MISO: METHOD FOR INTERVENTION ON SYSTEMS LINKED TO ATM OPERATIONS

INTRODUCTION DOCUMENT

1 CONTENT

2 INTRODUCTION

2.1 Purpose of this methodology

This methodology concerns interventions (see §1.4) scheduled for operational systems or in connection with operational systems which the technical services at the Air Traffic Control centres (APP, ACC, ….) are called on to perform.

It was formulated by:

- a first ad hoc working group, made up of representatives from the French ANSP, following serious incidents during such interventions, which were still all too frequent.,
- followed by a second working group tasked with analysing the feedback from one year's experience and proposing a more mature method. Its main objective was to simplify the method produced by the first working group.
- This was then supplemented by the work of a MISO-EPIS (EPIS: Preliminary Assessment of Safety Impact) working group tasked with more detailed analysis of the operational consequences of interventions for the Support Services.

It was coordinated by French ANSP, which will ensure that the products of the various working groups dealing with ESARRs (EUROCONTROL Safety Regulatory Requirements) are consistent.

The objective is to improve quality assurance in such work by:

- improving the assessment and management of technical and operational risks
- better preparing and coordinating the works in their complexity
- thus avoiding the classic problems, errors and lacks, in particular as regards coordination, the provision of information, "clean" completion, etc.
- promoting the use and development of feedback. (feedback tool)
- better reflecting the actual work of the services in order to perform interventions in good safety conditions.

2.2 General principles

- **The methodology is based on structured deliberations and risk analysis.** In order to determine the best intervention scenario and the appropriate methods, this type of approach is based on the principle that there is a link between cause and effect, which means that the more critical the effect, the greater the attention which needs to be paid to the cause in the control processes where it occurs and is addressed.
- **It aims to establish formal and systematic good practices in this area,** There is nothing revolutionary about this methodology, since clearly many of our staff already apply this process of deliberation, but there is no guarantee that it is applied systematically and comprehensively by everyone, and also the fact that this process of deliberation and analysis has not been formalised means that the same reference system is not shared by the various actors in a given operation. This is often the cause of problems - formalising this methodology will also allow experience to be put to good use and shared and will ensure that the commonly evaluated method is long-lasting.
- **It aims to simplify the coordination tasks and avoid omissions** by proposing check lists wherever possible (types, materials, bodies, technical risk score, risk-reduction measures, etc.) and the possible generic nature of routine and repetitive interventions.

2.3 The method tools

The measure is based on a relevant tool box, which should be added to. This unquestionably adds value to the work carried out by the groups. Three types of tool have been devised:

2.3.1 Support tools

They support the deliberation and analysis process:
Guide to analysis (impact, risks, etc.) and **use**
Reliability diagram for the services provided to the controllers
Risk Classification Scheme and list of hazards, etc.

2.3.2 Generic models

They are for producing the documentation needed to prepare and plan the intervention:

- Risk assessment *sheet*:
- **Normal** (or routine) procedure
- Supplements for **Assurance** procedure
- List and sequencing of **operations and tasks**
- Notice of work (or its minimum content)

2.3.3 Permanent enhancement tools

Certain tools will have to be adapted to reflect how they are actually used. This work to improve existing tools and devise new tools must be a continuous process, under the leadership of the French ANSP, which will ensure that they are consistent.

- **National** and local basis of the most common MISO sheets (intranet),
- **Feedback** (feedback and sheet closure)
- Table showing correspondence of Support Services and systems/equipment and their criticality

2.4 Scope

In the framework of SAM, MISO Guidance Material scope concerns the entire life cycle of a Planned Maintenance Intervention from preparation to completion and the feedback it may provide.

The targeted interventions are those scheduled for operational systems or in connection with other systems which are themselves operational.

The types of intervention identified are as follows:

- **F: Preventive maintenance**

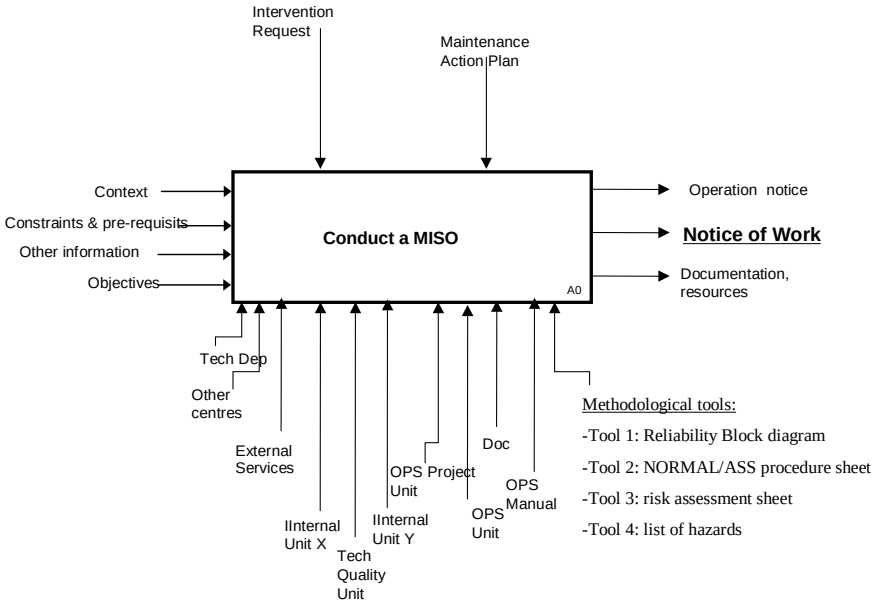
In France, MISO is also applied for the following interventions in addition to an a priori safety assessment of the change itself, when necessary:

- A: Change of component (hardware and/or software)
- B: Modification of operational context
- C: Modification of parameters
- D: Intervention linked to the system
- E: Geographical reorganisation of equipment

In the French ANSP, replacement of HW components leading to MISO only (and no safety assessment) is restricted to change of exactly like-to-like spare parts. Change of unlike HW components leads to a safety assessment and later, in order to prepare the physical replacement of the HW component, a MISO for such replacement is conducted.

2.5 The intervention preparation process

The diagrams below show both the scope of the methodology and the elements of the methodology (bold and underlined in the diagram below) presented in the remainder of the document.



2.5.1 Interventions at a single site

If a requirement or internal need is expressed by the Intervention Request, a sheet drafted originally by Technical Service staff, who becomes the coordinator for project preparations, is completed by Operational Service staff, specifically making an analysis of the operational risks and risk-reduction measures.

It is then validated by each of the services in so far as they are concerned on the basis of the centre's implementation of the French ANSP SMS (Safety Management System)

2.5.2 Multi-site coordinated interventions

For this type of intervention, concerning a number of sites, each centre will be responsible for its own MISO in respect of a specific change. However, a minor risk for one site might be a serious one for another site, so the intervention has to be coordinated.

As an example, in the French ANSP this is done at the two following levels:

- at a functional level – this will be the role of the "**Director**", who will compile the operational risk analyses, finalise an overall MISO with the Conductor and the centres, have it validated by French ANSP Operational Service (headquarters, not local to a Centre) and issue it.

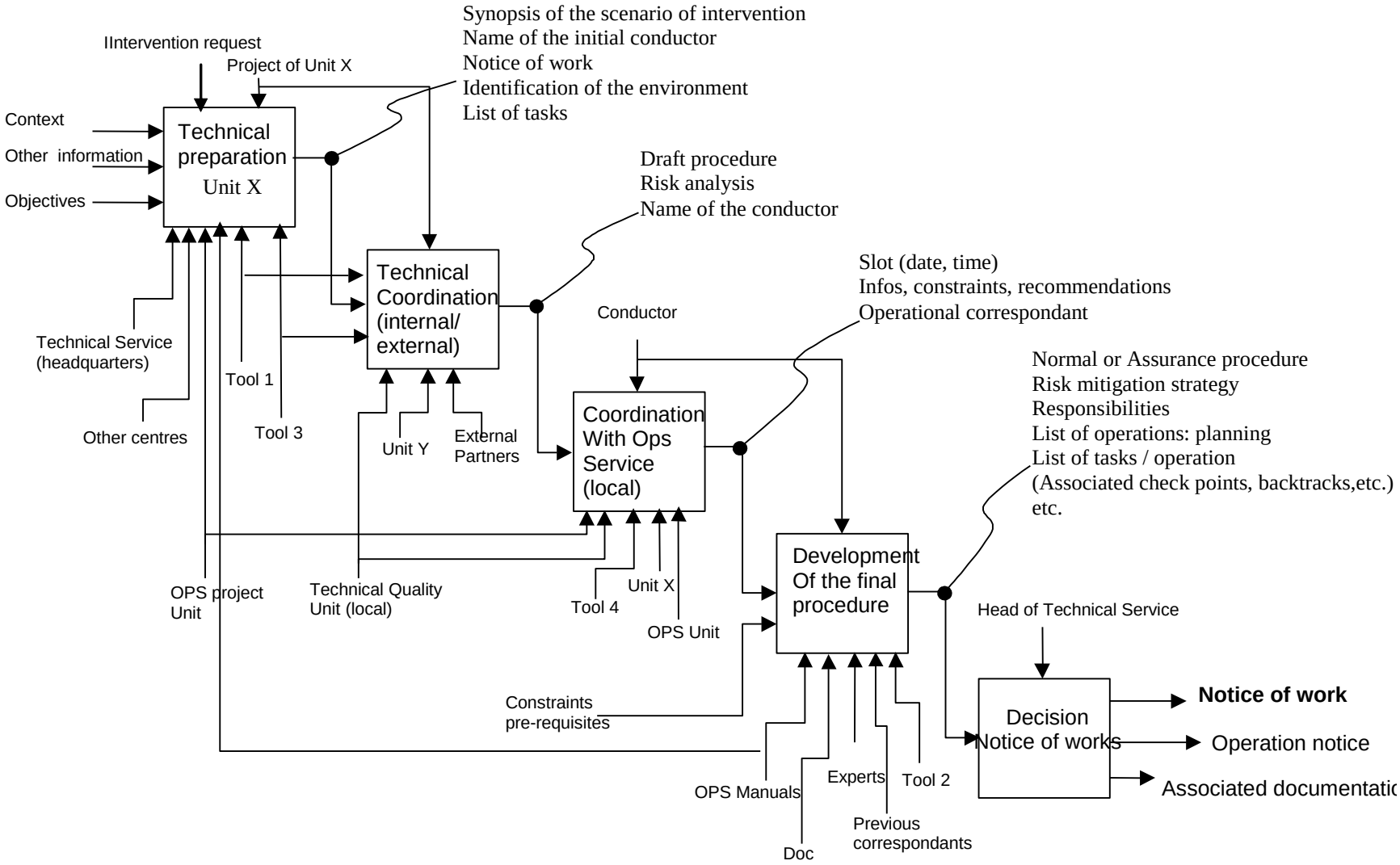
- The technical side of the intervention will be the responsibility of the "**Conductor**". This will almost always be the French ANSP Technical Service (headquarters, not local to a Centre), which will orchestrate proceedings, in particular in the case of backtracks (reversion to previous state). The same principle will apply for purely technical operations (Flight Plan format changes, etc.). It might sometimes happen that a centre will be chosen as the "Conductor" when the French ANSP Technical Service is not involved (multi-ACC).

In the French ANSP, occasionally, depending on the level of importance of the intervention, MISO procedure will no longer be enough as a project management tool. However, those rare cases are out of scope of the restricted applicability of MISO in the framework of SAM.

2.5.3 Concurrent multiple interventions at a number of sites

As some MISO might be uncoordinated due to local ignorance of other on-going MISO at other centres, such interventions are liable to have undesirable effects as they might affect the same distant system. In order to minimise such occurrences, all staff aware of such a situation are asked to advise the French ANSP Operational Service (headquarter), which will decide on priorities. One way to ease such coordination can be to request publication of all MISO on intranet.

**THE PROCESS OF PREPARATION OF
AN INTERVENTION LINKED TO AN OPERATIONAL SYSTEM**



3 DESCRIPTION OF THE STAGES

We have set out the broad outline of the various stages to the method below:

The guide and main support for this method is the ***risk assessment sheet***

1. This risk assessment sheet is in fact used throughout the preparation process for the intervention procedure. It is filled in progressively and reviewed where necessary.
2. This sheet should help, depending on the complexity of the operation, to determine the type of procedure to be applied for the intervention: NORMAL or ASSURANCE (see below), and to propose a context for the intervention for the Operational Service (local).
3. This sheet is for the Operational Service (local) to evaluate the criticality of the intervention as proposed by the Support Services in terms of its operational/functional impact (it will do so on the basis of the risk 'determinant' classification and the list of support services).
4. The sheet will clearly show the routine or exceptional risk-reduction measures required in the light of the previous analyses. This should make it possible to evaluate/estimate a residual risk level.
5. Lastly, **and above all**, this sheet should enable the various persons involved to share information on the risks and for this reason it is important, in addition to assessing the various types of risk from 0 to 3, to include any pertinent information under the "Observations" section. **This information will be useful in constructing and verifying a scenario which avoids or minimises the risks. It will also be useful when, after the intervention, the sheet is re-examined as feedback.**
6. This sheet should, upon completion, be attached to the finalised works procedure. It is included in the introduction to the Normal procedure (itself an outline of the more comprehensive Assurance procedure).

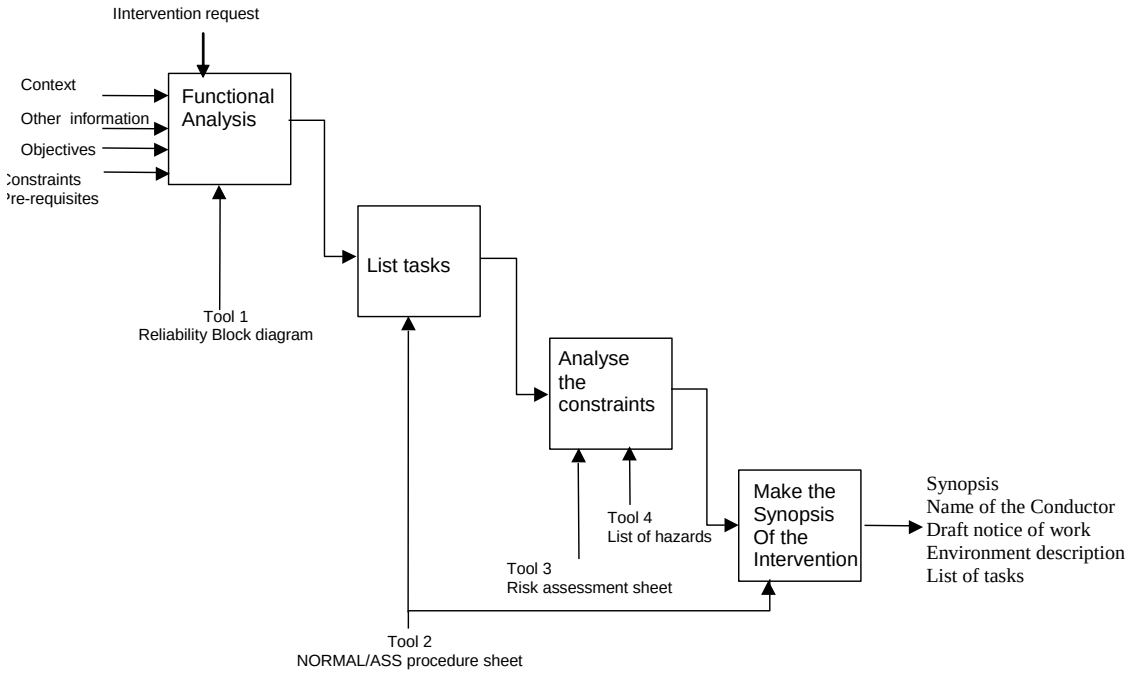
3.1 Technical preparation

3.1.1 The objectives of this stage

This stage must allow the Technical Service to analyse and then present, from its point of view, the broad outline of the proposed intervention.
The first two pages of the ***risk assessment sheet*** are devoted to a summary of this process and might therefore be used as a notice of work for contacts outside the local Technical Service (local Operational service and/or other technical services, external parties, etc.) impacted by the intervention.

This stage may be broken down into four sub-activities as follows:

THE PROCESS OF TECHNICAL PREPARATION BY UNIT X



3.1.2 Responsible for this stage

This stage in the procedure is carried out within the framework of the unit responsible for the system concerned by **a staff responsible for defining the**

planned intervention. **A staff responsible for the intervention** will be appointed at the end of this stage.

3.1.3 Phasing of the stage

3.1.3.1 Description of the intervention

This consists in:

- defining the intervention and its foreseeable consequences synthetically
- listing the equipment and/or functions impacted
- listing the various services or bodies concerned

The latter will list the bodies to which the notices of works have to be sent.

3.1.3.2 Technical risk analysis

This consists in:

- examining, solely from the technical point of view, the complexity and difficulties involved in the operation without prejudicial consequences
- determining which type of procedure will be required (NORMAL or ASSURANCE)
- setting out the expected temporary consequences of the intervention
- listing the hazards if the operation does not proceed as planned
- stating the mitigation means and risk-reduction measures proposed by the Technical Service to guarantee that the risks identified can be controlled.

3.1.4 Stage results

The result of this internal discussion stage within the Technical Service is:

- designation of the ***technical manager*** for the intervention within the unit
- ***identification of the environment*** (services, centres, partners, etc.) concerned by the operation
- a ***summary list of operations*** (and where applicable a list of associated tasks) which will be necessary and an initial sequencing proposal (chronology, final status, conditions for moving from one operation to the next, etc.)
- an initial idea of the ***associated constraints and consequences*** generated and the interfaces to be taken into consideration.
- the issue, where necessary, of a ***notice of work.*** This is particularly required whenever (technical and/or operational) partners outside the unit are impacted by the intervention, and need time to prepare.

Once this stage has been completed, the Technical Service has enough objectivity and a basic document enabling it to present an accurate picture of the proposed intervention [provisional (macroscopic) scenario, impact and constraints, interfaces concerned] to its partners, namely the Operational Service and/or the other technical services.

3.1.5 Tools which may be used in the course of the stage

- For the functional analysis

This involves clearly defining the equipment concerned by the intervention, where it is located and the functions affected known as Support Services, assessing potential risks, precisely identifying the functional redundancies which will still be

available, the known mitigation means (operational bypasses, feedback, etc.). In short, the scope, context and foreseeable consequences of the intervention.

Use may be made of:

- The first page of the ***risk assessment sheet*** which, through the exhaustive inventory of the systems on the site and the inventory of the potential correspondents and support services, should avoid any omissions
- The **reliability/safety/service diagrams** (new type of tool proposed in this methodology and referred to as *tool* 1 in the preceding diagrams). These diagrams should allow an objective examination of the expected degradation of the services (in the functional sense) available to control during the intervention. A further advantage of this tool is that it is not very technical and can therefore be used as a discussion paper in dealings with the control services. These diagrams rest on a common baseline, and shall be adapted to the local specificities.

- A summary list of the operations is produced on the basis of:

The first page of the procedure (part common to the NORMAL and ASSURANCE procedures). Subsequently in the process, it will be necessary to flesh out this list and incorporate an operating mode for those operations which appear sensitive.

- The following will be used to list and analyse the technical constraints, the expected consequences and potential consequences:
  - The second page of the risk assessment sheet devoted to an analysis of the technical risks, consequences and technical risk-reduction measures. It is on the basis of this evaluation of the technical risks that a decision will be made regarding the type of procedure (NORMAL or ASSURANCE) to be implemented.
  - The Guide to the impact and risk analysis. This identifies the various points to be considered when building a relevant scenario, taking account of the impact of the intervention and the precautions to be taken. It proposes a method for quantifying the impact and risks (all these elements then being summarised in the risk assessment sheet referred to above).
  - The list(s) of hazards regarding the “support service(s)” concerned.

- Notices of works are launched on the basis of:

the first page (with a second page if necessary) of the ***risk assessment sheet***.

3.2 External/internal technical coordination

3.2.1 The objectives of this stage

The previous stage makes it possible to determine whether the planned intervention has an impact on the "environment"

- consequences as regards the related systems
- interventions required of internal and/or external partners, etc.

If this is the case, the partners will have to be informed and, if necessary, to consolidate the foreseen scenario for the intervention that will have to be validated with them.

Furthermore, if the technical risk analysis rates the risk of *interaction with other systems* at >1, a technical coordination process has to be initiated from the preparation phase. This coordination will take place, depending on the circumstances, either through meetings and/or teleconferences, videoconferences or simply by telephone. The coordinators will generally be internal and external staff from the units concerned, and possibly external partners. It will be worthwhile involving the Technical Quality Unit (local) of every centre involved.

3.2.2 Person responsible for this stage

This stage in the procedure is initiated by the unit responsible for the system to which the intervention relates and it is thus **the responsible for defining the intervention** within this unit who will lead the coordination of the intervention definition. At the end of this stage, the **intervention responsible** will also be appointed in each of the units concerned.

3.2.3 Phasing of the stage

It is identical to that of the preceding stage and essentially involves reviewing the ***risk assessment sheet*** with the new services involved in order to ensure that no risks have been ignored.
If appropriate, additional operations and their operational sheets may be added at this stage.

3.2.4 Stage results

- *Designation of the **project manager**:* where in the previous stage a technical manager was designated within each unit for the system concerned by the intervention, it is important to designate an overall project manager. For a unique operation, this will in all likelihood be the technical manager, but for a complex intervention affecting a number of systems and sections, a choice will have to be made.
- Finalisation of the technical risk analysis
- Consolidation of a draft procedure.

The technical risk analysis facilitates a decision on the type of procedure to be defined (Normal, Assurance). The associated procedural model should be used for this initial draft (see below).

3.2.5 Tools which may be used in the course of the stage

These are the same as for the previous stage:

- Risk assessment sheet:
- Guide to analysis of impact and risks
- List(s) of hazards
- Reliability/safety/service diagrams

3.3 Coordination with Operational Service (local)

The previous stages enabled the broad lines of the planned intervention process to be defined. Where the risk and impact analysis (see risk assessment sheet) shows an index of more than 1 or where a significant number of indicators are set to a high value, a presentation/coordination action has to be performed with the Operational Service (local) concerned (meetings, teleconferences, etc.).

Irrespective of these figures, it may of course be decided (by the Project Leader, management or Technical Quality Unit (local)) that such coordination is required anyway.
Like the technical preparation stage, this stage will comprise a number of sub-stages.

3.3.1 Presentation of the project to Operational Service (local)

3.3.1.1 The objectives of this sub-stage

The objective is both to inform the Operational Service (Local) of the intervention, to provide an overview of the scenario envisaged by the Technical Service (with its constraints), and give it an idea of the associated impact (which a technical service is unable to assess in isolation) and the required risk-reduction measures (this time of an operational nature).

3.3.1.2 The actors in this sub-stage

The coordinators of this presentation measure will in general be staff from the OPS Project and OPS units (local). It would be worthwhile involving the Technical Quality Unit (local) on the technical side, although this will of course be in addition to the technical units concerned.

3.3.1.3 Tools which may be used in the course of the sub-stage

These are the same as for the previous stages:

- Risk assessment sheet:
- List(s) of hazards
- Reliability/safety/service diagrams

3.3.2 Operational risk assessment

3.3.2.1 The objectives of this sub-stage

On the basis of the presentation made by the Technical Service, the Operational Service will, support service by support service (in line with the ESARR definition of major function), evaluate the operational risks of the intervention on the basis of:

- the criticality of the support service

- the planned and potential temporary consequences
- the volume of traffic concerned
  - the state of completion of prior tests
- the typology of any backtracking (reversion to previous state)
- the routine mitigation means

Where appropriate, the Operational Service may decide on the basis of the analysis to introduce additional mitigation means (traffic regulation, additional ATCO per sector, etc.) to reduce the risk to an acceptable level.

3.3.2.2 The actors in this sub-stage

These are essentially staff at the OPS project and OPS units (local). They may nevertheless, where necessary, call upon the study's technical manager to clarify certain points of the scenario.

3.3.2.3 Tools which may be used in the course of the sub-stage

- ***Risk assessment sheet*** (essentially the operational risks part)
- ***List(s) of hazards***
- ***Reliability/safety/service diagrams*** (for an objective examination of the degree of redundancy maintained and the possible degree of degradation of certain functions)
- ***Matrix showing the correspondence between technical systems and support services*** (to facilitate the interpretation of the Operational Service by allowing it to associate the technical system concerned with one or more support services)
- ***Users guide*** *(it provides further explanation on how to fulfil theoperational risk assessment sheet, among other things)*

3.3.2.4 The results of the sub-stage

- designation of a coordinator for the intervention from the Operational Service (local).
- validation/modification of the scenario proposed by the Technical Service
- possibly, additional mitigation means
- one (of the) intervention slot(s)

3.4 Definition of the final procedure

3.4.1 The objectives of this sub-stage

The preceding stages and sub-stages have made it possible to make a good assessment of the risks and finalise a broad definition of the scenario and the (technical and operational) mitigation means to be implemented.
The objective of this last sub-stage is, within the overall procedure, to define in detail the chronology and compatibility of all the operations required to complete the intervention in good quality and safety conditions.

3.4.2 The actors in this sub-stage

These are the persons tasked with the study on the technical side and the operational side, who will have to work together to finalise the procedure.
They will seek assistance from their specialists where required.

At the end of this sub-stage, the technical manager for the intervention and the operational actors should be duly briefed.

3.4.3 Tools which may be used in the course of the sub-stage

There is the option of employing tools previously used, but the main tool for this sub-stage is the ***Local Procedure Development Guide*** (depending on the procedure selected).

The technical risk assessment will normally have made it possible to determine which type of procedure has to be used.

Two types of procedure are possible:

- ***NORMAL*** (No or very little impact or risk, essentially involving notification and coordination. In this case the procedure is on one page (excluding the impact and risk analysis) and is less formalised
  - list of meetings
  - list of documentation
  - list of persons involved
  - list of tasks

- ***ASSURANCE*** (the operation is more problematic in certain phases, either in terms of impact and risk or in terms of complexity or coordination). In this case the operation is at high-risk or has a major operational impact. It is essential to avoid any omissions, errors and guarantee the highest levels of efficiency and quality. In such cases the procedure needs to be more formalised in the above areas than in the previous procedure and will be exhaustive and prescriptive, laying down how the tasks are to be prepared, executed and completed as well as the required coordination, etc. Furthermore, the previous form will have to be supplemented by the more numerous and detailed tables of the Assurance form, and the various operational modes.

A different type of procedure (different to that determined by the technical risk assessment) may be finally chosen, but any such choice has to be justified and approved (especially when going from “assurance” to “normal”).

In connection with tools, it might also be useful to consult ***the procedures already defined (locally and at other sites) for similar interventions*** and the assessments and comments made upon closure of such procedures.

3.4.4 The results of the sub-stage

- The full procedure duly validated and approved.

3.5 Decision – Notice of Work

3.5.1 The Objectives of this sub-stage

At this level of preparation, it is necessary to present to the decision maker the final result of MISO, associated with the information about the jointly assessed criticality assessed (Technical and Operational Services).

3.5.2 The actors in this sub-stage

In all cases, the decision making process should be described in the local SMS manual.

In accordance with the final remaining risk (once all mitigation means are specified) and with the French ANSP SMS manual, the authorised person has to:

- Establish a notice of work for low criticality intervention (see Risk assessment sheet: rating “None” or “Significant”);
- Make decision and notify Operational Service (headquarters) (see Risk assessment sheet: rating “Major”);
- Ask for arbitration by the Operational Service (headquarters) (see Risk assessment sheet: rating “Serious”);
- Prohibit this intervention for most critical one (see Risk assessment sheet: rating “Accident inducing intervention”). In this case, MISO will have to be reiterated or another more detailed procedure/analysis initiated. The decision not to perform such intervention has to be notified to Operational Services (headquarters) such that a decision is made also by taking into account the risk induced by not performing such intervention.

In some cases, the Operational Services (headquarters) may have to notify the National Supervisory Authority (NSA).

3.5.3 Tools which may be used in the course of this sub-stage

- French ANSP SMS Manual.

3.5.4 The results of the sub-stage

- Notice of Work (its mandatory items are presented in the “MISO users handbook”.
- And/or Note to Operational Service (headquarters) NSA for arbitration.

3.6 Users feedback

3.6.1 Dissemination

MISO completed sheets will be disseminated by mail and/or intranet to the following interested parties:

- Local stakeholders (as MISO sheets are attached to notices of work);
- Other impacted units (by mail);
- Others centres (through intranet).

This data sharing will allow benefiting from previous experience, improving both MISO and intervention maintenance practices.

3.6.2 Intervention closure

To maximise the benefit of experience, the MISO procedure states that following an intervention an assessment will be made regarding the appropriateness of the procedure for the intervention in order to ensure that any errors or procedural problems are avoided in any similar interventions made subsequently.

3.6.3 Archiving and Updating

MISO sheets and associated documents related to an intervention will be archived as stated in the local SMS Manual.

MISO sheets, dedicated to generic or repetitive maintenance intervention, will have to be updated immediately after the analysis of the intervention closure when improvements are necessary for future reuse.