AIR TRAFFIC FLOW & CAPACITY MANAGEMENT

EVOLUTION PLAN FOR THE ECAC STATES

EDITION 1.0

EUROCONTROL

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

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Abstract

The main objective of the ATFCM Evolution Plan is to enable the achievement of the ATFCM Strategy that highlights the need to extend the role of ATFM in optimising the traffic flow patterns and capacity management and in facilitating the exchange of ATM data and the sharing of information.

Therefore, a seamless and continuous ATFCM process is described in order to ensure a better realisation of the ATM capacity towards the traffic demand. This process is sustained by the exchange of accurate ATM data and sharing of information among all stakeholders within a regulatory framework. The associated functional requirements are identified and are sorted out into Operational Improvements in order to allow a smooth transition from Strategy to implementation through appropriate projects management.

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ABBREVIATIONS

ABI	Advance Boundary Information Message (OLDI)
AC	Aircraft Commander
ACA	AUP/UUP Composition Application (software)
ACC	Area Control Centre
ACH	ATC Flight Plan Change Message
ACK	IFPS Acknowledgement Message
ACT	Activate Message (OLDI)
AD	Air Defence
ADEXP	ATS Data Exchange Presentation
AFP	ATC Flight Plan Proposal Message
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information, Regulation and Control
AIS	Aeronautical Information Service
AMC	Airspace Management Cell
ANSP	Air Navigation Service Provider
ANT	EATMP Airspace & Navigation Team
AO	Aircraft Operator
AOWIR	Aircraft Operator What-if Re-routing (CFMU Function)
APT	Airport (Requirement)
APL	ATC Flight Plan Message
ARO	ATS Reporting Office
ARN	ATS Route Network
ASM	Airspace Management
ATC	Air Traffic Control
ATD	Air Traffic Control & Data Processing Unit (EATMP)
ATFM	Air Traffic Flow Management
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management (ATS+ASM+ATFM)
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
ATSP	Air Traffic Services Provider
AUP	Airspace Use Plan
CADF	ECAC Centralised Airspace Data Function
CASA	CFMU Computer Assisted Slot Allocation
CHG	Modification Message
CDM	Collaborative Decision Making
CDR	Conditional Route
CFMU	EUROCONTROL Central Flow Management Unit
CPL	Current Flight Plan
CRAM	Conditional Route Availability Message
CRI	Critical Event (Requirement)
CTOT	Calculated Take-Off Time
D	Danger Area
EAD	European AIS Database
EATMP	European Air Traffic Management Programme (EUROCONTROL)
ECAC	European Civil Aviation Conference
ECIP	European Convergence and Implementation Plan

EET	Estimated Elapsed Time
ENV	CFMU Environment
EOBT	Estimated Off Block Time
ETFMS	Enhanced Tactical Flow Management System
ETA	Estimated Time of Arrival
ETO	Estimated Time Over
ETOT	Estimated Take-off Time
FDPS	Flight Data Processing System
FIR	Flight Information Region
FL	Flight Level
FMD	Flow Management Division (CFMU)
FMP	Flow Management Position
FMS	Flight Management System
FNM	Flow Notification Message
FPL	Filed Flight Plan
FPPS	Flight Plan Processing System
FUA	Flexible Use of Airspace
GAT	General Air Traffic
ICAO	International Civil Aviation Organisation
IFPLId	IFPS Flight Plan Identifier (ADEXP format)
IFPS	Integrated Initial Flight Plan Processing System
IFR	Instrument Flying Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
LoA	Letter of Agreement
MLS	Microwave Landing System
NATO	North Atlantic Treaty Organisation
NOP	Network Operations Plan
NOTAM	Notice to Airmen
OAT	Operational Air Traffic
OLDI	On-Line Data Interchange
PC	Provisional Council
PRC	Performance Review Commission
PRU	Performance Review Unit
R	Restricted Area
RAD	Route Availability Document
RCA	Reduced Co-ordination Airspace
REJ	Reject Message
REG	Regulatory (Requirement)
RFL	Requested Flight Level
RNDSG	Route Network Development Sub Group
RVR	Runway Visual Range

SA	Separation Assurance
SID	Standard Instrument Departure Route
SRS	Standard Routeing Scheme
STAR	Standard Instrument Arrival
TCM	Traffic Flow and Capacity Management (Requirement)
TMA	Terminal Control Area
TOS	Traffic Orientation Scheme
TOT	Take-Off Time
TRA	Temporary Reserved Airspace
TSA	Temporary Segregated Area
UIR	Upper Flight Information Region
UTC	Co-ordinated Universal Time
UUP	Updated Airspace Use Plan

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EXECUTIVE SUMMARY

The ATM 2000+ Strategy identifies that flow management, together with capacity management is a core operational process of ATM and that it is an evolutionary step forward in “managing the dynamic balance between capacity and demand”.

The ATFCM Strategy highlights that in its role definition, ATFM should not be restricted to slot allocation mechanisms but should also be extended to the optimisation of traffic flow patterns and capacity management.

The ATFCM Evolution Plan therefore consists of ensuring seamless Flow and Capacity Management operations through Strategic, Pre-tactical and Tactical ATFCM phases that are continuously iterative and interactive. Considering the planned resources (Airspace structure, ATC capabilities, airport schedule and traffic forecast), the seamless and continuous ATFCM process organises the ATM/airport capacity according to the civil and military traffic demand in order to conduct real-time operations with the intention to minimise impact of any disruptions and to take benefit of any opportunity. The main differences between the ATFCM phases are the number and role of partners involved in the CDM process, the time given to do it and the need for advance notice of the decision taken. The output of a phase aims at preparing the next phase and is therefore used as input element to be considered at the beginning of the next activity.

In order to achieve the ATFCM seamless process, the following Directions for Change and associated Lines of Actions are identified :

1. **Improving Traffic Flow and Capacity Management** aims at ensuring a better alignment of the ATM capacity towards the traffic demand, and a better efficiency of the ATFCM process in the balancing of demand and capacity. This Direction for Change is sustained by the following Lines of Actions :

    - Developing Capacity Management consists of proactively optimising the use of ATM/airport capacity to comply with the demand profile and of identifying and utilising appropriate other available capacity.
    - Improving Traffic Flow Management aims at developing the range of flow measures and procedures with ATC to best manage the expected traffic with the latest known resources.
    - Developing Network Management aims at considering the network effect from a central perspective.
    - Ensuring Quality of Service through the assessment of performance indicators aims at guaranteeing an efficient ATFCM Process in order to respond to the AOs needs.

    The improvement of the Traffic Flow and Capacity Management is conducted at National and International Level through a chain of collaborative actions that compares the traffic forecast with the planned ATM environment in order to identify the expected capacity shortfalls (Strategic activities). ATFCM solutions aiming at maximising the network capacity are assessed and the resulting change requests are considered within the ATM environment to define the most compromise between all parties. Pre-defined scenarios and associated *modus operandi* related to the use of routes, areas and sectors are established and validated before being published. The new environment database, the scenarios and any additional data (strategic forecast) required to conduct pre-tactical activities are provided to all partners.

As more accurate traffic demand and user capability data become available, they are compared with the strategic forecast data in order to identify the remaining capacity shortfalls. Through continuously iterative and interactive Pre-tactical activities, the ATC and AOs behaviour are organised in order to optimise the capacity and to use other available capacity. Where required, the demand is regulated through the application of restrictions. The result is the promulgation of an optimised and detailed operational plan (Network Operations Plan - NOP).

Due to real-time events, instability in NOP appears requiring to apply some refinements. The impact of the real-time events on the ATFCM situation is assessed in order to manage them accordingly through a dynamic reaction that leads to retrieve network stability and capacity optimisation. Adequate real-time ATFCM solutions are therefore implemented in collaboration with all partners concerned and a consolidated Network Flow and Capacity Picture is provided.

Several performance indicators aiming at ensuring a certain level of quality of the ATFCM Process are monitored in order to respond with efficiency to the AOs* needs (e.g. reduction of costs, maximum freedom of movements, etc).

2. **Improving Collaboration with the ATM Partners** addresses the relationship between ATFCM and other ATM activities and focuses mainly on the exchange of accurate ATM data (FPL, Airspace, crisis decision, etc) within a regulatory framework between all stakeholders. The following Lines of Actions compose this Direction for Changes :

   - Ensuring Flight Plan Data Consistency and Dissemination

     The evolution of flight planning is to accept the existence of differences and the specific needs of individual actors, while ensuring that a sufficiently common basis about the flight details exists in order to enable each actor to perform his specific duty in an effective and efficient manner. This imposes to ensure flight plan data consistency and to disseminate accurate flight plan data to all stakeholders of ATFCM in order for each one to act from it and eventually on it.

   - Optimising Interface with Airspace Management

     As optimised capacity management relies on airspace usage, there is a need to optimise the interface with airspace management in order to involve all airspace users, in particular the militaries, and to take into account their needs in the decision making process. The exchange and processing of accurate airspace data support this Line of Actions.

   - Collaborating with Airport Operations

     As tactical manager of the total network load, ATFCM must collaborate with airports in a genuine partnership. The airport must be seen as just one part of the whole ATM system in a “gate-to-gate” environment. The on-time delivery of the arriving aircraft at gate must be seen as a prerequisite for a subsequent on-time departure. To facilitate effective collaborative decision making, it is imperative that all data required to make an airport function smoothly and to enable full ATM system integration is made available where it is needed at the moment it is required.

Note * *Aircraft Operators (AOs) is used to denote all users of aircraft, including Airlines, Military Aviation, General Aviation, Arial Work and Sport Aviation.*

- Managing Critical Events

  The management of critical events as such provides a justification for ATFCM. This management, be it pro-active (known events) or reactive (unplanned, but prepared) is essential to minimise their impact and relies on an efficient sharing of information between all partners in order to keep the ATFCM picture as accurate as possible.

- Implementing a Regulatory Process

  As ATFCM is balancing between parties and inside parties, there is a need to implement a regulatory process to ensure equity between all partners and to assess compliance to the rules.

In order to sequence the implementation of the evolutions, the Directions for Change are developed into four sub-groups themselves sequenced in Operational Improvements. The requirements identified in the development of the Lines of Actions are inserted in each of the Operational Improvements. This organisation allows a smooth transition from their development to their implementation.

SECTION 1.
INTRODUCTION

1.1. PRESENTATION OF THE DOCUMENT

1.1.1. About the Document

This document constitutes the EUROCONTROL Air Traffic Flow and Capacity Management Evolution Plan for the European Civil Aviation Conference (ECAC) States. It explains the evolution of ATFCM to be followed by the ECAC States in order to implement a uniform European-wide Air Traffic Flow and Capacity Management System that encompasses all gate-to-gate phases of flight.

As a first stage, the document focuses on the ATFCM evolution based on a practical planning horizon of 2012. As both aviation and ATM will continue to evolve in the future, the evolution of ATFCM beyond 2012 will be identified afterwards. The document nevertheless provides an adaptable framework that can be used to help define future concept changes beyond that date.

The ATFCM Evolution Plan must be considered as a living document that will be reviewed periodically, to ensure that the rationale for the next step forward remains valid in the light of the progress made and to reflect the changes that will take place in aviation and ATM. It is intended that the evolutionary steps defined in this document will be consistent with and complementary to the ATM 2000+ Strategy and to the ATFCM Strategy.

Economic considerations must also be an integrated part of the ATFCM evolution that will affect the procedures and investments plans of all stakeholders over many years. The benefits from the resultant improvements in capacity and efficiency of ATFCM must be made in a cost-effective manner. Cost-efficiency and value-for-money of all requirements must be assessed through Cost-Benefit Analysis (CBA) with the overall target of an affordable ATFCM system. This process will ensure prioritisation of the implementation of the requirements and efficient usage of capital and resources at each decision stage under the supervision of EAG. It will comply with the guidelines of the Strategic Performance Framework that provides means to prioritise budgets and work programmes and to conduct impact assessments.

1.1.2. Structure of the Document

Executive Summary gives an overview of the content and main issues of the document.

Section 1 provides the background, explains the purpose of the document and the relationship with other ATM documents, reviews the partners expectations, describes the Collaborative Decision-Making Process and clarifies the safety issue.

Section 2 describes in detail the enhanced ATFCM process and identifies the associated functional requirements.

Section 3 describes in detail the improved collaboration with ATM partners and identifies the associated functional requirements.

Section 4 introduces the functional requirements into the different Operational Improvements.

1.2. PURPOSE

1.2.1. Background

The ATM 2000+ Strategy identifies that flow management, together with capacity management is a core operational process of ATM and that it will be an evolutionary step forward in “managing the dynamic balance between capacity and demand”.

The ATFCM Strategy highlights that in its role definition, ATFM should not be restricted to slot allocation mechanisms but should also be extended to the optimisation of traffic patterns and capacity management so that the slot allocation process is achieved in an optimised manner. Therefore, the emphasis of ATFCM shall be on managing the balance of Capacity and Demand planned strategically and applied tactically as a result of physical airport or airspace limitations. In addition, the ATFCM Strategy requires investigating the collaboration processes with the ATM partners in order to achieve a more efficient management of the ATM system within a gate to gate perspective. Considering the above mentioned requisites, the goal of the ATFCM Strategy is to enable flight punctuality and efficiency according to the available resources with the emphasis on optimising the network capacity through collaborative making process.

In order to achieve the goal of the ATFCM Strategy, two Directions for Change have been identified and are sustained by several Lines of Actions.

Improving Traffic Flow and Capacity Management
This Direction for Change aims at ensuring a better alignment of the ATM capacity towards the traffic demand, and a better efficiency of the ATFCM process in the balancing of demand and capacity. The Direction for Change is sustained by the following Lines of Actions :

- Developing Capacity Management
- Improving Traffic Flow Management
- Developing Network Management
- Ensuring Quality of Service

Improving Collaboration with ATM Partners
This Direction for Change contributes to support the achievement of the goal of the ATFCM Strategy and focuses mainly on the exchange of accurate ATM data (FPL, Airspace, crisis decision, etc) within a regulatory framework between all stakeholders. The following Lines of Actions compose this Direction for Change :

- Ensuring Flight Plan Data Consistency and Dissemination
- Optimising Interface with Airspace Management
- Collaborating with Airport Operations
- Managing Critical Events
- Implementing a Regulatory Process

1.2.2. Document Purpose and Relationship

The purpose of the ATFCM Evolution Plan is to develop the Directions for Change and associated Lines of Actions in order to identify the functional requirements. These operational and technical requirements will be translated in ECIP Objectives and in the CFMU Work Programme. This will lead to the establishment of several Projects allowing a smooth transition from strategy to implementation through appropriate projects management and progress monitoring activities.

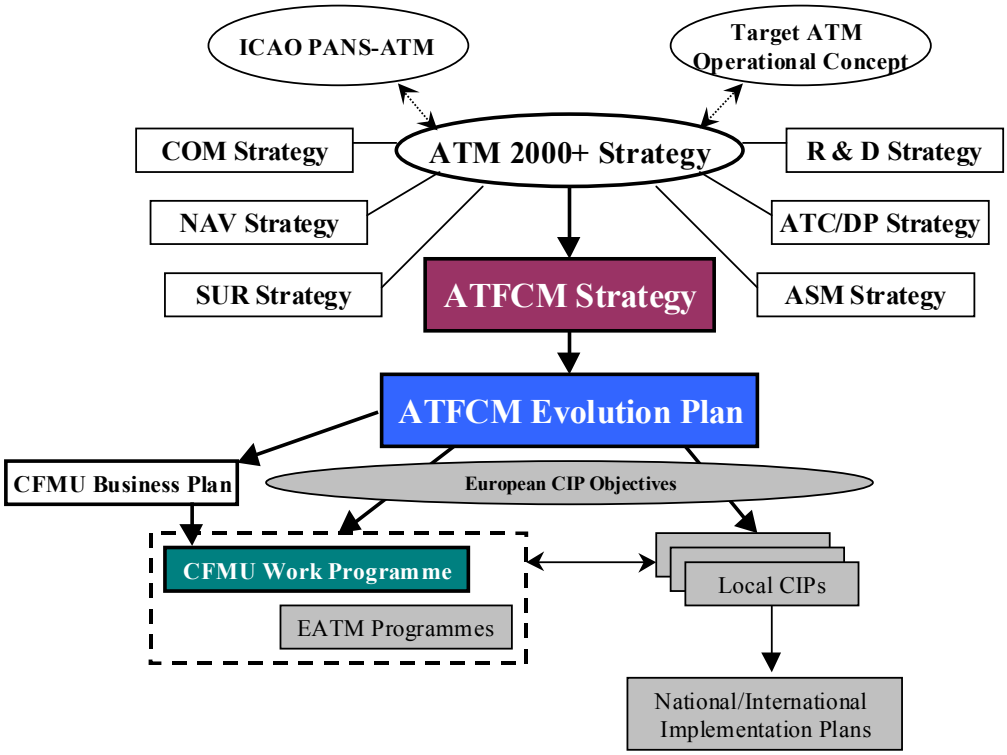

Figure 1 : Relationships

1.3. THE PARTNERS AND THEIR EXPECTATIONS

1.3.1. Civil Aviation

It is a key user of the ATFCM services. To Civil Aviation, the ability to operate to published schedules punctually and efficiently is the most concern after safety. These schedules involve a myriad of connecting and interdependent flights and events. The resources (aircraft and flight-crew) used for a particular flight form part of a continuous inter-connected process in which delay can have a serious and growing effect on subsequent flights.

In addition, Civil Aviation strives to satisfy its business objectives and optimise the operations by determining the optimum departure and arrival times of the aircraft and the routes and levels at which they wish them to fly.

Therefore, the Civil Aviation seeks:

- additional capacity to meet the increased demand, while reducing direct and indirect costs as well as improving safety levels;
- reduction in delays, in particular for connecting and interdependent short-haul flights involving the hub airports and main city pairs links;

- a certain degree of departure/arrival flexibility in order to maintain the efficiency of hub-and-spoke networks;
- a short and simple FPL filing process;
- agreement with ATM on the content of the filed FPL and all subsequent changes up to departure;
- the flexibility to formulate and modify flight plans as close to the EOBT as possible;
- the incorporation of flexible capacity management and the consideration of gate-to-gate operations within ATFCM;
- maximum freedom of movement to follow preferred and flexible flight profiles with minimum constraints;
- the expectations of the pilot are that the FPL held on the flight deck is correct and is the same as the one held by ATC units along the route of flight;
- equity of treatment between all airspace users.

1.3.2. Military Aviation

Military Aviation has a vital role to play in the security in Europe. This responsibility may necessitate the setting up of military operations in the frame of actions taken by international organisations (e.g. NATO), and for military aircraft to take precedence over civil aviation in some circumstances. It is, therefore, a fundamental responsibility that each State is able to train and operate its military air, sea and ground forces.

In order to carry out its operational tasks, military aviation seeks:

- freedom to operate at any time in all areas of the ECAC airspace;
- special handling in particular for priority flights and for time-critical missions, but also for military aircraft not fully equipped to the civil standard;
- temporary airspace reservations (TRAs, TSAs, etc) or restrictions (R, D), situated as close as practicable to the appropriate operating airfield, to contain activities such as low-level flying, in-flight refuelling, air combat training, high-energy flying activities which are incompatible with normal application of the Rules of the Air;
- airspace restrictions for non flight-related activities such as protection of areas of national interest, gunnery, missile firing, etc...

In addition, the interoperability between civil and military systems will become an increasingly important factor in future operations. The use of shared information raises institutional and systems architecture issues in the need to ensure that any data deemed ‘sensitive’ by the military (e.g. flight data on specific OAT flights) will be adequately protected within the civil ATM system. Confidentiality of military activities could therefore lead to access restrictions to some ATM databases.

1.3.3. Civil ATS Providers

The main objectives of the ATC are to prevent collisions between aircraft and to expedite and maintain orderly flow of air traffic. These objectives can be achieved by applying separation between aircraft and by issuing clearances to individual flights as close as possible to their stated intentions within the general framework of ATFCM measures and according to the state of ATM environment (airspace status, ATC sectors configuration, airport Infrastructure, weather, etc).

The ATC operational need is towards an information-rich collaborative decision-making environment, where data is at first provided in real-time, then exchanged system-wide feeding automated ATC tools. The trends are towards computer assistance to support the planning of optimisation of capacity in the enroute, arrival and departure phases.

In order to reach these objectives, the ATS Providers seek :

- more accurate information about the outbound and inbound flights estimates;
- the optimisation of the runway throughput;
- new collaborative procedures for the management of updates taking account AOs preferences;
- new collaborative procedures for the management of disruptions (e.g. boarding, taxi problems, etc).
- the possibility to align control sector boundaries with particular traffic flows or peaks in demand;
- the introduction of dynamically-sized sectors, dependent on particular traffic flows and density;
- the provision of any FPL and change to the FPL to relevant actors with sufficient lead time to enable incorporation into the local ATC process;
- the possibility of automatic interactions between IFPS, ATC and the pilot in order to make any necessary modifications to the FPL;
- the improvement of the assistance provided by AIS/ARO to the AOs.

1.3.4. Military ATS Providers

Besides some specific military objectives, the military ATS has to provide similar or identical services as the civil ATSPs. A military unit providing ATS could either be a military ATC Unit and/or an Air Defence Unit as far as area radar service is concerned. ATS at an airbase might be under the provision of military ATS, occasionally civil services and it could be provided to GAT and OAT.

Military ATS has similar service provision requirements to civil ATS. When military aviation is carried out within the “known environment” the operations will be made as much transparent as possible, in order to separate OAT and GAT and to enable for an efficient planning and co-ordination. On the other hand, information on planned movements and intended flight paths of civil air traffic, including real-time updates, have to be made available to the relevant military ATS and AD units to fulfill the requirements of States interest and defence needs.

Military ATS units would have to implement system functionality as required for civil ATS. In particular access to common airspace data information and close co-ordination between all civil and military ATS providers is vital. Where required, co-ordination procedures and appropriate tools have to be established between civil/military ATS and AD.

Increased communication and data exchange between the civil and military will be required at all levels of ATM, from the Strategic Planning Phase through to the safe conduct of flight operations by different types of air traffic on the day of operations. As the data exchange must be as transparent as possible, the confidentiality needs must be taken into account. However, the least impact to interoperability will be envisaged to ensure the best suitable co-ordination environment.

1.3.5. Airport

Many of the major European airports already suffer from traffic congestion and are sources of flight delay. This problem will be exacerbated and affect more and more airports unless airport capacity is increased, and remains, in step with improvements to en-route capacity. In addition, as airports are not ATM units, they are not always in the flight plan loop although they have an impact on the flight, and also they are impacted by the flights. Finally, more airfields are coming online which results in the possible of significant increase of demand in peak hours with added ATC complexity within en-route and terminal airspace.

Airport must therefore be considered as part of the overall ATM system within a gate-to-gate approach and ATM procedures must ensure that the potential airside airport capacity available at any particular point in time is used to the optimum effect. Military airbases used collaboratively by civil aviation must also be considered as part of the ATM and therefore, the related traffic must be subject to ATFCM measures, if required.

Therefore, the airport community desires :

- close co-ordination with the ATFCM Providers in order to have better knowledge of expected traffic volumes and to improve the predictability of departure and arrival times;
- to be included in the flight plan process;
- a coherence between airport slots and the relevant flight plans;
- ATM system to provide updates on a number of flight parameters, whenever there are relevant changes;
- ATM to take account of the available airport capacity at all times in order to be able to maximise the use of that capacity;
- ATM to determine strategies to be able to cope with unexpected changes in airport capacity;
- CDM and Information Management principles to improve airport/ATM integration.

1.3.6. ASM Providers

The main objective of Airspace Management is to achieve the most efficient use of airspace based on actual needs and, where possible, avoiding permanent airspace segregation.

Close co-operation between civil and military authorities and effective real-time civil/military co-ordination are recognised as fundamental requisites for a flexible use of airspace. In addition, so as to make efficient use of available airspace, real-time information on the current use of airspace should be provided to all parties concerned.

In order to facilitate pre-tactical flight-planning, comprehensive and up-to-date information on the daily allocation of European airspace should be disseminated in a form which is easily accessible to all partners concerned and published in ways which are tailored to the needs of each specific user group.

To support current and future ASM functions, advanced airspace management co-ordination tools and data displays, including dynamic and accurate environment data management facilities, will be required.

1.3.7. ATFCM Providers

The main objectives of ATFCM are to support ATC in preventing any system overloading and ensuring an optimum flow of air traffic to during times when demand exceeds, or is expected to exceed, the available capacity of the ATC system. The ATFCM Providers must provide maximum capacity based on conditions while maintaining the system's integrity.

In order to reach these objectives, the ATFCM Providers seek :

- more accurate and consistent data (e.g. on EOBT and ETOT including Taxi-time);
- to be made aware of any modification to the FPL;
- the suppression of duplicated FPL and ghost flight;
- the update of ETFMS with the changes of the Take-Off Time for regulated flights as well for non regulated flights;
- the anticipation of the Take-Off Time to decrease the number of late changes;
- better adherence to the ATFCM rules, procedures and processes.

Improved traffic management tools and extended inter-connection of computer systems are required to enable ATFCM to become more responsive to short-term changes in airspace constraints and provide better information about flight trajectories. These tools and interconnected systems will also ensure a more Collaborative Decision-Making process between the partners concerned in order to solve the identified capacity shortfalls with adequate ATFCM solutions

1.3.8. AIS/ARO

The main task of AIS/ARO, as defined in Annex 15 to the Chicago Convention, is to ensure the flow of aeronautical information necessary for the safety, regularity and efficiency of international air navigation. The AIS/ARO provides also flight plan handling service together with the provision of ATFCM information to pilots and aircraft operators.

As interface between AO and IFPS, AIS/ARO will continue to have a major role as initial advisor ensuring the consistency of FPLs. In the field of general assistance, the AROs will inform the AOs and, acting on its behalf, will possibly "propose" alternative when a change occurs concerning the feasibility of a flight (e.g. availability of a route).

This will require AIS/ARO to have access and/or use similar tools as the other ATM partners to get accurate and up-to-date ATFCM and FPL information.

1.3.9. IFPS

The current role of the IFPS is to check the flight plan for completeness and accuracy against the known environment and to distribute it to the relevant ATM services. After 6 years of operations, some 20% of flight plan submissions are still incorrect and require manual processing. In addition to basic syntax errors, a number of key reasons for FPL invalidation have been identified, but the main one is the lack of knowledge by the AO of the current airspace structure and availability.

The expectations of the IFPS are:

- to have access to a known, accurate and up-to-date ATM environment;
- to reduce the number of syntax errors;
- to be made aware of modifications to the flight plan data;
- to have its mandate clarified in terms of the service to be provided and the processing of flight plan updates after departure.

1.4. COLLABORATIVE DECISION MAKING PROCESS

Collaborative Decision Making is the process, which allows decisions about events to be taken by those best positioned to make them on the basis of most comprehensive, up-to-date and accurate information. This in turn will enable decisions about a particular flight to be made according to the latest information available, thereby enabling flights to be dynamically optimised to reflect near or real-time events.

This CDM process is a key enabler of the ATFCM Strategy allowing the sharing of all relevant information between the parties involved in making decisions and supporting a permanent dialogue between the various partners (e.g. AOs*, ATS, FMPs, CFMU, AMCs, AIS/AROs, Airport, etc) throughout all phases of flight. This will enable the various organisations to continuously update each other on events from the Strategic Level to the real-time. In this context, it must be clear that the military community is considered as a partner involved in the CDM process and that the military requirements will be addressed within the ATFCM Operational Improvements.

To be efficient and to reach the required objectives, the CDM should have the following characteristics :

- an inclusive process;
- a transparent process;
- a process that builds trust between the players involved.

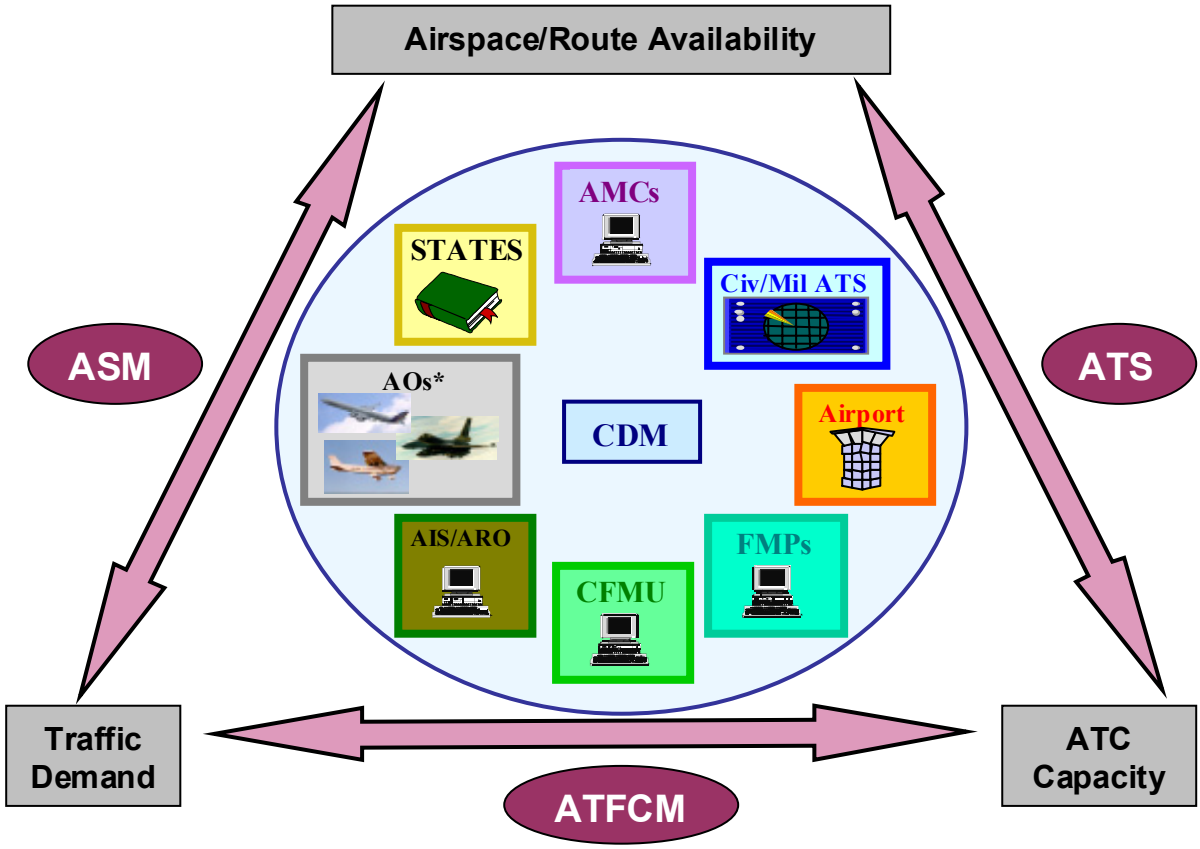

Figure 2 : CDM Partners

Note * *Aircraft Operators (AOs) is used to denote all users of aircraft, including Airlines, Military Aviation, General Aviation, Arial Work and Sport Aviation.*

1.5. SAFETY

One of the Major Objectives highlighted in the ATM 2000+ Strategy concerns the need of improving safety levels by ensuring that the number of ATM induced accidents and serious or risk bearing incidents do not increase and, where possible decrease.

Safety is the highest priority in aviation. The main purpose of the ATM services is to ensure the safe separation (Separation Assurance (SA)) of aircraft both in the air and on the ground, while maintaining the most efficient operational and economic conditions. Separation Assurance is enforced by regulatory aspects and sustained by consistent ATM data (e.g. FPL, airspace status, etc). Its implementation is performed through a multi-layered management safety planning process: initially through airspace management, and flow and capacity management; then separation provision by Air Traffic Control; and, finally, collision avoidance through cockpit tasks.

As one of the key player, the ATFCM through each of its activities aims at ensuring that safety can be achieved in the most efficient and economic way with minimum adverse impact on operational conditions.

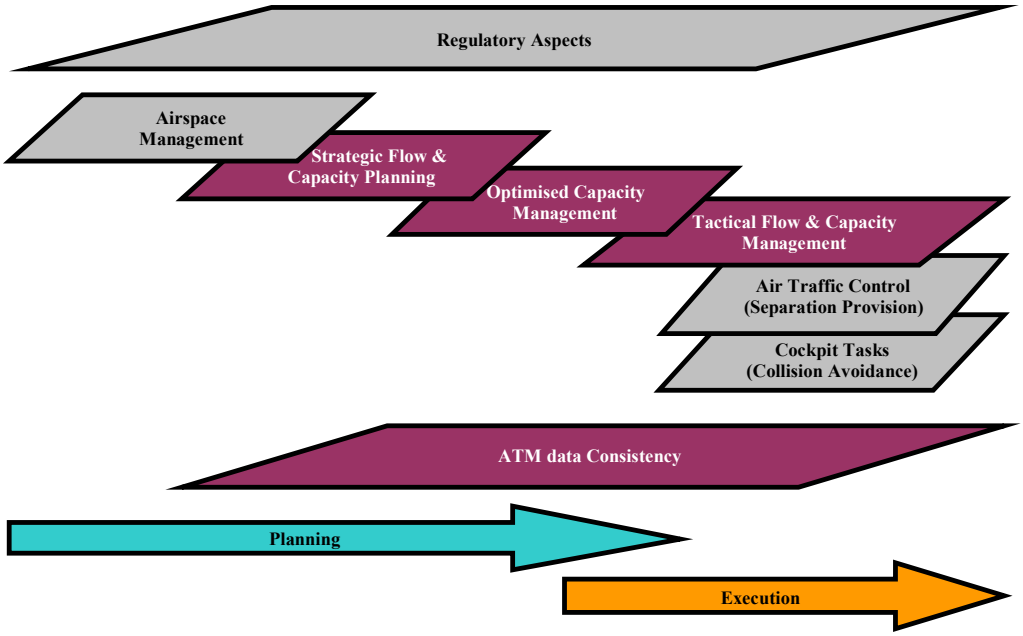

Figure 3 : ATM Safety Layers Time Line

Safety will not be mentioned as a separate objective but will be implicitly embedded within the development of the ATFCM Directions for Change that will ensure safer ATFCM operations from Strategic to Tactical phase through :

- more detailed planning based on a more accurate traffic forecast leading to a better accommodation of the traffic demand through capacity optimisation and a reduction of the controller workload;
- the consideration of the network effect from a central perspective through a CDM process allowing the sharing of relevant info between the partners that will take decision according to the global framework;

- the exchange of ATFCM data with airport in order to improve the accuracy of the departure/arrival sequence and the assistance in the managing of airport temporary difficulties (e.g. de-icing, etc);
- the FPL consistency and the dissemination of updates guaranteeing that the data presented to the controller correspond with the flight intentions of the pilot;
- the improvement of the co-ordination process between ASM and ATFCM for the establishment and use of airspace structure allowing AOs to have a more accurate knowledge of the airspace allocation;
- the improvement of ATM data exchange and information sharing processes to ensure common ATM awareness between all partners;
- the implementation of a regulatory process to ensure fairness between all parties and to monitor the compliance with the ATFCM measures;
- the management of special events in order to minimise their impact on the ATFCM situation.

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SECTION 2.

IMPROVING TRAFFIC FLOW AND CAPACITY MANAGEMENT

2.1. INTRODUCTION

The report of the Independent Study for the Improvement of ATFM stated that the current focus was primarily on avoiding the saturation of the control systems rather than on the optimisation of the efficiency of the global ATC system. It further stated that in its role definition, ATFM should not be restricted to slot allocation mechanisms but should also be extended to the optimisation of traffic flow patterns and capacity management so that the slot allocation process is achieved in an optimised manner.

In order to achieve this improvement in the management of traffic flows, a series of ATFCM solutions will be implemented including the prevention of overloads through capacity management and measures to avoid tactical overloads and bunching.

A chain of collaborative actions and decision-making activities involving all partners concerned will allow a smooth transition from the identification of expected capacity shortfalls to implementation of the adequate ATFCM solutions. As the decision of one partner may have a consequential effect on others, the CDM process will consider the network effect from a central perspective allowing each of the participants to take their decision within the global framework. In addition, the ATFCM will also focus on the Quality of Service provided to the AOs and this will be assessed through the monitoring of performance indicators.

2.2. THE MAIN INEFFICIENCIES

2.2.1. Structural Inefficiencies

The ATFM mandate has become too restrictive. Indeed, ATFM is still regarded as a synonym for slot allocation mechanism and its meaning should be extended to include the optimisation of traffic flow patterns and capacity management. Of course, the fragmentation of airspace and the division of responsibilities do not facilitate the mission of the CFMU. Therefore, important efforts must be undertaken to implement co-ordinated capacity management procedures and to educate all partners on this evolution.

2.2.2. Strategic Inefficiency

The current implementation of Traffic Orientation Policies is extremely complex. There is therefore a need to simplify and reconcile the two processes of building and using the route network in an efficient and continuous way with the definition of a consistent route and traffic policy.

2.2.3. Pre-tactical Inefficiencies

With a declared objective to maintain collaborative optimisation of the network, the pre-tactical activity is based on a close relationship between CFMU, FMPs and ACCs. The success of this organisation depends to a large extent on the quality of human relations between individuals and confidence in each other, as well as accuracy, reliability and timeliness of information shared.

Thus the awkward role of FMPs, caught between the CFMU and national ACCs requirements, requires a successful combination of high technical and diplomatic skills for efficient results.

An enlarged use of mechanically-driven process based on electronic exchange of messages has inherently reduced the communication and negotiation process between individuals. However, cross-border co-operation and co-ordination between FMPs seems to be very limited.

An increased emphasis on individual performances of ACCs tends to diminish common awareness of the global performance of the system. When implementing a restriction, delays generated are attributed to the ACC originator, without any other consideration. A potential result is that a particular ACC may have excellent results due to upstream ACC protections.

Finally, more and more decisions take place at the last minute for flexibility and business purposes. For example, neighbouring ACCs wait for others' decisions to implement restriction measures to see what extent upstream restrictions could protect them.

2.2.4. Tactical Inefficiencies

One striking fact is the extremely high dependence of the global ATC system on the individual day traffic patterns. It is common to see the same ACC, with the same traffic pattern, implementing restrictions on one day, and relaxing them on another day. This probably results from a lack of anticipation by ATFCM.

The overdeliveries, increased complexity or bunching in en-route sectors can induce declarations of capacity below the relevant level in order to protect controllers from excessive peaks of traffic. The main causes of overdeliveries are the lack of adherence to ATFCM slots, an inconsistent flight profile and the implementation of late restrictions. Furthermore, closing the gap between ATFCM and ATC activities alleviates the management of tactical complexity and bunching. The direct adverse effect of experiencing overdeliveries is the proclivity of FMPs to integrate an added margin of safety when declaring their capacity. Thus, the same factors that contribute to overdeliveries also contribute, in varying degrees, to under-utilisation.

2.3. DEVELOPMENT OF THE LINES OF ACTIONS

2.3.1. Introduction

2.3.1.1. Generalities

The improvement of the Traffic Flow and Capacity Management is sustained by the following Lines of Actions :

- Developing Capacity Management

  Optimised Capacity Management aims at organising the ATM/airport capacity according to the predicted traffic demand. The proactive optimisation of the capacity consists of :
  - optimising the utilisation of the capacity to satisfy the demand ;
  - identifying and utilising appropriate other available capacity.

- Improving Traffic Flow Management

  Optimised Flow management aims at developing the range of flow measures and procedures with ATC to best manage the expected traffic with the latest known resources.

- Developing Network Management

  The development of the Network Management aims at considering the network effect from a central perspective.

- Ensuring Quality of Service

  The enhancement of the ATFCM process aims at providing an efficient Service in order to respond to the AOs needs (e.g. preferred flight profile, punctuality, etc). The quality of the service must be ensured through the assessment of performance indicators.

As these Lines of Action are intrinsically inter-related, they are not addressed as distinct issues but are considered as a whole within the improvement of the ATFCM process.

2.3.1.2. ATFCM Solutions for Capacity Shortfalls Resolution

Acting as a co-ordinator between all parties concerned, the CFMU will identify the lack of capacity in regard to the expected demand and, taking into account the constraints of the clients (ACCs, AOs, etc), and will explore all possible solutions in collaboration with the partners concerned (ATS Providers, AOs, Airports, FMPs, AMCs). Additionally, the CFMU will analyse the benefits of flow change, the overall impact on ATM/AO and will disseminate the information to all partners. This will be supported by the use of improved historical data and simulation tools to provide a better picture of short-term events.

The identification of capacity shortfalls compared to the forecast demand will require the possible solutions depicted in Figure 4 to be considered. The aim is to manage the ECAC Airspace Capacity whilst minimising restrictions. It will limit the impact on airspace users while ensuring greater efficiency in both traffic and capacity management.

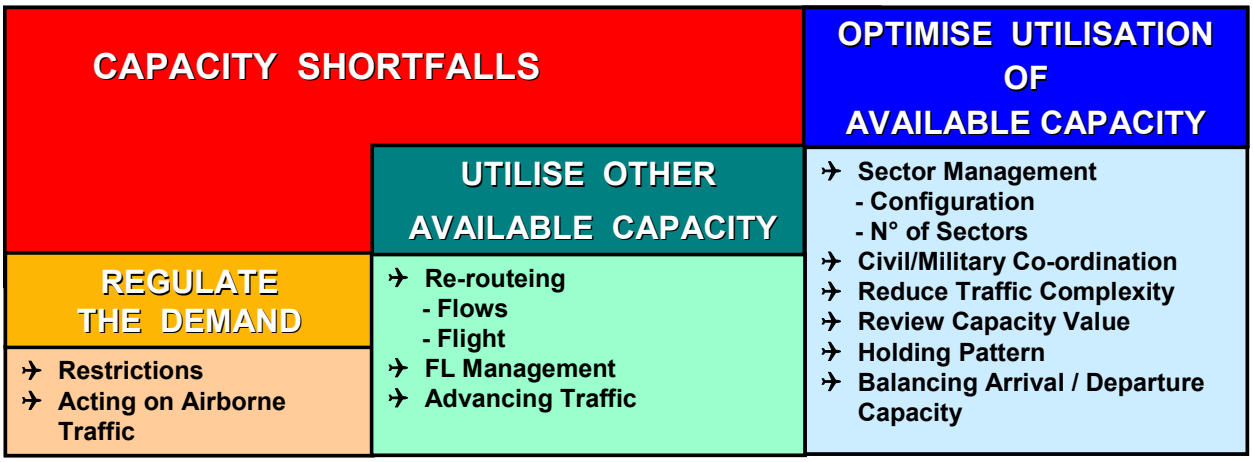

Figure 4 : Possible ATFCM Solutions for Capacity Shortfalls Resolution

These ATFCM solutions shall remain interconnected as they can be combined in various options leading to the provision of a total efficient traffic and capacity situation. For example, some of the ATFCM solutions contributing to solve expected capacity shortfalls could be implemented at the Pre-tactical phase followed by the application on airborne traffic of other ATFCM solutions at the Tactical phase in order to manage the controller workload.

The ATFCM solutions shall also be implemented holistically in order to guarantee a Pan-European wide benefit in capacity and traffic flow management. In contrast, taken separately they could provide a limited benefit locally.

A post-analysis of the results of the tactical day in regard to the intended plan will facilitate the assessment and improvement of the ATFCM solutions. Best practices will be identified by the CFMU and will be shared between all stakeholders.

2.3.1.3. Use of Scenarios

An important enabler for an efficient optimisation of the capacity is the use of pre-defined scenarios established at Strategic and/or Pre-tactical Level. The scenarios will consider as assumptions the ATM environment together with the traffic forecast in order to define an associated *modus operandi* leading to the achievement of the expected results. The *modus operandi* will describe the recommended links and working methods in terms of network use, required ATFCM measures and sectorisation. The scenarios will be fine-tuned and improved, if required, through simulations. These simulations will aim at evaluating their efficiency to provide CFMU and ATS Providers with the necessary flexibility to respond to the traffic demand, and to provide AOs with multiple options. The adequate scenarios will be stored, made accessible to the external users and used when and where required.

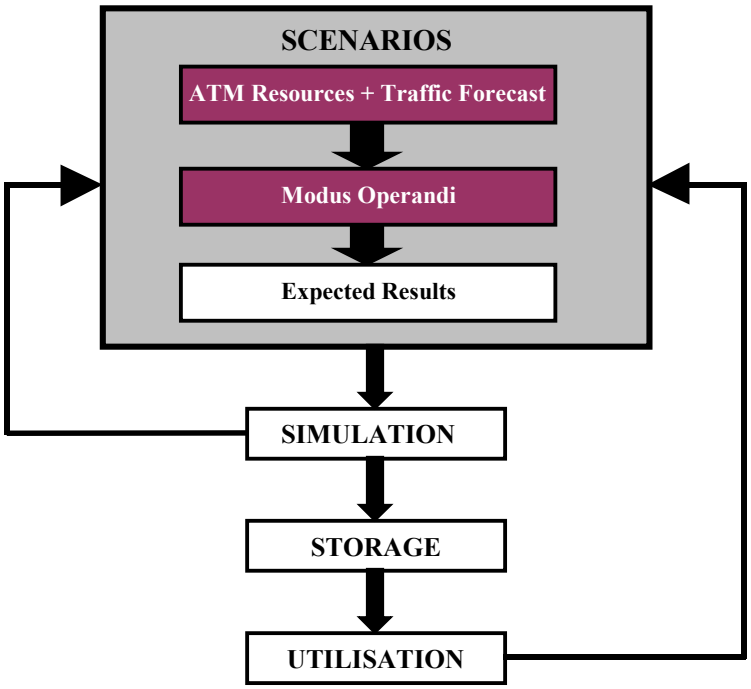

Figure 5 : General Working Process for the Establishment of Scenarios

2.3.2. Description of the ATFCM Solutions

2.3.2.1. Optimised Utilisation of the Available Capacity

2.3.2.1.1. Sector Management

Air Traffic Control sectorisation is the means of subdividing the totality of control tasks into manageable portions, at which throughput and capacity can be quantified.

In order to optimise the utilisation of the available capacity, two methods of Sector Management will be used :

- the management of sector configuration;
- the management of the number of sectors .

The management of the sector configuration will consist of optimising the configuration of the current number of sectors in order to meet the traffic demand and with the aim of minimising the delays. It shall be clear that the different sector configurations proposed by the ATS Providers shall be assessed in order to achieve the best compromise at a network level.

The management of the number of sectors consists of identifying the appropriate number of sectors that are required both from the local and network point of view to accommodate the traffic demand. This method encompasses the provision of additional sectors or the reduction of active sectors according to, for example, different traffic patterns or based on the comparison between the morning and the afternoon traffic volumes. In other words, it means the re-allocation of resources to different time of the day or calling upon additional resources for peak period.

2.3.2.1.2. Civil/Military Co-ordination

The ASM consists of sharing and/or segregating airspace among various categories of users and according to their real needs. The ASM functions have been implemented through the Flexible Use of Airspace (FUA) Concept that considers airspace as one continuum to be used flexibly on a day-to-day basis. The objectives of the FUA Concept are to increase the capacity of the air traffic system in order to respond to the traffic demand, and to allow the maximum joint use of airspace by appropriate civil/military co-ordination.

The co-ordination process between the CFMU, the ACCs/FMPs and the Airspace Managers/AMCs in any of the ATFCM phases will be strengthened to allow the CFMU to identify early in advance capacity shortfalls, which can be solved by a better airspace design and allocation.

To that end, routing scenarios using pre-defined permanent and/or conditional routes developed during the Strategic Phase and/or requirement for Reduced Co-ordination Airspace (RCA) application will be defined for critical ACC sectors to solve the capacity shortfalls identified at pre-tactical level. Such pre-defined scenarios will be based either on the status, potential availability, adaptability and permeability of associated military reserved areas (i.e. Temporary Airspace Allocation Concept) or Conditional Routes (i.e. Enhanced CDR Concept).

2.3.2.1.3. Reduction of the Traffic Complexity in order to decrease the Controller Workload

The objective of this solution is to identify the use of tactical operational techniques to create a less complex traffic situation that will decrease the overall controller workload. Consequently, it will result in an increase of the capacity.

It is the responsibility of each ATS Provider to determine the potential benefit in capacity resulting from a reduction of the traffic complexity and the associated controller workload.

2.3.2.1.4. Revised Capacity Value

The objective of this ATFCM solution is to determine with the local units, their ability to increase temporarily their capacity according to the traffic workload and the associated complexity, to accommodate the forecast traffic demand.

The awareness of capacity value adaptation will be based on post analysis of the traffic situation data that will be stored and shared between the CFMU and the local units concerned.

This activity will be an iterative assessment of the stored traffic data with the aim of fine-tuning and finally identifying the appropriate capacity value according to pre-defined traffic situation scenarios.

2.3.2.1.5. Holding Pattern

The objective of this ATFCM solution is to optimise the utilisation of the airport holding pattern facilities. The holding pattern may therefore be considered as a “reservoir” allowing the use of the runway at its optimised landing-rate and minimising the need for ATFCM restrictions.

However, the following issues are still pending and should be addressed by the airports/ATS Providers in collaboration with the CFMU :

- to what extent could this solution be pre-planned;
- is this solution applicable to all aerodromes (e.g. geographical issue, ATC procedures issue, etc);
- the capacity values provided by airports and associated ATS Providers should consider the holding pattern capabilities.

2.3.2.1.6. Balancing of Arrival/Departure Capacity

This ATFCM solution consists of identifying an imbalance between arrival and departure traffic depending on ground infrastructure layout and capacity. CFMU through the CDM process with airport and ATS Providers will determine the optimised arrival/departure capacities.

2.3.2.2. Utilisation of Other Available Capacity

2.3.2.2.1. Re-routing

This ATFCM solution consists of moving traffic from sector(s) with traffic demand surfeit into other sector(s) where appropriate capacity is available or where the imbalance is much less pronounced. Different types of re-routing by flow or by flights, mandatory or recommended, will allow CFMU through CDM process to ensure the implementation of re-routing scheme.

The re-routing might have some impact on some elements that have to be considered. Any re-routing shall be co-ordinated in such a way that it will reduce the overall network delay and must take account of any increase in ATC complexity. In addition, it has to be established that extra-penalties incurred by re-routing that has been agreed through the CDM process must be acceptable to AOs and spread equitably among them.

There will be a need to identify those possible re-routed flights/flows that would provide the best capacity benefits. This ATFCM solution may impose the development of specific procedures and associated co-ordination processes between the ACCs involved in order to perform safe and efficient re-routings. During this process FPL data must be accurately maintained.

2.3.2.2.2. Flight Level Management

The management of the flight level consists of modifying the RFL of the flights/flows (e.g. early climb, late descent, change of cruising level, etc) in order to accommodate any constraint that will take place on the expected route.

This measure will be considered as follows :

<u>At the Strategic Level :</u>

- the best flight profile and associated RFL is identified in order to avoid the possible constraint;
- this procedure is published in strategic document (e.g. AIPs, RAD);
- FPL processing systems must be able to support this measure.

<u>At the Pre-Tactical Level :</u>

- through the CDM, a new RFL will permit the transit through the constraint not activated;
- this procedure is published in pre-tactical document.

<u>At the Tactical Level :</u>

- through the CDM, the RFL is modified using established procedures within pre-defined scenarios.

Should the management of FL be envisaged, care shall be taken about the possible upstream and downstream problems that could be created and that could increase the traffic complexity and the controller workload. Traffic climbing/descending in a sector originally designed for overflying traffic may quickly create overloads even if official capacity is not reached.

In addition, modifications to the RFL shall be limited to the real necessity to avoid yo-yo flight profiles and an efficient scale of RFL changes shall be identified taking into account the AOs requirements (e.g. the change of the cruising RFL 360 into RFL 100 is not relevant). It shall also be clear that the management of flight levels is not intended to interfere with the task of controllers to provide separation between aircraft.

2.3.2.2.3. Advancing Traffic

This ATFCM solution consists of allowing an earlier take-off time or providing an earlier ETO in order to remove the flight from the regulated area. When advancing the flight, care shall be taken about other possible restrictions that could have a more penalising impact on the advanced flight.

The use of this solution will be reflected as follows :

- at the pre-tactical level, advanced slots will be proposed to AOs providing that they will not impact the airport slots;
- at the tactical level, an advanced slot will be proposed by CFMU according to agreed procedures.

As this solution shall be based on accurate and correct FPL data, there is a need to evaluate to what extent the EOBT value currently inserted in the FPL already includes some expected delays anticipated and calculated by the AOs.

2.3.2.3. Regulation of the Demand

2.3.2.3.1. Implementing Restrictions

When implementing restrictions that decrease the demand according to the sector capacity, CFMU is required to achieve a very fine balance between the contradictory objectives of protection of the safety of operations in ATC sectors and the minimisation of penalties incurred by AOs. Therefore, the restrictions shall be minimised and consistent with ATC protection.

Two different methods for the implementation of restrictions can be considered :

- implementation on a given airspace requiring ATC protection;
- implementation considering the network effect.

The first method consists of implementing a restriction on a given airspace where traffic demand exceeds the airspace capacity declared by the ATS Provider in order to comply with the ATC protection.

The second method considers the network to find dedicated areas where restrictions could be implemented in order to protect a given airspace. This approach could be developed along the following lines :

- the restriction could be applied to one sector in order to protect other sectors;
- the restriction could be applied to a flow of traffic. In order to ensure effective capture of the traffic concerned, an airspace volume involving more than one sector may need to be selected.

- the restriction could be applied to the destination as a means of capturing a flow.
- the restriction could be applied on a flow generating high complexity of traffic in order to reduce the controller workload that will result in capacity increase.

2.3.2.3.2. Acting on Airborne Traffic

Possibilities to act on traffic loads after take-off already exist and shall continue to be developed in order to decrease the controller workload (see para 2.3.2.1.3). However, the tactical use of these ATC operating techniques (e.g. local re-routing, FL adjustments, parallel streams, speed management, minimum departure interval, etc) are mainly restricted within TMA environment (e.g. speed management) or at the local level (ACC) to solve sector capacity problems without co-ordinating with up- and downstream ACCs.

The ATFCM will require the use of all of these ATC operating techniques during all phases of the flight (departure, en-route and arrival phases). Furthermore, as the decision of each individual ATSP may have impact on other ones, the intention to use these techniques should, if time permits, consider the eventual impact on the network. Therefore, their implementation should be co-ordinated with up- and downstream ATSPs together with the CFMU through the CDM process.

2.3.3. Seamless and Continuous ATFCM Process

Historically, the ATFM has been divided in three phases (Strategic, Pre-tactical and Tactical) during which specific activities were conducted according pre-defined timeframes (One year and one week before the day of operations, on the day of operations).

The ATFCM evolution will consist of ensuring seamless and continuous Flow and Capacity Management operations from strategic planning to tactical usage without considering fixed timeframes (see figure 6). The main differences between the ATFCM phases will therefore be the number and role of partners involved in the CDM process, the time given to do it and the need for advance notice of the decision taken.

The objective of the seamless and continuous ATFCM process is the provision of an effective ATFCM Service that will consider the initial planned resources (Airspace structure, ATC capabilities, airport capabilities and traffic forecast) to organise the ATM/airport capacity according to the traffic demand. The intention is to minimise impact of any disruptions and to take benefit of any opportunity in order to enable all stakeholders to conduct efficient real-time operations. The Strategic, Pre-tactical and Tactical phases will be continuously iterative and interactive. The output of a phase will aim at preparing the next phase and will therefore be used as input element to be considered at the beginning of the next activity together with any feedback.

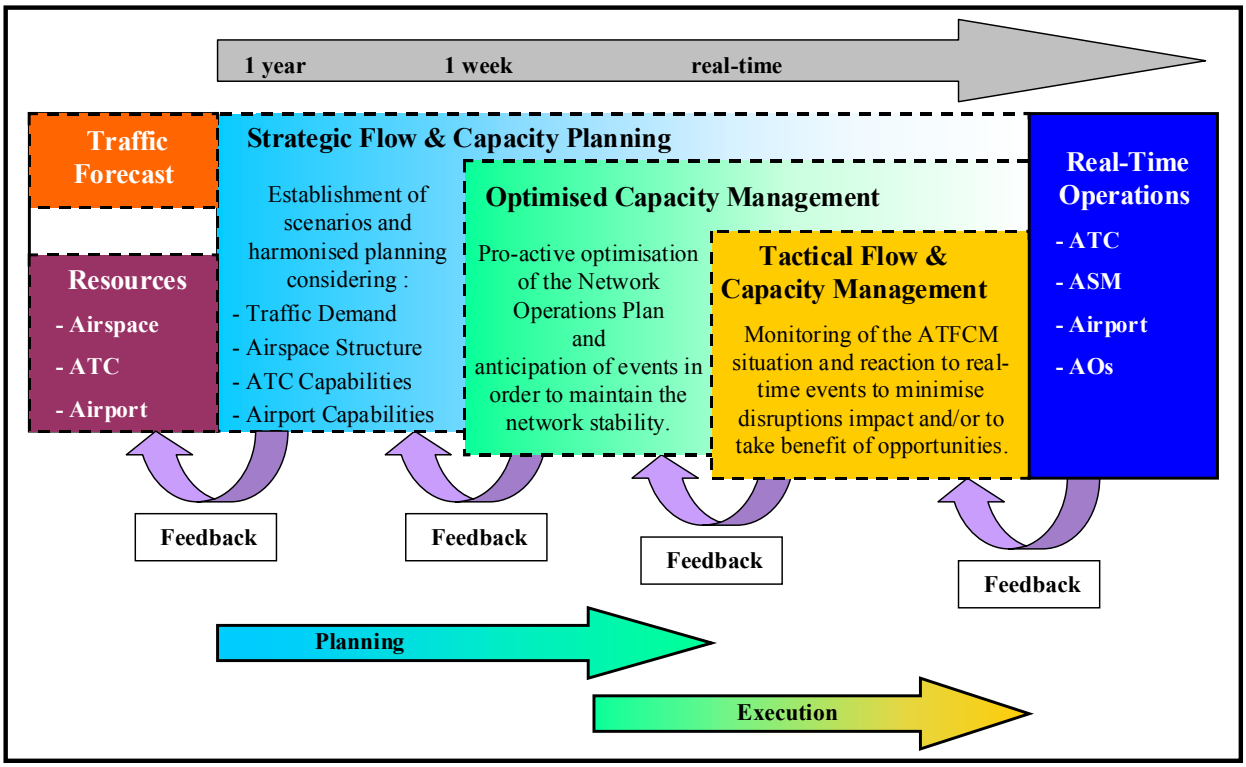

Figure 6 : Seamless and Continuous ATFCM Process

The Strategic and Pre-tactical phases will aim at establishing an ATM “platform” (Network Operations Plan - NOP) as optimised and stable as possible enabling all partners to fine-tune the planning of their resources according to the expected traffic demand.

On the day of operations, the Pre-tactical activities will continue as more accurate information will become available, and will induce the amendment of the NOP and dissemination of updates. The purpose of these Pre-tactical activities will be to preserve the stability of the NOP and associated updates through the anticipation of any possible events in order to avoid as much as possible the need to react in real-time and to enable each of the partners of the network to be aware of the situation.

However, some real-time events will impact on the NOP in generating instability. The Tactical phase will consist of continuously and pro-actively monitoring the real-time situation in order to identify these real-time events. This phase will assess their impact on the ATFCM situation and manage them accordingly through a dynamic reaction with the implementation of adequate co-ordinated ATFCM solutions that will lead to retrieve network stability and capacity optimisation.

The figure 7 illustrates the difference between Pre-tactical and Tactical activities from a current time perspective when an event occurs. According to the assessed demand and to the optimised capacity, ATFCM measures have already been implemented within a stable NOP through Pre-tactical activities.

However, this stable plan may be impacted by an event that modifies the initial conditions. New or revised ATFCM solutions have to be found in order to retrieve the stability. They will be implemented according to the status of the flights and the capabilities of the ATFCM partners:

- the situation of the airborne traffic impacted on short notice by the event is solved with the immediate use of ATC operating techniques.
- for other airborne traffic, for traffic about to depart and for traffic having already submitted a FPL, the Tactical activities manage the ATFCM situation through the fine-tuning of the detailed flights and of the existing measures (individual re-routings, capacity adjustment etc) and if required through a revision of the existing plan. If the impact is for a long period, this tactical phase converges towards a Pre-tactical one.
- the traffic on the ground having not yet submitted a FPL is impacted by revised ATFCM measures through NOP updates as result of Pre-tactical activities.

The solutions are impacting each other : ATC techniques will create a disruption that will affect the Tactical ATFCM solutions that in turn will impact the Pre-tactical plan. The Pre-tactical phase will take into account these actions to better refine its further plan (domino effect). Depending on the size of the disruption, the activity will be contained at ATC level, or spread over a longer period.

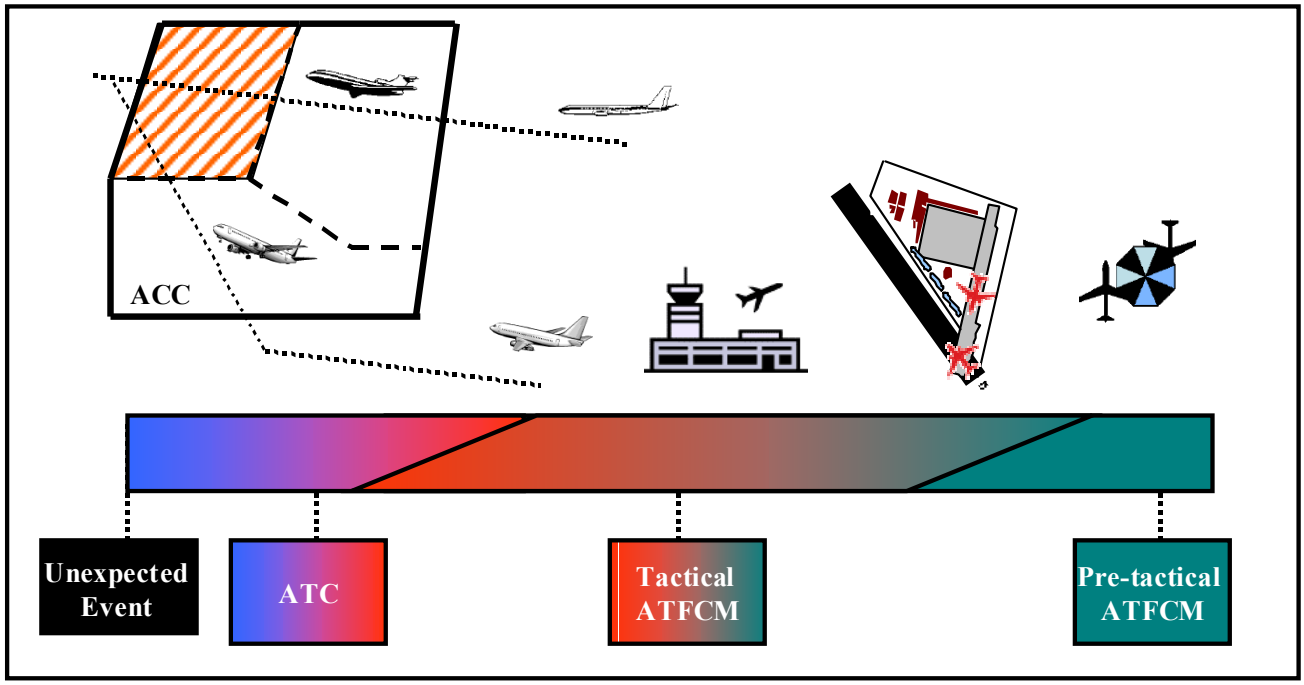

Figure 7 : Difference between the Pre-Tactical & Tactical Phases

The Strategic, Pre-tactical and Tactical phases will be supported at any stage by post-analyses to ensure that the rationale for the next step forward remains valid in the light of the operational experience. The post-analyses shall be based on indicators showing what works and what does not work in order to implement the required improvement. In addition, “Best Practices” identified by the CFMU will be shared between all stakeholders and will be taken into account during CDM processes.

Depending on the results of the post-analysis conducted in real-time or during long term simulation, the improvement to be implemented will be considered at the appropriate ATFCM phase. Real-time monitoring and evaluation will highlight problems that will be initially solved by the fine-tuning of the appropriate ATFCM solutions implemented in real-time. Should the problem be more important or be redundant, a solution will be found through pre-tactical CDM. In the same manner, adaptation of the pre-defined scenarios according to post-analysis studies will allow resolution of major capacity problems. Ultimately, the post-analysis will identify critical situations requiring adaptation of the planned resources in the Strategic phase.

Requirement TCM 01 : Define post-analysis procedures, tools and indicators in order to evaluate the efficiency of the implementation of the ATFCM solutions at any stage of the ATFCM activities.

Requirement TCM 02 : Establish feedback mechanism to ensure that the results of post-analysis will be used as input data in each of the ATFCM activities

Requirement TCM 03 : Develop procedures and associated tools to share "best practices" between all partners.

As the objective of the ATFCM process is the provision of an efficient ATFCM Service, it is required to ensure a certain level of quality in order to respond to the AOs needs (e.g. reduction of costs, maximum of freedom of movement, etc). In addition, the ATFCM impact on the flight needs to be considered in the greater scope of punctuality in order to provide a target to all stakeholders regarding delays in which the focus will be on arrival times.

Therefore, several performance indicators must be developed in order to support different monitoring areas such as capacity management, the effectiveness of the ATFCM process, the minimising of overdeliveries, etc.

The development of tools for traffic situation analysis and indicators monitoring will rely on the capacity to capture actual position data, to match them to flight plan data, to record them and finally to provide support for analysis. The prerequisite will be to obtain an updated reporting of flight positions taking into account that deviations may be caused by various reasons such as ATC short-term requirement, Airspace Status modification (e.g. opening a CDR3), winds, or non-compliance with ATFCM measures.

Requirement TCM 04 : In order to ensure the Quality of Service, the CFMU systems shall be able to keep track of the planned and the current trajectories and capacity.

Requirement TCM 05 : Develop additional quality control tools to enable the identification of abuses of the system.

Requirement TCM 06 : Develop additional quality control tools to monitor closely the CFMU performance.

Requirement TCM 07 : Develop "on-line" tools to ensure quality control.

Requirement TCM 08 : Ensure the provision of data reports and statistics on ATFCM operations and delay situations in support of performance evaluation for managerial and operational decision making of ATC service providers.

Requirement TCM 09 : Develop procedures to track the operational performance of the ATM system and the contribution of individual ATS providers.

Requirement TCM 10 : Improve on-line access to CFMU operational data in order to assist ATFCM partners to make informed decisions regarding their own actions (e.g. FPL optimisation).

2.3.4. Application of the ATFCM Solutions within the ATFCM Process

2.3.4.1. Strategic ATFCM (Planning Phase)

Strategic ATFCM will aim at forecasting the need for capacity and at adjusting the demand in order to prevent strong imbalances within available capacity. This Planning Phase will consist of optimising the available capacity by successive refinements of tuneable factors (airspace organisations, staffing arrangements, etc), of adjusting the demand in some particular areas or time periods when there are imbalances, and of informing all partners through data exchange.

These objectives will be achieved through a chain of collaborative actions that can be conducted at National and International Level. The traffic forecast will be compared with the planned ATM environment and, through iterative processes, users and service providers will be able to examine and refine their plans in order to optimise the users schedules and service provider's plans. This iterative process will be conducted initially in a semi-automated environment, but will be progressively enhanced by the use of simulation tools and the growing benefits of Information Management, to accurately model the airspace and the demands placed on it. This will potentially be developed into a fully interactive planning and decision process that will provide the optimum balance between users' needs and service providers' capabilities.

The expected capacity shortfalls will be highlighted by comparing the forecast European traffic demand with the airport schedule and capacity, with the Airspace Structure (routes, sectors, etc) including capacity values and taking into account the planned ATC capabilities.

Requirement TCM 11 : Improve process to get data on the current and expected traffic evolution (intentions of the AOs) and on expected airspace changes.

Requirement TCM 12 : Develop simulation tools in order to identify the expected capacity shortfalls in the network and at sector levels through the comparison between the ATM data and the forecast traffic.

The sectors and airports concerned will be identified and several ATFCM solutions will be assessed (see figure 8) through a CDM process between all partners involved in order to optimise the local and/or the overall capacity. The resulting change requests will be consider within the ATM environment in order to define the most effective compromise between all parties.

Requirement TCM 13 : Set-up collaborative processes between all partners involved aimed at defining the "change requests" to the ATM environment that are required to accommodate the forecast traffic demand.

The use of simulation tools will permit more accurate evaluation of the benefits associated with the possible ATFCM solutions.

Requirement TCM 14 : ***Develop a sector management tool to assist ATS Providers in defining sectors configurations and in enabling the assessment of the impact of the different configurations in the overall area.***

Requirement TCM 15 : ***Assess through simulation the impact of the activation/de-activation of FUA structures on the traffic situation.***

Requirement TCM 16 : ***ATS Providers to identify through simulations operational techniques leading to less complex traffic situations.***

Requirement TCM 17 : ***Develop a capacity planning tool to assist ATS Providers in the provision of an operational capacity plan through the assessment of different options.***

Requirement TCM 18 : ***ATS Providers to evaluate through simulations the possible benefits of an optimised use of the airport holding patterns.***

Requirement TCM 19 : ***ATS Providers to determine through simulations the optimal balance of arrival/departure capacities of airports.***

Requirement TCM 20 : ***Identify through simulation the possible re-routings and develop co-ordination procedures between ATS Providers concerned.***

Requirement TCM 21 : ***Evaluate through simulation the potential benefits of FL management on the network and define the procedures of use.***

Requirement TCM 22 : ***Assess through simulation the impact of critical events and unstable flows.***

The remaining expected capacity shortfalls would be solved by reducing the traffic demand for the critical areas wherein no other solution could be found. Some capacity shortfalls will also be considered as acceptable at the Strategic level because the fine-tuning of the ATFCM solutions during the Pre-tactical and/or Tactical working process should solve them.

Pre-defined scenarios and associated Modus Operandi related to the use of routes (e.g. Conditional Routes, re-routings), activation/de-activation of areas (e.g. TSAs) and sector management (e.g. merging of sectors) will therefore be established. These scenarios will aim at absorbing all the planned traffic patterns at the sector and at the network level. They shall be as efficient as possible in order to provide CFMU and ATS Providers with the necessary flexibility to respond to increased traffic demand, and AOs with multiple options. In addition, critical situations, crisis and special events should also be anticipated by defining some potential scenarios.

Requirement TCM 23 : ***Define standard ATFCM scenarios and associated Modus Operandi (sectors, routes and areas) in order to respond with flexibility to the variation of the traffic demand.***

Requirement TCM 24 : Define scenarios in order to anticipate critical events.

A pre-validation of the airspace structure before any publication (e.g. AIP) and before implementation will be conducted together with the evaluation of the possible scenarios. When validated, the data and the scenarios incorporated in the RAD will be provided to the ATFCM users to enable them to check their own flight plans and to consolidate their own databases.

Requirement TCM 25 : Pre-validate scenarios and new airspace structure before any publication.

Requirement TCM 26 : Ensure the storage of the scenarios and associated Modus Operandi.

Requirement TCM 27 : Develop access to the CFMU Environment database (as part of the Airspace Data Repository concept) to all partners concerned.

Requirement TCM 28 : Establish a transparent process to ensure that the output of the Strategic phase will be communicated to all parties concerned in the Pre-tactical activities.

This stage will be followed by the Pre-tactical and Tactical working process that will consider the pre-defined scenarios together with the more accurate traffic demand and user capability data.

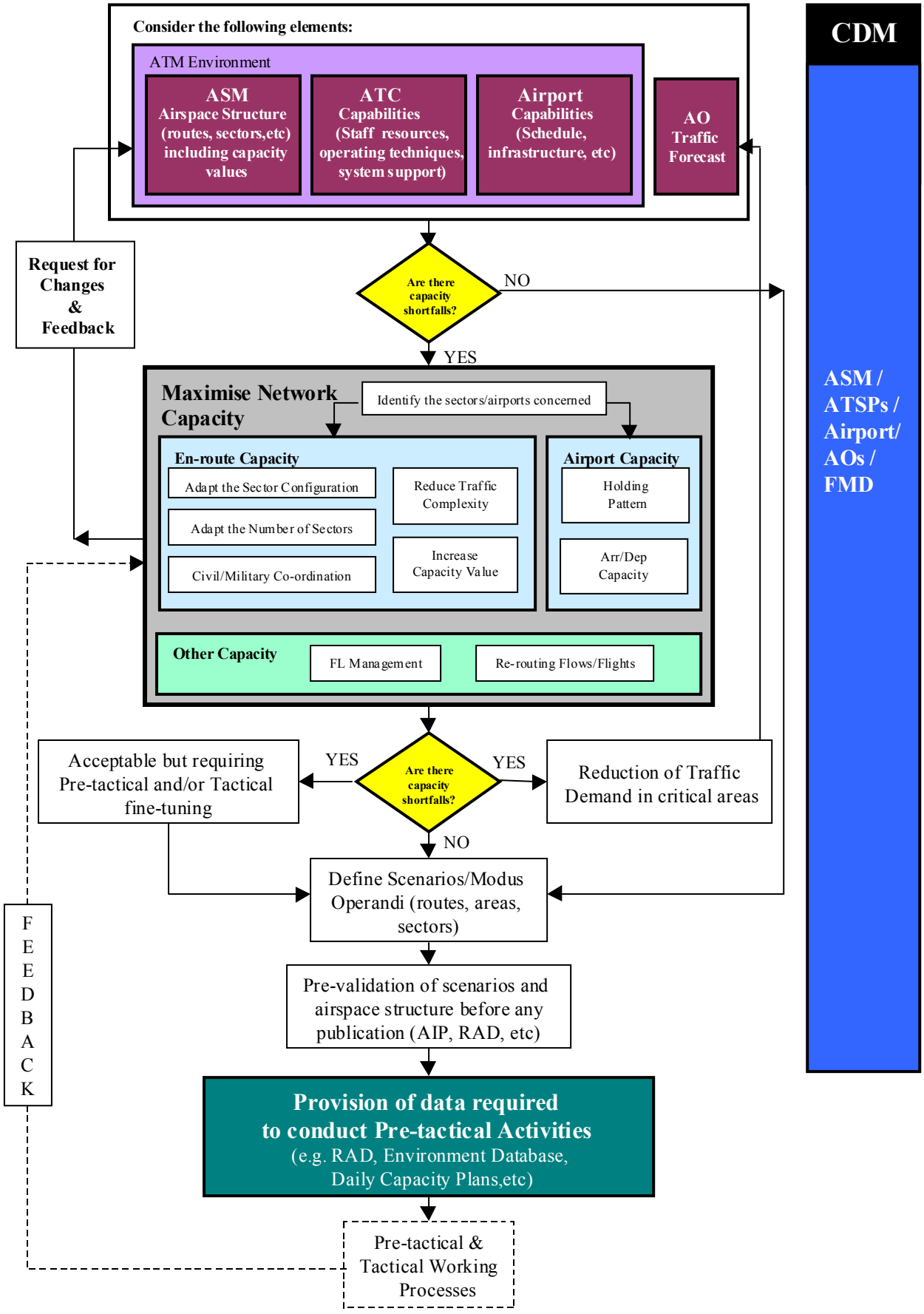

Figure 8 : Working Process for Strategic ATFCM (Planning Phase)

2.3.4.2. Pre-tactical ATFCM (Anticipating Phase)

The Pre-tactical ATFCM will consist of optimising the capacity through a more effective organisation of the ATM/airport capacity according to the predicted traffic demand. This optimised capacity management will rely on the use of the ATFCM solutions according to a chain of collaborative actions and decision-making activities as described in the figure 9. This top-down approach will allow a smooth transition from the identification of expected capacity shortfalls to implementation of restrictions as the last solution to be considered.

This working process starting about one week before the operations will aim mainly at refining the details of the original forecast over time and at preparing and promulgating an optimised and detailed plan (Network Operations Plan - NOP). The process will be a continuously iterative and interactive validation, development and refinement of long-range forecasts supported by lessons learned and best-practices, built into a rolling NOP, as better traffic demand and user capability data become available. As result of all simulations of the various ATFCM solutions, scenarios will continue to be established, fine-tuned, stored and used within the NOP.

This working process will be supported by CDM activities involving all partners concerned (CFMU, ATS Providers, AMCs, and AOs). The discussions occurring during the CDM activities shall lead to a consensus view and solution implying an official commitment of each participant. Depending on the type of ATFCM solutions to be considered, only a limited number of partners could be involved, while, in other circumstances, all stakeholders would participate to the CDM activities.

Requirement TCM 29 : Set-up collaborative processes between all partners involved aimed at identifying the most appropriate ATFCM solution(s) to be implemented in order to establish an efficient Network Operations Plan.

Requirement TCM 30 : Ensure the participation of AOs in the ATFCM CDM process in order to increase the AOs knowledge on the possible solutions and to take the best solutions under the prevailing circumstances.

The working process will initially consists of comparing the forecast demand with the declared capacity in order to identify the capacity shortfalls. To that end, the imbalances will be clarified by the different sector configurations. Therefore, the ATS Providers will provide CFMU with all their manageable sectorisation options associated with the capacity values. In addition, other data of interest such as meteo forecast may be required to support this process.

At this stage, as the ATFCM measures are not implemented, the network capacity is equivalent to the sum of the capacity values delivered by each FMP.

Requirement TCM 31 : Develop procedures to get Strategic ATFCM data, expected traffic demand and other data of interest.

Requirement TCM 32 : Develop simulation tools in order to identify the expected capacity shortfalls at the network and sector levels through the comparison between the Strategic ATFCM data and the expected traffic.

In collaboration with the partners concerned, the ATC behaviour will be organised in order to maximise the network capacity through optimising the local capacity. To that end, ATFCM solutions such as the “Sector Management”, the “Increase of Capacity Value”, the “Enhancement of Civ/Mil Co-ordination”, the “Reduction of Traffic Complexity”, the “Holding Pattern” and “the “Balancing of Arrival/Departure Capacity ” will be assessed, validated and implemented. The result will be to solve some capacity shortfalls in sectors. However, imbalance between demand and capacity could still exist.

Requirement TCM 33 : Develop a sector management tool to assist ATS Providers in configuring their sectors according to the traffic demand.

Requirement TCM 34 : Assess through simulation the impact of the activation of airspace structure on the traffic demand.

Requirement TCM 35 : Develop a co-ordination tool between AMC, CFMU and FMP(s) concerned in order to :
- ***review the airspace allocation to better accommodate the traffic demand,***
- ***enable CFMU to re-consider with the FMPs the declared capacity according the updated airspace structure.***

Requirement TCM 36 : AMCs to provide accurate information on airspace allocation and route availability according to the “Airspace Data Repository concept”.

Requirement TCM 37 : CFMU to update the Environment database according to the airspace allocation decision.

Requirement TCM 38 : Develop an assistance tool allowing ATS Providers to identify the operational techniques to be implemented to reduce the controller workload.

Requirement TCM 39 : Develop an assistance tool allowing the ATS Providers concerned to use the airport holding patterns at their optimum level.

Requirement TCM 40 : Develop an assistance tool allowing the CFMU and the ATS Providers concerned to identify imbalance between arrivals and departures and to implement the optimised Arrival/departure capacities.

The network capacity will be assessed in order to optimise other usable capacity. Where this available capacity might be used, the CDM process will allow consultation to implement the best ATFCM solutions such as the “Re-routing”, the “FL Management” and the “Advancing Traffic”. A re-assessment of the network capacity picture will be conducted to identify the remaining imbalances and if the capacity could be optimised in any sectors or airports. The final remaining imbalances will be solved by the application of restrictions where required. A last assessment of the network capacity will be conducted in order to reduce the number of restrictions by trying to optimise the capacity in some sectors or airports.

Requirement TCM 41 : Develop tools to assist CFMU to identify the “other available capacity”.

Requirement TCM 42 : ***Develop means to assist the CFMU and the concerned ATS Providers to identify the possible re-routed flights/flows providing the best benefits according to the traffic demand and AOs capabilities.***

Requirement TCM 43 : ***Ensure that any route amendments will be notified to all parties concerned through the FPL processing.***

Requirement TCM 44 : ***Develop FL management tool to assess the impact of the RFL changes on the downstream ACCs and on the traffic complexity, and publish associated procedures in pre-tactical document.***

Requirement TCM 45 : ***Develop procedures in order to identify flights that are in position to receive an earlier take-off time or ETO, to assess the impact of this solution on the network and to propose advanced slots to AOs.***

Requirement TCM 46 : ***Improve slot allocation mechanism through :***
- ***adjustment of CASA parameters;***
- ***monitoring of CASA performance;***
- ***development of tools to assist in restriction implementation (What-if);***
- ***development of tools to assess the best restriction implementation strategy.***

The final result of this working process will be the finalisation the day before the operations of a consolidated NOP developed according to the solutions solving the capacity shortfalls, but still imposing delays to some AOs where restrictions are implemented. The NOP will provide an overview of the ECAC ATM situation from which the partners may access and extract data for selected areas to support their operation and, if required, to create their specific operations plan. On the day of operations, Pre-tactical activities will continue to take place in order to update closer to the operations, the NOP according to more accurate information as, for example the Updated Airspace Use Plan.

Requirement TCM 47 : ***Extend the CFMU network management activities on the day of operations.***

In order to promulgate the NOP and associated updates, and to notify any ATFCM information to all stakeholders concerned, a collaborative ATFCM interface will be developed taking full advantage of modern communication means.

Requirement TCM 48 : ***Improve the ATFCM information process in order to disseminate the NOP and the updates to reach the wider audience.***

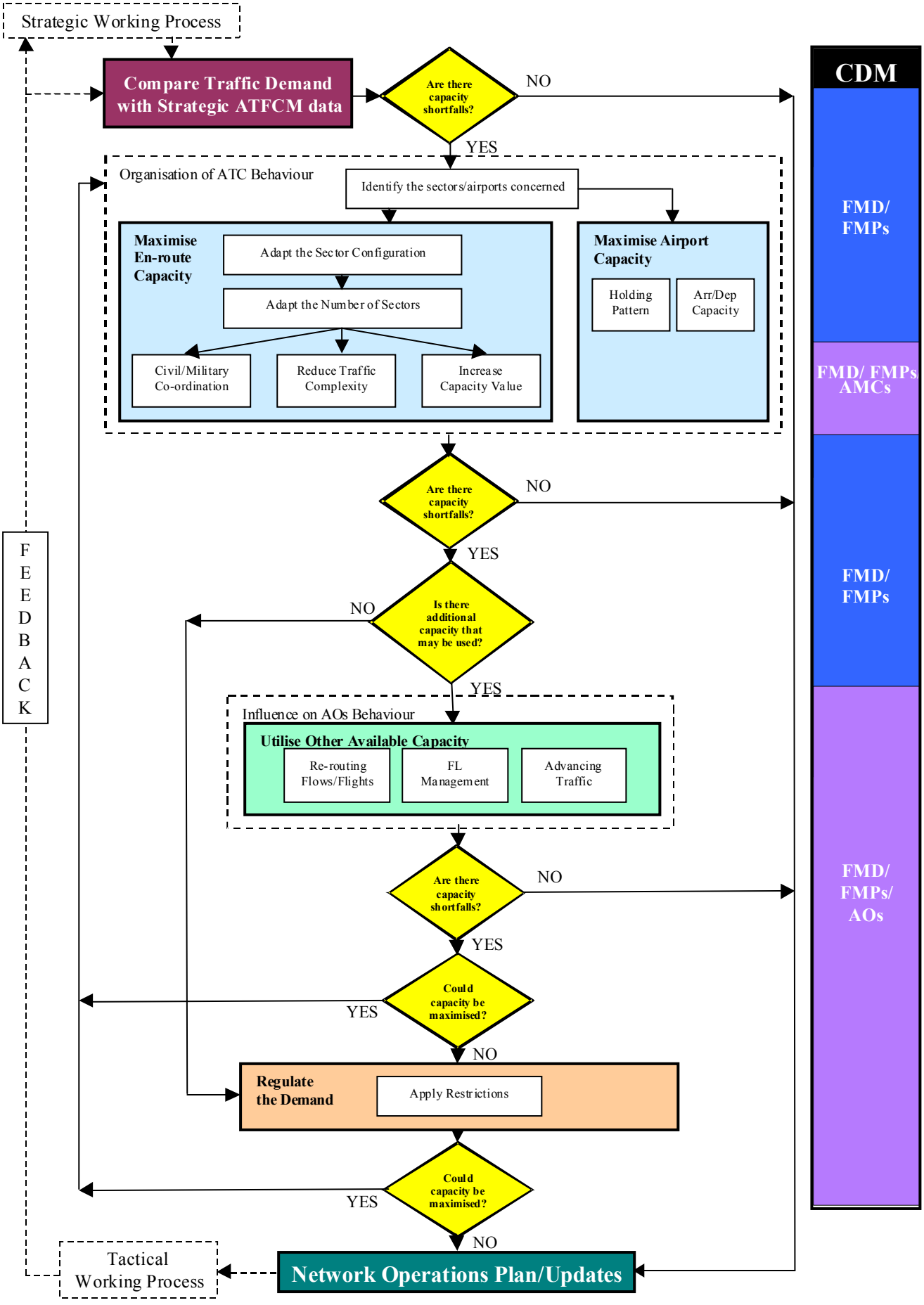

Figure 9 : Working Process for Pre-tactical ATFCM (Anticipating Phase)

2.3.4.3. Tactical ATFCM (Reacting Phase)

As already explained, the Pre-tactical and Tactical activities will continuously be carried out on the day of operations. The Tactical phase will therefore consist of continuously and pro-actively monitoring the ATFCM situation to identify and consider the real-time events. This will aim at applying any refinements needed to the NOP in order to restore the ATFCM stability. The need to adapt the original plan may result from significant weather phenomena, unexpected ground or space infrastructure opportunities/limitations, more accurate FPL data, revised sectors capacity values, etc. The main purpose will be to minimise the impact of any disruptions and to take benefit of any opportunity. This will rely on the provision of the traffic and capacity situation as accurate as possible to all partners.

Requirement TCM 49 : Develop procedures to get accurate information on real-time events.

Requirement TCM 50 : Improve the accuracy of the capture of the real-time traffic data.

Requirement TCM 51 : Improve short-term traffic prediction tool.

Requirement TCM 52 : Develop tools and procedures to assist CFMU and ATS Providers in assessing the impact of real-time special events (weather phenomena, ground or space infrastructure opportunities/limitations, etc) on the network and local level capacity, according to the Network Operations Plan and/or the current ATFCM situation.

Requirement TCM 53 : Develop What If tools in order to conduct short-term simulations.

The working process for tactical ATFCM activities (see figure 10) will be similar to the process enabling the capacity optimisation during the Pre-tactical phase. The main differences will be the number and role of partners involved in the CDM process and the time given to do it, as most of the events will require the implementation of real-time solutions. According to real-time capacity shortfalls or opportunities, the adequate ATFCM solution(s) will be considered, assessed and implemented through the CDM process to guarantee a beneficial impact on the network. Tactical use of ATC operating techniques aiming at acting on airborne traffic will be considered as additional real-time ATFCM solutions to be implemented at any stage of the flight (departure, en-route and arrival phases).

Requirement TCM 54 : Ensure that the collaborative processes between all partners concerned allow to conduct within a short timeframe the identification, assessment and implementation of adequate and co-ordinated ATFCM solutions including the use of ATC operating techniques acting on airborne traffic, followed by their notification.

Requirement TCM 55 : Develop information sharing process in order to support the CDM.

Requirement TCM 56 : Develop a sector management tool allowing data exchange between CFMU and ATS Providers to up-date in real-time the current configuration, including the number of activated sectors.

Requirement TCM 57 : ***Improve the CFMU Environment database in order to process real-time updates of airspace structure.***

Requirement TCM 58 : ***Develop an assistance tool allowing CFMU and ATS Providers to exchange accurate capacity data and to adapt the best capacity value according to the traffic data.***

Requirement TCM 59 : ***Develop re-routing processes to assist the CFMU and the ATS Providers concerned to identify the possible re-routed flights/flows providing the best capacity benefits.***

Requirement TCM 60 : ***Ensure that real-time route amendments are notified through the FPL processing.***

Requirement TCM 61 : ***Develop FL management tool to assess which pre-defined scenario will be used in order to modify the RFL and make the controller who will control the flights/flows, aware of the modification of the RFL.***

Requirement TCM 62 : ***Develop slot allocation procedures and tools to improve restriction implementation and management of individual flights (e.g. departure sequence, unexpected events, local constraints, etc).***

To enable all partners to conduct their operations, a consolidated Network Flow and Capacity picture will be provided. This Network Flow and Capacity picture will look like a snapshot of the ATM real-time situation that will enable a comparison with the existing NOP in order to identify any discrepancy between the plan and the current reality. The evaluation of the efficiency of the implementation of the ATFCM solutions will allow fine-tuning or re-considering them, if needed.

Requirement TCM 63 : ***Provide a consolidated Network Flow and Capacity picture to all partners, including flight intentions, status of airspace (permeability, opening and closing time), capacity values, ATFCM measures and constraints data, airport and meteo data.***

Requirement TCM 64 : ***Ensure the re-distribution of ETFMS flight data to ATS Providers concerned.***

Requirement TCM 65 : ***Develop tools to support the monitoring of the Network Operations Plan and the evaluation of its effectiveness.***

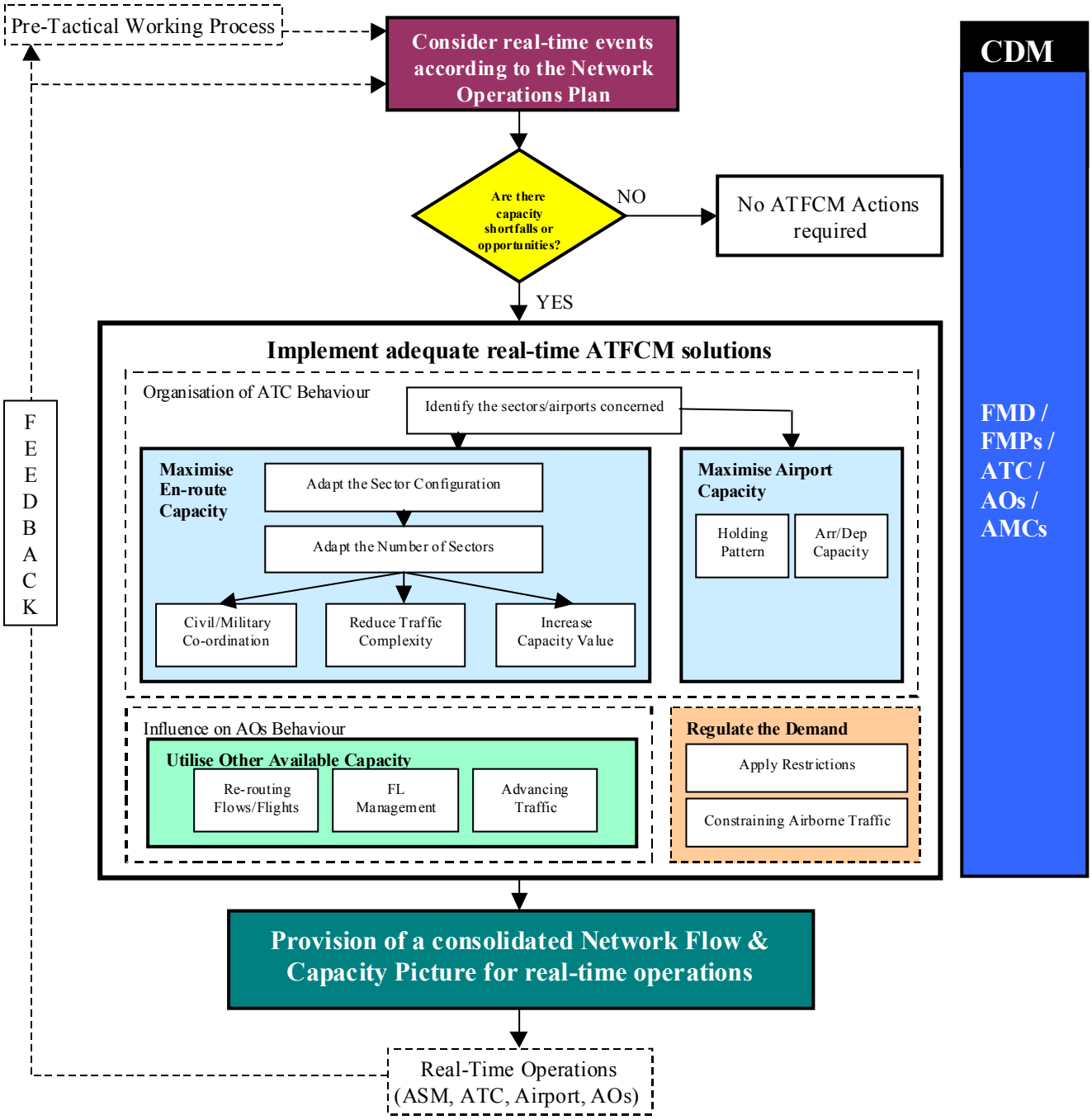

Figure 10 : Working Process for Tactical ATFCM (Reacting Phase)

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SECTION 3.

IMPROVING COLLABORATION WITH ATM PARTNERS

3.1. INTRODUCTION

The report of the Independent Study for the Improvement of ATFM highlighted also the need to address the relationship between ATFCM and other ATM activities. Therefore, the Direction for Change called “Improving Collaboration with ATM Partners” has been identified. The Direction for Change will contribute to support the achievement of the goal of the ATFCM Strategy. It will focus on the exchange of accurate ATM data (FPL, Airspace, response scheme to critical events, etc) and on the improvement of the collaboration processes between all stakeholders within a regulatory framework.

The following Lines of Actions will compose this Direction for Change :

- Ensuring Flight Plan Data Consistency and Dissemination

  In its evolution, flight planning has to accept the existence of differences and the specific needs of individual actors, while ensuring that a sufficiently common basis about the flight details exists in order to enable each actor to perform his specific duty in an effective and efficient manner. This will ensure flight plan data consistency and dissemination of accurate flight plan data to all stakeholders of ATFCM in order for each one to act from it and eventually on it.

- Optimising Interface with Airspace Management

  As optimised capacity management relies on airspace usage, there will be a need to optimise the interface with airspace management in order to involve all airspace users, in particular the militaries, and to take into account their needs in the decision making process. Therefore, the improvement of the co-ordination processes and the exchange and processing of accurate airspace data will support this Line of Actions.

- Collaborating with Airport Operations

  As tactical manager of the total network load, ATFCM will collaborate with airports in a genuine partnership. The airport will be seen as just one part of the whole ATM system in a “gate-to-gate” environment. The on-time delivery of the arriving aircraft at gate will be seen as a prerequisite for a subsequent on-time departure. To facilitate effective collaborative decision making, it will be imperative that all data required to make an airport function smoothly and to enable full ATM system integration, will be made available where it will be needed and at the moment it will be required.

- Managing Critical Events

  ATFCM will play a key role in the management of critical events. This management, be it pro-active (known events) or reactive (unplanned, but prepared) will be essential to minimise their impact and will rely on an efficient sharing of information between all partners in order to keep the ATFCM picture as accurate as possible.

- Implementing a Regulatory Process

  As ATFCM is balancing between parties and inside parties, there will be a need to implement a regulatory process to ensure equity between all partners and to monitor compliance to the rules.

As these Lines of Actions are clearly related to specific domains, they will be developed as distinct issues in order to ease the identification of the associated requirements and to avoid any possible confusion between the different processes of information sharing.

In addition, their development will be aligned with the ongoing activities conducted in the specific EATM domains and associated programmes such as airspace management, airport, flight and airspace data and regulatory matters.

3.2. ENSURING FLIGHT PLAN DATA CONSISTENCY AND DISSEMINATION

3.2.1. Generalities

The flight plan (FPL) is the primary interface between the Aircraft Operators (AO) and the ATM world in respect of the key elements of a flight and its intentions. ATM uses the FPL as the basis for data provision to ATC and ATFCM for planning purposes and ultimately as the basis for ATC decision making.

The Independent Study for the improvement of ATFM has raised attention to current FPL processing and distribution methods indicating that the system as a whole was working in an open loop. Although FPLs are agreed between AO and IFPS at the time of filing, subsequent changes may be made unilaterally by various actors and as a consequence, relevant data may be lost or not passed to those who need it. Further studies (Consistent flight data studies – EUROCONTROL ATD/CFMU) confirm that flight plan data presented to the controller is often not consistent with the flight intentions known to the pilot.

The impact of this data inconsistency is potentially high as far as safety is concerned but is generally alleviated firstly by ATC clearance delivery and read-back and secondly through the inter-ATC co-ordination processes (e.g. inter-sector co-ordination and OLDI) enabling the identification and resolution of inconsistencies. In spite of these safeguards, however, the clearance and co-ordination processes are not infallible and several safety incidents have reported inconsistent flight plan data as a major contributing factor. Studies analysing the extent and causes of flight plan data inconsistencies are being undertaken under the sponsorship of the EATMP Flight Data Management Sub-group (FDM SG). These studies include comparisons of AO/CFMU/ATS Providers/Radar/Airport data.

Flight Plan inconsistency can also have other consequences in terms of the overall efficiency of the ATM system.
For instance:

- if ATC controllers are not confident that the information presented to them is accurate then extra workload may result in confirming its validity.
- if inaccurate data is held in ATM systems then the planning of ATM is impacted and there is a resultant increase in the workload to resolve the inaccuracies. Such inconsistencies may impact on confidence in the system resulting in an under-declaration or reduction of ATM capacity.

The following paragraphs attempt to analyse the problem of flight plan inconsistency and its causes and seek to define the changes that will be required to ensure that all relevant actors have the same FPL information. This could be termed a Single Flight Plan for Europe.

Further developments of Flight Planning will be carried out at a later stage in close co-ordination with the appropriate EUROCONTROL departments. These further developments may include such advancements as data-linking and significant changes to the FPL format to better reflect flight capabilities and intentions.

3.2.2. The Problem of Consistency

3.2.2.1. The Roots of Inconsistency

Because the basic FPL data fulfils many roles it is not uncommon for it to be adapted to suit the need of the various users.

3.2.2.2. FPL Profile Constraints

There is, of course, part of the flight plan that cannot always be fully known 100% in advance. For instance SID/STARs are impossible to plan accurately and weather factors may also result in last minute changes so there must some scope within the flight planning procedures to permit late changes. However, once a FPL has been accepted by IFPS, there is currently no mechanism for ATM to update it before departure.

The IFPS determines a profile in accordance with the known environment structure. The IFPS validates the submitted FPL against this known environment and upon acceptance, calculates a profile for FPL addressing purposes which means determining which FIR/UIRs will be penetrated by the flight. The profile calculation is an exercise performed at the time of FPL submission and when modification messages are received. No re-calculation of the profile is initiated by the system as a result of ATM activity before departure. After departure, a limited number of flight plan update messages are received, processed and distributed by IFPS (AFP, FNM and MFS messages).

3.2.2.3. ATC Constraints

ETFMS applies additional constraints to the IFPS profile to match it to “sector penetration” rules and builds a new profile that often differs from IFPS.

It is not uncommon for ACCs to have specific FPPS requirements that are not published in the AIP and are consequently not reflected in the CFMU ENV. Some ATS Providers also input FPL information on a different route to that specified in the accepted FPL because they possess more current information concerning the route availability.

In particular, certain Letters of Agreement between ATC partners that have an impact on other actors, are not always captured in the CFMU Environment database, although this has been improving over the years.

Problems are caused because feedback is not always provided to IFPS, either at the time or post-event, when a third party changes the basic flight plan data.
All these factors may contribute to an eventual lack of consistency between the flight plan data held by the aircrew, IFPS and ATC.

3.2.2.4. ASM Constraints

The Flexible Use of Airspace (FUA) has further complicated the flight planning process. The FUA process indicates what CDR2 routes will be available for the following day. Flexibility implies that changes are made to FPL/RPL when airspace becomes available or is closed. This requires positive action by the AO through IFPS in which case all the relevant actors will be informed of the change of route. As already indicated however some ACCs process a revised route within their FPPS in the knowledge that it is available but without notifying other actors of the change. An open CDR2 is often interpreted as the route that will actually be flown even if the flight plan was filed and accepted on an alternative segment.

3.2.3. A Vision on Flight Plan Consistency

The ICAO Flight Plan is the common basis. While many elements are firmly determined in the flight plan, other elements however are less certain at the initial flight planning stage (e.g. SID, STAR, timing information in particular the total EET, etc).

Based on this initial flight plan, each ATM actor concerned with the flight elaborates a 4-dimensional flight profile using its own methods and tools, and optimising it for its own specific purpose: The Aircraft Operator for calculating the optimum fuel load and programming the on-board FMS; IFPS for ensuring adequate distribution of the flight plan; ETFMS for ensuring accurate sector counts; ATC FDPS systems for performing sector planning and generating a flight progress strips at the desired time. All of those profiles are *virtual profiles*: none of them fully represent the exact profile that will actually be flown by the aircraft!

These are the realities, and it would be incorrect to aim at achieving one unique profile between all actors. In fact, a common profile should not be an aim in itself, since differences are acceptable (e.g. SID, STAR, accuracy of FLs and time estimates), provided certain common elements are used by all actors (e.g. aircraft type, route, equipage).

The proposed vision for the evolution of flight planning is to accept the existence of differences and the specific needs of individual actors, while ensuring that *a sufficiently common basis about the flight details exists in order to enable each actor to perform his specific duty in an effective and efficient manner*. In the rest of this document, the expression 'common flight plan' is used with that meaning.

At the time the aircraft pushes back, all actors must have been synchronised with the common flight plan. Once accepted by IFPS, a flight plan is regarded as an *initial contract*: a change can only be made if the complete updated flight plan remains correct and if all actors are kept informed[*]. Keeping the contractual information current should be the responsibility of each actor.

The proposed strategy is to focus on the flight planning actors (See Figure 11) and achieve the above level of consistency between them. Consistency of the flight plan is the foundation that will induce consistency amongst the other actors, as the following diagram suggests.

With the above definition of consistency, the concept of a 'Single Initial Flight Plan for Europe' is made more concrete. An analysis of high level requirements for achieving the objective can be performed. In essence, there are two issues that need to be addressed:

- there needs to be a definition of what common elements are required to be consistent between the various actors;
- the procedures and tools for updating this common information need to be agreed.

Note [*] *The term 'contract' should not be understood in the sense of a commitment that the flight will be executed exactly as agreed at the time of 'signature'. ATC is and remains the sole authority delivering clearances and changes may occur for various tactical reasons. The contract is binding the actors in the sense that a change cannot be performed partially and unilaterally: a complete and correct flight plan solution must be guaranteed and all actors must be kept informed of the change*

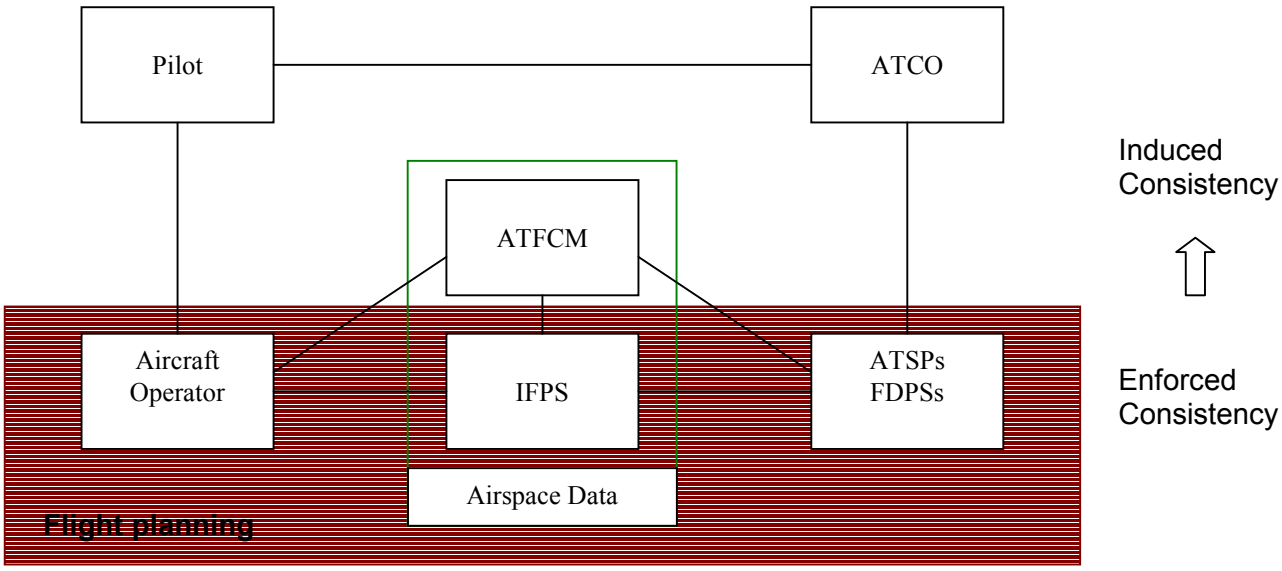

Figure 11 : Consistency between the FPL Partners

3.2.4. Single Initial FPL Concept

3.2.4.1. Common Definition of Flight Plan Consistency

While there will always remain certain areas of uncertainty in the detailed flight plan until the very last minute (taxi time, CTOT, SID, STAR, ETOs, etc), there should be a common basis in all exchanges about the flight intentions.

The definition should be established of the minimum set of the flight plan and the profile characteristics to serve as the common basis for which flight plan consistency has to be maintained among all actors. The ICAO flight plan will be used as the starting point; it is however possible that it would have to be supplemented by additional information. Successive versions of each flight plan might need to be retained for later reference, in particular in order not to loose the original flight intentions.

Requirement FPL 01 : ***Define a minimum set of flight plan and profile characteristics to serve as the common basis for which flight plan consistency has to be maintained among all partners.***

3.2.4.2. Flight Plan Consistency and Sharing

3.2.4.2.1. Pre-flight : initial contract

Ownership of the data contained in a FPL has to be made clear. Obviously the Aircraft Operator has the authority to specify the route it wishes a flight to take. If, however, the required route fails in IFPS then in accordance with IFPS procedures a dialogue has to take place between IFPS and the AO to “agree” on an alternative route. This “agreement”, once acknowledged by IFPS, should be considered as an initial contract between the airspace user and ATM, managed by IFPS.

Requirement FPL 02 : ***Establish a formal contractual status for flight plans and clarify the mandate/responsibility of each actor.***

This would mean that any changes to the route would require a “revision” of this contract while the aircraft is in the pre-flight stage. Thus an AO should continue to send a standard ICAO CHG message if it initiated a change of route - the contract would be updated once the ACK has been sent by IFPS.

Requirement FPL 03 : Develop procedures for the handling of changes to accepted flight plans.

Equally, when a change occurs in the availability of a route, IFPS should inform the AO and possibly “propose” a viable alternative. Detection by IFPS would imply a re-processing of the FPL at a time or times before EOBT, e.g. in response to the issue of a CRAM, other FUA related message, a network management scenario, etc.

Requirement FPL 04 : Develop a FPL reprocessing mechanism (rules, procedures and systems) to take account of airspace changes.

This notion of contract would also imply that ATC couldn’t change the route of the initial filed FPL without the agreement of the AO either directly or through IFPS. Adequate communication means should be available for that purpose.

Requirement FPL 05 : Develop communications between ATSP, AOs and IFPS, to enable route change proposals to be negotiated.

In order to reduce the instances of discrepancies between the route approved by IFPS and that required by the ACC, the CFMU ENV would need to fully and accurately reflect the current airspace status and structure of the State concerned.

Requirement FPL 06 : Ensure that IFPS, via the CFMU Environment database, fully and accurately uses the current airspace of all participating States.

It is important to note that while the flight plan contract is binding ATM and the Airspace User, the actors will change during the life cycle of the flight plan. The contract is initially established between the AO and IFPS (which is accepting the flight plan on behalf of ATM); the responsibility will subsequently shift from the AO to the pilot on one hand, from IFPS to ATC on the other hand, with the involvement of ATFCM, Airports and Military at appropriate stages.

3.2.4.2.2. Initial Flight Plan Repository

In order to achieve global consistency, a repository of the common flight plans needs to be developed and made accessible to all actors involved. The repository will contain the common elements of the flight plan and profile. All actors will then be able to use those elements to calculate their local profiles. Provision of information back to the AO could be considered either via a message or through provision of access to the flight plan repository. This repository could also be used to store flight information of common interest such as the aircraft registration or the ICAO 24-bits aircraft address. As IFPS is already the focal point for flight plan data and flight plan data distribution today, it would seem appropriate to expand its role to cover this requirement.

Requirement FPL 07 : Develop and enable access to a flight plan repository in order to establish a common reference for flight plan details.

In order to enable after-the-fact analysis of data consistency and thus further improvements of the whole process, archived flight plan history will be made available to all concerned. The CFMU data warehouse is being developed to contain this information.

Requirement FPL 08 : Provide access to archived flight plan data to all partners concerned.

3.2.4.3. Departures from outside the IFPS Distribution Area

Departures from outside the IFPS distribution area pose quite a different problem because it is often not possible for IFPS to contact the originator. In such cases where an FPL is referred for manual processing in IFPS, operational procedures require that acceptance of the FPL is forced in the IFPS without correction, and an IFP/ indicator is placed in Item 18 of the FPL to indicate to the FPL distribution addressees that the FPL is non-compliant in some respect. The IFP/ indicator identifies the nature of non-compliance but does not identify which airspace(s) is affected.

The CFMU could provide positive input regarding the changes that would be required to enable the FPL to be accepted. Such advice could be transmitted to ACCs with the distributed FPL and at some future stage could possibly be data-linked to the aircraft as an “advisory” in respect of the “original” FPL.

Any subsequent modifications to the route would be expected via normal AFP message procedure, in particular if the aircraft potentially entered the CFMU area at a point other than that specified in the original FPL.

Requirement FPL 09 : IFPS to advise ATC of the correct route, within the IFPS Zone, for flights departing from outside the IFPS distribution area.

Requirement FPL 10 : Develop ways of ensuring feedback to the AO and/or pilot regarding errors in filed flight plans, particularly for flights departing from outside the IFPS distribution area.

3.2.4.4. Airports

The management of airport slots requires the co-ordinated airports to be made aware of the flight intentions. The project of EC regulation 95/93 on airport slots asks ATM to ensure the consistency between the flight plan and these slots. The capability of ATM to perform this task is closely linked to knowledge of local airport rules and schedules. In order to enable consistency checking between FPL departure and arrival estimates and airport slots for flights subject to airport co-ordination, the FPL should be sent to the airport authorities.

Requirement FPL 11 : Provide relevant flight plan information to airport authorities.

As the flight plan is an operational tool, the ACK would be sent back to the Aircraft Operator, indicating that this consistency with airport slot will be checked with the airport authority. It will therefore be the task of the involved parties (airport authority, ATC, AO and CFMU/IFPS) to assess the consistency of the FPL with the airport slot according to the operational situation.

Requirement FPL 12 : In collaboration with the concerned partners, develop procedures for consistency checking between airport slots and flight plans.

Updates to the flight plan are also of interest to all airports to efficiently manage their platforms. Relevant information known by the CFMU should be provided to the airport (ETA, Cancellation, Diversion, etc) in close co-ordination with the ATS services.

Requirement FPL 13 : Update airports on relevant current flight intentions.

3.2.4.5. Standards

Local flight plan systems have developed their own system standards. This sometimes contributes to inconsistency problems.

Requirement FPL 14 : Implement ADEXP.

Requirement FPL 15 : Support the implementation of industry standard for FPL data exchange.

A single flight plan reference should be used (IFPLId) by all ATM systems in their information exchange. Extension of the concept world-wide could be studied.

Requirement FPL 16 : Use IFPLId.

3.2.5. Management of ATC FPL Updates

At some parameter time before the EOBT the aircraft comes under the control of ATC. The occurrence of this event may differ between aerodromes, for some the request for ATC clearance may be the trigger event, for others it could be the start-up request. Whatever the event, it is clear that from this stage, the responsibility of IFPS and the AO for the initial contract is transferred, the responsibility for the route clearance moves to an agreement between the pilot and ATC. This transition needs to be properly identified in order to enable decision–making of modification to the flight plan.

Work is taking place through the airport CDM activities to understand the operational process and the way information are and should be exchanged. The IFPS as other actors need to be made aware of the responsibility evolution and any agreed modifications at that stage.

Requirement FPL 17 : Develop procedures and information sharing systems in the phase shortly before departure with regard to responsibility for flight plan updates.

For ATC purposes it was always considered adequate for subsequent changes to the flight profile to be communicated downstream though OLDI messages (ACT/ABI). There is, however, a requirement for additional communication of significant changes to the flight profile for ATFCM purposes. FMD and the FMPs are required to monitor the actual traffic situation throughout their area of responsibility and need, therefore, to be updated on potential and actual changes to the planned profile of individual flights. Agreement has been made through the EAG and its subgroups that downstream ACCs would benefit from being made aware of such information at an early stage. IFPS is a crucial actor in the information distribution task since it “owns” the original distribution list for the FPLs. In order to enable IFPS to receive and process such information, the existing AFP (ATC Flight Plan) message was expanded to permit route and other significant changes to be notified to the CFMU by ATC (e.g. diversion, change of flight rules or flight type, en-route cruising level, etc., as described in the ECIP objective). CFMU then re-distributes this information to appropriate ACCs either in the form of APL or ACH messages, or via ETFMS information distribution. The AFP, APL, ACH process needs to be implemented and fine-tuned.

Requirement FPL 18 : Implement and refine AFP/ACH/APL processing for flight plan updates.

Clearly if the consistency loop between AO, ATC and the CFMU is to be maintained then the information ATC can provide in the AFP messages must be provided and must be of sufficient quality to enable CFMU to determine an accurate route for the flight before the re-transmission takes place. This places a responsibility on ATC to provide meaningful and accurate route data as far as is practicable.

Requirement FPL 19 : Ensure that modifications to the flight plan after departure are provided to all relevant actors and include enough information for describing the remainder of the flight.

3.2.6. Optimising the Flight Plan Filing Process

3.2.6.1. Flight Plan Filing

AOs are responsible for the submission of correct flight plans taking account of published ATM constraints and their own constraints and priorities. The role of the CFMU is neither to take responsibility for the correctness of flight plan submissions nor to substitute for providers of flight planning services. Nevertheless there is strong evidence that by taking advantage of technological advances, by external deployment of some CFMU interfaces and knowledge, and by a reorientation of IFPS human resources from a corrective to a preventive processing strategy, major advantages could be obtained.

Flight plan filing/ routing assistance shall be limited to enabling airspace users to plan their operations taking account of published ATM constraints and their own operational priorities. Such actions contribute to consistency and a more optimum use of available capacity. The action is also a major enabler of increased automation in IFPS (target 95% automatic acceptance / reject), and can therefore lead to major cost reductions in current FPDS staff costs (annual saving of 30% to be gradually achieved over a five year period).

Flight plan originators can be considered in two categories, each with differing operational needs. Major operators usually have access to a sophisticated flight-planning infrastructure: they emphasise their need for accessing up-to-date and accurate operational ENV data from their flight planning tools. Smaller aircraft operators (e.g. general aviation) and military usually have a much lighter or even basic flight-planning infrastructure: while having easy and cheap access to a modern communication infrastructure, they require more general assistance during flight planning.

Today, finding a valid route in the increasingly complex European airspace has become such a challenge that aircraft operators usually have visibility of several solutions only if they have access to sophisticated tools. This can be a contributory factor to incorrect flight plans and in the end, sub-optimum use of the available capacity. Hence, assistance services would provide valuable guidance in the increasingly complex European airspace. It would also help increasing the efficiency and effectiveness of flight plan filing, ultimately reducing its global costs (i.e. internal CFMU costs, and costs to airspace users and ATS Providers).

The CFMU should therefore examine how the IFPS could provide a more strategic and proactive service to flight plan originators. IFPS should aim at the highest possible automatic acceptance rate and should focus efforts on route optimisation. As a result, the role of IFPS operators will move to more expertise in route/airspace availability issues. Emphasis will be less on reactive flight plan checking and more on the provision of flow rather than flight specific route information. Flight planning assistance will greatly contribute to increasing the overall quality of submitted flight plans, which will in turn decrease the need for subsequent changes.

Requirement FPL 20 : ***Develop flight planning syntax assistance tools in order to assist originators filing syntactically correct flight plan.***

Requirement FPL 21 : ***Develop flight planning route finding and optimisation tools, including ATFCM impact (routing assistance).***

Requirement FPL 22 : ***Develop services to provide latest Airspace and ATFCM situation.***

Requirement FPL 23 : ***Develop easy-to-use flight plan filing tools taking benefit of modern and effective communication infrastructures.***

Requirement FPL 24 : ***Develop interface standards for FPL filing applications in order to allow a seamless integration of the flight planning and filing process among all actors.***

As interface between AO and IFPS, AIS/ARO will continue to have a major role as initial advisor ensuring the consistency of FPLs. In the field of general assistance, the AROs will inform the AOs and, acting on its behalf, will possibly "propose" alternative when a change occurs concerning the feasibility of a flight (e.g. availability of a route).

One service previously provided by AROs was to address FPLs to the relevant ATSUs for the entire route of flight, through reference to standard addressing tables or charts to determine the correct FIR/UIRs. This is a service that could be provided by IFPS for the route portion outside the IFPS area of responsibility.

Requirement FPL 25 : ***Develop addressing of flight plan outside IFPS distribution area.***

3.2.6.2. Repetitive Flight Plan Filing

RPL data is processed on receipt against the environment known at the time of seasonal submission, at each AIRAC, and again when the RPL becomes an FPL at 20 hours prior to EOBT. The contract between the CFMU and the AO can be considered, in the particular case of RPLs, to be made when the acknowledgement of the RPL file has been made and any error list has been corrected. Any subsequent changes due to errors occurring during the processing for the monthly AIRAC update would constitute a revision to the initial contract. The route selection provided in an RPL is limited because it is not permitted to file CDR2 type routes due to the fact that the RPL files are usually submitted weeks to months ahead of the intended flight at which time the CDR2 availability is unknown.

RPL data currently comprises about 45% of all flight data used by the CFMU. The main advantage of RPLs for CFMU has shifted from one of providing valuable data on demand for strategic ATFCM purposes, to one of reducing day to day workload in the IFPS Ops Rooms. RPL represents a similar workload saving advantage for Aircraft Operators. However, the percentage of flight plans filed via RPL has started to reduce somewhat. This is apparently due to more sophisticated commercial flight planning systems, the high number of changes to RPLs (aircraft type, etc.), and difficulties for RPLs to avail of opportunities offered by FUA and other "late" airspace changes.

The provision of some additional flexibility and dynamicity for RPLs should be examined. The requirements listed above for improving FPL change mechanisms prior to departure should be extended and developed in order to provide such flexibility to RPLs. Concepts such as an "abbreviated" pre-flight plan (e.g. city pair, EOBD, aircraft type group, etc.), with co-ordination processes with the originator in order to ensure updating and completion of the FPL with all parties concerned, taking into account the most recent environment and data from the AO.

Procedures and systems aimed at improving the dynamicity and flexibility of the RPL system should be developed. Such system would look more like a stored flight plan system than a traditional RPL one but may provide AOs with an attractive alternative.

Requirement FPL 26 : Develop new mechanisms to enable early filing and storage of flight plans.

3.3. OPTIMISING INTERFACE WITH AIRSPACE MANAGEMENT

3.3.1. Generalities

3.3.1.1. Background

Following PRC proposals, the Provisional Council has requested the Director General to launch two studies:

- in 1999 at PC 6, an Independent Study was initiated to optimise the use of existing capacity and to improve ATFM strategy, processes and operations, in order to reduce delay;
- in 2000 at PC 8, a Report was initiated to examine the implementation status of the Flexible Use of Airspace (FUA) concept and identify where improvements to Civil/Military Co-ordination in ATM might be required.

3.3.1.2. Scope for Improvements

Both the Independent Study for Improving ATFM and the Status Report of Civil/Military Co-ordination in ATM have identified the urgent need to enhance ASM/ATFCM/ATC processes at strategic, pre-tactical and tactical levels.

ASM/ATFM LEVELS	RECOMMENDATIONS	
	Independent Study for the Improvement of ATFM	Status Report of Civil/Military Co-ordination in ATM
Strategic	Simplify and reconcile the two processes of building and using the route network in an efficient and continuous way with the definition of a consistent route and traffic orientation policy.	Establish mechanisms to ensure international co-ordination of airspace design and management.
Pre-Tactical	Implement new efficiency-oriented activities during the pre-tactical phase.	Investigate : - methods which will significantly increase the ability of temporary airspace structures (e.g. CDRs 2) to provide ATS capacity increase, ATFM delay reduction and improved flight efficiency; - a more effective method for the notification and dissemination of airspace status during pre-tactical operations.
Tactical	In order to ensure that all ATM actors have a better understanding of the impact of their decisions, encourage global awareness by giving them instantaneous information about the air traffic situation in Europe, including tactical alternative options.	Investigate a more effective method for the notification and dissemination of airspace status in real-time (ASM Level 3) phase.

Figure 12 : Scope for Improvements

As described in the Action 23 of the Civil-Military Co-ordination Action Plan, the purposes of this enhancement of ASM/ATFCM/ATC processes are to ensure the consistency between the improvements of ASM, ATFCM and ATC processes and to ensure seamless FUA operations from strategic planning to tactical usage through:

- a consistent route and traffic distribution policy at ASM and ATFCM Strategic Levels;
- the alignment of the pre-tactical ASM and ATFCM processes closer to the time of operations;
- the centralisation, processing and dissemination of accurate ASM data;
- consistency in Flight Plan processing and distribution.

3.3.2. Review of the Current ASM/ATFCM/ATC Processes

3.3.2.1. Strategic Level

The planning and establishment of Permanent ATS Routes and Conditional Routes (CDRs) is currently conducted nationally within the framework of the Annual Rolling Process established by the Route Network Development Sub-Group (RNDSG) under the auspices of ANT, with the participation of CFMU.

The end result of this international process is the implementation by all ECAC States of successive versions of the ATS Route Network (ARN). However, there are still inconsistencies in publication of associated ATS routes in national AIPs, which requires definition of common AIS guidelines.

In addition, the use of the ATS route network to solve ATFCM constraints has led to different Traffic Distribution policies initiated by the CFMU.

Initially, this was performed through the establishment of an annual ATFCM Strategic-Plan based on a "Traffic Orientation Scheme" (TOS) completed then by a "Standard Routeing Scheme" (SRS) in co-operation with ICAO. Currently, this is achieved through the publication of the "Route Availability Document" (RAD) at AIRAC date.

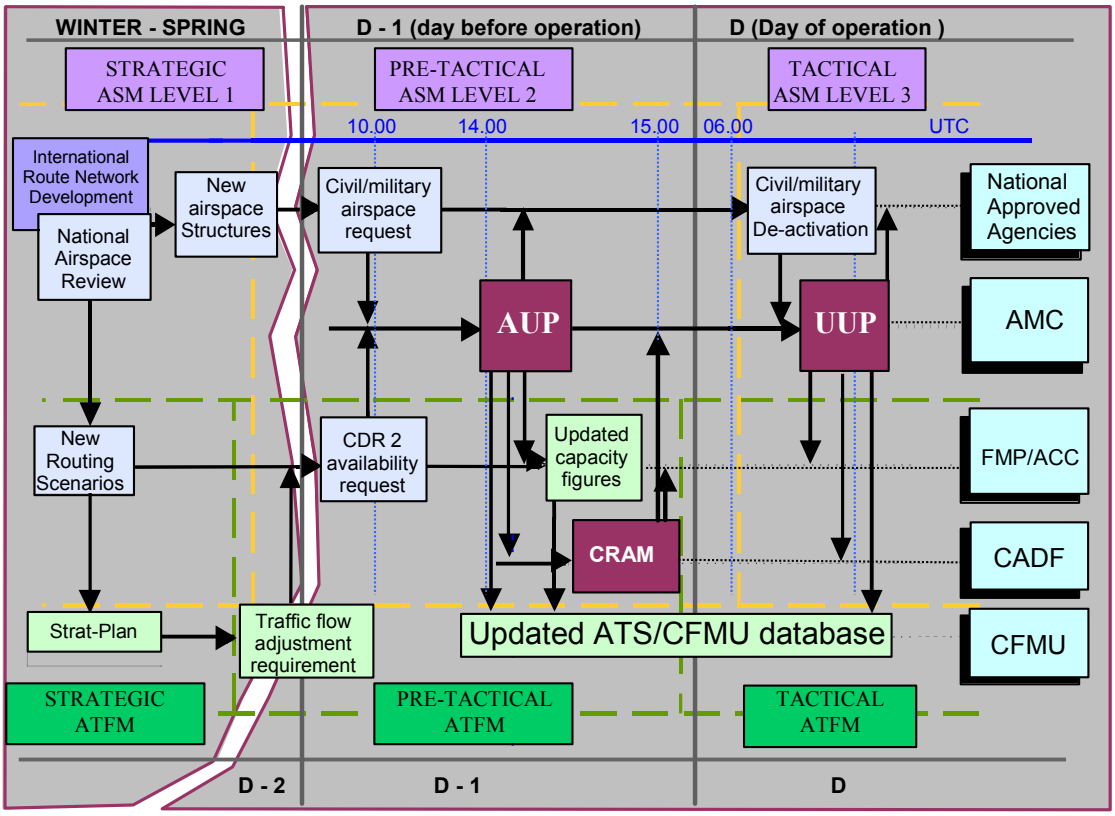

Figure 13 : Current ASM/ATFCM/ATC Process

3.3.2.2. Pre-tactical Level

The daily allocation of the required airspace is decided by a joint national civil/military Airspace Management Cell (AMC). This cell collects and analyses all airspace and route requests and publishes the national daily Airspace Use Plan (AUP). From all AUPs the CFMU/CADF extracts information on CDR availability for incorporation into the international “Conditional Route Availability Message” (CRAM) for further manual or automated processing (ADEXP format) by AOs.

Current role of CFMU in airspace management (ASM) at Pre-tactical level is generally limited to system-support and the compilation/distribution of the CRAM.

The basic data of all ATS Routes/CDRs, airspace restrictions (D, R) and some airspace reservations (TSAs, TRAs) published in national AIPs are therefore updated today with information on CDR availability through the daily CRAM, but with NOTAM and CRAM not always fully consistent.

RPLs and FPLs filed on CDRs 1 during the published accessibility period and FPLs filed on available CDRs 2 are normally processed by the IFPS.

In the case of the non-availability of particular CDR(s) known at the time of the filing of a flight plan, the IFPU operator may either modify or reject the flight plan which is filed along CDRs 1 or CDRs 2 that are not available in the requested time period, in accordance with rules agreed between the CFMU and a given AO.

In case of a flight having an ATFCM slot such that the CDR 2 cannot be flown, the flight plan shall be changed by the operator so as to use an available ATS route, which may result in a revised ATFCM slot.

3.3.2.3. Tactical Level

If a reduction in the activation time, or a cancellation, of a TSA allocated in the current AUP can be agreed between units concerned, the subsequent release of airspace enables ACCs/FMPs to open specific CDRs at a short notice and to re-route traffic flows accordingly.

These changes to the airspace allocation are usually effected by the AMC through an "Updated Airspace Use Plan" (UUP) issued on the day of operation and transmitted to the relevant ACCs/FMPs, military units and to the CFMU for information. However, this UUP is not flight plannable by the AOs.

Similarly, military ATS units are able to use TSAs at short-notice after agreement between units concerned. The resulting changes in airspace allocation are not promulgated and are only known by the civil and military ATS units concerned.

The benefits from tactical re-allocation of airspace are limited today to only a change in associated capacity figures given by ACCs/FMPs concerned.

3.3.3. Proposed Enhanced ASM/ATFCM/ATC Processes

3.3.3.1. Strategic Level – Planning Phase

Improve co-ordination process between DSA/AMN and CFMU/FMD within RNDSG activities regarding the establishment and use of the ATS Route Network with, in particular, a clear identification of the assumptions used.

Requirement FUA 01 : Set-up of a common ASM/ATFCM/ATC mechanism for the establishment of route structure and associated sectorisation including their instructions for use.

Requirement FUA 02 : Pre-validate the main airspace changes before their publication in AIPs.

Improve national FUA Strategic Level 1 co-ordination process between civil and military to better accommodate shared use of airspace between all users groups that will lead to maximise the network capacity.

Requirement FUA 03 : ***Ensure that "Airspace change requests" required to maximise the network capacity will be co-ordinated with the ASM planners.***

ATS route structure and traffic distribution has to be developed in close correlation. The route architecture will be planned in order to accommodate the variation in traffic demand. Conversely, the traffic distribution will conform to the recommended operational practices for the route utilisation ('modus operandi') in order to derive, from the structure, the best capacity. To that end, ATS route structure planning will incorporate sector configuration compatibility, including modular cross-border sectorisation.

Requirement FUA 04 : ***Ensure that the definition of new airspace structures will be accompanied with their 'Modus Operandi' describing routes, sectors and areas relationship and associated scenarios providing CFMU with the necessary flexibility and AOs with multiple options.***

3.3.3.2. Pre-Tactical Level – Anticipating Phase

The co-ordination process between the CFMU, the ACCs/FMPs and the AMCs in the pre-tactical ATFCM Phase needs to be strengthened to allow the CFMU to identify early in advance capacity shortfalls which can be solved by a better airspace allocation. The airspace flow and capacity management service needs to be provided based on flexibility aimed at deriving the maximum capacity in a constant collaborative process with AMCs and FMPs, using pre-planned validated route and associated sectorisation scenarios.

Requirement FUA 05 : ***Review the relationship between the CFMU, AMCs, and FMPs to provide national AMCs with wider information on traffic demand in order to review, when possible, the airspace allocation accordingly.***

Requirement FUA 06 : ***Develop a Collaborative Decision Making process between the CFMU, AMCs, and FMPs together with associated supporting tool for pre-tactical activities in order to optimise the network capacity.***

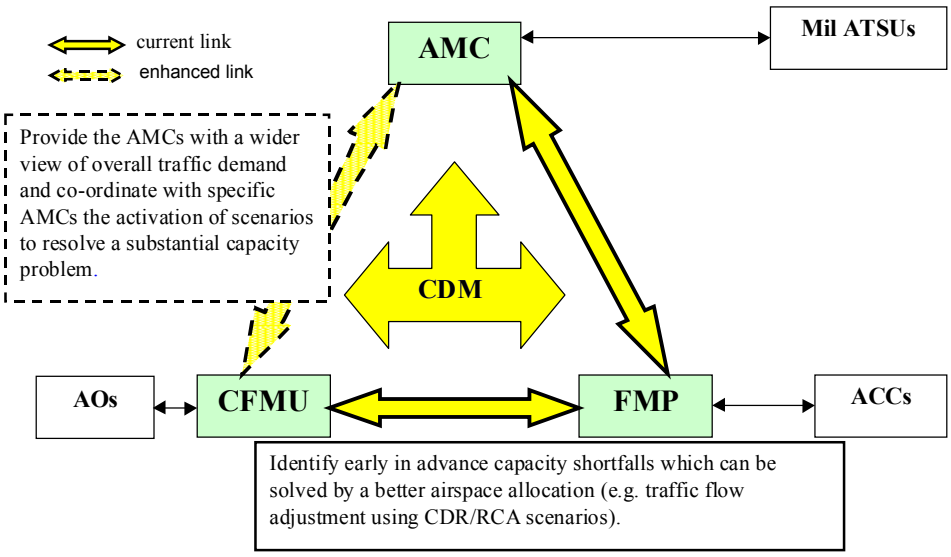

Figure 14: Enhanced Link between CFMU and AMC

In addition current pre-tactical timeframe needs to be revised and moved closer to the operations than initially considered at the start of the FUA Concept.

Requirement FUA 07 : ***Review the current pre-tactical timeframe for ASM & ATFCM (Anticipating Phase) and move it closer to the time of operations in order to get best benefit from more accurate information.***

To that end, routing scenarios using pre-defined permanent and/or conditional routes developed during the Strategic Level (Planning Phase) and/or requirement for Reduced Co-ordination Airspace (RCA) application will be defined for critical ACC sectors to solve the capacity shortfalls identified at pre-tactical level.

Requirement FUA 08 : ***Include alternative CDRs scenarios and application of RCA (Reduced Co-ordination Airspace) procedure as possible ATFCM measures.***

3.3.3.3. Tactical Level – Reacting Phase

The main differences between pre-tactical and tactical activities will be the number of partners involved in the negotiation process, the time given to do it and the need for an advance notice of the decision taken.

In order to maintain a consistent real-time picture of the airspace/route availability and the capacity situation, the CFMU will be able to collect from ACCs/FMPs and other responsible authorities (e.g. military ATSUs) or AMCs in case of late revised allocation, all CDRs and Areas opening/closing time at a short notice or even in real time.

Requirement FUA 09 : ***Develop procedures and tools enabling CFMU to collect real-time airspace data (e.g. CDRs and Areas opening and closing time).***

Requirement FUA 10 : ***Develop tools to assist CFMU to assess the impact of the real-time airspace changes on the network and local level capacity.***

Requirement FUA 11 : ***Develop a CDM process that will allow within a short timeframe to identify, assess and implement adequate ATFCM solutions according to the airspace changes, followed by its notification.***

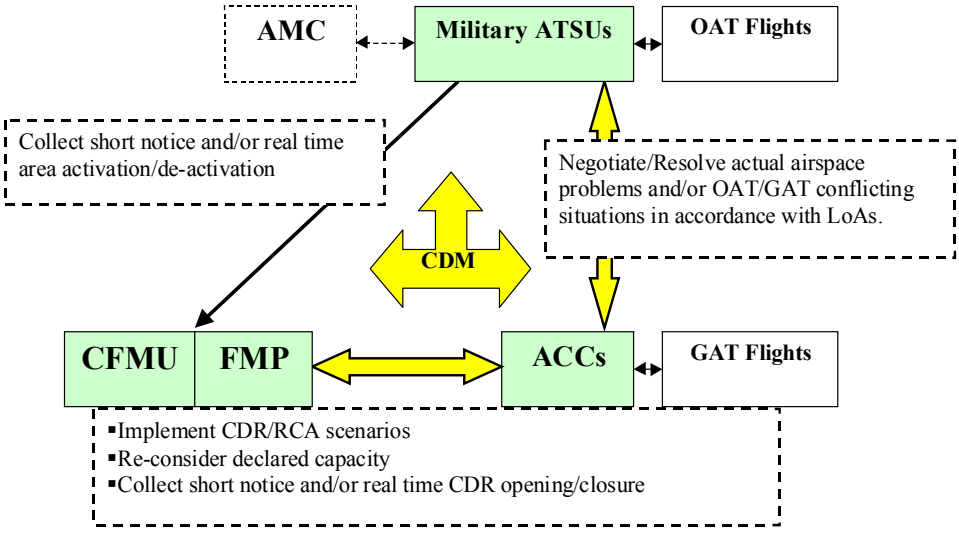

Figure 15: CDM for Tactical Activities

3.3.3.4. Flight Plan Processing Consistency

As strategic airspace establishment and then pre-tactical airspace allocation and traffic flow restriction have a direct impact on FPL submission by airspace users and their further processing, three different possibilities need to be further investigated as follows:

- No need to require AOs to amend their FPLs - because the ATC controller will be able, through enhanced FPPS, to update the CPL and re-route the flight accordingly (i.e. CDR1 closure/CDR3 availability);
- Possibility for AOs to amend automatically their FPLs - through upgraded AO Flight Planning Systems allowing them to assess a more up-to-date routeing compared with the one planned in the FPL/RPL and using a new system supported tool providing an easy access to information on the Routes/CDRs and/or airspace availability (i.e. CDR2) as well as ATFCM constraints in force.
- IFPS empowered by AOs to automatically correct or modify their FPLs according to the accurate data available in the ENV Data Base on ATFCM and ASM constraints in force (i.e. mandatory CDR2 scenario).

Consistency in Flight Plan Processing is therefore essential to ensure that any airspace changes and/or ATFCM measures affecting a FPL are properly addressed.

Requirement FUA 12 : Develop a Common Flight Plan Repository Concept in order to ensure the consistency of the Flight Plan Processing.

When a change occurs in the availability of a route, IFPS should inform the AO and possibly “propose” a viable alternative. Detection by IFPS would imply a re-processing of the FPL at a time or times before EOBT (e.g. in response to any airspace changes or re-routing scenario in force, etc). This re-processing must ensure that updated FPL remains correct and that all partners in general and the pilot in particular are kept informed.

Requirement FUA 13 : Consider the airspace changes in the FPL reprocessing that has to be supported by flight plan reprocessing assistance services.

Flight Plan actions before departure refer to *Filed Flight Plan* (FPL), involve IFPS and require CFMU to be fully aware of all ATM constraints in force. Actions in flight occur only on ATC or pilot requests and refer to *Current Flight Plan* (CPL), the update of which is currently addressed through OLDI/SYSCO messages between adjacent ACCs, the current one in charge of the flight and the next one. But, changes affecting downstream ATC units or potentially impacting the future airspace organisation and/or the ATFCM situation are not yet properly addressed. Therefore, IFPS will receive and process such information through the existing AFP (ATC Flight Plan Proposal) message that will be expanded to permit route and other significant changes to be notified to the CFMU by ATC (e.g. diversion, change of flight rules or flight type, etc…). This information will subsequently be redistributed to affected ACCs either in the form of APL (ATC Flight Plan) or ACH (ATC Flight Plan Change) messages, or via ETFMS information distribution.

Requirement FUA 14 : ***Fine-tune and implement the AFP, APL, ACH messages in order to advise the downstream ACCs about any change in the route field of the FPL.***

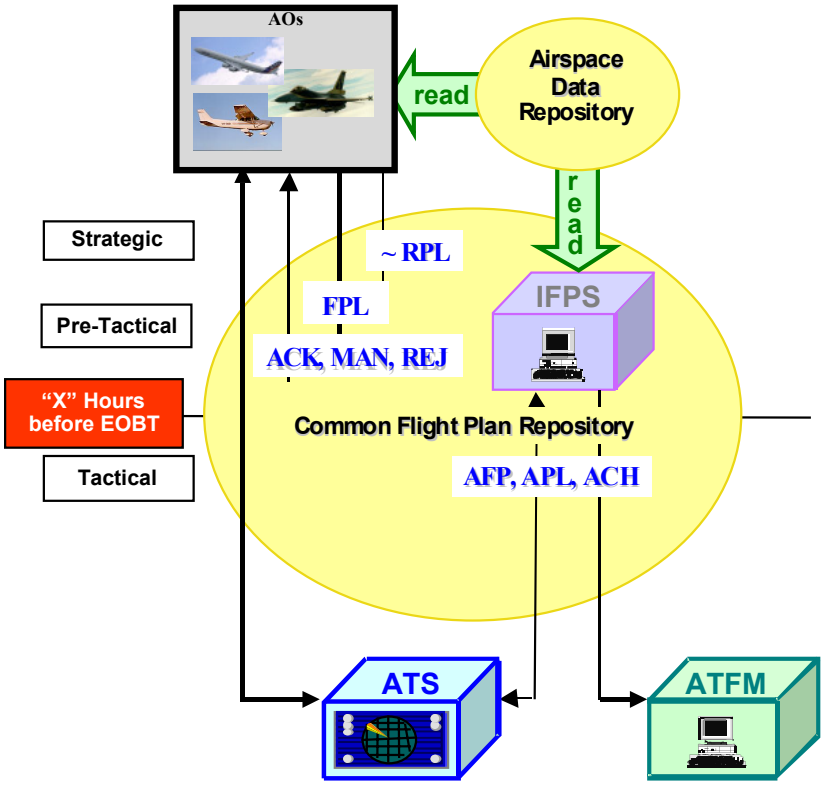

Figure 16 : Common FPL Repository

3.3.3.5. Airspace Data Repository

In order to support the proposed enhanced processes at strategic, pre-tactical and tactical level, a rapid access to accurate information on airspace status (e.g. portal web access) with a sufficient advance notice requires now an approach to overcome the limitations of the current manual mechanisms for the dissemination of updated information through message such as NOTAM, CRAM or AUP.

The expectation is now to provide accurate information on airspace and route availability based on the concept of a consistent Airspace Data Repository updated potentially in real-time and in accordance with all ATM airspace-related decisions, including information on routes, sectors and areas. Within this context, the current CRAM/AUP messages will become obsolete as the AMC will directly input or update the relevant information in the database.

Therefore, information about the past, present and future status of airspace shall no longer be kept as separate incompatible pieces of information, but as different data elements of the same logical piece of information which could be stored in different systems (i.e. EAD and CFMU Environment database as central systems, Regional systems and National/Local systems), as convenient. Any query to the common airspace data repository shall define the time parameter of its scope allowing any user to retrieve information related to a future, present or past status.

Then, having access to this common Airspace Data Repository, all users involved in ATM will benefit from such a standard source of consolidated, consistent and up-to-date information and will have the possibility to process automatically consistent digital airspace information.

Requirement FUA 15 : ***Identify the operational and technical specifications for the CFMU part of the Airspace Data Repository, or define new specifications for additional tools, if required.***

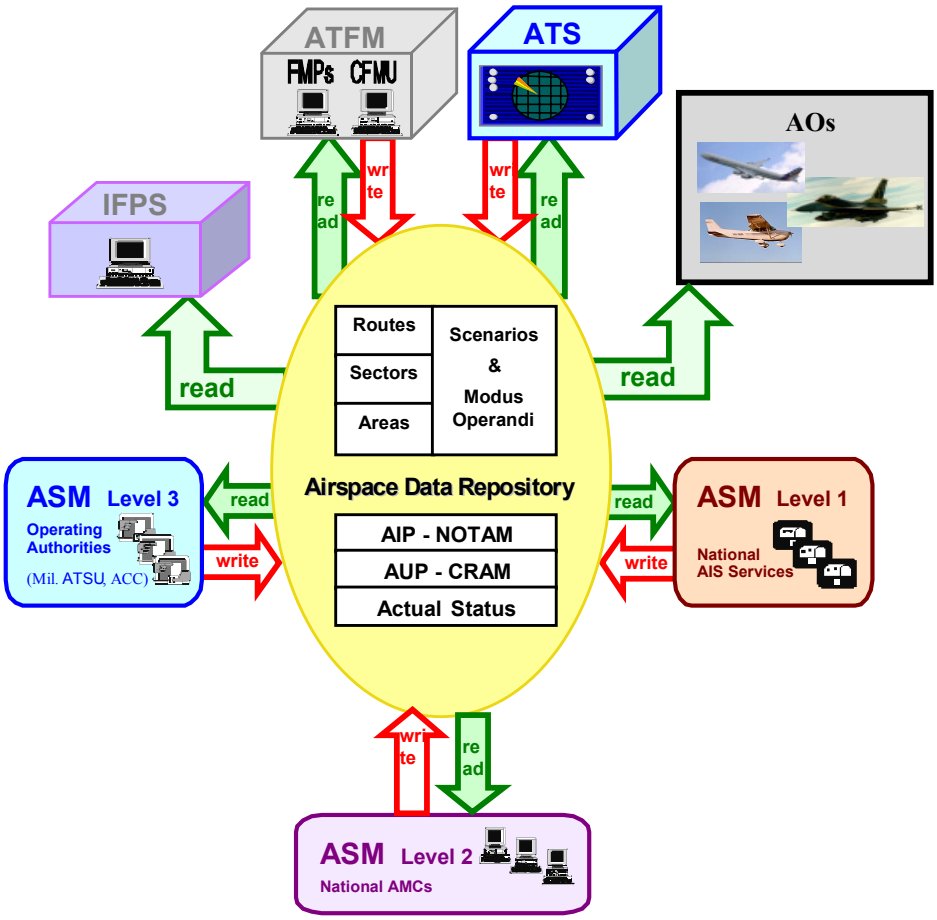

Figure 17 : Airspace Data Repository

3.4. COLLABORATING WITH AIRPORT OPERATIONS

3.4.1. Generalities

Airport congestion is already a limiting factor at some airports. Many of major airports are operating at their maximum throughput for longer periods of the day, and some have already reached their operating limits as prescribed by physical as well as political and environmental constraints. The use of such airports is heavily regulated. This situation is expected to become more widespread as traffic continues to increase. Furthermore, future traffic distribution patterns are likely to generate congestion at airports that currently do not experience capacity problems.

The effective operation of European ATM as a network will require decisions based on the broad-scale integration of data, often within a short time horizon. As the tactical manager of the total network load, ATFCM will have to collaborate with air traffic control, aircraft operators, and airport in a genuine partnership. To gain the greatest benefit from the availability of real time status data, the future airport operations systems will possibly require some degree of real time interaction with both the aircraft operators and the air traffic services providers.

Airports need to be seen as being a part of the whole ATM system in a “gate-to-gate” environment. It is the point of interaction between aircraft operators, airport operators, the passengers, freight shippers, ground handlers and related services, meteorological services as well as ATFCM. To facilitate swift and effective collaborative decision making, it is imperative that all data required to make airports function smoothly and to enable full ATM system integration, is made available where it is needed at the moment it is required.

3.4.2. The Current Main Issues

3.4.2.1. Relationship between airport slots and ATFCM process

In order to improve the planning process, the relationship between the airport slots and the ATFCM process must be made more consistent. CFMU and national airport slot co-ordinators possess a part of the puzzle. It would be of great interest, for both parties to fit those parts together. A direct benefit of their information sharing would be an important increase in airport operations predictability, mainly with regard to arriving traffic.

3.4.2.2. Out of the Network

A study conducted by the CFMU to examine the situation of slot adherence at the most critical airports showed that some of them did not seem aware of their obligations for the implementation of ATFCM measures.

This situation may be explained by the fact that airports have generally been kept out of the major decisions and processes of the ATFCM system.

3.4.2.3. Poor sharing of information

The poor sharing of information between airports, AOs, ATC and the ATFCM community leads to the use of inaccurate data within the ATFCM system.

Another problem, is the late communication to ATFCM of airline decisions regarding delayed or cancelled flights (as a consequence, scarce and valuable slots may be wasted entirely)

3.4.2.4. Lack of interface between Aerodrome Control (Tower) and ATFCM

All too often, an aircraft that has pushed back and disconnected from the tug, has nowhere else to go but to the Runway holding position. The controller has to accommodate arriving aircraft and fit the departures into a sequence, and is subject to any number of difficulties before aircraft can be lined-up and cleared to take-off.

Because the interface between Tower and ATFCM is relatively limited, often no attempt is made to try and interact with ATFCM to see if a flight can depart earlier or later. In the case of flights not having a CTOT, the situation is also poor. Experience shows that as priority is given to flights having to meet a CTOT, flights not having one can often experience more delay than if they were regulated. Therefore, Towers must have an ability to interface easily and quickly with ATFCM if they are going to be able to comply with CTOTs and have the flexibility to update ETFMS.

3.4.2.5. Management of Airport Disruption

Disruption of the normal airport operations, including ATFCM, can occur due to causes such as de-icing, failure of equipment (e.g. ILS, Radar, ATC computer), blocking of a runway or taxiway, etc. These situations have initially been managed by using ETFMS functionality, not primarily planned for such usage, and therefore having shortcomings.

3.4.3. The Collaboration with Airport Operations

3.4.3.1. Introduction

As described in the ATM 2000+ Strategy, there is a need to consider and manage a flight as a single continuous event, from planning, through execution, to the post-flight activities.

This Gate-to-Gate concept coincides to a large degree with the scope of the airports', ATSPs' and AOs' processes with a common goal of providing a seamless and coherent handling of flights. The overall aim of the Gate-to-Gate is to define, develop and implement an integrated approach to flights based on uniform principles that provide for their smooth and seamless management throughout all phases of flight.

An essential enabler is the timely sharing of validated and up-to-date information about flights and their operating conditions among all those involved in their planning and execution.

For the benefit of uniform interpretation, the following definitions have been extracted from the "Airport Operations Glossary of Commonly Used Terminology" (Edition AOT/13-IP1 dated 17/06/03):

- Declared Capacity : stated limiting capacity of the airport in aircraft movements per hour.
- Sustained Runway Capacity : maximum runway throughput, or flow rate, which can be achieved over a sustained period of time when aircraft operate under IFR, under specific traffic mix, in good weather conditions, with good ATM/runway system management, in accordance with safety standards and recommendations, and with an acceptable maximum delay for a limited period of time (to be defined locally).

3.4.3.2. Strategic Level

3.4.3.2.1. Consistency between Airport Declared Capacity, Airport Slots and ATFCM Measures

In general, the throughput of an airport refers to the amount of traffic that can be safely and efficiently accommodated in any one hour and is defined as the hourly capacity *. Many different constraining factors (weather not included) can affect the definition of this hourly capacity :

- Stand capacity can be a limiting factor : if there is no more room on the airport, no further arrivals can be accepted.
- Ground handling capacity : a flight cannot depart until all passengers have boarded, until it has been refuelled as required or until de-icing operations have been completed, etc.
- Environmental restrictions on runway use : these restrictions are imposed to minimise the environmental effects of operations for local residents.
- Taxiway system capacity : taxiway structure can affect runway capacity.
- Runway system capacity : this capacity value is limited by the number of movements that can be handled, considering wake vortex and runway separation limits. Depending on the configuration of runways, arrival and departure capacities may be linked by a total movements capacity, or may be completely separate. The strategy for runway use is also considered: for example mixed mode gives a different capacity compared to dedicated take-off and landing runways.
- ATC capacity : the staff resources, the sectors capacity value, the dominate direction of arriving and departure demand, the available terminal airspace around the airport and the landside equipment (ILS,MLS, Radar, etc.) can also be limiting factors.

The declared capacity of the airport is usually a working value for hourly capacity, arrived at by considering the dominant factors for that airport under “typical” conditions. Therefore the declared capacity will often be slightly less than the maximum number of movements that the airport can achieve in one hour when everything is operating smoothly.

The factors having a direct impact on the ATFCM situation are the Runway and the ATC capacity limits. These factors contribute to define the number of arriving aircraft (Arrival capacity) and the number of departing aircraft (Departure capacity) that can be handled by ATC according to the configuration of runways and the aircraft separation minima (e.g. wake turbulence separation, radar separation, runway separation criteria, etc). The declared capacity will be less that the sum of the Arrival and Departure capacity values in order to provide the necessary flexibility to respond to fluctuations in the traffic demand.

Note *: *This time parameter has been arbitrary selected by the author to ease the readability of the document. However, the use of different time parameters (e.g. daily, 20 minutes, etc) can also be required in order to support the operational needs.*

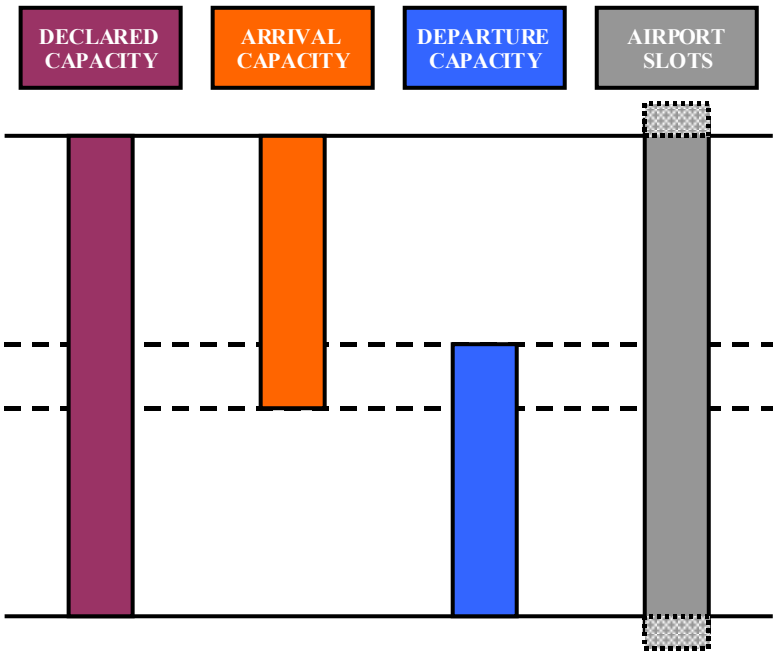

Figure 18 : Relationship between Airport Slots and Capacity values

The airport Authorities and ATS Units in collaboration with the CFMU will consider all possible factors that can impact on the Arrival and Departure traffic in order to define an as accurate as possible declared capacity. The use of simulation tools will allow the identification of efficient scenarios and associated Modus Operandi that will describe the recommended links and working methods in terms of airport infrastructure, sectorisation, staff resources, type of traffic and ATFCM measures. This will aim at determining the optimised arrival/departure capacity values according to the traffic forecast while minimising the need for ATFCM restrictions.

Requirement APT 01 : ***Define Scenarios and Modus Operandi describing the recommended links and working methods in terms of airport infrastructure, sectorisation, staff resources, traffic type and ATFCM measures.***

Requirement APT 02 : ***ATS Providers to evaluate through simulations the possible benefits of an optimised use of the airport holding patterns.***

In addition to the declared capacity, the system of “airport slots” acts as another filter to reduce overloads at airports for which there is high demand, and to avoid airlines publishing schedules that they will be unable to fly because of congestion at airports.

The number of airport slots will often be greater than the declared capacity. If too many flights arrive they will be held in arrivals stacks, enabling maximum use of the sustained runway capacity. If fewer slots had been offered, airport declared capacity (and commercial potential) would have been wasted.

The number of airport slots will allow the identification of the forecast airport traffic that will be assessed in order to determine its impact on the network capacity. In addition, post-flight analysis will be conducted to evaluate the consistency between the airport expected traffic (based on the number of slots) and the real throughput. The number of airport slots will therefore be fine-tuned according to the results.

Requirement APT 03 : ***Assess the impact of the expected airport traffic demand (based on airport slots) on the network capacity.***

Requirement APT 04 : ***Define post-analysis procedures, tools and indicators in order to evaluate the consistency between expected airport traffic demand (based on the airport slots) and the real airport throughput.***

The management of airport slots will require co-ordinated airports to be made aware of the flight intentions. The capability of ATM to ensure the consistency between the flight plan and these slots is closely linked to the knowledge of local airport rules and schedules. In order to enable consistency checking between FPL departure and arrival estimates and airport slots for flights subject to airport co-ordination, the FPL will be sent to the airport authorities.

Requirement APT 05 : ***Ensure the provision of relevant flight plan information to airport authorities.***

Requirement APT 06 : ***In collaboration with the concerned partners, develop transparent procedures allowing to check the coherency between airport slots and flight plans.***

3.4.3.2.2. Management of Special Events (Airshow, Works on Runway, etc)

Several planned events conducted at the airport level may induce a temporary reduction of the airport declared capacity below the “normal” level. Works on runway or airshow cause severe disruption as the traffic can be limited according to the runway capabilities or totally prohibited during airshow flying activities. Some flights may require special arrangements, such as security associated with flights of heads of state or flights to certain countries.
As most of the time, these events are planned in advance, the related information will be disseminated as soon as possible to all partners allowing the AOs to review their schedules and the CFMU to assess the impact of the new traffic demand on the network capacity.

Requirement APT 07 : ***Establish a transparent process to ensure that the airport Special Events information will be communicated to all parties concerned.***

Requirement APT 08 : ***Assess the impact of airport Special Events on the network Capacity.***

According to the result of the assessment, several ATFCM solutions will be collaboratively considered in order to comply with the traffic modifications. This will lead to the implementation of changes to the ATM environment (Airspace Structure, ATC and airport Capabilities) to absorb the revised traffic forecast and in the reduction of traffic demand for the critical areas wherein no other solution could be found.

Requirement APT 09 : ***Set-up collaborative process between partners concerned aimed at defining the “change requests” to the ATM environment in order to accommodate airport special events.***

3.4.3.3. Pre-tactical Level

3.4.3.3.1. Implementation of ATFCM Solutions

As described in the Section 2, several ATFCM solutions will aim at maximising the airport declared capacity through a collaborative process between the partners involved in the Pre-tactical phase. These solutions that rely on a better organisation of the ATC behaviour, will consist of optimising the utilisation of the airport Holding Pattern facilities and of determining the optimised arrival/departure capacities in order to maximise the airport throughput.

Requirement APT 10 : ATS Providers to assess the use of airport holding patterns as a possible solution to optimise runway capacity.

Requirement APT 11 : Develop means for ATS Providers to implement ATFCM solution to optimise airport arrival/departure capacities.

The use of simulation tools will allow the identification of the best local and en-route ATC operating techniques (e.g. Miles in Trail) required to optimise the airport throughput. These operating techniques will rely on an efficient co-ordination process between the CFMU, the airports and the ATS Units involved in order to integrate the arriving and departing traffic smoothly.

As these solutions will impact on airport operations, the airport infrastructure and other airport factors (e.g. turn around procedure, taxi procedures) will have to be taken into consideration to guarantee the consistency between the air-side and land-side operations.

Requirement APT 12 : Identify through simulations the best local and en-route ATC operating techniques that will maximise the airport throughput.

3.4.3.3.2. Relationship between FMP and Airports

Where local ATFCM solutions not impacting on the network capacity will be identified, their collaborative assessment, validation and implementation will be conducted through a “small-scale network” that will include the airports and the associated FMP. Acting as interface between the network and the local level (airport), the role of the FMP will evolve in a more pro-active co-ordination body that will consider the en-route and associated ATC requirements together with the airport ATC and infrastructure constraints to achieve the best compromise. The FMP will therefore be involved in the assessment of the above mentioned ATFCM solutions and associated scenarios (see para 3.4.3.3.1) and in the collaborative implementation of measures aiming at solving local capacity shortfalls. However, the network capacity will not be impacted by these local solutions unless efficient co-ordination with CFMU exists in order to keep an accurate and consistent ATFCM situation. In addition, any existing constraints or measures implemented within the area of responsibility of other FMPs will have to be known. The involvement of airports in the Pre-tactical ATFCM Process, and the strengthening of the FMP role will undoubtedly call for an efficient information sharing process between all partners.

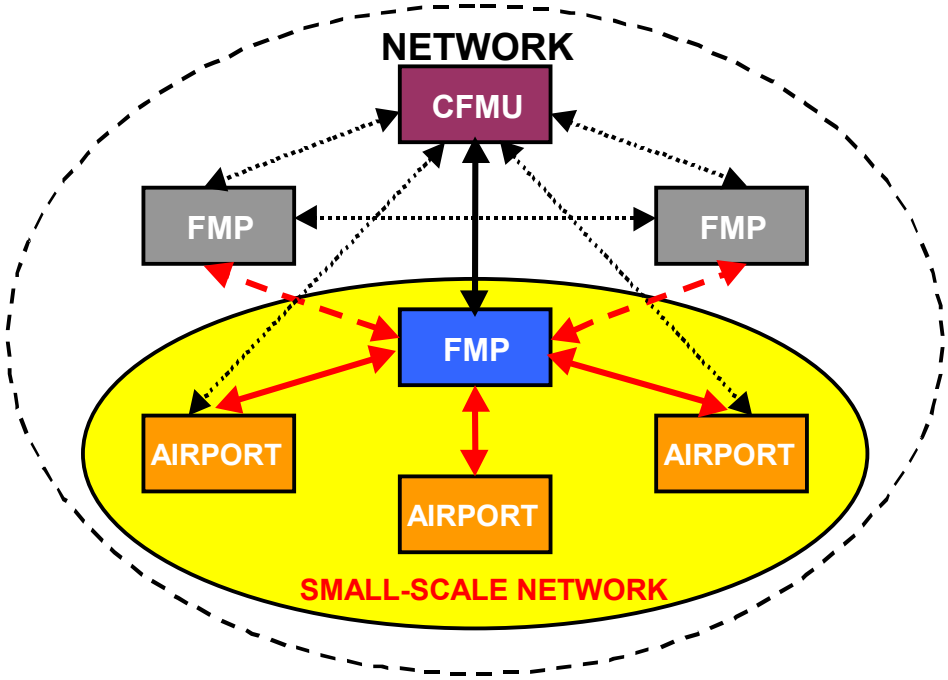

Figure 19 : The Small-scale Network

Requirement APT 13 : ***Define collaborative process between FMP(s) and associated airports in order to conduct "small-scale network" operations during Pre-tactical phase.***

Requirement APT 14 : ***Ensure the dissemination of information between the small-scale network partners, the CFMU and other FMPs.***

3.4.3.4. Tactical Level

3.4.3.4.1. Airport CDM

3.4.3.4.1.1. Sharing of Information

Collaborative Decision Making (CDM) refers to a concept aimed at improving flight operations through the increased involvement of Aircraft Operators, ATS Units and airport operations in the process of Air Traffic Management (ATM). This will take the internal priorities of the Aircraft Operators or the airport Operations into account before and during the flight and development of Information Management systems and procedures in order to make full use of available data.

The bilateral influence of the airport CDM Process and ATFCM in the management of the departure sequence and the associated need to share information is a reality that will lead to a significant improvement of the ATFCM efficiency. Through the sharing of more accurate flight plan data (e.g. Departure and Arrival Time Data) this airport CDM concept will aim at achieving common situational awareness between the partners concerned and at improving both inbound and outbound traffic predictability.

Requirement APT 15 : ***Develop information sharing in order to provide CFMU with more accurate departure data consolidated at airport level.***

Requirement APT 16 : ***Develop information sharing in order to provide airports with more accurate arrival data.***

The sharing of flight plan data will allow to conduct a co-ordination process in three phases aiming at providing as accurate as possible departure time. At a first stage, the data exchange will allow to forecast a reliable departure time that will guarantee the consistency between the FPLs and the airport scheduling. At a second stage, the departure data will be fine-tuned by the AOs according to their turn around activities. Finally, more precise departure data will be settled through a collaborative pre-departure sequence considering specific reasons (such as slot compliance, airline preference, evacuation of gate for arriving aircraft, etc). This pre-departure sequence will be established and used by ATC in order to optimise the runway throughput.

Requirement APT 17 : ***Ensure flight plan data consistency between the airport scheduling, the FPLs, the AOs requirements and the pre-departure sequence in order to guarantee the slot adherence.***

Several modifications of the airport operational infrastructure and procedures (e.g. runway in use, position of the gate, taxiway conditions, SID, etc) may have an impact on flights. The knowledge of most of these constraints by the ATFCM community is not relevant. However, the resulting impact of these constraints on the flight will be notified through FPL updates in order to keep the ATFCM network situation accurate and consistent. Conversely, several FPL updates are also of interest to all airports to efficiently manage their stands. Relevant information known by the CFMU will be provided to the airport (Cancellation, Diversion, etc).

Requirement APT 18 : ***Ensure that updates to the current Flight Plan (SID/STAR, TOT, taxi-time etc) resulting from airport constraints and from changes of their operational status and procedures will be provided by the airport concerned in order to keep accurate and consistent the ATFCM network situation.***

Requirement APT 19 : ***Ensure that relevant information on FPL updates will be provided to airports concerned in order to manage efficiently their platforms.***

Finally, airport CDM will enhance last minute flexibility requirements (changes at short notice) and will facilitate the dissemination of information concerning reduced capacity of an airport due to weather or other disruptions. It will also allow faster recovery to normal operations when the disruption is over.

Requirement APT 20 : ***Ensure the processing of late updates of traffic data sent by the airport, in the CFMU systems.***

Requirement APT 21 : ***Ensure that any updates of capacity value related to weather or other disruptions taking place at the airport will be notified to all parties concerned in due course.***

3.4.3.4.1.2. ATFCM Interface with Aerodrome Control (Tower)

Towers must have an ability to interface easily and quickly with ATFCM if they are going to be able to comply with CTOTs and have the flexibility to update ETFMS in real time. This will also be extended to making direct requests to ETFMS concerning CTOTs, which because of airfield conditions, cannot be met. Therefore, specific ATFCM interfaces for Towers will be developed in order to provide them with a picture of their traffic as seen by ATFCM and enabling them to adapt this picture to their own needs.

Requirement APT 22 : ***Develop tools and procedures enabling Tower to have a clear picture of the ATFCM situation and to update ETFMS as required.***

3.4.3.4.2. Relationship between FMP(s) and Airports

Within a small scale network (see para 3.4.3.3.2), some local En-route problems will be solved by the collaborative implementation of local restrictions (e.g. small flight delays in order to avoid local en-route capacity peak, use of minimum departure interval, etc) providing that the impact on the network capacity will be negligible.

Requirement APT 23 : ***Define collaborative process between FMP(s) and associated airports in order to conduct "small-scale network" operations during Tactical phase.***

3.4.3.4.3. Assistance to the Management of Airport Disruptions

During the management of airport disruptions (e.g. de-icing, failure of ATC equipment), CFMU has no way to know the order in which the aircraft will depart. Therefore, there is a need to have a central co-ordination body located in the airport concerned, responsible for collecting and disseminating all relevant information to all parties involved. CFMU and FMP will assist the airport in the management of these situations through the processing of the variation of the declared capacity and the consideration of the updates of the departure sequence according to the information provided by the central co-ordination body.

Requirement APT 24 : ***Develop procedures and tools in order to assist airport in the management of disruptions.***

3.4.3.4.4. Weather Impact

When weather conditions impose to conduct low visibility operations, separation between aircraft must be increased, and arrival rates and airport declared capacity decrease accordingly. These approach procedures are much more restrictive than the procedures in effect during better weather conditions. Improving the capability of ATFCM to know when low visibility operations will start and end will result in significant improvements in capacity. Many of the delays due to weather result from not being able to predict this information accurately. There is therefore a need to share weather information and associated airport declared capacity updates between all partners concerned in order to anticipate the impact of the weather conditions on the network capacity. This will lead to optimise the landing capacity based on the type of equipment available on board and at the airport (ILS, MLS).

Requirement APT 25 : ***Ensure the capture and sharing of more accurate weather forecast in order to anticipate capacity shortfalls or potential benefits.***

Requirement APT 26 : ***Ensure a more accurate processing of the weather data during the monitoring of the ATFCM situation and when assessing the implementation of possible ATFCM solution.***

Requirement APT 27 : ***Develop procedures and tools allowing to consider the type of equipage (ILS, MLS) available on board and at the airport in order to fine-tune the declared airport capacity value during bad weather conditions and to implement ATFCM solutions accordingly.***

3.5. IMPLEMENTING A REGULATORY PROCESS

3.5.1. Generalities

The provision of a clear and consistent ATFCM regulatory framework will contribute to further safety and efficiency of the European ATFCM system. It will provide in particular a clearer definition of the roles, responsibilities, rights and obligations of each party.

The efficient and safe functioning of ATFCM depends on the players' adherence to ATFCM rules and instructions. However, ATS providers, aircraft operators, and aircraft commanders at times exploit the weaknesses and flexibility of the system. In a number of instances, ATS providers provide low estimates of sector capacity resulting in an increased number of regulated airspace sectors. Examples of AOs misuses include ghost flight plans, simultaneous flight planning, delay compensation through false EOBTs, misuses of STS indicators and missing flight plans.

Therefore, there will be a need to ensure effective mechanisms for the enforcement of the ATFCM system. However, even under the revised Convention, EUROCONTROL's powers to issue directly applicable and binding regulatory measures and its enforcement power remain weak and unclear.

3.5.2. The Regulatory Situation Today

3.5.2.1. International Conventions versus Agreements

The current legal base of ATFCM regulations consists of :

- ICAO Convention and its annexes, in particular annexes 2 and 11;
- EUROCONTROL Revised Convention, in particular articles 7 and 19;
- Letters of agreements (CFMU-ACC) and service agreements (CFMU-AO);
- EUROCONTROL ATFM Users Manual.

ICAO Convention and Annexes as well as EUROCONTROL Convention come under the jurisdiction of international law. They are binding agreements between sovereign states. By contrast, letters of agreement belong to international commercial law because they are contractual agreements between public or private operators.

3.5.2.2. Compliance with ATFCM Instructions

According to Article 19.1 of the revised Convention, EUROCONTROL shall determine, the necessary regulatory measures, and shall communicate them to aircraft operators and to the appropriate air traffic services. The Contracting Parties shall ensure that aircraft operators, aircraft commanders and the appropriate air traffic services comply therewith, unless prevented by compelling reasons of safety."

Within the general context of ATM, CFMU can therefore address ATFCM measures directly to both ATS providers and aircraft operators. The wording of Article 19.1 however, is not wholly conclusive as to whether these measures have direct effect upon providers and operators and provide a mandatory basis for ATC and flight planning.

Furthermore, the reference to the states' role in ensuring compliance with ATFCM instructions raises doubts about the nature of such measures.

Also, although Article 19.1 asks states to ensure that aircraft commanders (AC) comply with ATFCM measures, EUROCONTROL may not give such instructions directly to pilots. Any authority to interact directly with the AC during the actual operation of a flight rests with the competent (local) domestic ATC provider. The actual management of flight operations as the essential operative part of ATM having ultimate "real-worldeffect" therefore remains the prerogative of the states.

3.5.2.3. EUROCONTROL's Limited Enforcement Mandate

EUROCONTROL has only a very limited enforcement mandate under the revised Convention. While EUROCONTROL has a mandate to record cases of non-compliance, enforcement actions remain the province of states:

- Enforcement vis-à-vis ATS providers :

  Enforcement vis-à-vis ATS providers remain the sole responsibility of states.

- Enforcement vis-à-vis aircraft operators and aircraft commanders :

  Enforcement vis-à-vis users needs State approval. Enforcement proceedings may take two different forms:
  - proceedings instituted by the member state where non-compliance was recorded; and
  - proceedings instituted by EUROCONTROL itself in a domestic court with the agreement of the member state where the proceedings are to be instituted.

- Recording of violations by EUROCONTROL :

  Under Article 20 of the revised Convention, EUROCONTROL's authority to appoint officers to record infringements of the air navigation regulations will be extended to violations of ATFCM regulations and instructions.

3.5.3. ATFCM Regulatory Provisions

3.5.3.1. Introduction

In sum, even under the revised Convention, it is not totally clear whether ATFCM instructions are directly applicable to ATS providers and aircraft operators and would provide a mandatory basis for flight planning. Moreover, the revised Convention essentially leaves enforcement to states. Therefore, to strengthen ATFCM in Europe, EUROCONTROL's CFMU will be vested with a clear ATFCM mandate and thereby clarify the legal status of ATFCM instructions; it will also provide a general framework for the enforcement of ATFCM rules and measures.

In addition, ATFCM-relevant obligations introduced by the Single European Sky Regulations will be taken into consideration in order to guarantee the harmonisation of the ATFCM provisions.

3.5.3.2. Implementation of an ATFCM Regulatory Framework

The regulatory framework for ATM standardisation in Europe should include standards and rules for ATFCM, and in particular, the interface between ATC and ATFCM. Therefore, there is a need to establish an ATFCM regulatory process in order to submit the proposals and principles that will frame the regulatory roadmap for ATFCM.

This ATFCM regulatory process will be sustained by the EUROCONTROL Notice of Proposed Rule-Making (ENPRM) that will be the basis of a formal consultation and discussion on principles. The ENPRM will likely establish a formalised multiple-step approach to the initiation of rule-making and the drafting of a proposal. Important issues will be to remain consistent with the Single Sky regulatory provisions and to consider military requirements through a joint civil/military rule-making process.

Requirement REG 01 : Ensure that ATFCM will be considered within the regulatory framework for ATM in Europe through an appropriate ENPRM Process.

Requirement REG 02 : Ensure that the ATFCM rule-making process will consider and be consistent with the regulations introduced by the Single Sky (e.g. system interoperability, etc).

Requirement REG 03 : Ensure that the military requirements will be considered through a joint civil/military rule-making process.

3.5.3.3. Common ATFCM References

All ATFCM parties accept the need for European ATFCM. However it is necessary for them to share common ATFCM references that are reflected in the relevant ICAO documentation. Indeed, these common references already exist but are not recognised at the highest level and in the clearest way.

This explicit definition and statement of ATFCM role/status will pave the way towards a common understanding of the principles to be applied.

Requirement REG 04 : Establish clear definition and statement of ATFCM role/status in order to ensure the sharing of common ATFCM references.

3.5.3.4. Safety

ATFCM has less direct impact on safety than ATC. An ATFCM regulation should nevertheless ensure that key safety implications have been properly addressed. The following aspects seem of a particular importance:

- respect by CFMU of capacity limits set by ATS Providers;
- monitoring of over-deliveries;
- impact of flight plans tactical changes;
- impact of non adherence to the ATFCM measures.

Those safety-related rules would aim at ensuring that the objective of looking for optimal utilisation of the ATM network has no detrimental effect on safety levels.

Requirement REG 05 : Ensure that regulatory provisions will properly address the following safety issues :
- ***respect by CFMU of capacity limits set by ATS providers;***
- ***monitoring of over-deliveries;***
- ***impact of flight plans tactical changes;***
- ***impact of non adherence to the ATFCM measures.***

3.5.3.5. Principles of ATFCM

The ATM Strategy for the years 2000+ lists the basic principles that must prevail in ATFCM to ensure common awareness and collaborative ATFCM:

- Efficiency/Quality;
- Equity/Fairness;
- Transparency;
- Participation;
- Information Sharing;
- Anticipation/Pro-activity & Flexibility.

Those principles should be officially stated in the regulatory material to ensure common awareness on these consensual issues and to trigger positive behaviours.

Enabling to set up a clear framework for ATFCM in Europe, the official establishment of these principles will allow to reach a common understanding that will ensure those ATFCM principles are adhered to.

Requirement REG 06 : Ensure that the regulatory material will consider the following principles :
- ***efficiency/quality;***
- ***equity/fairness;***
- ***transparency;***
- ***participation;***
- ***information sharing;***
- ***anticipation/pro-activity & flexibility.***

3.5.3.6. Regulatory Organisation

To remedy uncertainties concerning the interpretation of Article 19.1 of the revised Convention, Member States that have ratified the revised Convention should be required to ensure through their appropriate domestic legislative processes that any ATFCM measures agreed between the CFMU, ATS providers and aircraft operators have direct and binding effect upon them. ATS providers and aircraft operators must be required, through national law, to observe regulatory measures in the area of ATFCM unless prevented by compelling reasons of safety. Aircraft commanders should be required to prepare a flight in such a way that compliance with ATFCM instructions could be achieved.

Requirement REG 07 : Establish a clear ATFCM mandate to be conferred to CFMU and clarify the legal status of ATFCM instructions.

In addition, the role of each of the different parties in ATFCM (including military) must be clearly defined by the regulatory material to ensure non-ambiguity in the definition of responsibilities for ATFCM operations, and to encourage co-operative behaviour. In particular, rights and obligations of each party should be identified. Tolerance applying to them should be defined as required and monitored in order to assess the global performance of ATFCM at ATM network level.

Requirement REG 08 : Ensure enforcement of the ATFCM system through the definition in the regulatory material of the role, responsibilities, rights and obligations of each parties.

Requirement REG 09 : Establish monitoring mechanism of associated indicators to assess the compliance of each parties to the regulatory provisions.

A non-compliance procedure for ATFCM should also be open to complaints from all players involved (including EUROCONTROL members) and should apply to CFMU, ATS providers, aircraft operators and aircraft commanders. An independent non-compliance committee whose members should be representatives of all ATFCM players should treat complaints. As a safeguard against abuse, the non-compliance process should be limited to repeated violations of regulations and instructions that reflect systems non-compliance. The non-compliance committee should issue findings and recommendations on a case-by-case basis and regular reports.

Requirement REG 10 : Set up an independent non-compliance committee responsible for treating complaints from all players involved according to a well defined non-compliance procedure.

A general, flexible supervisory/regulatory mechanism, enabled to interpret and to contribute in updating the rules of the regulatory provisions, will better fit the needs of stakeholders than too rigid regulatory texts.

Requirement REG 11 : Establish flexible supervisory/regulatory mechanism in order to interpret and to contribute in updating the rules of the regulatory provisions.

Requirement REG 12 : Establish a regulatory body responsible for promulgating and updating the regulatory provisions.

3.5.3.7. Regulatory Provision for ATFCM Measures

The regulatory texts should describe in a general way the available ATFCM measures (e.g. slot allocation, re-routing, sector management, etc). For some of these measures, the regulatory provisions should provide the relevant parties with appropriate means of information/decision/action/means of compliance to ensure a full efficiency of regulated ATFCM. The expected result of regulatory provisions for ATFCM measures will be to ensure a better and more systematic application of existing rules that are not yet clearly stated or not well accepted by all ATFCM parties. These regulatory provisions should in particular contribute to a better adherence to ATFCM measures by improving the awareness and the participation of the ATFCM parties.

Transposing this progress to the flight plan, the regulatory provisions are expected to ensure consistency of ATFCM measures with the requested flight plan. They shall also contribute to integrate the ATFCM Data with the ATC Data to have seamless operation and continuity between ATFCM and ATC (Flow Control).

Requirement REG 13 : Describe regulatory provisions for ATFCM measures.

3.5.3.8. Provision of Information

Increasing transparency and awareness consists in providing each ATFCM partner with timely and relevant information, so that this partner can efficiently contribute to the ATFCM process, while understanding clearly the decisions taken by other parties.

Regulatory provisions shall specify in general terms the nature and the recipients of the information (e.g. expected and airborne traffic, airspace availability, archive data, etc) to be provided by each partner, subject to application, interpretation and update of these general terms by the ATFCM supervisory/regulatory function.

Requirement REG 14 : Specify in the regulatory provisions the nature and the recipient of the information to be provided by each partner.

Participants will adhere to this information-sharing exercise only if they are assured that confidential or sensitive data will not diverted from their original purpose. Therefore, this issue of information confidentiality should be tackled by a regulation with a view to an equitable treatment and adapted sanction regime.

Requirement REG 15 : Establish regulatory provisions to cover the issue of information confidentiality.

Regulatory provisions should also contribute to seamless operations between ATFCM functions and other ATM services, by prescribing and encouraging use of interoperability standards.

Requirement REG 16 : Ensure that the regulatory provisions will prescribe the use of interoperability standards for the exchange of information.

As the regulatory provisions are expected to ensure the coherence and interoperability of flight plan information through all stakeholders, they should also support the introduction of the Single Initial Flight Plan concept.

Requirement REG 17 : Ensure that the regulatory provisions will address the coherence and interoperability of flight plan information in accordance with the Single Initial Flight Plan concept.

General Access to Archive Data for ATFCM parties is expected to provide transparency and to allow further analysis to check compliance or to detect weaknesses in the process.

Requirement REG 18 : Ensure that the regulatory provisions will include the general access to archive data to allow further analysis of the ATFCM system.

3.5.3.9. Critical Events

A critical event can lead to an unusual situation involving a major loss of capacity, or a major increase of congestion, or a major failure in the information flow in one or several pieces of European airspace.

In order to enable the ATFCM parties to react properly, the regulatory provisions will consider the need for applying collaboratively specific measures and procedures to respond to the critical events.

Requirement REG 19 : ***Ensure that regulatory provisions will allow ATFCM parties to apply specific measures and procedures (non-standards) according to the critical events to be managed.***

3.6. MANAGEMENT OF CRITICAL EVENTS

3.6.1. Generalities

The management of critical events, be it pro-active (known events) or reactive (unplanned, but prepared) is essential to minimise their impact on the ATFCM situation. Therefore, to ensure safety and a continuous operation, the ATFCM community must be able to deal with different contingencies at all level of operation.

The objective of planning for the management of critical events is to prepare for uninterrupted operations at all times regardless of technical or catastrophic failures, as well as industrial action, be it a breakdown of a radio frequency at a small airport or a major international crisis. This will be achieved by developing "response schemes" at all levels and co-ordinating them. Having pre-defined scenarios and procedures will eliminate much of the ambiguity, which occurs during a crisis, and will lead to a more appropriate and thorough set of responses. In addition, an efficient sharing of information between all partners concerned will allow to keep the ATFCM picture as accurate as possible.

Defining terms is essential to understand within the ATFCM framework the nature of critical events and the associated organisational responses.

- Crisis refers to the impact on the ATFCM organisation and its ability to cope with or respond to a critical event.
- Critical event refers to a sudden and usually unforeseen event leading to a high drop in ATFCM capacity, involving many partners and requiring immediate action to minimise consequences and to retrieve network stability.
- Management of critical events refers to specific activities conducted within iterative and interactive phases in order to handle critical events and their consequences.
- Response Scheme refers to pre-defined scenarios, procedures and associated measures to be implemented in order to react to critical events.

The management of critical events will therefore only focus on events identified according to the above definition (e.g. 11th September-like event, etc). Any other events with forewarning (e.g. expected industrial actions, etc) will be handled through the normal ATFCM working processes as described in the para 2.3.4.

3.6.2. Policy for the Management of Critical Events

A simplified approach about management of critical events could mainly focus on response activities. Being able to respond, however, must be considered as only one phase of the management. The ATM community must also address critical events before they occur and must share in the responsibility to aid recovery. As a result, the management of critical events can be defined by the following phases :

- Preparedness : activities performed in advance to develop response and recovery capabilities (e.g. response scheme).
- Response : activities performed after a critical event occurs to minimise the impact and to stabilise the ATFCM situation.

- Recovery : activities performed after a crisis has been stabilised to return to normal situation.
- Evaluation : activities performed when the situation is back to normal to analyse and assess the previous phases and to correct and improve them according to the results.

All these phases shall be conducted in close co-operation with the all partners to guarantee the efficiency of the management process. Therefore, the establishment of the management policy and the development of the response schemes need to be carried on by a team representing all functional areas of the ATFCM community supported when required by other agencies such as NATO, UNO, law enforcement.

Requirement CRI 01 : ***Set-up collaborative processes between all partners involved aimed at establishing the management policy of critical events.***

Requirement CRI 02 : ***Ensure that the management policy of critical events will consider the preparedness, response, recovery and evaluation phases.***

3.6.2.1. Preparedness Phase

The purpose of the preparedness phase is to provide a uniform basis for operating procedures and measures to assure rapid, controlled and predictable responses to the various types of critical events. Preparedness means being ready in advance to react promptly and effectively in the event of crisis.

The starting point is the identification of the potential critical events that could affect the normal operations. This list should include all possible critical events no matter how remote the likelihood of their occurrence. Against each item listed, its potential impact severity level should be estimated in order to frame the response scheme in the context of the real needs.

Once the assessment stage has been completed, the structure of the response scheme can be established (see para 3.6.3) and will propose a range of milestones to move the ATFCM situation from its disrupted status towards a return to normal operations.

Requirement CRI 03 : ***Develop response schemes according to the identified critical events and considering their impact on the operations.***

In order to enable the ATFCM parties to react properly, there could be the need to get rid of the standards rules and to develop specific measures and procedures (non-standards) that will be considered in the response scheme. The collaborative use of these non-standards rules (e.g. management of industrial actions, cutting down the demand, etc) must be agreed by all parties concerned and must be sustained by regulatory provisions.

Requirement CRI 04 : ***Ensure that the use of specific measures and procedures (non-standards) addressed by the response scheme will be sustained by regulatory provisions.***

When developed, the response scheme must be subject to regular evaluation by persons who would undertake those activities if the related critical event occurred in reality. The evaluation procedures should be documented and the results recorded to ensure that feedback is obtained for fine-tuning the response scheme.

Requirement CRI 05 : ***Define procedures to evaluate and fine-tune the response schemes according to the obtained feedback.***

Once accepted, it is necessary that all personnel must be made aware of the response scheme and be aware of its contents and their own related duties and responsibilities (personnel training). It is important that all personnel consider the response scheme seriously, even if the critical events seem remote and unlikely. In addition, obtained feedback from staff will ensure that the responsibilities and duties are understood, particularly those, which require close dependency on actions being taken by others.

Requirement CRI 06 : ***Define procedures to inform and train personnel about the response scheme and their own related duties and responsibilities.***

Finally, the response scheme must be kept up to date and applicable to current operational circumstances. Any changes resulting from the evaluation phase must be properly reflected. Someone must be assigned for ensuring that the response scheme is maintained and updated regularly and should ensure that information concerning changes are communicated to all personnel and partners concerned.

Requirement CRI 07 : ***Define procedures to ensure that response schemes will be kept up-to-date and applicable to current operational circumstances according to regular evaluation.***

3.6.2.2. Response Phase

The response phase consists of considering and assessing in real-time the occurring critical events and implementing corrective measures according to the response scheme in order to minimise the impact on the ATFCM situation and to retrieve the stability of the network.

Significant signals should be established in order to identify as early as possible and anticipate the occurrence of critical events. This would allow reducing or eliminating the need for contingency measures.

Requirement CRI 08 : ***Define significant signals enabling to anticipate the occurrence of critical events.***

However, as most of the critical events are unpredictable, their identification and their notification are important activities to be addressed. These activities are part of the situation assessment stage together with the evaluation of the impact of the critical events on the local and network capacity. This situation assessment conducted through a CDM process will allow to get an as accurate as possible picture of the crisis and to decide the appropriate response scheme and associated measures to implement.

Requirement CRI 09 : ***Set-up collaborative processes between all partners involved aimed at performing the situation assessment stage (identification, notification and impact evaluation of the critical events), and deciding the appropriate response scheme to implement.***

Continuous monitoring of the implemented measures will be conducted in order to adjust them accordingly and to progressively retrieve the stability of the network.

Requirement CRI 10 : ***Establish procedures to continuously monitor the implemented response scheme.***

3.6.2.3. Recovery Phase

When stability of the network capacity has been retrieved thanks to the implemented measures, the recovery phase will focus on repairing the "damage" (e.g. delays) and re-establishing normal working processes.

As recovery efforts will be most successful if they are based on realistic planning, pre-defined procedures according to the response scheme in force will be established through the CDM process. These procedures will consist of assessing the feasibility of restoring normal operations, of determining priorities between flights and partners and of disseminating the related information. The cornerstone of this recovery phase will be the flexibility in the mind of all partners allowing to find the best compromise.

Requirement CRI 11 : ***Establish recovery procedures to restore the normal operations through collaborative agreement on priorities between flights and partners.***

3.6.2.4. Evaluation Phase

The evaluation phase consists of performing the debriefing of all personnel and partners involved with the aim of analysing and assessing the outcome of the crisis. This will allow to fine-tune and improve accordingly the response scheme through the promulgation of updates to all partners concerned.

Requirement CRI 12 : ***Establish procedures to assess the outcome of the management of the critical events through the debriefing of the personnel and partners involved.***

3.6.3. Response scheme

Planning is essential for efficient management of critical events. Response scheme as an extension of the critical events identification and assessment, guides the personnel involved to establish and achieve a pre-determined level of preparedness that will in turn aim at resolving the crisis.

The response scheme could rely on the 4 C's :

- Contain : Isolating the event and protecting potential affected partners and areas (airspace , route, airport).
- Control : Using pre-defined scenarios and procedures in order to manage the event.

- Co-ordination : Ensuring that all responders work together as a team.
- Communicate : Ensuring that all responding personnel and partners share information and work towards a common goal.

Requirement CRI 13 : Ensure that the response schemes will address the containment, control, co-ordination and communication issues.

3.6.4. Sharing of Information

An important issue of the management of critical events is the notification of their occurrences. This requires that any statement (be it electronic mail message, phone call or fax) provides information about the event that is clear, concise and accurate. Another important consideration when communicating about the critical event is to be factual. Attempting to hide aspects of the event by providing false or incomplete information not only prevents a successful resolution to the event but also may make the situation worse.

The choice of language used when notifying can have an effect on the way that information is received. When inflammatory terms are used, the expectations of negative outcomes are raised. It is important to remain calm both in written and spoken notification.

All these issues related to a clear, concise and accurate notification of the occurrence of critical events call for the use of standard phraseology and pre-defined message templates that will guarantee to be understood by all partners concerned.

Requirement CRI 14 : Define standard phraseology and establish message templates in order to notify the occurrence of critical events.

The notification of the event to the CFMU and the provision of this information from this central source to all partners concerned will ensure to conduct a CDM process according to common reference and will allow to implement adequate response scheme. The real-time sharing of information from a central position will aim at achieving global consistency and at keeping the ATFCM picture as accurate as possible. The result of the CDM process and the dedicated plan and/or measures to be implemented will also be communicated from the CFMU. The main benefits of this centralised information-sharing will be :

- the reduction of the number of messages avoiding duplication and inconsistency of information;
- the reduction of the workload at the local level as the interface between partners will be centrally handled ;
- the guarantee that the latest version of the information is available to all;
- a common awareness about the critical event, its impact and the measure to be implemented;
- an easy and standardised access to the information leading to a saving of time;
- the consistency of information as basis for an efficient decision support

Requirement CRI 15 : ***Develop and enable access to critical events information in order to guarantee common references and global consistency.***

3.6.5. Organisation

A major issue is to know who is in charge of co-ordinating the activity of multiple players. A mistake that can be made is to have a number of points of contact that are not pulling their efforts together. This will only add to the confusion of the event and will probably lead to additional confusion, wasted and/or ineffective effort. Therefore, a limited number of points of contact (POC) must be clearly identified. They must have the technical expertise to participate to the CDM process and to co-ordinate locally the implementation of the ATFCM measures. Furthermore, they must be able to take appropriate decision in using non-standards rules and procedures in order to react promptly to the critical events. This will impose that the role and responsibilities of each partner within the management of the critical events together with the mechanism enabling the implementation of the response scheme (e.g. who has the leadership, according to which rules, etc) be accurately defined.

Requirement CRI 16 : ***Establish an organisational structure with a limited number of points of contact that will enable the collaborative management of the critical events.***

Requirement CRI 17 : ***Establish a mechanism enabling the implementation of the response scheme and considering the role and responsibilities of each partner within the management of the critical events.***

SECTION 4.

TRANSITION PLAN FOR THE IMPLEMENTATION OF THE OPERATIONAL IMPROVEMENTS

4.1. INTRODUCTION

4.1.1. ATFCM Roadmap

As identified within the ATFCM Strategy and in order to implement the evolution of ATFCM, the Direction for Changes and associated Lines of Actions have been organised into four sub-groups :

- Strategic Flow and Capacity Management
- Optimised Capacity Management;
- Tactical Flow & Capacity Management;
- Collaboration with ATM Partners.

Each sub-group has been sub-divided in three Operational Improvements (OI) of 5 years covering the next 5, 10 and 15 years in order to reflect the continuous process of their evolution and to sequence their implementation.

Strategic Flow and Capacity Planning	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**16**	**15**	**17**
Establishing Strategic ATFCM																
Develop Synergies with Resource Managers																
Consolidated Planning Of Resources																
Optimised Capacity Management	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**16**	**15**	**17**
Implementing OCM Principles																
Flexible Capacity Management																
Common Capacity Management																
Tactical Flow and Capacity Management	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**16**	**15**	**17**
Increasing ATFCM Capabilities																
Aligning with ATC and Airport Horizons																
Traffic Optimisation																
Collaboration with ATM Partners	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**16**	**15**	**17**
Facilitating ATM Data Exchange																
Sharing ATM Information																
Common ATM Awareness																

Figure 20 : ATFCM Roadmap for Operational Improvements

4.1.2. Purpose

The purpose of this section is to cluster the functional requirements identified within the Directions for Changes and associated Lines of Actions within the Operational Improvements. These requirements will be translated in ECIP Objectives and in a CFMU Work Programme. This will lead to the establishment of several projects allowing a smooth transition from strategy to implementation through appropriate projects management and progress monitoring activities.

4.2. IMPLEMENTATION PLAN

4.2.1. Methodology

In order to ease their reading and understanding, the Operational Improvements are described in the form of a common checklist that contains the functional requirements to be collaboratively developed. Some of them will impose close co-ordination with other ATM domains and are identified in the checklist within the column “ATM”. The development and implementation process will be managed through associated projects.

With the aim of identifying the related projects, the requirements are sorted within the following Fields of Development:

- ATFCM Process : encompasses the requirements related to the working methods and supporting tools enabling the conduct of ATFCM activities;
- Common Awareness : focuses on the requirements highlighting the need for data exchange and information sharing that will enable all stakeholders to access to consistent ATM data;
- Partnership Management : considers the requirements that describe the collaborative decision making process between partners in order to support the ATFCM Process;
- Quality Management : embraces the requirements dealing with the monitoring of indicators, the post-analysis procedures and the feedback mechanisms in order to ensure the quality of ATFCM service.

A list of ECIP objectives was established in the European Convergence and Implementation Plan with the primary focus on ETFMS and collaborative flight planning implementation. Therefore, references to these objectives are provided notwithstanding their possible revision and the development of additional objectives according to the identification of the projects.

4.2.2. Operational Improvements

Hereafter, the Operational Improvements* are presented according to their common implementation steps with the target date being that when full benefit throughout the ECAC area will be realised.

Note * *As result of an increase in the ATFCM scope, the appellation of some Operational Improvements is slightly different than that used in the ATM 2000+ Strategy (Edition 2003) in order to reflect with more accuracy the relationship between ATFCM and other ATM activities. The next edition of the ATM 2000+ Strategy will be amended accordingly.*

OPERATIONAL IMPROVEMENT	ESTABLISHING STRATEGIC ATFCM	Timeframe
Sub-group :	Strategic Flow and Capacity Planning	2004-2008
Direction for Change:	Improving Traffic Flow and Capacity Management	

Description :	
Rationale :	The proper definition of roles and co-ordination of responsibilities of each actor/partner and stakeholder in the Strategic Flow and Capacity Planning activities will be established. This OI will be marked by improvements in the assessment of the balance between traffic demand and airspace capacity. Earlier information of problems in critical areas will allow better co-ordination and management of the provision of en-route capacity and the use of the airspace. It will provide airspace users with more detailed information of the service providers' plans and capabilities.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :			ATFCM	ATM
ATFCM Process	TCM 12 :	Develop simulation tools in order to identify the expected capacity shortfalls in the network and at sector levels through the comparison between the ATM data and the forecast traffic.	▲	
	TCM 14 :	Develop a sector management tool to assist ATS Providers in defining sectors configurations and in enabling the assessment of the impact of the different configurations in the overall area.		▲
	TCM 17 :	Develop a capacity planning tool to assist ATS Providers in the provision of an operational capacity plan through the assessment of different options.		▲
	TCM 20 :	Identify through simulation the possible re-routings and develop co-ordination procedures between ATS Providers concerned.	▲	
	TCM 21 :	Evaluate through simulation the potential benefits of FL management on the network and define the procedures of use.	▲	
	TCM 22 :	Assess through simulation the impact of critical events and unstable flows.	▲	
	TCM 25 :	Pre-validate scenarios and new airspace structure before any publication.		▲
	APT 03 :	Assess the impact of the expected airport traffic demand (based on airport slots) on the network capacity.		▲
	APT 08 :	Assess the impact of airport special events on the network capacity.	▲	
Common Awareness	TCM 03 :	Develop procedures and associated tools to share "best practices" between all partners.	▲	
	TCM 04 :	In order to ensure the Quality of Service, the CFMU systems shall be able to keep track of the planned and the current trajectories capacity.	▲	
	TCM 08 :	Ensure the provision of data reports and statistics on ATFCM operations and delay situations in support of performance evaluation for managerial and operational decision making of ATC service providers.	▲	
	TCM 09 :	Develop procedures to track the operational performance of the ATM system and the contribution of individual ATS providers.		▲
	TCM 10 :	Improve on-line access to CFMU operational data in order to assist ATFCM partners to make informed decisions regarding their own actions (e.g. FPL optimisation).	▲	
	TCM 26 :	Ensure the storage of the scenarios and associated Modus Operandi.	▲	

Requirements :			ATFCM	ATM
	TCM 27 :	Develop access to the CFMU Environment database to all partners concerned.	▲	
	FUA 12 :	Develop a Common Flight Plan Repository Concept in order to ensure the consistency of the Flight Plan Processing.	▲	
	FUA 15 :	Identify the operational and technical specifications for the CFMU part of the Airspace Data Repository, or define new specifications for additional tools, if required.		▲
	CRI 06 :	Define procedures to inform and train personnel about the response scheme and their own related duties and responsibilities.		▲
	CRI 15 :	Develop and enable access to critical events information in order to guarantee common references and global consistency		▲
Partnership Management	TCM 11 :	Improve process to get data on the current and expected traffic evolution (intentions of the AOs) and on expected airspace changes.		▲
	TCM 13 :	Set-up collaborative processes between all partners involved aimed at defining the “change requests” to the ATM environment that are required to accommodate the forecast traffic demand.		▲
	TCM 24 :	Define scenarios in order to anticipate critical events.	▲	
	TCM 28 :	Establish a transparent process to ensure that the output of the Strategic phase will be communicated to all parties concerned in the Pre-tactical activities.	▲	
	FUA 01 :	Set-up of a common ASM/ATFCM/ATC mechanism for the establishment of route structure and associated sectorisation including their instructions for use.		▲
	FUA 03 :	Ensure that “Airspace change requests” required to maximise the network capacity will be co-ordinated with the ASM planners.		▲
	CRI 01 :	Set-up collaborative processes between all partners involved aimed at establishing the management policy of critical events.		▲
	CRI 02 :	Ensure that the management policy of critical events will consider the preparedness, response, recovery and evaluation phases		▲
	CRI 03 :	Develop response schemes according to the identified critical events and considering their impact on the operations.		▲
	CRI 07 :	Define procedures to ensure that response schemes will be kept up-to-date and applicable to current operational circumstances according to regular evaluation.		▲
	CRI 13 :	Ensure that the response schemes will address the containment, control, co-ordination and communication issues..		▲
	CRI 14 :	Define standard phraseology and establish message templates in order to notify the occurrence of critical events.		▲
	CRI 16 :	Establish an organisational structure with a limited number of points of contact that will enable the collaborative management of the critical events.		▲
	CRI 17 :	Establish a mechanism enabling the implementation of the response scheme and considering the role and responsibilities of each partner within the management of the critical events.		▲
Quality Management	TCM 01 :	Define post-analysis procedures, tools and indicators in order to evaluate the efficiency of the implementation of the ATFCM solutions at any stage of the ATFCM activities.	▲	
	TCM 02 :	Establish feedback mechanism to ensure that the results of post-analysis will be used as input data in each of the ATFCM activities	▲	
	TCM 05 :	Develop additional quality control tools to enable the identification of abuses of the system.	▲	
	TCM 06 :	Develop additional quality control tools to monitor closely the CFMU performance.	▲	

OPERATIONAL IMPROVEMENT	IMPLEMENTING OCM PRINCIPLES	Timeframe
Sub-group :	**Optimised Capacity Management**	**2004-2008**
Direction for Change:	**Improving Traffic Flow and Capacity Management**	

Description :	
Rationale :	This OI will establish new rules and procedures to enable the progressive shift from the reactive management of demand to the proactive global management of capacity (i.e. network management). This will be supported by the use of improved historical data and simulation tools to provide a better picture of short-term events.
ECIP Objective :	FCM 02 : Initial capacity management.

Requirements :			**ATFCM**	**ATM**
ATFCM Process	TCM 32 :	Develop simulation tools in order to identify the expected capacity shortfalls at the network and sector levels through the comparison between the Strategic ATFCM data and the expected traffic.	▲	
	TCM 33 :	Develop a sector management tool to assist ATS Providers in configuring their sectors according to the traffic demand.	▲	
	TCM 46 :	Improve slot allocation mechanism through : - adjustment of CASA parameters; - monitoring of CASA performance; - development of tools to assist in restriction implementation (What-if); - development of tools to assess the best restriction implementation strategy.	▲	
	FUA 07 :	Review the current pre-tactical timeframe for ASM & ATFCM (Anticipating Phase) and move it closer to the time of operations in order to get best benefit from more accurate information.		▲
Common Awareness	TCM 30 :	Ensure the participation of AOs in the ATFCM CDM process in order to increase the AOs knowledge on the possible solutions and to take the best solutions under the prevailing circumstances.	▲	
	TCM 37 :	CFMU to update the Environment database according to the airspace allocation decision.		▲
	TCM 41 :	Develop tools to assist CFMU to identify the “other available capacity”.	▲	
	TCM 48 :	Improve the ATFCM information process in order to disseminate the NOP and the updates to reach the wider audience.	▲	
Partnership Management	TCM 29 :	Set-up collaborative processes between all partners involved aimed at identifying the most appropriate ATFCM solution(s) to be implemented in order to establish an efficient Network Operations Plan.	▲	
	TCM 31 :	Develop procedures to get Strategic ATFCM data, expected traffic demand and other data of interest.	▲	
	TCM 45 :	Develop procedures in order to identify flights that are in position to receive an earlier take-off time or ETO, to assess the impact of this solution on the network and to propose advanced slots to AOs.	▲	
	TCM 47 :	Extend the CFMU Network Management activities on the day of operations.	▲	

Requirements :		ATFCM	ATM
Quality Management	TCM 01 : Define post-analysis procedures, tools and indicators in order to evaluate the efficiency of the implementation of the ATFCM solutions at any stage of the ATFCM activities.	▲	
	TCM 02 : Establish feedback mechanism to ensure that the results of post-analysis will be used as input data in each of the ATFCM activities	▲	

OPERATIONAL IMPROVEMENT	INCREASING ATFCM CAPABILITIES	Timeframe
Sub-group :	Tactical Flow and Capacity Management	2004-2008
Direction for Change:	Improving Traffic Flow and Capacity Management	

Description :	
Rationale :	Enhancements will be made to the quality of tactical flow management through improved traffic monitoring capabilities via the availability of surveillance-derived traffic information. This will enable more accurate prediction of traffic and ATC workload, which in turn will allow actors to benefit from last minute opportunities. It provides the first elements to close the gap between ATC and ATFCM.
ECIP Objective :	FCM 01 : Implement enhanced traffic flow management services.

Requirements :			ATFCM	ATM
ATFCM Process	TCM 53 :	Develop What If tools in order to conduct short-term simulations.	▲	
	TCM 62 :	Develop slot allocation procedures and tools to improve restriction implementation and management of individual flights (e.g. departure sequence, unexpected events, local constraints, etc).	▲	
	APT 27 :	Develop procedures and tools allowing to consider the type of equipage (ILS, MLS) available on board and at the airport in order to fine-tune the airport capacity value during bad weather conditions and to implement ATFCM solutions accordingly.		▲
Common Awareness	TCM 55 :	Develop information sharing process in order to support the CDM.		▲
	TCM 63 :	Provide a consolidated network Flow and Capacity picture to all partners, including flight intentions, status of airspace (permeability, opening and closing time), capacity values, ATFCM measures and constraints data, airport and meteo data.	▲	
	TCM 64 :	Ensure the re-distribution of ETFMS flight plan data to ATS Providers concerned.	▲	
	APT 22 :	Develop tools and procedures enabling Tower to have a clear picture of the ATFCM situation and to update ETFMS as required.	▲	
	APT 15 :	Develop information sharing in order to provide CFMU with more accurate departure data consolidated at airport level.		▲
	CRI 08 :	Define significant signals enabling to anticipate the occurrence of critical events.		▲
Partnership Management	TCM 49 :	Develop procedures to get accurate information on real-time events.	▲	
	TCM 54 :	Ensure that the collaborative processes between all partners concerned allow to conduct within a short timeframe the identification, assessment and implementation of adequate and co-ordinated ATFCM solutions including the use of ATC operating techniques acting on airborne traffic, followed by their notification.		▲
	CRI 09 :	Set-up collaborative processes between all partners involved aimed at performing the situation assessment stage (identification, notification and impact evaluation of the critical events), and deciding the appropriate response scheme to implement.		▲
	CRI 11 :	Establish recovery procedures to restore the normal operations through collaborative agreement on priorities between flights and partners		▲

Requirements :			ATFCM	ATM
Quality Management	TCM 01 :	Define post-analysis procedures, tools and indicators in order to evaluate the efficiency of the implementation of the ATFCM solutions at any stage of the ATFCM activities.	▲	
	TCM 02 :	Establish feedback mechanism to ensure that the results of post-analysis will be used as input data in each of the ATFCM activities	▲	
	TCM 05 :	Develop additional quality control tools to enable the identification of abuses of the system.	▲	
	TCM 07 :	Develop “on-line” tools to ensure quality control.	▲	
	TCM 50 :	Improve the accuracy of the capture of the real-time traffic data.	▲	
	TCM 51 :	Improve short-term traffic prediction tool.	▲	
	TCM 65 :	Develop tools to support the monitoring of the Network Operations Plan and the evaluation of its effectiveness.	▲	
	APT 21 :	Ensure that any updates of capacity value related to weather or other disruptions taking place at the Airport will be notified to all parties concerned in due course.	▲	
	CRI 10 :	Establish procedures to continuously monitor the implemented response scheme..		▲
	CRI 12 :	Establish procedures to assess the outcome of the management of the critical events through the debriefing of the personnel and partners involved.		▲

OPERATIONAL IMPROVEMENT	FACILITATING ATM DATA EXCHANGE	Timeframe
Sub-group :	**Collaboration with ATM Partners**	**2004-2008**
Direction for Change:	**Improving Collaboration with ATM Partners**	

Description :	
Rationale :	This OI will aim at improving the ATM data exchange with, and the assistance to, airspace users in support of flight plan filing and dissemination of more up-to-date information on airport and airspace constraints. Airspace users will be able to make more informed decisions when compromises are needed between delay, re-routing, trajectory limitations or costs.
ECIP Objective :	FCM 03 : Implement collaborative flight planning.

Requirements :			**ATFCM**	**ATM**
ATFCM Process	APT 17 :	Ensure flight plan data consistency between the Airport scheduling, the FPLs, the AOs requirements and the pre-departure sequence in order to guarantee the slot adherence.		▲
	REG 02 :	Ensure that the ATFCM rule-making process will consider and be consistent with the regulations introduced by the Single Sky (e.g. system interoperability, etc).		▲
	REG 03 :	Ensure that the military requirements will be considered through a joint civil/military rule-making process.		▲
	REG 04 :	Establish clear definition and statement of ATFCM role/status in order to ensure the sharing of common ATFCM references.		▲
	REG 05 :	Ensure that regulatory provisions will properly address the following safety issues : - respect by CFMU of capacity limits set by ATS providers; - monitoring of over-deliveries; - impact of flight plans tactical changes; - impact of non adherence to the ATFCM measures.		▲
	REG 06 :	Ensure that the regulatory material will consider the following principles : - efficiency/quality; - equity/fairness; - transparency; - participation; - information sharing; - anticipation/pro-activity & flexibility.		▲
	REG 07 :	Establish a clear ATFCM mandate to be conferred to CFMU and clarify the legal status of ATFCM instructions.		▲
	REG 08 :	Ensure enforcement of the ATFCM system through the definition in the regulatory material of the role, responsibilities, rights and obligations of each parties.		▲
	REG 13 :	Describe regulatory provisions for ATFCM measures.		▲
	REG 19 :	Ensure that regulatory provisions will allow ATFCM parties to apply specific measures and procedures (non-standards) according to the critical events to be managed.		▲
	CRI 04 :	Ensure that the use of specific measures and procedures (non-standards) addressed by the response scheme will be sustained by regulatory provisions		▲

Requirements :			ATFCM	ATM
Common Awareness	FPL 01 :	Define a minimum set of flight plan and profile characteristics to serve as the common basis for which flight plan consistency has to be maintained among all partners.		▲
	FPL 04 :	Develop a FPL reprocessing mechanism (rules, procedures and systems) to take account of airspace changes.	▲	
	FPL 06 :	Ensure that IFPS, via the CFMU Environment database, fully and accurately uses the current airspace of all participating States.		▲
	FPL 08 :	Provide access to archived flight plan to all partners concerned.	▲	
	FPL 09 :	IFPS to advise ATC of the correct route, within the IFPS Zone, for flights departing from outside the IFPS distribution area.	▲	
	FPL 11 :	Provide relevant flight plan information to airport authorities.		▲
	FPL 13 :	Update airports on relevant current flight intentions.		▲
	FPL 14 :	Implement ADEXP.		▲
	FPL 16 :	Use IFPLId.		▲
	FPL 17 :	Develop procedures and information sharing systems in the phase shortly before departure with regard to responsibility for flight plan updates.		▲
	FPL 18 :	Implement and refine AFP/ACH/APL processing for flight plan updates.		▲
	FPL 22 :	Develop services to provide latest Airspace and ATFCM situation.		▲
	FUA 13 :	Consider the airspace changes in the FPL reprocessing that has to be supported by flight plan reprocessing services.	▲	
	FUA 14 :	Fine-tune and implement the AFP, APL, ACH messages in order to advise the downstream ACCs about any change in the route field of the FPL.		▲
	APT 05 :	Ensure the provision of relevant flight plan information to airport authorities.		▲
	APT 07 :	Establish a transparent process to ensure that the Airport Special Events information will be communicated to all parties concerned.		▲
	APT 16 :	Develop information sharing in order to provide Airport with more accurate arrival data.	▲	
	APT 18 :	Ensure that updates to the current Flight Plan (SID/STAR, TOT, taxi-time, etc) resulting from airport constraints and from changes of their operational status and procedures will be provided by the airport concerned in order to keep accurate and consistent the ATFCM network situation.		▲
	APT 19 :	Ensure that relevant information on FPL updates will be provided to Airports concerned in order to manage efficiently their platforms.		▲
	REG 14 :	Specify in the regulatory provisions the nature and the recipient of the information to be provided by each partner.		▲
	REG 15 :	Establish regulatory provisions to cover the issue of information confidentiality.		▲
	REG 16 :	Ensure that the regulatory provisions will prescribe the use of interoperability standards for the exchange of information.		▲
	REG 17 :	Ensure that the regulatory provisions will address the coherence and interoperability of flight plan information in accordance with the Single Initial Flight Plan concept.		▲
	REG 18 :	Ensure that the regulatory provisions will include the general access to archive data to allow further analysis of the ATFCM system.		▲

Requirements :			ATFCM	ATM
Partnership Management	FPL 02 :	Establish a formal contractual status for flight plans and clarify the mandate/responsibility of each actor.		▲
	FPL 03 :	Develop procedures for the handling of changes to accepted flight plans.		▲
	FPL 05 :	Develop communications between ATS Providers, AOs and IFPS, to enable route change proposals to be negotiated.	▲	
	FPL 12 :	In collaboration with the concerned partners, develop procedures for consistency checking between airport slot and flight plans.		▲
	FPL 20 :	Develop flight planning syntax assistance tools in order to assist originators filing syntactically correct flight plan.	▲	
	FPL 21 :	Develop flight planning route finding and optimisation tools, including ATFCM impact (routing assistance).	▲	
	FPL 23 :	Develop easy-to-use flight plan filing tools taking benefit of modern and effective communication infrastructures.	▲	
	APT 06 :	In collaboration with the concerned partners, develop transparent procedures allowing to check the coherency between airport slot and flight plans.		▲
	APT 24 :	Develop procedures and tools in order to assist airport in the management of disruptions.	▲	
	REG 01 :	Ensure that ATFCM will be considered within the regulatory framework for ATM in Europe through an appropriate ENPRM Process.		▲
	REG 10 :	Set up an independent non-compliance committee responsible for treating complaints from all players involved according to a well defined non-compliance procedure.		▲
	REG 11 :	Establish flexible supervisory/regulatory mechanism in order to interpret and to contribute in updating the rules of the regulatory provisions.		▲
	REG 12 :	Establish a regulatory body responsible for promulgating and updating the regulatory provisions.		▲
Quality Management	REG 09 :	Establish monitoring mechanism of associated indicators to assess the compliance of each parties to the regulatory provisions.		▲
	CRI 05 :	Define procedures to evaluate and fine-tune the response schemes according to the obtained feedback.		▲

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OPERATIONAL IMPROVEMENT	DEVELOP SYNERGIES WITH RESOURCES MANAGERS	Timeframe
Sub-group :	**Strategic Flow and Capacity Planning**	**2006-2012**
Direction for Change:	**Improving Traffic Flow and Capacity Management**	

Description :	
Rationale :	In this OI there will be a scope expansion of the established procedures through further involvement of more and new types of actors (e.g. airport and airspace managers) in order to reach ECAC-wide coverage. This OI will be marked by the definition of standard scenarios and modus operandi describing the recommended links in terms of sectors, routes and areas usage in order to respond with flexibility to the variation of traffic demand.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :			**ATFCM**	**ATM**
ATFCM Process	TCM 15 :	Assess through simulation the impact of the activation/de-activation of FUA structures on the traffic situation.	▲	
	TCM 16 :	ATS Providers to identify through simulations operational techniques leading to less complex traffic situations.		▲
	TCM 18 :	ATS Providers to evaluate through simulations the possible benefits of an optimised use of the airport holding facilities.		▲
	TCM 19 :	ATS Providers to determine through simulations the optimal balance of arrival/departure capacities of Airports.		▲
	FUA 02 :	Pre-validate the main airspace changes before their publication in AIPs.	▲	
	APT 02 :	ATS Providers to evaluate through simulations the possible benefits of an optimised use of the airport holding patterns.		▲
Common Awareness	No Identified Requirements			
Partnership Management	TCM 23 :	Define standard ATFCM scenarios and associated Modus Operandi (sectors, routes and areas) in order to respond with flexibility to the variation of the traffic demand.		▲
	FUA 04 :	Ensure that the definition of new airspace structures will be accompanied with their 'Modus Operandi' describing routes, sectors and areas relationship and associated scenarios providing CFMU/FMD with the necessary flexibility and AOs with multiple options.		▲
	APT 01 :	Define Scenarios and Modus Operandi describing the recommended links and working methods in terms of airport infrastructure, sectorisation, staff resources, traffic type and ATFCM measures.		▲
	APT 09 :	Set-up collaborative process between partners concerned aimed at defining the "change requests" to the ATM environment in order to accommodate the Airport special events.		▲
Quality Management	APT 04 :	Define post-analysis procedures, tools and indicators in order to evaluate the consistency between expected airport traffic demand (based on the airport slots) and the airport real throughput.		▲

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OPERATIONAL IMPROVEMENT	FLEXIBLE CAPACITY MANAGEMENT	Timeframe
Sub-group :	**Optimised Capacity Management**	**2006-2012**
Direction for Change:	**Improving Traffic Flow and Capacity Management**	

Description :	
Rationale :	In this OI, progress will be made to achieve the proactive management of capacity where emphasis will be put on improved collaboration with military and airports to optimise activities of all concerned. Simulation facilities will be used to select, collaboratively, solutions and scenarios to meet demand and to prepare for crisis and special situations.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		**ATFCM**	**ATM**
ATFCM Process	TCM 34 : Assess through simulation the impact of the activation of airspace structure on the traffic demand.	▲	
	TCM 38 : Develop an assistance tool allowing ATS Providers to identify the operational techniques to be implemented to reduce the controller workload.		▲
	TCM 39 : Develop an assistance tool allowing the ATS Providers concerned to use the airport holding patterns at their optimum level.		▲
	TCM 40 : Develop an assistance tool allowing the CFMU and the ATS Providers concerned to identify imbalance between arrivals and departures and to implement the optimised Arrival/departure capacities.		▲
	TCM 42 : Develop means to assist the CFMU and the concerned ATS Providers to identify the possible re-routed flights/flows providing the best benefits according to the traffic demand and AOs capabilities.	▲	
	TCM 44 : Develop FL management tool to assess the impact of the RFL changes on the downstream ACCs and on the traffic complexity, and publish associated procedures in pre-tactical document.		▲
	FUA 08 : Include alternative CDRs scenarios and application of RCA (Reduced Co-ordination Airspace) procedure as possible ATFCM measures.		▲
	APT 10 : ATS Providers to assess the use of airport holding patterns as a possible solution to optimise runway capacity.		▲
	APT 11 : Develop means for ATS Providers to implement ATFCM solution to optimise airport arrival/departure capacities.		▲
	APT 12 : Identify through simulations the best local and en-route ATC operating techniques that will maximise the airport throughput.		▲
Common Awareness	No Identified Requirements		

Requirements :		ATFCM	ATM
Partnership Management	TCM 35 : Develop a co-ordination tool between AMC, CFMU and FMP(s) concerned in order to : - review the airspace allocation to better accommodate the traffic demand, - enable CFMU to re-consider with the FMPs the declared capacity according the updated airspace structure.		▲
	FUA 06 : Develop a Collaborative Decision Making process between the CFMU, AMCs, and FMPs together with associated supporting tool for pre-tactical activities in order to optimise the network capacity.		▲
	APT 13 : Define collaborative process between FMP(s) and associated airports in order to conduct “small-scale network” operations during Pre-tactical phase.	▲	
Quality Management	No Identified Requirements		

OPERATIONAL IMPROVEMENT	ALIGNING WITH ATC AND AIRPORTS TACTICAL HORIZONS	Timeframe
Sub-group :	Tactical Flow and Capacity Management	2006-2012
Direction for Change:	Improving Traffic Flow and Capacity Management	

Description :	
Rationale :	In this OI, ATC, Airport Operations and ATFCM will align their short-term horizons thanks to enhancements in data consistency and accuracy. As all actors have access to the same data, they will meet in common awareness and agreed decisions. The gap between ATC, ATFCM and airport operations will be reduced.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		ATFCM	ATM
ATFCM Process	TCM 52 : Develop tools and procedures to assist CFMU and ATS Providers in assessing the impact of real-time special events (weather phenomena, ground or space infrastructure opportunities/limitations, etc) on the Network and local level capacity, according to the Network Operations Plan and/or the current ATFCM situation.	▲	
	TCM 56 : Develop a sector management tool allowing data exchange between CFMU and ATS Providers to up-date in real-time the current configuration, including the number of activated sectors.		▲
	TCM 57 : Improve the CFMU Environment database in order to process real-time updates of airspace structure.		▲
	TCM 58 : Develop an assistance tool allowing CFMU and ATS Providers to exchange accurate capacity data and to adapt the best capacity value according to the traffic data.		▲
	TCM 59 : Develop re-routing processes to assist the CFMU and the ATS Providers concerned to identify the possible re-routed flights/flows providing the best capacity benefits.		▲
	TCM 61 : Develop FL management tool to assess which pre-defined scenario will be used in order to modify the RFL and make the controller who will control the flights/flows, aware of the modification of the RFL.		▲
	FUA 10 : Develop tools to assist CFMU to assess the impact of the real-time airspace changes on the network and local level capacity.		▲
	APT 20 : Ensure the processing of late updates traffic data sent by the airport, in the CFMU systems.		▲
	APT 26 : Ensure a more accurate processing of the weather data during the monitoring of the ATFCM situation and when assessing the implementation of possible ATFCM solution.		▲
Common Awareness	No Identified Requirements		
Partnership Management	FUA 11 : Develop a CDM process that will allow within a short timeframe to identify, assess and implement adequate ATFCM solutions according to the airspace changes, followed by its notification.		▲
	APT 23 : Define collaborative process between FMP and associated airports in order to conduct “small-scale network” operations during Tactical phase.		▲

Requirements :		ATFCM	ATM
Quality Management	No Identified Requirements		

OPERATIONAL IMPROVEMENT	SHARING ATM INFORMATION	Timeframe
Sub-group :	**Collaboration with ATM Partners**	**2006-2012**
Direction for Change:	**Improving Collaboration with ATM Partners**	

Description :	
Rationale :	This OI will deliver/implement universal access to accurate and consistent ATM information, including the profile of the flight and the progress of it. (e.g. through information exchange with flight plan service providers and with airports). FPL changes will be dynamically cross-checked against up-to-date information on airports, airspace and ATFCM constraints. Furthermore, FPL will be re-assessed against changes in airports, airspace and ATFCM situation.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		**ATFCM**	**ATM**
ATFCM Process	No Identified Requirements		
Common Awareness	TCM 36 : AMCs to provide accurate information on airspace allocation and route availability according to the “Airspace Data Repository” concept.		▲
	TCM 43 : Ensure that any route amendments will be notified to all parties concerned through the FPL processing.		▲
	TCM 60 : Ensure that real-time route amendments are notified through the FPL processing.		▲
	FPL 07 : Develop and enable access to a flight plan repository in order to establish a common reference for flight plan details.		▲
	FPL 10 : Develop ways of ensuring feedback to the AO and/or pilot regarding errors in filed flight plans, particularly for flights departing from outside the IFPS distribution area	▲	
	FPL 15 : Support the implementation of industry standard for FPL data exchange		▲
	FPL 19 : Ensure that modifications to the flight plan after departure are provided to all relevant actors and include enough information for describing the remainder of the flight.		▲
	FPL 25 : Develop addressing of flight plan outside IFPS distribution area..	▲	
	FPL 26 : Develop new mechanisms to enable advance filing and storage of flight plans	▲	
	FUA 05 : Review the relationship between the CFMU, AMCs, and FMPs to provide national AMCs with wider information on traffic demand in order to review, when possible, the airspace allocation accordingly.		▲
	FUA 09 : Develop procedures and tools enabling CFMU to collect real-time airspace data (e.g. CDRs and Areas opening and closing time).		▲
	APT 14 : Ensure the dissemination of information between the small-scale network partners, the CFMU and other FMPs.	▲	
	APT 25 : Ensure the capture and sharing of more accurate weather forecast in order to anticipate capacity shortfalls or potential benefits.		▲
Partnership Management	FPL 24 : Develop interface standards for FPL filing applications in order to allow a seamless integration of the flight planning and filing process between all actors.		▲
Quality Management	No Identified Requirements		

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OPERATIONAL IMPROVEMENT	CONSOLIDATED PLANNING OF RESOURCES	Timeframe
Sub-group :	Strategic Flow and Capacity Planning	2011-2017
Direction for Change:	Improving Traffic Flow and Capacity Management	

Description :	
Rationale :	This OI will see the completion of elements required for the development of a strategic/proactive system that will enable a consolidated planning of resources in terms of airspace infrastructure, staff, costs and timing. This iterative process will be developed into a fully interactive planning and decision making process that will provide the optimum balance between users' needs and service providers' capabilities.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		ATFCM	ATM
ATFCM Process			
Com Awa			
Partı Mana			
Post-analysis			

The requirements will be identified afterwards according to :
- **the implementation of the 2008 & 2012 Operational Improvements;**
- **the continuous evolution of the ATFCM, ATC, ASM & Airport domains.**

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OPERATIONAL IMPROVEMENT	COMMON CAPACITY MANAGEMENT	Timeframe
Sub-group :	**Optimised Capacity Management**	**2011-2017**
Direction for Change:	**Improving Traffic Flow and Capacity Management**	

Description :	
Rationale :	This OI will finalise the evolution towards collaborative and proactive management of en-route and airport capacities. It is expected that airport capacity will be the main remaining bottleneck and that en-route maximum capacity is normally available. To use to the maximum the available capacity, a common and co-ordinated optimisation process will be necessary.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		**ATFCM**	**ATM**
ATFCM Process			
Com Awa			
Partı Mana			
Post-analysis			

The requirements will be identified afterwards according to :
- **the implementation of the 2008 & 2012 Operational Improvements;**
- **the continuous evolution of the ATFCM, ATC, ASM & Airport domains.**

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OPERATIONAL IMPROVEMENT	TRAFFIC OPTIMISATION	Timeframe
Sub-group :	**Tactical Flow and Capacity Management**	**2011-2017**
Direction for Change:	**Improving Traffic Flow and Capacity Management**	

Description :	
Rationale :	A common, complete, accurate and up-to-date picture of the current traffic situation will be available to all actors with the required level of detail and access. This will be used via analysis tools to identify opportunities for traffic optimisation (i.e. further increase of punctuality, of cost effectiveness) and to identify the impact of discrepancies or disturbances. When identified, simulation tools will be used to explore remedial options both at global and local level. Flexible and consolidated resource management at a pan-European level will facilitate a cost-effective support to tactical operations in both normal and special circumstances.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		**ATFCM**	**ATM**
ATFCM Process			
Com Awa			
Partı Mana			
Post-analysis			

The requirements will be identified afterwards according to :
- **the implementation of the 2008 & 2012 Operational Improvements;**
- **the continuous evolution of the ATFCM, ATC, ASM & Airport domains.**

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OPERATIONAL IMPROVEMENT	COMMON ATM AWARENESS	Timeframe
Sub-group :	Collaboration with ATM Partners	2011-2017
Direction for Change:	Improving Collaboration with ATM Partners	

Description :	
Rationale :	This OI will include full flight plan data exchange and information sharing between all actors enabling them to have a common ATM awareness. The data will describe the latest confirmed intentions of each flight, with the level of accuracy and detail (e.g. trajectory, equipment, performance, weight, status, slot, etc…) to meet requirements of the actors concerned. Airspace data and airport data will be available at any time to any concerned partner to ensure its own objective.
ECIP Objective :	No specific ECIP Objective defined at the moment.

Requirements :		ATFCM	ATM
ATFCM Process			
Com Awa			
Partn Mana			
Post-analysis			

The requirements will be identified afterwards according to :
- **the implementation of the 2008 & 2012 Operational Improvements;**
- **the continuous evolution of the ATFCM, ATC, ASM & Airport domains.**

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