC EVENTS"***
  Keep "Events Altering Normal Operations" which are "realistic events" for the unit/service considered (i.e. whose probability is significant enough to be considered). Based on "Risk assessment" methods and may be supported by occurrence database(s) of events/incidents (technical and operational - if existing and/or information collected from another national agency whose expertise is specific to categories of events (e.g. Security services for Security threats, national/local authorities responsible for prevention of natural disasters°).

Realistic events can be listed by using both criteria to include or exclude them.

- ***Consider events are "realistic" when:***
  - the mitigation of their consequences is required as per regulation:

e.g."false fire detection alarms" when a national regulation enforces usage of sprinklers in the Ops room to extinguish fire; then a procedure (dry pipes) should be in place to manage false alarms;

  - already experienced:

e.g. as known by history or recorded in occurrence database(s);

  - experienced by other ANSPs in a "similar" operational environment;
  - equivalent to another "realistic event" or linked through a chain of events.

- ***Exclude events when rationale exists that prevents them from being considered "realistic" and document decision:***
  - when the event is unlikely to occur and for which no direct or indirect mitigation means exist; thus risk is considered as negligible and it is accepted:

e.g. meteorite hitting ATC (if big meteorite then all staff killed and adjacent ACC may also be impacted);

  - an event is unlikely to occur (but for which mitigation means could exist); thus risk is considered as negligible and it is accepted

e.g. earthquake above a given magnitude in an area which has no records of such activity;

  - associated or equivalent to another unrealistic event.

STEP 3 - DO I HAVE A PLAN TO MANAGE THE CONSEQUENCES OF THE "REALISTIC EVENTS"?

- ***STEP 3.1 CONTINGENCY PLAN(S) EXIST TO "MANAGE" THE EVENT***

  - Compare 'performance' of existing "contingency measures" in terms of safety, security, capacity and environment (when relevant) to the requirements set at Policy level.
    - When Requirements are met - no need to develop/change them (except as a consequence of the Step 5 "safety assessment/safety case").
    - When Requirements are not met - re-design.
    - If it is not possible to design or re-design viable contingency plan(s), then re-visit Requirements (see Step 3.3).
  - Confirm plans have been subjected to safety assessment.

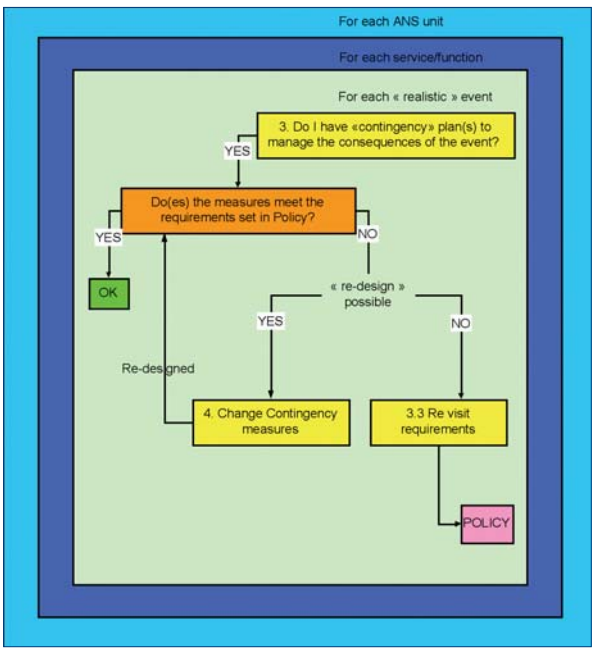


Figure 7: Process to confirm or change existing CP

- ***STEP 3.2 NO CONTINGENCY PLAN EXISTS TO "MANAGE" THE EVENT***

  - ***Initiate two actions:***
    - Firstly, "deal with current situation" with the System "As-is" (i.e. people, procedures and equipment); Agree with the other parties (State authorities, Users) modifications of the requirements set at Policy level, on a temporary basis till appropriate contingency measures are in place

      Re-visit requirements (see step 3.3).
    - Secondly, develop new contingency measures to manage the consequences of the event.

      Once contingency measures have been developed follow Step 3.1.

- ***STEP 3.3 RE-VISIT REQUIREMENTS SET AT POLICY LEVEL***

  When there are no contingency measures in place to manage the consequences of the event;
  Or when it has been determined that the contingency measures (either in place or developed) are inadequate to satisfy all the requirements set at Policy.

  Guiding principles:
  - Safety is considered to be a 'constant'; it should not be compromised (e.g. ANSP has to ensure 'fail to safe' in emergency and degraded modes of operation);
  - Security requirements could only be "temporarily" not met with the explicit agreement of the appropriate State authorities;

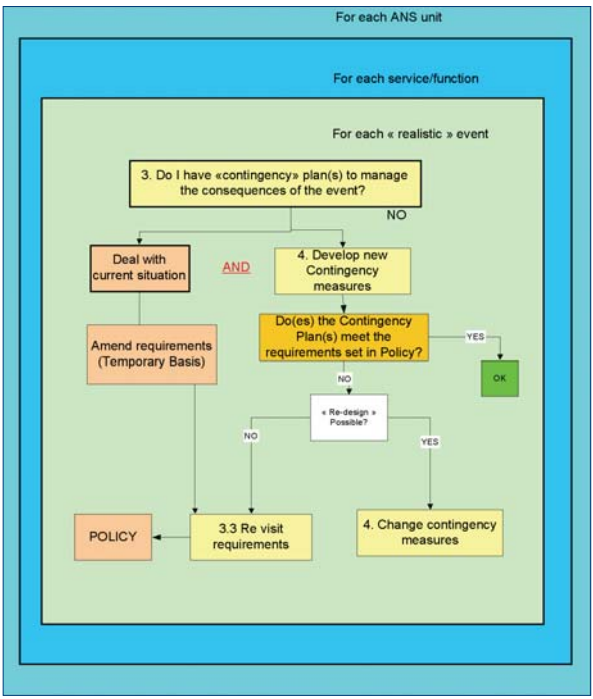


Figure 8: Process to deal with current situation and develop new CP

  - Capacity, flight efficiency (and possibly environment) are 'variables' to manage the consequences of the event while maintaining Safety and Security.

STEP 4 - DEVELOP OR CHANGE CONTINGENCY PLAN(S)

- ***STEP 4.1 DEVELOP OR CHANGE CONTINGENCY PLANS FOR EMERGENCY AND DEGRADED MODES OF OPERATION***

  Contingency measures for "emergency" and /or "degraded mode of operation" might consist of:
  - Development of "fall-back" systems to improve the resilience of the technical systems;
  - Development of "emergency " and/or "degraded modes of operation" contingency procedures to be actioned during contingency situations ;
  - Development, as relevant, of the "people" aspects (both operational, technical and maintenance staff) and "procedures".

A possible process to follow is presented below.

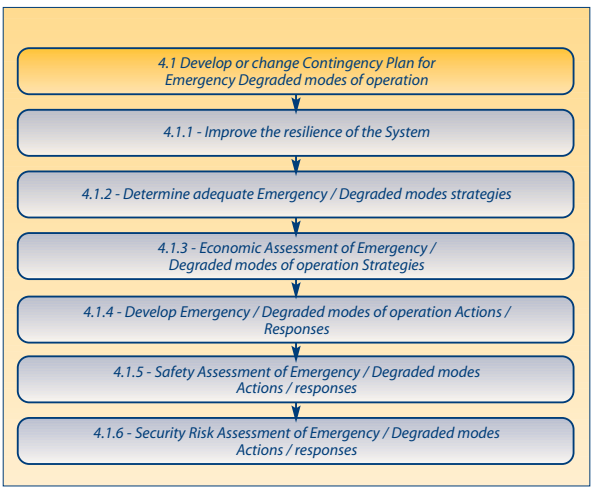


Figure 9: Develop or change CP for Emergency/Degraded modes

- ***Step 4.1.1 Improve the Resilience of the System***

  Development of "fallback" systems to improve the resilience of the system should be addressed at design stage in compliance with the ESARRs (in particular ESARR4 and ESARR6 for Software).

Notwithstanding levels of resilience, it is necessary to develop "contingency strategies" to manage the situation when the "fallback" systems fail.

- ***Step 4.1.2 Determine adequate "Emergency" and/or "Degraded modes of operation" contingency strategies***

  Main drivers of strategies are Safety and Security requirements identified at the Policy step.

- ***Determine and select alternative operating methods/strategies to be used after a loss or disruption of service:***
  - ***to ensure the safety of the airspace Users (Emergency situation);***
  - ***and/or to ensure a graceful degradation of the operations (Degraded modes of operation)***

In case of Total outage, 'failing' unit strategies could be either "Contingency (Alternate) Airspace strategies" or "Contingency (Alternate) Location strategies". See Planning Operational Checklist and sub checklists (Operational Alternate airspace and Operational Alternate location).

In case of Partial outage, strategies may be to remain at the failing unit and provide ANS with the remaining capability of the unit ("Degraded modes of operation"). In addition, the failing unit may execute strategies planned for total outage as appropriate to the situation.

- ***Consider protection of vulnerabilities and single points of failure in service critical processes identified during the 'filtering of realistic events' process.***

Contingency strategies selected should mitigate the effects of, and ensure the organisation can tolerate and recover acceptably from:

- *All contingency related scenarios identified in the 'filtering of realistic events process'.*
- *Denial of access or loss of any worksite(s).*
- *Denial of airspace.*
- *Insufficient personnel.*
- *Any technology failure/outage.*
- *Any supplier or utility failure and any outsource or other service unit failure.*

Contingency Strategies should also have demonstrably low likelihood of being concurrently affected by another service disruption. Any contingency plan must consider and limit common points of failure, such as a national flight data processing centre. Causes of failure of a primary site could also prevent other centres from taking over workload from the failing site.

- ***Consider mutual aid provided by or to other organisations*** (e.g. CFMU and neighbouring ANSPs).
- ***Document rationale for all strategies and their development approach.***
- ***Keep documentation fully up to date to reflect ANSPs' changing requirements.***
- ***Senior manager sign off the contingency strategies.***

- ***Step 4.1.3 Economic assessment of "emergency/degraded modes of operations" strategies***

  Financial considerations are limited to the necessary actions to implement "minimum requirements" at an acceptable cost.

- ***Step 4.1.4 Developing Contingency Planning Actions/Response***
  - ***Develop appropriate actions /responses.***

  Key requirements are:
  - *Clear procedures for the escalation and control of any incidents*
  - *Communications with stakeholders*
  - *Plans to resume interrupted activities (if relevant)*

ANS related issues to be considered while developing the contingency measures are further discussed in Checklist Planning Operational and Technical.

- ***Ensure Contingency measures are developed in compliance with ESARRs 4, 5 and 6.***

- ***Step 4.1.5 Safety Assessment of Emergency/Degraded mode of operations***
  - ***Conduct analysis of the safety impact of the "realistic events" that trigger the need for an Emergency and/or Degraded Mode plan***
  - ***Conduct risk assessment and mitigation of the Degraded Mode procedure:***
    - ***during procedure definition (e.g. equivalent to a FHA);***
    - ***during procedure design (e.g. equivalent to a PSSA);***
    - ***during procedure development (e.g. equivalent to a SSA).***

Criteria to evaluate the development of procedures:
- *Check existence of appropriate level of coordination between operational and technical relevant staff;*
- *Check that level of safety always remains acceptable (fail safe);*
- *Check that level of traffic is tuned to allow safe operations during the Degraded Mode of Operations (e.g. normal level of traffic may be reduced to allow managing safely degraded modes that may occur anytime including peak traffic conditions)*
- *Check that maximum usage and reliance of well-proven and existing practices is made;*

The level of assurance should be as a minimum equivalent to the practices as recommended for Procedure Assurance Level PAL 4 (see SAM-SAAP) tailored to such type of procedure.

PROCEDURE ASSURANCE LEVEL (PAL) 4

I PROCEDURE DEFINITION	II PROCEDURE DESIGN AND VALIDATION	III PROCEDURE DEVELOPMENT	V OPERATION
I3 Establish a proven and well-documented starting point for the definition phase ***I2*** Ensure a minimum set of quality assurance activities ***I1*** Ensure involvement of relevant operational expertise	***II3*** Ensure suitable validation ***II2*** Ensure that HMI has been assessed ***II1*** Establish an acceptable risk level (in qualitative terms)	***III2*** Ensure an acceptable quality assurance level ***III1*** Establish an Implementation Plan which includes quality assurance activities v3 Ensure minimum proficiency levels	***V3*** Ensure minimum proficiency levels ***V2*** Establish a reporting system covering occurrences relating to the procedure ***V1*** Ensure documentation control

A Template is provided to support the development of Emergency / Degraded mode of operation procedures in Appendix D of the Guidelines.

In addition, an example of template usage is provided in the Appendix E of the Guidelines.

- ***Step 4.1.6 Security Assessment of "Emergency/Degraded mode of operations"***

  As with Safety, an analysis of the Security impact of the Realistic Events (RE) that trigger the need for an Emergency and/or Degraded mode plan should be conducted in order to identify the parts of the ATM service and system which are 'degraded' and those which are not 'degraded'.

  - ***Conduct analysis of the safety impact of the "realistic events" that trigger the need for an Emergency and/or Degraded Mode plan***

    Criteria to evaluate the development of procedures:

  - *Check existence of appropriate level of coordination between civil/military relevant staff or those with specific ATM Security responsibilities;*
  - *Check that level of ATM security always remains acceptable;*
  - *Check that level of traffic is adjusted to allow, if necessary, the prosecution of ATM Security related operations (e.g air policing) during the Degraded Mode of Operations;*
  - *Check that maximum usage and reliance of well-proven and existing practices is made.*

- ***STEP 4.2 DEVELOP OR CHANGE CONTINGENCY MEASURES FOR SERVICE CONTINUITY***

  Some guidance is given below on development of contingency measures to ensure or restore continuity of services for disruption longer than 48 hours.

  The proposed approach is to identify the Maximum Agreed Period of Disruption of a service or function (MAPD) and then to determine if there is a real "business case" to develop measures to ensure the continuity of the service or function considered.

- ***Step 4.2.1 Impact Assessment***

  Assess Impact on the requirements (Policy, Economic, and Corporate) of the disruption:

  - *Safety: effects on ability to provide or maintain safe ANS.*
  - *Working Conditions: effects on workload of ATCOs and Flight Crew.*
  - *Adverse Operational and Environmental Conditions: effects on the ability for ATCO and/or Flight Crew to cope with adverse operational and environmental conditions*
  - *Functional Capabilities: effects on the ground part of the ATM system and aircraft functional capabilities.*
  - *Economic Impact - loss of revenues, penalties, insurance premiums.*

Figure 10: Process to develop CP for Service continuity (as per policy and operational concept)

- *Corporate Level Impact - loss of reputation, loss of customer, loss of licence to operate.*

Within the limits set by the ANSP policy on Contingency , and within the framework of the Operational concept, agree at what point in time these become intolerable - ***Maximum Agreed Period of Disruption - MAPD.***

the ANSP to ensure as much as possible the completeness of the IA.

- ***Step 4.2.2: Is There a Potential Need for Service Continuity?***

  Review MAPD for each service/function along with all the "realistic events" to assess if there is a potential need to develop "Service continuity"

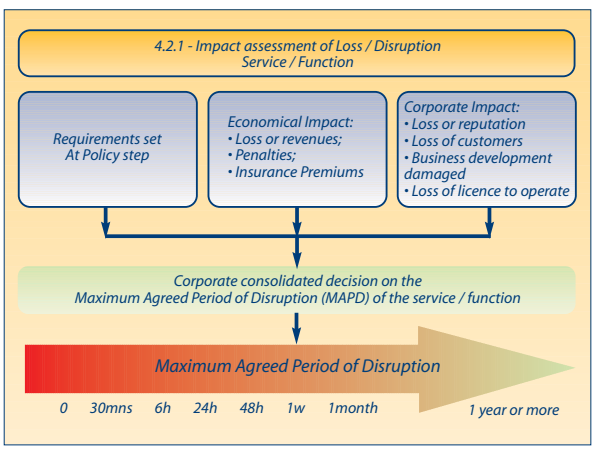


Figure 11: Determination of MAPD

- ***Conduct Impact Assessment (IA) to identify, quantify and qualify the impact of a loss or disruption of Air Navigation service/function provided or any function/service supplied (e.g. IT, Power supply)***
- ***Conduct 'brainstorming' to determine MAPD (in terms of minutes, hours, days, months) of the concerned service/function.***

"brainstorming" sessions should involve different levels of management and different departments of

- ***4.2.2 a) Potential Need for Service Continuity Based on MAPD?***
  - ***Consider MAPD against appropriate timeframe (e.g. 48 hours)***
  - ***MAPD < timeframe (e.g. 48 hours),***
    - ***Consider further "service continuity" strategies and process step 4.2.3***
    - Such service/function is a potential "candidate" for further development of "Service Continuity" strategies.
    - For MAPD in terms of seconds/minutes, "fallback" systems should be developed to improve the resilience of the system.
    - For MAPD in terms of minutes/hours up to the appropriate timeframe (e.g. 48 hours), consider also development of contingency measures for "Emergency mode of operations" and/or "Degraded modes of operation" (refer step 4.1).
  - ***MAPD > timeframe (e.g. 48 hours),***
    - ***Assess if there is a "case" to support the development of Service Continuity measures.***

      This "case" could be confirmed:
    - *When there is a possibility of loss/disruption of service/function caused by the "realistic events" identified in Step 2 for a duration greater than the MAPD of the service/function;*
    - *On the basis of other "business considerations" (e.g. political/operational/economical).*

A possible approach to support the confirmation that a case exists to consider further "Service Contingency" strategies is provided in § 7.1, step 4.2.2 b) "potential need for Service continuity based on events" of the Guidelines.

- ***Step 4.2.3 Determine and Develop Service Continuity Strategies***

  Objective is to maintain and/or resume ANS services and their

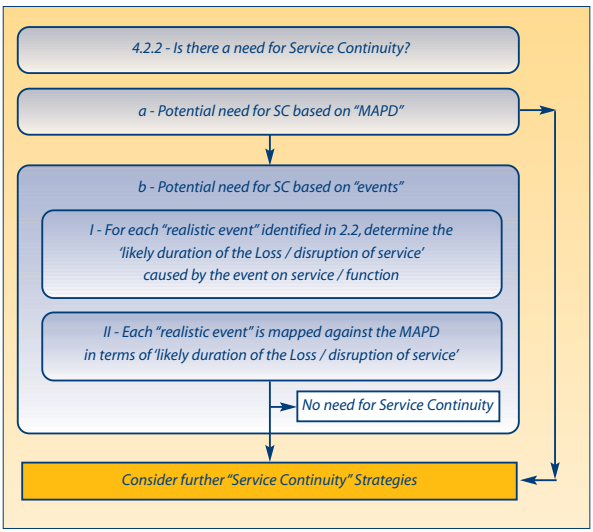


Figure 12: Determination of need for Service Continuity

dependencies (internal and external) to a priority, and time-table determined in the Impact Assessment.
Main drivers are capacity requirements identified at the Policy step and economics

- ***Determine and select alternative operating methods/strategies to be used after a loss or disruption of service to ensure the appropriate continuity of service***

See Step 4.1.2 and Checklist/sub Checklist for Planning regarding the determination and selection of alternative operating methods/strategies to be used after a loss or disruption of service:

- Planning Operational
- sub checklist Planning Operational Alternate airspace
- sub checklist Planning Operational Alternate location

Contingency Strategies should also have demonstrably low likelihood of being concurrently affected by another service disruption. Continuation of restart capabilities need to be realistic.

- ***Step 4.2.4 Economic assessment of Service continuity***

Financial considerations are one of the main drivers to implement "Service continuity" measures (for more guidance, refer Appendix H of the Guidelines).

Economic considerations may lead either:

- ***to continue development of Service continuity Actions/response (see step 4.2.5);***
- ***or to abandoning the development of "Service continuity" measures (no business case);***
- ***or re-visiting the requirements (in terms of capacity, flight efficiency during service continuity) set at Policy level (see step 3.3).***

- ***Step 4.2.5 Developing Service Continuity Actions/Response***
  - ***Develop appropriate actions/responses.***
    The elements to be covered are similar to those mentioned for "Emergency/degraded modes of operations" - refer to Step 4.1.4 and Checklist Planning Operational and Technical.
  - ***Ensure Contingency measures are developed in compliance with ESARRs 4, 5 and 6.***

- ***Step 4.2.6 Safety Assessment of Service Continuity***
  - ***Define Service Continuity scenarios (or "Concepts of Operations") depending on the state of the "Ops System" (availability of staff, equipment, infrastructure; required traffic volume; …).***
  - ***Perform a Safety Assessment of "Service Continuity" operations using a methodology in compliance with ESARR4 - e.g. EUROCONTROL SAM.***

- ***Step 4.2.7 Security Assessment of "Service Continuity"***
  - ***Conduct a security assessment of the selected Service Continuity mode(s) of operation***
    using a methodology such as the Sec RAM.

STEP 5 - "RECOVERY BACK TO NORMAL OPERATIONS"

- ***Develop appropriate measures to ensure a safe resumption or upgrade of the services after a contingency situation.***
- ***Conduct a safety assessment of the measures in compliance with ESARR4 -e.g. applying EUROCONTROL SAM.***

STEP 6 - DOCUMENT CONTINGENCY PLAN(S)

The Contingency Plan pulls together the response of the whole organisation to total loss or major disruption of ANS service capability. Those using the plan should be able to select and deploy appropriate strategies from those available in the plan and direct the maintenance and/or resumption of service units according to agreed priorities and requirements.

- ***STEP 6.1 CONTINGENCY PLAN(S)***
  - ***Check Plans specify the detailed measures and actions that are required to enact the chosen contingency strategies.***
  - ***Will Plan(s) facilitate the maintenance or resumption of ANS service delivery?***
  - ***Can those using the contingency plan(s) select and deploy appropriate strategies and actions and direct the maintenance or resumption of service units according to agreed priorities and requirements?***
  - ***Are Contingency Plan(s) modular in design and do they contain checklists of considerations for action by nominated actors and personnel?***

Contingency Plan (s) (and/or sub-service level unit plans if relevant) should contain information on:

- Document owner and maintainer
- Roles and Responsibilities of key actors
- Invocation and mobilisation instructions
- Action lists
- Resource requirements
- Essential information - contact details, LoAs etc
- Forms/annexes - checklists etc

- ***Step 6.2 Crisis Management Plans***
  - ***Are Contingency Plan(s) consistent with Crisis management Plan(s)?***

Planning for contingency measures should be conducted within the larger framework of "crisis management". In that context, outline guidance of "crisis management" considerations to help in the development of holistic plans is provided in § 11 Crisis management of the Guidelines.

The links between the development of contingency plans and crisis management plans are also mentioned in different sections: § 6.5"Crisis Management" at ANSP (Policy) and Step 6.2 Crisis Management Plans (Planning) of Guidelines.

For more guidance refer in *chapter 7.6 and chapter 13 of the Guidelines*.

CHECKLIST OF PLANNING - OPERATIONAL ISSUES

This checklist provides a list of the planning issues to be considered when conceiving contingency strategies and subsequent detailed actions as outlined in the § 7.2 of the Guidelines (Planning - Operational Considerations).

Generally, contingency planning considerations in respect of safety, operations, engineering and cost are common to ACC, APP and TWR functions.

ANSPs

OPERATIONAL CONSIDERATIONS

- ***General***
  - Tactical Considerations. Confirm that the Contingency Plan(s) specify
    - How to assure safety of aircraft in affected airspace?
    - The handover/takeover of control during crisis situations?
    - How to accommodate traffic demand to the best of remaining capacity?
    - ATFM measures in cooperation with CFMU (see also Checklists for Achievement and Execution)
  - Adopt, whenever possible, the principles of "minimal differences" i.e.:
    - The normal airspace structure and sectorisation
    - The normal ATC procedures
    - Identical workstation HMI
    - Validated controllers from the 'failing' unit to man the contingency work stations at the 'aiding' unit.
    - Initial Team should be restricted in size, adaptable and flexible, rapidly deployed

Overriding principle to be followed: ATCOS are qualified to exercise the privileges of the ratings only in sectors/Units for which they are trained

  - Other factors affecting the transfer of personnel to other 'aiding' ANS units - see checklists for Achievement and Execution
- ***Contingency Strategies***
  - Check Generic Requirements for potential contingency strategies in Sub-Checklist
  - Check specific issues in Sub-Checklists relating to Alternate Airspace and Alternate Location strategies
- ***Military Considerations***
  - Ensure exchange of Flight Plan information (for Air Defence/Air Policing), as required
  - Ensure provision of ATS to military aircraft by civil controllers so as not to compromise military operations

    More on Military as an 'aiding' unit described above/in 'Alternate Location strategies' sub-checklist.
- ***Airspace Management***
  - Outage affecting FUA: Airspace Management Cell (AMC) continues with its responsibilities pending system and staff availability
- ***ATFCM/CFMU***

  The roles of the ANSP regarding ATFCM and coordination with CFMU are described in the checklists for Achievement and Execution & Assurance
- ***AIS***
  - Information flow (NOTAM, AIP/AIC publication, AIS, AUP, CRAM, METAR...)
  - Broadcast of contingency measures by fax, NOTAM, email, AFTN
  - Send ATFCM measures to CFMU
  - Issue NOTAM as soon as possible according to contingency phases/actions
- ***EAD/EAB***
  - Consider failure of EAD services
  - Consider how EAB can help to support clients

    24hr Helpdesk available, Operational User Handbooks
- ***Airports***
  - Ensure that solutions to infrastructure problems (e.g. airfield pavement, loss of taxiway, closure of runway) are devised through close cooperation between ATC and the airfield operator
  - Ensure continued availability of essential CNS services and/or the provision of alternate arrangements and procedures through close cooperation between ATC and the appropriate organisation (e.g. Airport Operating Authorities)
- ***Meteorological Services*** (limited to information flow necessary for providing ATS)
  - (ANSP) check that Met Services provider has contingency plan in place
- ***Other Operational Considerations***
  - Amend/adapt SIDs and STARs
  - Ensure contingency plan includes Transition arrangements to/from contingency operations
    - Acceptance of stop of traffic
    - Duty roster(s)
    - Initial steps towards long-term contingency measures
  - Check that sets of documentation (plans, log books, checklists etc) are available at the contingency premises.
  - Confirm details of Contingency Contact Points and Crisis Management centres (responsibilities, location(s))

SUB-CHECKLIST OF GENERIC REQUIREMENTS FOR POTENTIAL CONTINGENCY STRATEGIES

The following table introduces considerations that are generic to a number of potential contingency strategies. The points raised follow a sequence of events starting with the Planning Process, through to the Fail to Safe, Service Continuity and Recovery modes of operation. Maintenance of contingency plans is also covered. The table should be read in conjunction with the Specific Requirements for each potential strategy described later in the Annex.

GENERIC REQUIREMENTS
PLANNING
Preparation of Plans

• Establish requirements for contingency
• Identify key resources including facilities management.
  ◦ Ensure key personnel in ANSPs (i.e. potential failing and aiding units) are provided with means to communicate at short notice.
  ◦ Liaise with sub-contractors and infrastructure providers.
• Establish contingency planning group.
• Ensure early engagement with Regulator/NSA as necessary:
  ◦ e.g. obtain approval from regulators and State authority for procedures and practices that affect the airspace of the failing unit.
  ◦ e.g. clarify licensing and training issues when staff may be providing safety related services for the airspace of a neighbouring country.
• Ensure training of staff (ATCOs and ATSEP) in contingency measures.
• Document contingency plans.
• NSA(s) to verify the existence and content of contingency plans.
  ◦ In case of cross-border provisions of services in case of contingency, NSAs of both failing and aiding units should verify contingency plans

FAIL TO SAFE
Phase 1 - Immediate Actions
A dangerous situation has been identified. Focuses on the safe handling of aircraft in the airspace of the failing unit, using all technical means still operationally available. • Secure actual traffic situation • Consider, evacuation of the airspace -'clear the skies'   ◦ However, and if time permits, systems engineering teams and sub-contractors could be consulted to determine if they can resolve a failure before this critical decision is taken. • Try to determine the magnitude of problem and the duration of the outage. • Prepare fall-back instructions to ensure the safety of operations allowing a 'smooth' transition to phases 2-5. • Appropriate authorities will identify the seriousness of the situation and initiate appropriate contingency measures. • Initiate process of informing all interested parties
Phase 2: Short/Medium Term Actions (<48 hours)
Focuses on stabilising the situation and, if necessary, preparing for longer term contingency arrangements: • Contingency measures should be initiated; • Complete notification of all concerned, • Determine and coordinate flow control measures; • Initiate delegation of ATS, where appropriate.

GENERIC REQUIREMENTS

SERVICE CONTINUITY

Phase 3: Initiation of the option

Content depends on the strategy considered

Phase 4: Optimisation

The aim is to optimise capacity gradually up to maximum potential (within the published or reduced ICAO route and sectorisation structures in line with previously agreed end-user and regulator expectations.

- Upgrade means of communication as much as is possible.
- Use 'normal' coordination procedures as much as possible.
- Consider any knock-on consequences or 'domino effects' on third-party ANSPs/states who will be affected by the increase in work-load for the aiding units.

RECOVERY

Phase 5: Longer-term Response and Recovery

The aim is to revert back to the original unit and working position in a safe and orderly manner:

- Initiate Transition Plan - taking into account technical and operational conditions.
- Inform all interested parties of intention to revert to 'Normal' operations.
- Assign staff between failed unit and contingency facility for 'shadow' or parallel operations during transition period.
- Co-ordinate the time at which normal operations can be resumed.
- Implement updates to flight plan and radar data processing systems.
- Authorise the resumption of 'Normal' operations.

MAINTENANCE OF PLANS

- Hold immediate 'hot' debrief
- Conduct 'lessons learned' exercise after actual or practice demonstrations of contingency plans.
- Revise contingency planning arrangements and promulgate changes as necessary
- Ensure contingency planning is part of organisation's "Change management" processes.

More guidance is provided in Appendix C of the Guidelines.

SUB-CHECKLIST OF PLANNING - OPERATIONAL - ALTERNATE AIRSPACE ISSUES

This checklist provides supplementary information on planning considerations affecting a range of alternate airspace type contingency strategies.

- ***Determining Contingency Strategies - Alternate Airspace Issues***
  - ***Closure of Airspace and Re-routing***
  - ***Simplified Route Structure/CFLAS***
  - ***ATS Delegation***
  - ***TIBA (Traffic Information Broadcast)***
  - ***High Seas***

A table to assist with the determination of alternate airspace contingency strategies is available in Appendix C of the Guidelines.

- ***Airspace Structure and (revised) Sectorisation***

  The same sector lay out is the preferred option, but most probably difficult to achieve for delegation of the provision of ATS
  - **Short-term closures:**
    - Ensure Safety - Emergency and Degraded modes
    - Dispersal of traffic
    - Grounding aircraft
    - Implement strict ATFCM measures
  - **Long-term closures:**
    - Crisis/conflict scenarios
    - By-pass airspace; consider Re-Routeing solutions
    - 'Aiding' units able to absorb additional traffic
    - Involve CFMU
    - Inform ICAO at planning stage and request approval before execution

- ***Simplified Route Structure - Conflict Free FL Allocation Scheme (CFLAS)***
  - Number of crossing points limited
    - Instigate CFLAS for vertical separation
    - Contingency Plan specify that aircraft are to maintain level flight in affected airspace
  - System would not be applicable for departures and arrivals in affected airspace

- ***Procedural (Corridors)***
  - Consider design procedural "corridors" to and from some airports, with the help of ANSPs of neighbouring states.
    - *The viability of these arrangements will depend on the proximity of the selected airport to a country's borders and the ability of neighbouring states to offer assistance.*

- ***Delegation of ATS***

  Check issues such as:
  - Planning phase must focus on establishing political, managerial and technical consensus to be embodied within an International agreement.
    - *As described above, may involve simplified route structure and cFLAS.*
  - Ensure rehearsal of contingency provisions in LoA to guarantee that they can be acted upon when the need arises.
  - Alert neighbouring units during the Immediate Actions phase.
  - Agree Immediate Actions between the two (or more) ANSPs:
    - *Should the skies of the failing unit be cleared or should some form of service provision be shared across the failing and the aiding unit - assuming that the aiding unit can re-route traffic into the failing unit's national air space?*
    - *No agreement to enable another ANSP to control the national airspace of another service provider.*
    - *Includes the hand-over of traffic from the failing unit - assuming that this is possible using secondary and back-up systems.*
  - Ensure all aircraft accounted for.
  - Confirm any routing and loading changes, e.g. a simplified route structure and reduced traffic levels. These may be characterised as:
    - *Vertical Takeover (ATS above/below specified FL/altitude)*
    - *Horizontal Takeover (ATS in UIR/FIR or other specified volume of airspace)*

      Workload may be redistributed in consultation with the CFMU and neighbouring states in order to optimise any residual capacity in the failing unit and, for example, to minimise disruption to overflights.
  - Revise LoAs and technical/managerial aspects of any high-level international agreement.

    Overall, whilst theoretically possible, ATS Delegation to neighbouring states is a difficult option and the complexity of issues to be resolved and the workload involved need to be clearly understood.

- ***High Seas***
  - Provision of ATS over the 'high seas' remains responsibility of State(s) normally responsible
  - Approval of contingency plan by ICAO mandatory
  - ICAO can consider temporary re-assignment of responsibility for ATS provision

- ***Traffic Information Broadcast by Aircraft (TIBA)***
  - Pilot transmissions of supplementary/advisory information on VHF frequency designated in contingency plan and promulgated
    - Frequency: one that is normally used in affected airspace
    - Procedure described in ICAO Annex 11 - ATS, Attachment C

- ***Letters of Agreement (LoA)***
  - Consider revision of existing LoAs or new LoAs specifically for contingency operations.
    For content consider guidance given in Standard contingency agreement between ANSPs

SUB-CHECKLIST OF PLANNING - OPERATIONAL - ALTERNATE LOCATION ISSUES

This checklist provides supplementary information on planning considerations affecting a range of alternate location contingency strategies.

STRATEGIES OF ANSP AS "FAILING UNIT"

- ***Determining Contingency Strategies - Locations of Alternate Contingency Premises***

- ***Consider potential contingency strategies***
  To identify candidate strategies, refer sub-Check list on Potential Contingency Strategies

- ***Considering aiding Unit within same State***
  - Other ACC
  - Other TMA/CAC
  - Other APP
  - TWR at national airport
  - Military units (ATS and/or Air Defence)
  - ATS Training/Development Unit/ Simulator
  - Common Contingency Centre (for hosting State)
  - Mobile TWR
  - Old TWR on same airfield

However, it should be noted that:
- *while for loss/disruptions initiated by ATS related causes, "co-location" or "proximity" may be an advantage in terms of operation and logistics;*
- *for events whose impact is geographically located (e.g. "fire", "flood" (terrorism), "pandemics") proximity with the "failing unit" may disqualify the "aiding unit".*

- Considering aiding Unit in adjacent state
  - Other ACC
  - APP/CAC
  - Common Contingency Centre (for other States)

A table to assist with the determination of alternate location contingency strategies is available in Appendix C of the Guidelines.

- ***Assessment of Available/Minimum Required Work Positions***
  - Consider the available "aiding units" within or outside the State
  - And assess the potential capacity they could bring during contingency.
    Assessment of remaining capacity is a function of the level of the technical degradation and is of paramount importance.

  - ***Check issues such as:***
    - the number of available work stations/positions at selected location
    - expanding possibilities (area of responsibility) of 'aiding' sectors
    - the degree of cooperation of aircraft operators in consolidating flights to maximise load factors
    - exploitation of available capacity in adjacent or other airspace *(important role to play by the CFMU - see Checklists for Achievement and Execution)*
    - adjusting military flying activities - see below
    - a possible relaxation of environmental constraints to ease the traffic flow

  - ***Determine required Control Positions:***
    - For an ACC (Number of sectors, Supervisor ...)
    - For APP (Arrival, Departure, Co-ordinator, Supervisor...)
    - For TWR (Local Control, Taxi and Parking...)
    - Identical workstation HMI (whenever possible)

IMPLICATIONS FOR AN ANSP AS AN "AIDING UNIT"

- Check implications of the support provided as an "aiding unit"
  - Operational
    - Spare capacity which can be made available;
  - Technical
    - Frequency availability
    - Surveillance coverage
    - Data processing systems;
    - Availability of spare Controller Working positions
  - Staff
    - Staff availability, competence and training
  - Logistics
    - Facilities management, Accommodation
  - Security (e.g. Access, vetting)

CHECKLIST OF POTENTIAL CONTINGENCY STRATEGIES - ALTERNATE LOCATION

Several potential alternate location type strategies have been identified that are candidate for considerations while defining contingency strategies.

CO-LOCATED FACILITIES

- Consider if obsolete systems can be used as a fallback facility.
  - *These applications can be retained on a 'care and maintenance' basis that enables ops teams to use them if the primary system fails; they provide considerable additional assurance during operations to 'clear the skies'.*
  - *However, some old systems may only be used for 'clear the skies' operations and may not be approved for use during higher traffic loadings.*
- Consider the need for additional training for staff who will be servicing and using the obsolete(fall back) systems
- Begin configuring the contingency facility if possible as part of the Immediate and Short-Term Actions
- Consider using contingent system to assist in 'clearing the skies'.
- Obtain management support and approval to use shared, Co-Located facilities for contingency operations as a Short to Medium-Term action
- Ensure systems teams validate both the technical infrastructure and also the data during the Relocation phase.
- Consider vulnerabilities for co-located systems.

More detailed guidance on Co-Located strategies is in the *Guidelines Appendix C*.

MULTI-USE FACILITIES (TRAINING DEVELOPMENT UNITS, TRAINING SCHOOLS, SIMULATORS)

Some ANSPs propose the development of national centres based on their training/simulation facilities which are in some cases a short distance away from any of the major national control centres.

- Expansion of existing facilities required?
  - Check impact if used for long-term contingency operations
    Limit negative impact on testing, training and development
  - Check difficulty in running rehearsals/ exercising contingency plans.
    When training and simulation systems are needed to run a test of contingency procedures then these resources will not be available for routine systems engineering and training.
- Consider any resources that are shared with other groups inside an ANSP.
  - Ensure that other users of the shared systems can free the resource when it is required and that the resource can be brought on-line for contingency purposes.
  - Ensure that use of, for instance, a Training Development Unit (TDU) does not prevent systems teams from diagnosing and fixing problems.
    Diagnose and fix may be required to recover to normal operations
- Consider configuration of contingency facility into operational system as part of the Immediate and Short-Term Actions. For example:
  - *Check certification of TDU for operational work;*
  - *Check 24h response time*
  - *Check Testing arrangements*
- Consider using contingent system to assist in 'clearing the skies'.
- Obtain management support and approval to use Multi-Use facilities for contingency operations as a Short to Medium-Term action.
- Consider facilities management and site access/security as the contingency facility becomes active.
- Ensure systems teams validate both the technical infrastructure and also the data during the Relocation phase.

More detailed guidance on Multi-Use strategies is in the *Guidelines Appendix C*.

CENTRALISED (NATIONAL) FACILITIES

The Centralised strategy relates to a single national centre as opposed to any international element which is covered in the Common Systems strategy. Many aspects of the Centralised strategy are similar to those described in the Co-Located and Multi-Use sections; however, they are not mutually exclusive. For instance, a national centralised contingency centre can be Co-Located with at least one ATM centre. However, this is not always the case, for example, one ANSP can also establish a centralised contingency facility within their training school and not close to any of the major operational centres.

- Identify an appropriate strategic location for the central contingency facility.
  This is not simply a technical decision; it will be determined by national infrastructures and geography.
  It is also political because employees in other sites may feel threatened by the centre's ability to replicate some portion of the outlying centre's 'normal' traffic flows.

- Assess economic viability of the stand-alone facility considered -
  Costs could be off-set if site also configured as a common Training and R&D facility that could be re-configured for contingency operations
- Social dialogue may be required to address this issue.
- Consider need for more localised supplementary support including mobile towers.
- Alert other users of the shared, centralised facility that a failing unit may call upon this scarce resource.
- Consider need for some initial reconfiguration in anticipation of a contingency being declared
  This may depend upon the level of staffing available at the national contingency centre.
- Consider a 'Hot Swap' from the failing unit to the contingency facility before the 'skies are cleared' if the contingency facility is well supported and configuration issues are relatively straightforward.
- Decide the best allocation of human resources between the failing and the centralised unit.
  - Confirm the concept of ATCOs of 'failing' unit(s) moving to Centralised (National) facility
  - Check social acceptability of staff to be housed away from their families for potentially long periods of time.
- Manage Staff rest, shifts and training to ensure that operations are optimised in the centralised contingency unit.
- Gather feedback:
  - Determine what impact the transition to a centralised national facility had upon the workload of the adjacent units as they adjust to hand-over from the failing centre.
    Possible shortcomings may raise the political issues that often complicate the establishment of single, centralised facilities.

More detailed guidance on ***Centralised (National) System strategies*** are in the *Guidelines Appendix C.*

SHARED COMMON SYSTEMS (INTERNATIONAL) - (CONTINGENCY CENTRES/OTHER CENTRES IN ADJACENT STATES)

This strategy is certainly one of the most promising scenarios for the mid-term in the context of FABs.

- Focus on establishing political, managerial and technical consensus to be embodied within an International agreement.
  - Obtain Stakeholder(s) (States and ANSPs) agreement that the considered centre will be the Shared Common Centre of the group of states.
- Assess economic viability of the Shared Common System considered -
- Agree on costs for provision of Cross-Border contingency
  - States will either have to pay for any additional equipment and facilities provided or bear similar costs to provide reciprocal contingency capabilities.
  - Costs could be off-set if site also configured as a common Training and R&D facility that could be re-configured for contingency operations
  - Option is potentially more cost-effective if State is the "host nation"
- Aim to have minimal differences in the systems (e.g. HMI) between potential Aiding Units/shared common site so that it is ready to pick up the flow of traffic within a minimum period after any disruption.
  - Ensure surveillance and communications infrastructure can be patched to a shared contingency control facility.
  - Ensure transfer of Flight planning data and other data.
  - Coordinate the work of internal support staff within ANSPs and also the different sub-contracting organisations used to maintain common systems between different ECAC states.
- Initiate negotiations with the adjacent administrations and document institutional instruments such as Letters of Agreement and Memorandums of Understanding etc.
  Detailed considerations regarding this issue can be found in Chapter 5 of the Guidelines.
- Produce a staff relocation strategy.
  - Confirm the concept of ATCOs of 'failing' unit(s) moving to CCC
  - Consider social issues due to potentially prolonged "relocation/detachment of staff".
- Obtain approval from regulator(s) or State authority for procedures and practices that affect the airspace of the failing unit.
  - Clarify licensing and training issues beforehand if controllers implementing those procedures are operating from within the borders of another member State.
- Inform other participating ANSPs/States once an Aiding unit or the shared common centre is activated.
- Consider the transfer of staff back to the failing unit when 'normal operations' are ready to be resumed.

- Gather feedback.
  - Determine what impact the transition to an (International) Shared Common Systems facility had upon the workload of the adjacent units as they adjusted to hand-over from the failing centre.
    Possible shortcomings may raise the political issues that often complicate the establishment of such a facility.

More detailed guidance on Shared Common Systems (International) strategies is in the *Guidelines Appendix C*

MILITARY FACILITIES (CO-LOCATED)

If co-located, likely to be affected by same contingency events as civil operations

- Consider transfer military operations to adjacent/other military units to enable essential civil operations to continue
- Confirm State Military Authorities agreement.
  Military authorities should be consulted during 'Setting Requirements'
- If Military facilities are in separate buildings, check resilience of building (to fire, flood etc), plant (electricity, water systems, generators) and system integrity is acceptable for civil operations.
  Military ATC needs to use common workstations which can support civil functions/operations.

MILITARY FACILITIES (ISOLATED)

- Confirm State Military Authorities agreement
  Military authorities should be consulted during 'Setting Requirements'
- Check arrangements do not impinge on National Defence/Security commitments/operations
- Check military infrastructure/functionality (surveillance, FDP etc) is suitable for civil operations
- Check military work positions/HMI - differences with civil ones
  Differences may entail expensive, ongoing training regime
- Check suitability of Military communications for civil operations:
- Limited VHF
- Limited ground/ground connectivity to adjacent civil units
- Check resilience of building (to fire, flood etc ..), plant (electricity, water systems, generators) and system integrity meet civil operations standards

TOWER WITHIN SAME STATE

- Consider available capabilities / options -
  Likely to be limited to:
  - *Old Tower (maintained to operational standard)*
  - *Mobile Tower (e.g. shared use with military)*
  - *Last resort option: standby facilities elsewhere on the airfield (terminal, ops building with suitable communications)*
- Ensure chosen option has line of sight for approach/departure and manoeuvring area
  Mandatory requirement
- Consider availability of other functions including:
  - Approach and landing aids
  - Airport lighting , surveillance and communication facilities
  - Access to AFTN etc

CHECKLIST OF PLANNING - ENGINEERING CONSIDERATIONS

This checklist provides a list of the engineering aspects to be considered when conceiving contingency strategies and subsequent detailed actions as outlined in the Engineering Considerations

More Guidance is provided in *Appendix G of the Guidelines.*

ENGINEERING APPROACHES

The Engineering approach to contingency is likely to have a strong influence on the selection of ANSPs' overall contingency strategy(ies).

IN-HOUSE ENGINEERING

- Specific solutions are tailored for local needs..
  This limits opportunities for 'commercial off the shelf' solutions.
- ANSPs retain considerable internal resources for the development and maintenance of their ATM systems infrastructures.
- Communications are supported between systems and operational staff because they are both employed by the same organisation.

CONTRACTORS AND SUB-CONTRACTORS.

Often met when complex CNS or ATM systems or sub-systems are in operation

- ANSP outsource development and maintenance expertise to external contractors.
- Contractors may be required to support contingency operations (emergency, degraded modes of operation and service continuity).
- Contractual agreements are necessary to explicitly state the extent of support that may be expected by an ANSP from a contractor under contingency.

Liaison with Contractors and sub-Contractors is necessary during the planning phase.

'COMMERCIAL OFF THE SHELF' (COTS)

Several elements of ATM systems and CNS infrastructure are COTS.

- Use of COTS limit direct access of ANSP engineering staff to equipment (hardware and/or software):
  There may only be limited opportunities for ANSP engineers to directly access the underlying code for both technical and commercial reasons, for example, real time operating systems.
- Problems can arise from complex interactions between COTS components and other bespoke elements of the ATM infrastructure.
  e.g. It can be difficult to diagnose intermittent failures that stem from COTS systems if ANSPs cannot look inside those components to identify the sub-systems that are failing.

TECHNICAL (INTERNATIONAL) LETTERS OF AGREEMENT.

Within the context of SES, several ANSPs have begun to develop agreements for the joint procurement of common infrastructures; these agreements provide a template for the exchange of technical support under contingency,

- International letters of agreement are extended beyond immediate operational requirements to provide wider systems support.
- Systems engineers from one ANSP may be sent to help those of a failing unit in another country.

CROSS BORDER INFRASTRUCTURE COOPERATION

- Geographic and technical constraints on smaller ECAC states can result in some ANSPs relying on their neighbours for systems engineering support
  for instance if a service provider has no available land mass on the periphery of an High Seas FIR they may request data from a neighbours radar site that does cover elements of their air space.

LIFECYCLE APPROACH TO SYSTEMS ENGINEERING IN CONTINGENCY

Systems engineering provision for contingency must change during the lifecycle of ATM applications.

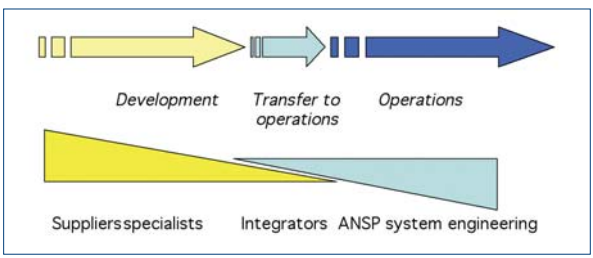


Figure 13: Involvement of Suppliers and ANSP Engineering staff vis a vis ATM Life Cycle

- Many major systems are initially commissioned from specialist suppliers.
- System suppliers and integrators act as external contractors
- As the system moves towards initial installation, the ANSP systems engineering teams should gradually be introduced to the underlying architectures and technologies.
- Over time internal systems engineering teams take over responsibility for maintaining infrastructure systems from the initial supplier.
- ANSP system engineering gradually also assumes greater control and independence in coordinating the technical response to any contingency.

  Or the original supplier may maintain responsibility for the system - if this occurs then the people who originally developed the application are usually replaced by a smaller number of support technicians who are often available 'on call' to an ANSP.
- Within smaller ANSPs there may not be the same 'defences in depth' as provided in larger states. Similarly, there may not be the same range of internal technical support to 'cope' when suppliers hand-over equipment if subsequent problems arise.

AS CHANGES ARE INTRODUCED TO THE INITIAL SYSTEM:

- External suppliers may lose the necessary contact with the system as it evolves.

  This may reduce their ability to be of immediate assistance during any subsequent contingency.
- Original supplier development teams may be replaced by technical staff who do not understand the detailed underlying engineering of an application that may be necessary in contingency.
- Contingency plans should consider both the internal and external staffing requirements for a range of core infrastructures as the identity and nature of these systems will change over time.
- The impact of changes in support to systems infrastructure on contingency planning should be considered within the wider forms of risk assessment that are conducted before new applications are handed over to an ANSP.

More details on the Engineering approaches is in the Guidelines Chapter 9 and Appendix G

CHECKLIST OF PLANNING - TECHNICAL CONSIDERATIONS

This checklist provides a list of the Technical aspects to be considered when conceiving contingency strategies and subsequent detailed actions as outlined in the Engineering and Technical Considerations.

More guidance is provided in *Appendix G of the Guidelines*

TECHNICAL ASPECTS

SURVEILLANCE

SURVEILLANCE INFRASTRUCTURE

- Check Surveillance Coverage Requirements for contingency operations
  - Evaluation of radar performance available at contingency location
- Check available radars - new radar connections/links required
  - Is dual/triple coverage required and/or provided?
- Adapt existing or set up new Surveillance Data sharing agreements
- Airport surveillance and detection radars
  - Assess impact of loss on low-visibility operations

COMMUNICATION

AIR/ GROUND COMMUNICATION

- Check availability of back-up Transmitter station and separated back-up Receiver station for all primary and secondary frequencies
- Check separation of point to point connections between the ATS unit and the Tx/Rx stations
- Check availability of frequencies at dispersed aiding unit
  - 8.33 Khz coverage
- Investigate possible interference of frequencies used at the 'failing' unit with the aiding unit
- Assess the possibility of 'remote control' of frequencies from the aiding unit

GROUND/GROUND COMMUNICATION

- Ensure sufficient availability of Telephone and Intercom communications
- (Strip) printers and respective connections.
- Voice and data communications with airports, adjacent Centres and flow management units
- AMHS.
- OLDI connections.
- Fax

DATA PROCESSING SYSTEMS

SURVEILLANCE DATA PROCESSING

- Sensor configuration and coverage - potential implications for separation minima or type of service provided
- SSR Code allocation - potential implications for allocation rules

FLIGHT DATA PROCESSING

- Controller Working Positions
- Sectorisation schemes - potential implications for standing procedures
- Flight data management and distribution rules
- Flight data update eligibility
- Interfaces with: IFPS, CFMU, adjacent ACCs, APPs, TWRs, military control units

ENVIRONMENT DATA PROCESSING

- Environment data management and distribution rules
- Environment data update eligibility

CHECKLIST OF ACHIEVEMENT / IMPLEMENTATION ACTIONS

This checklist provides a list of the headline actions to be completed by stakeholders to implement their contingency plans as outlined in Chapter 8 of the Guidelines.

STATES

- ***Rules and Regulations***
  - Check that the rules and regulations (such as operational procedures) to be applied by 'aiding' units are approved by the respective states and included in any relevant written agreements (between States, or between ANSPs as approved by States)

The other State actions in relation to Achievement are included in the Roles and Responsibilities and Legal aspects Checklists.

NSAs

The Achievement actions for NSAs are included in the in the Roles and Responsibilities and Legal aspects Checklists.

ANSPs

SAFETY ASSESSMENT

- Confirm that contingency plans (and the actions therein) are supported by validated Safety Arguments/Plans/Cases as necessary.

TESTING AND VALIDATION

Testing and validating contingency plans is essential. The purpose of testing is to ensure that each component of an ANSP's contingency plans is regularly reviewed, tested and updated on a scheduled basis.

The key element is the role of people and their resilience in skills, knowledge, management and decision-making.

- ***Develop Test Programme***
  - Confirm existence of a regular timetable of test activities to test all facets of contingency plans:
    - Technical - does the equipment work?
    - Procedures - are the procedures correct?
    - Logistical - do the procedures work together in a logical fashion?
    - Timeliness - can the procedures achieve the necessary recovery for each activity?
    - Administrative - are the procedures manageable?
    - Personnel - are the right people involved and do they have the required skills, authority and experience?

- ***Consider and decide test and validation options***
  - Technical Test
  - Desk-top exercise/walk through of plan content
  - Escalation and call-out communications tests
  - Individual Business/Service Unit tests and/or integrated 'whole' organisation tests
  - Use of Simulator/TDU
  - Live trial - unlikely in most instances
  - Consider involvement of suppliers

- ***Develop Initial Test Plan***
  - Agree scope, aims, objectives and success criteria of the test
    - All personnel to have taken part in realistic test event
    - All contingency worksites/command centres(crisis management centres) tested
    - All systems tested (see Technical Testing)
  - Check chosen Plan includes documentation of each step required for each aspect of the testing
  - Check that the Plan includes labelling of lines/equipment and production of block and schematic diagrams of the technical equipment requirements
  - Ensure test plan does not expose ANSP to additional risk

- ***Appoint Testing Team***
  - ATCOs
  - Technical Staff
  - Operations Staff
  - Safety Staff

- ***Technical Testing***
  - Modify and test data bases in an off-line computer
  - Confirm correct equipment configuration for radar displays, EDDs and strip printers
  - Test OLDI configuration, if appropriate
  - Test Frequencies - in particular coverage of 8.33 MHz
  - Test Telephones/intercoms
  - Test surveillance connections and bypass modes
  - Test FDP system functionality
  - Test AFTN/MET data reception and processing
  - Test integrated communications at all contingency operational positions

- ***Final Testing***
  - Liaise with operational ATC personnel for final Technical test
  - Test all systems/equipment/data links simultaneously

- ***Conduct Live Trial***

Not practicable during peak hours of operation and when contingency strategy for a large ACC is to disperse to several small facilities

  - Check that ATC has prepared a procedure plan for live testing including 'fallback' or 'back-out' procedures in event of failure
  - Check ATS sector positions equipped with appropriate maps and information for airspace to be tested
  - Brief ATC and Technical staff
  - Execute Plan

- ***Communications***
  - Review, verify and update Contact Details/Telephone lists of key personnel:
    - Operational Supervisors, managers.
    - Adjacent ANS units
    - Technical staff
    - Non-operational staff.
  - Test call-out/initiation cascade plan(s)

- ***Feedback***
  - Debrief all staff immediately after the test
  - Produce Post Test Report with corrective recommendations (as necessary)
  - Refine contingency plan as necessary

- ***Repeat Tests as necessary***

- ***Update databases/documentation***

HUMAN RESOURCES

- ***Personnel***
  - Designate and nominate Managers, Supervisors, ATCOs and technical staff to execute the plan

- ***Training***
  - Confirm ATCOs, Supervisors and Technical staff are trained to deal with "Emergency" and "De-Graded" modes of operation.
    This is requirement of ESARR 5
  - Consider the specific training needs to support Service Continuity contingency operations
    This is wholly dependent on the contingency strategies and measures adopted by the ANSP and can only be decided upon at a local level by an ANSP (supported by its NSA).

SUBSEQUENTLY

  - Confirm nominated ATCOs at both the 'failing' and 'aiding' units are properly trained to cope with planned/proposed contingency operations
    - Confirm nominated 'failing' unit ATCOs trained and/or familiar with 'aiding' unit equipment/HMI etc
    - Check that there are regular familiarisation visits to 'aiding' units, if appropriate
    - Consider simulation and real-time training (on new/altered procedures and processes if necessary)
  - Confirm that specifications for contingency operations are defined in Unit Training Plan(s) and part of OJT and Continuation Training
  - Confirm that technical staff are trained in contingency set-up procedures
  - Check special/additional training for Supervisors and Managers
  - Consider the training needs and involvement of external suppliers and sub-contractors
  - Check that contingency responsibilities of non-operational staff are understood and practised
    - Confirm Crisis Management Plans are available
    - Confirm detailed Administrative actions/plans are in place

- ***Licensing of ATCOs and Technicians***
  - Confirm that ATCOs are qualified to action contingency measures
    - Confirm that there are sufficient trained ATCOs with appropriate Ratings/Unit endorsements
    - Check that ATCOs satisfy medical requirements
    - Check that OJT /Refresher Training includes training provision for contingency operations
  - **External (cross-border issues)**
    - Confirm that ATCO licences are 'valid' in other state(s)
    - Confirm that the level of competency is compliant with new host nation requirements
    - Confirm the responsibility for oversight and supervision (host nation NSA or in combination with State of 'failing' unit) has been agreed
      See the Legal Checklist and Guidelines Chapter 5 for more details

- ***Operational Capability***
  - Check that the contingency plan ensures provision of uninterrupted service

- ***Relocation***
  - Check availability of a pre-agreed Staff re-location plan
    A response time of 24 hrs generally permits re-configuration of services and allows controllers to travel to the contingency location.
  - Check that transport plans are in place to transfer personnel to contingency locations
  - Check that accommodation plans are in place to house dispersed personnel at or near to the alternate locations
  - Check access arrangements in place at the new premises for relocated ATM Personnel

- ***Social/Welfare***
  - Check that CISM procedures are in place
  - Check that other social and welfare networks are in place to support ATCOs in dispersed locations

CFMU RELATED ACTIONS (BEFORE KNOWN CRISIS/EVENT)

- ***ANSP Actions Relating to CFMU***
  - Provide the CFMU with all essential data, including Airspace Data, and updated capacity figures for individual Traffic Volumes applicable
  - Provide the CFMU with updated lists of route availability applicable for contingency measures, including route structure and the flight levels for which the CFLAS eventually applies.
  - Co-ordinate the contingency airspace reconfiguration with the CFMU in order to enable correct flight plan distribution and relevant ATFM measures

- ***CFMU Actions Relating to ANSP***
  - Assess the potential impact of the crisis on the network
  - Ensure the proper coordination of any foreseen ATFCM measures.
  - Plan the alleviation of the impact on AOs through any possible ATFCM solution (e.g. re-routings, Calling for more capacity from other ANSP's, etc)
  - Provide awareness and communication to and with the involved as well as affected ATM partners (including AOs), through CFMU's already established communication channels.

SECURITY

- Confirm contingency plans are fully integrated and compatible with the requirements, as necessary, of Security Management Systems

- Check that vetting procedures are in place for ATM personnel nominated for external relocation during contingency operations

- Check collaborative support security measures are in place between civil and military authorities as necessary

- Confirm actions to deal with cross-border air security incidents, air defence and air policing activities are included, as necessary, in contingency plans

CHECK OVERALL PREPAREDNESS

- Confirm ANSP can implement a contingency plan in accordance with State requirements.

- Obtain State approval of Contingency Plan (including liaison with other states as necessary)

- Check that "aiding" ATM units are clearly defined in contingency plans

- Check that staff know their roles and responsibilities relating to Contingency Plans;
  This should be supported by an ongoing awareness campaign - see the Promotion Checklist and Guidelines Chapter 12

- Confirm that Contingency plans have been tested and validated to provide assurance that strategies and plans will work as anticipated when required

- Check that tests do not expose organisation to unacceptably increased levels of risk

CHECKLIST OF EXECUTION AND ASSURANCE ACTIONS

This checklist provides a list of the headline actions to be included in contingency plans to ensure that stakeholders can execute their contingency plans as outlined in Chapter 9 of the Guidelines.

STATES

The Execution and Assurance actions for States are included in the Roles and Responsibilities Checklist

ANSPs

EXECUTION

- ***Documentation***
  - Check availability of Contingency Plans and Crisis Management Plans for operational, technical and managerial staff as appropriate

- ***Initial Responses***
  - ATCO/Technician/Supervisor in charge assess situation then.
    - Either manage response through appropriate prepared plans
    - And/or escalate to crisis management team as per Contingency/Crisis Management Plan.
  - If a response is required then immediate things to consider include:
    - Are the others from whom a response is required present and able to undertake the roles assigned to them?
    - Informing operational counterparts - neighbouring units and potential 'aiding' units of the situation.
    - Communication of what has happened to senior management, as per Crisis Management Plan?

- ***Incident Management Methods and Techniques/Supervisors***
  There are many Incident management methods; a generic one is suggested here.
  - **Contain** - Is there anything that can be done immediately to stop the problem getting worse?

REMEMBER, ASSURING SAFETY IS THE FIRST PRIORITY!

  - **Look** at the Crisis/Contingency Plan - is there a pre-planned response that fits this incident?
  - **Follow** the documented procedure which may include detailed actions within the following steps:
    - **Communicate** - trying to solve the problem on your own may waste time if the situation then gets out of control
    - **Assemble** a team to respond to the incident, if necessary
    - **Assess the situation** - find out as much as you can without putting yourselves at risk.
    - **Predict** the likely outcome - and adapt the Contingency Plan to provide a response strategy
    - **Predict** a 'worst case' outcome - and have a 'back-up' response strategy
    - **Escalate** the response to the required level within the organisation
    - **Execute** the response strategy
    - **Evaluate** the progress of the response against the likely outcome
    - **Review** the effectiveness of the response as soon as the situation allows

CFMU RELATED ACTIONS (DURING A CRISIS/EVENT)

- ***ANSP Actions Relating to CFMU***
  - Provide the CFMU with updated capacity figures for individual Traffic Volumes applicable
  - Provide the CFMU with updated lists of route availability applicable for contingency measures, including route structure and the flight levels for which the CFLAS eventually applies
  - Co-ordinate the contingency airspace reconfiguration with the CFMU in order to enable correct flight plan distribution and relevant ATFCM measures

- ***CFMU Actions Relating to ANSP***
  - Provide awareness and communication to and with the involved as well as affected ATM partners (including AOs), through CFMU's already established communication channels
  - Ensure the proper coordination of any ATFCM measures
  - Reducing and Monitoring the demand in response to any capacity reduction in order contribute to safety (in the concerned area and in its neighbourhood);
  - Alleviating the impact on AOs through any possible ATFCM solution (e.g. re-routings, calling for more capacity from other ANSPs, etc)

- ***Notification of Contingency Operations***
  - Issue NOTAM (as necessary) to describe type of outage, expected duration and contingency methods of operation
  - Inform State/NSA as required by national regulation/legislation
  - Issue NOTAM to notify Users of resumption of 'normal operations' as soon as practicable after contingency operations are completed

- ***Phased Approach to Execution***

  A Contingency Plan may consist of the following phases. It should be noted that not all occasions will fit this model and in some situations it would be necessary to move from one phase to another non-convectively (e.g from Phase 3 to Phase 5) .

FAIL TO SAFE

Phase 1 - Immediate Actions

A dangerous situation has been identified. Focuses on the safe handling of aircraft in the airspace of the failing unit, using all technical means still operationally available.

- Secure actual traffic situation
- Consider possible options:
  - Delegation of ATS
  - cFLAS.
  - or Evacuation of the airspace -'clear the skies';
- Try to determine the magnitude of problem and the duration of the outage.
- Prepare fall-back instructions to ensure the safety of operations allowing a 'smooth' transition to phases 2-5.
- Appropriate authorities will identify the seriousness of the situation and initiate appropriate contingency measures.
- Initiate process of informing all interested parties - neighbours and CFMU

Consider control room evacuation, if necessary

Phase 2: Short/Medium Term Actions (<48 hours)

Focuses on stabilising the situation and, if necessary, preparing for longer term contingency arrangements:

- Contingency measures should be initiated;
- Complete notification of all concerned,
- Determine and coordinate flow control measures;

Initiate delegation of ATS, where appropriate.

SERVICE CONTINUITY

Phase 3: Initiation of the option

Content depends on the strategy considered

For instance, actions taken in the case of a "Relocation" strategy are:

Actions start when staff of the failing unit arrives at the aiding unit(s).:

- Detach staff to 'aiding' unit(s).
- Open contingency working positions at 'aiding' unit(s);
- Stabilise new situation;
- Staff of the failing unit should become familiar with the operational facilities of the aiding unit.
- Improve the flow capacity.
- Maintain the published or introduce a reduced ICAO route structure and sectorisation in the failing unit.
- Utilise all technical means to establish and maintain communication necessary to provide ATS in the 'failing' unit.

Phase 4: Optimisation

The aim is to optimise capacity gradually up to maximum potential (within the published or reduced ICAO route and sectorisation structures in line with previously agreed end-user and regulator expectations.

- Upgrade means of communication if necessary.
- Use 'normal' coordination procedures as much as possible.
- Consider any knock-on consequences or 'domino effects' on third-party ANSPs/states who will be affected by the increase in workload for the aiding units.

RECOVERY

Phase 5: Longer-term Response and Recovery

The aim is to revert back to the original unit and working position in a safe and orderly manner:

- Initiate Transition Plan - taking into account technical and operational conditions.
- Inform all interested parties of intention to revert to 'Normal' operations.
- Assign staff between failed unit and contingency facility for 'shadow' or parallel operations during transition period.
- Co-ordinate the time at which normal operations can be resumed.
- Implement updates to flight plan and radar data processing systems.
- Authorise the resumption of 'Normal' operations.

ASSURANCE

The organisation's response to contingency situations (real or tests) should be evaluated and any necessary changes made to procedures, personnel or contracts ASAP.

Assurance activities are aimed at gathering data with a view to assisting ANSPs with post-event analysis and identification of lessons learned (see checklist for Promotion).

- ***Recording***
  - Check availability of diaries/log books/checklists etc
    - To record all major events and decisions - e.g. initiation, escalation
  - Confirm ATC radar/voice recording equipment conforms with requirements
    - Statutory requirement to help with possible post incident investigation
    - Consider use of proprietary crisis management information systems
- ***Monitoring***
  - Management meetings
  - Supervision (of operational activities)
- ***Support CFMU to improve ATFCM measures***
  - Participate to ATFCM post ops analysis
  - Contribute to building set of ATFCM best practices in cooperation with CFMU.
- ***Post Test or Live Event Analysis***
  - Debrief senior executive and other associated personnel.
    See also testing part of the Achievement checklist
  - Conduct post test or post event analysis
    - Produce report with lessons identified and corrective recommendations
    - Produce Remedial Action Plan and implement recommendations
- ***Management Processes (Maintenance)***
  - Check that Contingency Plan maintenance programme is clearly defined and documented
    Programme should be owned by a responsible member of the senior management team
  - Check that formal change control is provided for all contingency planning components
    Change processes involving contingency planning should be considered during change
  - Ensure that Contingency planning is embedded in ANSPs' normal management and risk management processes
    Consider use of formal audits/reviews - internal or State/NSA

CHECKLIST OF PROMOTION ACTIONS

This checklist provides a list of the headline actions to be completed by stakeholders to promote and maintain their contingency plans as outlined in Chapter 10 of the Guidelines.

STATES

- Approve amendments of contingency plans as necessary
  following testing and/or live activation.

NSAs

- Provide continuous oversight of contingency plans following implementation of amendments

ANSPs

Contingency Planning Promotion ensures communication of the contingency culture, dissemination of lessons learnt and enables continuous improvement.

- ***Awareness Campaign***
  - Ensure all staff are aware of their Roles and Responsibilities in Contingency.
  - Conduct a coordinated campaign or programme can help to maintain awareness at the optimum level.
  - Levels of awareness amongst staff will vary but general requirements may include:
    - Raising the alarm
    - Call-out/cascade systems
    - Threat response to a range of specific scenarios - fire, flood, technical outage etc.
    - Evacuation drills and procedures.
    - Overview of the Contingency measures.
    - Inclusion of Contingency in staff induction/arrival training.
- ***Information Dissemination***
  - Ensure that Contingency plans are widely distributed - although disclosure should also be on a strict 'Need to Know' basis
    Security and/or business/commercial interests must be safeguarded in accordance with corporate and national requirements
  - Conduct specific "lessons learned" dissemination to operational, technical and managerial staff as part of post event analysis.
    Aim is foster continuous improvement and to embed contingency planning into organisation's culture
    Senior Managers should influence and lead

CHECKLIST OF ECONOMIC ANALYSIS OF CONTINGECY PLANNING (SERVICE CONTINUITY)

This section provides an overview of economic analysis in the context of Service Continuity contingency matters as outlined in Annex H of the Guidelines.

PURPOSE OF THE ECONOMIC ANALYSIS

- To demonstrate that contingency planning is cost beneficial.
  To that effect the economic analysis should demonstrate that a well organised response to total loss or major disruptions of air navigation service is more cost effective than the uncoordinated measures resulting from a "wait and see" attitude

- To assess, provided that this is achievable, which contingency plan or combination of contingency plans is the most cost beneficial response to total loss or major disruptions of air navigation service

- To assist decision makers through for example the determination of a realistic envelope of investment in setting priorities and allocating scarce budgetary resources

- Categories of stakeholders to be considered
  - Airspace Users
  - ANSPs
  - Airports and society
  - Passengers

IMPACT OF OUTAGES FROM THE AIRSPACE USERS' PERSPECTIVE

- Airspace Users would potentially be exposed to:
  - Delays on the ground
  - Re-routings of flights around the Area of Responsibility (AoR) of the failing unit
  - Diversions to airports outside the AoR of the failing unit
  - Fight cancellations

  Airspace Users having their main base of operations in the AoR of the failing unit could be exposed to severe financial troubles

IMPACT OF OUTAGES FROM THE ANSPS' PERSPECTIVE

- ANSPs are exposed to public criticism, damage to corporate reputation and customer base.

- ANSPs performing under the cost recovery mechanism have strong expectations that unit rates should reduce steadily.
  In case of a long-lasting outage of one of their units the chargeable service units would decrease and the ANSP's unit rate would be severally affected all the more when airspace users would fly around the airspace, making the situation even worse.

- ANSPs performing under a price cap regime linked to a performance targets have a vested economic interest in ensuring that consequences of outages are kept as low as possible.
  ANSPs where a long lasting outage would occur would be exposed to severe financial trouble.

IMPACT OF OUTAGES FROM THE AIRPORTS' AND LOCAL SOCIETY'S PERSPECTIVE

- Airports located within the AoR of a failing unit would be severely hit by long lasting outages of the TMA.
- The impact would include indirect societal losses (i.e linked to loss of jobs, impact on tourism and revenues from air freight) in the catchment area of the airport.

- Closure of an airport will have knock-on effects on other airports.
  Negative effects on the origin & destination airports as a direct proportion of the number of flight cancellations, positive on nearby airports as a direct proportion of the number of flights diverted to such airports.

IMPACT OF OUTAGES FROM THE PASSENGERS' PERSPECTIVE

- Passengers usually departing or landing at airports located under the AoR of a failing unit would be potentially exposed to:
  - Delays before departure
  - Obligation to use more time consuming or more expensive modes of transport, when available
  - Obligation to go to distant airports when no other mode of transport is available
  - Travel cancellations when no alternative is available

OPERATIONAL CONCEPT OF SERVICE CONTINUITY

As a founding stone of the economic analysis, Economic Guidelines recommend the production of an operational concept of service continuity, demonstrating how the strategy would address potential threats of outages.

- To that effect ANSPs should describe for each relevant unit:
  - The threats against which he seeks protection, including probability of occurrence
  - The technical solution (s) to address such threats
  - The practical consequences in case the threat would occur:
  - Which ATM services would be hit and how
  - How long it would take to restore capacity and the pattern of capacity recovery
  - How that would impact capacity in neighbouring ACCs
  - At what cost.

Predictability is of importance. Airspace users can much faster fine-tune their operations if the operational concept accurately details the progressive restoration of capacity over the coming weeks and months.

PERFORMANCE OF THE ECONOMIC ANALYSIS

- Economic Guidelines Recommend that:
  - Each ANSP performs its own specific economic analysis, separately or in co-operation with other ANSPs.
  - Each ANSP consider the traffic characteristics of those of the "20% users providing 80% of the local traffic".
  - Whilst ANSPs are best placed to assess the risk of occurrence of an ATM outage, they may wish to require the support of external risks experts to assess the probability of occurrence for each case of external event and each candidate ATM unit.
  - ANSPs should produce accurate figures for the total duration of the outage and pattern of capacity recovery
  - The reaction of the neighbouring ACCs in terms of capacity reduction and duration of such reduction should be discussed between neighbouring ANSPs within the context of the preparation of their contingency plans.

PERFORMANCE OF THE ECONOMIC ANALYSIS: TOOLS

- Economic Guidelines recommend the use of a model of similar to the EUROCONTROL SAAM (System for Assignment and Analysis at a Macroscopic level)capable of producing a reasonable estimate of the number of disruptions to be incurred under the "wait and see" scenario.

- Economic Guidelines recommend the use of an economic model capable of handling the probability of occurrence of events

PERFORMANCE OF THE ECONOMIC ANALYSIS: INDIVIDUAL VALUES

Results are very much dependant on some individual values

- Airspace Users' values:
  - ANSPs should take into account the values recognised by the main operators of their AoR for the performance of their economic analysis.

- ANSPs' values
  - ANSPs should take into account their own en-route and TMA costs for the performance of their economic analysis.

- Airports' values
  - ANSPs take into account the actual revenues of the airports located in their AoR for the performance of their own economic analysis.

- Passengers' value of time
  - ANSPs use agreed upon national data when available.

PERFORMANCE OF THE ECONOMIC ANALYSIS: DIALOGUE WITH STAKEHOLDERS

- Dialogue with the State authorities
  - The State authorities are the entities in a position to take into account categories of interests that are not directly represented: passengers; regional and national economies, environment and military.
    States could account for such interests

- Dialogue with the Airspace Users
  - All Airspace Users would not express the same priorities in case of a major outages
  - ANSP should seek guidance as to their preferred trade-off between delays, re-routings and cancellations and as to their cost items

- Dialogue with the Airports
  - Significant differences in perceptions between categories of airports (e.g. a hub airport and a traditional airport)
  - ANSPs and regulators should initiate a dialogue with the airports situated in the AoR of the unit for which service continuity is being discussed.

ECONOMIC ASSESSMENT NOT EXCLUSIVE

- No decision to invest depends solely on the results of an economic assessment of candidate strategies
- The final decision to invest in service continuity shall take into account other considerations
  Such as:
  - Political decision
  - Conclusions of the safety and security assessment of each mitigating strategy
  - Availability of resources: financial and human
  - Priorities in the allocation of financial and human resources
  - Opportunity to link decisions together (e.g. waiting for new technology or upgrading of facilities)
  - Binding nature of the legal framework (e.g. SES, ICAO)

Economic analysis is only a part of the decision making process in Service Continuity

Further detailed guidance is included in the *Guidelines Annex H*

A diagrammatic presentation of the foregoing is shown opposite.

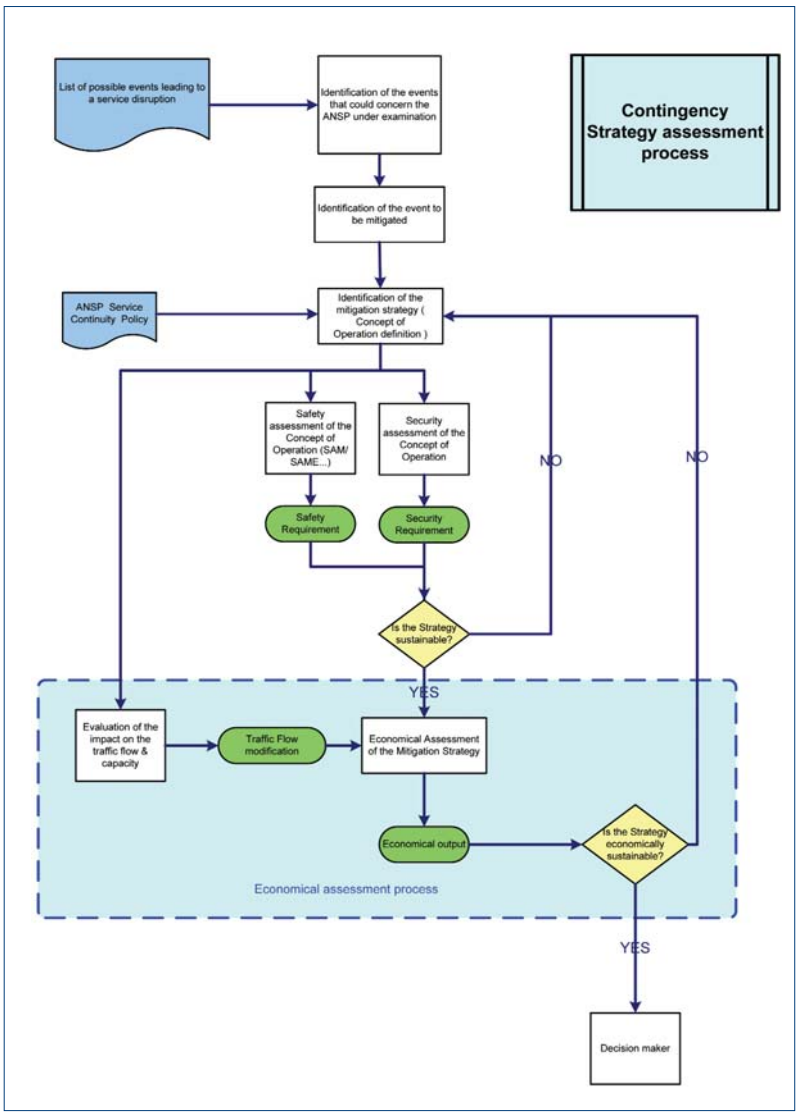


Figure 14: Economical Assessment of Contingency strategies within the overall process

OVERVIEW OF POTENTIAL METHODOLOGY FOR SAFETY ASSESSMENT (SERVICE CONTINUITY)

This section provides an overview of the headline actions to be completed by stakeholders to conduct safety assessments of Service Continuity contingency matters as outlined in Annex K of the Guidelines.

- **Construct a Safety Argument to support ANS Contingency Planning - Service Continuity based on the use of recognised practices**

  Such as:
  - SAM Air Navigation System Safety Assessment Methodology
  - SCDM Safety Case Development Manual
  - GSArg Generic Safety Argument for ATM Safety Assessment

- Figure 15 shows the level of safety and the service type in function of the time.

  The horizontal axis shows time, the durations of the different phases shown are not representative of the length of those phases. They could be very different from one event to another or from one environment to another.

2 vertical axes have been superimposed:

- ***Safety:*** The Safety Target line shows the minimum level of safety that shall be achieved, it is not a function of time nor a function of the service type provided.

  The "Achieved Safety Level" represents the level actually achieved by the service provided. It could fluctuate according to certain circumstances or events occurring in the context of the concerned ATM Unit. The "Achieved Safety Level" is considered as "acceptable" as long as it remains above the Safety Target line

- Service Type: Represents the evolution from one Mode of Operations (e.g.: "Normal Mode", "Service Continuity Mode"…) to another in function of the time. A Service type/mode of operations should have a defined set of minimum/maximum functionalities, availability of key equipments, key staff etc).

  Also service types/modes of operations are represented as flat lines: traffic level, staffing, number of sectors operating, availability of some functionalities etc might evolve within a given service type/mode of operations.

REPRESENTATION OF SERVICE TYPES

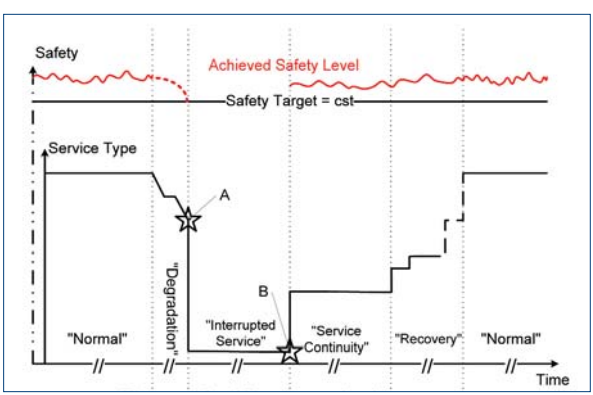


Figure 15: Level of Safety and the Service Type

Evolution from one mode of operations to another is presented as going from the "Normal Mode of Operations", until a set of failures or shortcomings appear in the system (failure of some equipment, staffing reduced under a given limit, …). Those disruptions could appear all at once or one after another (represented by the dotted stairs).

The key element at this point is for operations personnel (controllers, supervisors, technicians) to identify that during those disruptions, the "Achieved Level of Safety" is degrading. It is very important that a decision is made (before the "achieved level of safety" becoming unacceptable - i.e.: dipping under the safety target-) to change the type of service and to and to go into "Interrupted Service".

The diagram also shows:

- Achieved Safety Levels are not easy to measure, moreover during a phase as dynamic as the "Degradation Phase". The red-dotted line dipping represents the fact that ***a decision is needed to switch from the "Normal" to the "Interrupted Service" mode of***

Operations before the "Achieved Safety Level" becomes unacceptable.

- ***Star "A"*** represents the moment persons in charge of Operations take the decision to go to "Interrupted Service", considering that it is not "safe enough" to keep on working in the current mode of operations.
- ***Star "B"*** represents the moment the management/political decision is made to go to "Service Continuity". The service continuity mode of operation is fully described by a dedicated operational concept *(see Checklist Operational Concept and Chapter 7 of the Guidelines)*

In some peculiar circumstances, minimum conditions to go to "Service Continuity" mode of operations might not be met thus requiring the failing Unit to switch to another mode of operations (e.g. into an Emergency mode of operations).

The "Recovery" phase could be undertaken in one "go" or through a staged approach. It represent the phase where key faulty elements of the system (e.g. equipment, people or procedures) are put back in place (transfer into operation) in order to facilitate the reversion to the "Normal" mode of operations. It is represented as a stepped phase as this is the most generic approach to it.

-GENERIC SAFETY ARGUMENT OF SERVICE CONTINUITY

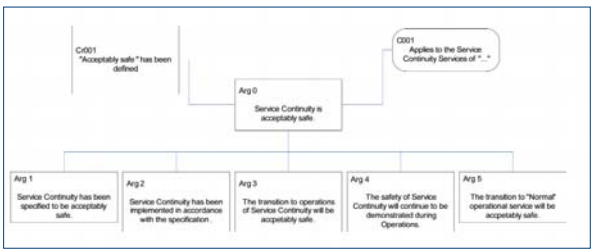


Figure 16: Generic Safety argument for Service Continuity

The generic Safety Argument for Service Continuity is based on Goal Structured Notation (GSN, {SCDM}); where:

- ***Cr001*** represents the Safety Criteria defining what is "acceptably safe" (this could be an absolute, relative or reductive criteria)
- ***C001*** represents the Context in which the Concept of Service Continuity is considered; i.e.: the operational concept considered in its environment of use (an OPS concept that is considered for one ATS Unit might not be applicable for another one; e.g.: Paris CDG airport vs. a regional airport).
- ***Arg1*** supports the claim that Service Continuity has been specified to be "acceptably safe"
- ***Arg2*** supports the claim that Service Continuity has been implemented to be "acceptably safe"
- ***Arg3*** supports the claim that the transfer into Operations of Service Continuity concept is "acceptably safe". It covers the Safety assessment of the early beginning of the "Service Continuity Phase" shown in the Service Types diagram.
- ***Arg4*** supports the claim that Service Continuity is "acceptably safe" during Operations. It covers the Safety assessment of the operations in "Service Continuity Phase" shown in the Service Types diagram.
- ***Arg 5*** supports the claim that transfer back from Service Continuity to "Normal mode of Operations" is "acceptably safe". It covers the Safety assessment of the "Recovery Phase" shown in the Service Types diagram.

CONCLUSIONS

1. ***The Safety Assessment of "Service Continuity" should be the same type of Safety Assessment as the one performed for the "Normal Operations"*** (based on a dedicated Concept of Operations).
   Like-wise, the Safety Assessment of the "Recovery" phase is a Safety Assessment of a transfer into operation phase.

2. Building a ***Safety Argument for "Service Continuity" is very similar*** to the one needed for ***"Normal Ops"*** (if not yet included in the Normal Ops operational concept).
   It relies heavily on the ***need for a dedicated Operational Concept*** *that describes the different failing scenarios, and if not the scenarios themselves, at least the key parameters (what is the minimum set of the staff, equipment and procedures required to go to "Service Continuity") that, when degraded, will lead to the need for "Service Continuity".*

3. ***ANSPs should monitor*** (as part of their SMS/SMM) ***key indicators*** including the ones that will allow ***relevant people*** in the organisation t***o make the decision that safety is severely impaired*** and that ***it is time to switch to another mode of operations***, e.g."Service Continuity".

TERMINOLOGY

The following major terms are used throughout this document.

TERM	DEFINITION
	CONTINGENCY - GENERAL
Contingency Plan	The detailed exposition of all the actions, including their associated timing and responsibilities, to be performed following the declaration of ***any of the contingency modes*** shown in the Contingency Life-Cycle.
Contingency Life-Cycle	All potential contingency modes ranging from 'Normal' Operations, 'Emergency' Situations; 'Degraded' Modes of Operation; 'Service Continuity'; 'Recovery to Normal Operations' and back to 'Normal Operations'.
'Normal' Operations	Routine service provision within a non-significant variation in Quality of Service.
Implementation	The various steps involved in producing a viable contingency plan(s) based on selected strategies and verifying that the detailed preparations are in place that will enable the plan(s) to be executed.
Execution	The physical enactment of the actions and measures detailed in a contingency plan(s) in response to an event that triggers any contingency mode of operation.
Requirements	The detailed demands (safety, security, capacity, efficiency and environment) placed on an ANSP by the State Authorities and agreed with Users relating to the expected ANS provision in contingency situations.
	CONTINGENCY MODES (FROM THE CONTINGENCY LIFE-CYCLE)
'Emergency' Mode	'Emergency' modes are those situations following unforeseen or sudden catastrophic events that may lead to potential unsafe situations and/or partial or full interruption of the ANS provision, therefore prompting an immediate response to contain the adverse impact and where feasible initiate recovery actions.
Fallback Modes of Operation	Fallback mode is the use of systems or services that provide redundancy/back-up to those available in support of normal operations, to cope with foreseen or unforeseen unavailability or degradation of the main service provision.
Degraded Modes of Operation	A reduced level of service invoked by equipment outage or malfunction, staff shortage or procedures becoming inadequate as a knock-on effect of one or several deficient system elements.
Service Continuity	Service Continuity (SC) is the availability of suitable arrangements allowing alternate ANS services of an agreed quality of service to be readily activated when a long-term disruption of normal service provision is anticipated. SC is also characterized by containing the impact and duration of disruption of ANS-critical services and the ability to restore a defined service level (capacity) with due priority.
Recovery	Transition back to Normal operations from any of the contingency modes of operation.

TERM	DEFINITION
	OUTAGES
Outage/Failure	A state of inability to continue to provide the normal air navigation service at an agreed quality of service.
Disruption of Service	The inability to continue to provide normal air navigation service provision, caused by staff shortage, unlawful interference, equipment failure, natural disasters or any other unforeseen hazards, resulting in a significant loss in air navigation service provision capabilities.
	SEVERITY OF OUTAGES
Outage	An exceptional circumstance, foreseen (e.g. pandemics, industrial action) or unforeseen (e.g. security breach), affecting one or more elements of the System (people, procedures & equipment) that, in the absence of adequate fallback arrangements, may lead to service disruption.
Partial Outage	Partial outages are situations where: ● a defined portion of the total traffic is serviced by a failing unit and the rest by one or more aiding unit(s); ● a defined number of sectors/groups are still able to continue with the service provision, whilst the remaining sectors/groups are supported by one or more aiding units; ● a defined set of ATS is still provided by the failing unit while the remaining set is provided by one or more aiding unit(s); ● any combination of the preceding cases.
Total Outage	The providing unit is declared out of service due to a complete inability to provide air navigation services.
	PREDICTABILITY OF OUTAGES
Unforeseen Outage	"Unforeseen" outage is a failure that may lead to potential unsafe situations and/or disruption of the ANS provision and either is: ● Unforeseen; ● Or predicted but at too short notice to permit the deployment of a suitable contingency mode.
Foreseen Outage	"Foreseen" outage is a failure that may lead to inability to continue with the ANS provision but is foreseen with sufficient notice to permit the deployment of a suitable contingency mode.
	DURATION OF OUTAGES
Short-Term Outages	Outages or disruption of services lasting not more than 48 hrs.
Long-Term Outages	Outages or disruption of services lasting more than 48 hrs.
Maximum Agreed Period of Disruption(MAPD)	It is the maximum period of time an ANSP can tolerate a loss or disruption of any Air Navigation service/function provided.
	AIDING / FAILING UNIT
Aiding Unit	An ATM unit able to provide support to a failing unit.
Failing Unit	ATM unit unable to provide its services due to catastrophic outage or disruption.

ACRONYMS

The following acronyms are used throughout this document.

ACRONYM	DEFINITION
ACC	Area Control Centre
AD	Air Defence
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AOP	Airport Operator
AoR	Area of Responsibility
ASM	Airspace Management
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management
ATS	Air Traffic Service
ATSP	Air Traffic Service Provider
CBA	Cross Border Area
cFLAS	Contingency FL Allocation Scheme
CFMU	Central Flow Management Unit
CM	Crisis Management
CND	Cooperative Network Design
CNS	Communication, Navigation and Surveillance
CR	Common Requirements
CTF	Contingency Task Force
EAB	EAD and Aeronautical Information Bureau (EAB)
EAD	European Aeronautical Information Database
EC	European Community
ECAC	European Civil Aviation Conference
ECIP	European Convergence and Implementation Programme
ESP	European Safety Programme for ATM
ESARR	EUROCONTROL Safety Regulatory Requirement
ESSIP	European Single Sky Implementation (replaces ECIP)
EU	European Union
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAB	Functional Airspace Block
FDM	Flight Data Management
FDP	Flight Data Processing
FIR	Flight Information Region
FL	Flight Level
FPL	Flight Plan
FUA	Flexible Use of Airspace
GAT	General Air Traffic
HMI	Human Machine Interface

ACRONYM	DEFINITION
HR	Human Resources
IA	Impact assessment
ICAO	International Civil Aviation Organisation
LoA	Letter of Agreement
MET	Meteorological
MoT	Ministry of Transport
MoU	Memorandum of Understanding
MAPD	Maximum Agreed Period of Disruption
NOTAM	Notice to Airmen
NSA	National Supervisory Authority
OAT	Operational Air Traffic
OLDI	On Line Data Interchange
RA	Risk Assessment
RE	Realistic Event
SAM	Safety Assessment Methodology
SAAM	System for Assignment and Analysis at a Macroscopic level
SES	Single European Sky
SecMS	Security Management System
SMS	Safety Management System
TDU	Training Development Unit
TIBA	Traffic Information Broadcasts by Aircraft
TLS	Target Level of Safety
TMA	Terminal Manoeuvring Area
TWR	Tower (ATC)
VCS	Voice Communication System

WEBSITE*info*

www.eurocontrol.int/ses/public/standard_page/sk_sesis_guidelines.html

To provide feedback on the use of this material, to get more information on the subject, or to be informed of the next editions of the Guidelines, please contact Mr Gerald Amar, Project manager at: *contingency.planning@eurocontrol.int*

This document can also be read in conjunction with the "EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services (Including Service Continuity)" that may also be obtained from the EUROCONTROL Internet or E-mail addresses listed above.

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