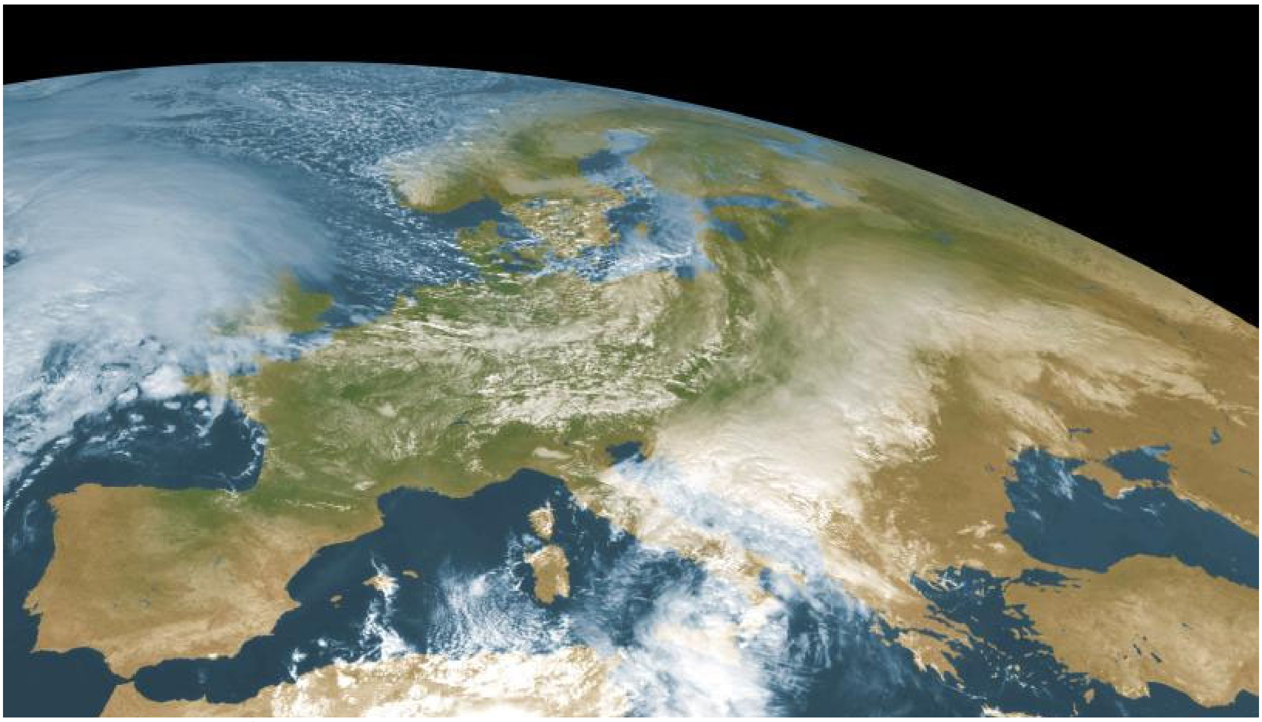
Report commissioned
by the Performance Review Commission

Report on Aeronautical MET Costs



Performance Review Unit
May 2004

BACKGROUND

This Report has been commissioned by the Performance Review Commission (PRC).

The PRC was established in 1998 by the Commission of EUROCONTROL, in accordance with the ECAC Institutional Strategy (1997).

One objective in this Strategy is "to introduce strong, transparent and independent performance review and target setting to facilitate more effective management of the European ATM system, encourage mutual accountability for system performance and provide a better basis for investment analyses and, with reference to existing practice, provide guidelines to States on economic regulation to assist them in carrying out their responsibilities."

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ABSTRACT

This report analyses the costs for providing meteorological services to aviation in Europe. It addresses the following areas:

- The regulatory environment;
- The aeronautical MET infrastructure;
- Aeronautical MET products and services;
- The aeronautical MET cost base;
- Allocation and recovery of aeronautical MET costs;
- Users consultation and information disclosure;
- The development of MET costs recovered through charges; and,
- Comparisons of aeronautical MET charges.

Keywords

EUROCONTROL Performance Review Commission - Aeronautical MET costs & charges - National Meteorological Service - MET products and services - Aeronautical MET infrastructure - Allocation and recovery of aeronautical MET costs - MET users consultation - Development of aeronautical MET costs - KPIs - Benchmarking - Single European Sky

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Executive Summary

Meteorological services have been established by States for the protection of life and property and the well-being and safety of their citizens. Today, National MET Services (NMS) fulfil a large variety of tasks and functions and have a multitude of user groups with different needs and requirements. Amongst others, vital industries such as energy, agriculture, transportation, fishery, construction, tourism, the media, and users such as the military and the general public, benefit from MET services and products.

According to the International Civil Aviation Organisation (ICAO) and the Single European Sky regulations (SES), aeronautical MET services are part of Air Navigation Services (ANS). The costs for aeronautical MET services are therefore usually part of consolidated ANS charges and subsequently recovered from aeronautical users.

Aviation is one of the few industries directly charged for MET services. In 2002, aeronautical MET costs represented approximately 6% of total (en-route and terminal) ANS costs. Overall, civil aviation paid some €380 million for en-route and terminal MET services in Europe in 2002.

Over the past decade, the field of meteorology has evolved significantly. World-wide MET satellite systems, the availability of low-cost, high-powered computing and new communications technologies, such as the Internet, have significantly changed the provision and distribution of MET services and products.

The formation of global and regional MET organisations and systems and new technologies with the potential to aid and automate labour intensive observational tasks suggest scope for a centralisation of operations and thus a reduction in overall costs for the benefit of a growing number of MET users.

Over the past years, aeronautical MET charges have repeatedly given rise to discussion as to whether civil aviation pays a fair share of national MET costs and if civil aviation subsidises other MET users.

In order to assess whether the large contribution of civil aviation towards the recovery of national MET costs is justified, a need to analyse the provision of aeronautical MET services in Europe was identified.

The aeronautical MET infrastructure

Since no two MET service providers are the same, to compare performance and value for money, and to understand reasons for differences, it is necessary to examine the context in which the individual aeronautical MET service providers operate.

By nature, the MET infrastructure is an interdependent system relying on global observational data for the production of forecasts and warnings. Broadly, the MET infrastructure can be grouped into global, regional and national levels.

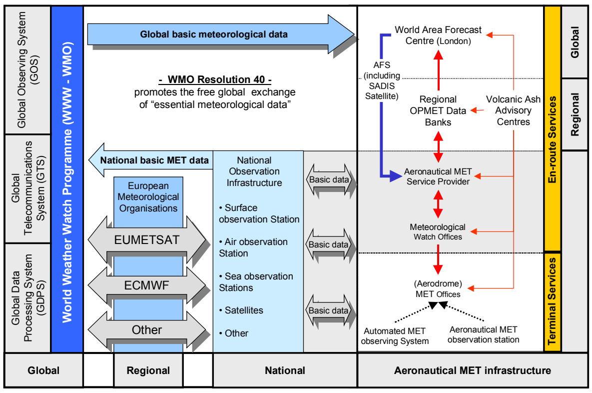
One of the most important systems for global MET data dissemination is the World Weather Watch Programme (WWW), co-ordinated by the World Meteorological Organisation (WMO). States are asked to feed their national MET data into the global WWW system for the free and unrestricted exchange of basic MET data.

The WWW programme provides a substantial share of the data for the two World Area Forecast Centres (WAFCs) in London and Washington DC. Developed jointly by ICAO and the WMO as a global aeronautical en-route MET system, the WAFCs are supplying upper wind and temperature forecasts and humidity data for the whole world for aircraft en-route above Flight Level (FL) 50.

In addition, significant weather forecasts are supplied globally above FL250 and down to FL100 over limited geographical areas, e.g. over the EUROCONTROL Member States. Each WAFC provides backup for the other, ensuring routine product distribution in case of one centre’s failure.

At a regional level, European organisations such as the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Centre for Medium Range Weather Forecasts (ECMWF) are important when examining MET services provision in Europe.

Contributions to those organisations are usually governmental subscriptions based on Gross National Product (GNP) shares and consequently outside the direct control of the MET service providers.



The European aeronautical MET infrastructure

At a national level, MET Watch Offices (MWOs), Aerodrome MET Offices and aeronautical MET Observation Stations form the backbone of the aeronautical MET system.

Whereas Aerodrome MET Offices are mainly responsible for aerodromes and the surrounding areas, the MET Watch Offices are generally responsible for observing weather conditions in Flight Information Regions (FIR).

Dedicated aeronautical MET Observation Stations make the actual weather observations at aerodromes and, to a small extent, at other points of significance to international aviation. At some locations, observations are made by the use of automatic or semi-automatic observing equipment (Automated MET Observing System).

As recognised by the WMO[1], the aeronautical MET infrastructure and MET data supplied by aircraft contribute significantly to the overall national and global MET observation system which is used for the benefit of many different user groups and the general public.

MET products and services

Aeronautical MET service providers produce a wide range of products to meet the requirements set out in ICAO documents. Generally speaking, aeronautical MET products and services fall into three categories:

- *Aerodrome Reports (METARs and local reports);*
- *Forecasts, and*
- *Warnings.*

METARs provide aeronautical users with information on the weather conditions at an aerodrome, reported every half-hour and used for pre-flight and in-flight planning. The local reports are more detailed, updated when significant changes occur, and are used for landing and take-off.

METARs are also part of the data set used to produce and monitor aerodrome forecasts and warnings. Whilst forecasts refer to weather conditions expected in the future, warnings generally refer to existing, as well as expected conditions.

Aeronautical MET products are designed to meet the requirements for the various stages of flight and flight planning. They can be grouped into two categories:

- *those provided for aerodromes and the surrounding area (aerodrome, landing & take-off); and,*
- *those provided for a specified area or region (en-route).*

Whilst aeronautical MET products for FL below 100 are mainly 'produced' by national MET service providers, a large share of en-route MET products is supplied by the WAFCs.

According to ICAO, aeronautical MET service providers should make full use of WAFC products to fulfil their tasks. However, the extent to which WAFC products are utilised is the decision of the individual States.

[1] *WMO, Commission for Aeronautical Meteorology, Framework for Implementing Cost Recovery for Aeronautical Meteorological Services, March 2003.*

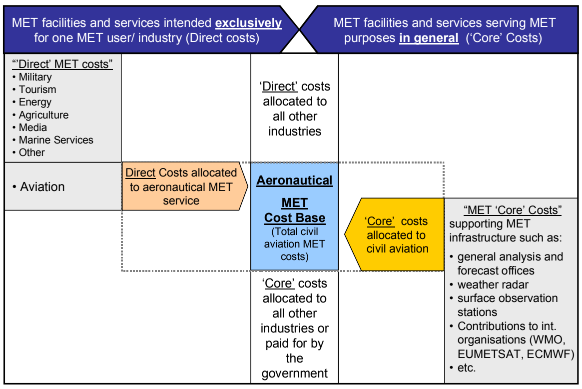
The aeronautical MET cost base

The framework that is commonly used to determine the share of the national MET costs that is to be allocated to civil aviation is outlined below.

ICAO and WMO provide basic guidance, including an inventory list of what can be attributed to civil aviation. However, the guidance material is not binding and therefore leaves scope for interpretation. Consequently, there are many ways of calculating the share of MET costs to be recovered through ANS charges.

To establish the aeronautical MET cost base, the national MET costs are usually divided into:

- direct costs for aeronautical MET services;
- direct costs relating to other industries; and,
- 'core' costs for services that provide the underpinning infrastructure to enable the delivery of products to individual industries.



Framework for determining the aeronautical MET cost base

According to ICAO guidelines, the aeronautical MET cost base is the sum of direct costs for MET facilities and services intended exclusively to serve aeronautical requirements plus a share of the MET 'core' costs.

Whilst direct costs for aeronautical MET services are relatively easy to identify, the allocation of 'core' services among user groups seems to be more difficult.

The costs for MET 'core' services cannot be allocated to one individual industry sector or user group and includes, amongst others, items such as the observation network, satellite systems, and general forecast and data processing centres. In some States, international MET duties (such as the contributions to international satellite system) appear to be a major cost driver of which a significant share is attributed to civil aviation. Overall, 'core' costs allocated to civil aviation typically represent a share of more than 50% of total civil aviation MET costs.

In this context, aeronautical users argue that the costs for the meteorological 'core' system should not be allocated to any specialised MET user group as it is indispensable for the State's general obligation to safeguard the lives and property of its citizens.

However, it is at the States' discretion which method they want to apply. Consequently many different mechanisms to calculate the share of MET 'core' costs that is to be recovered through aeronautical charges have emerged.

At the one extreme, States may decide not to recover any of the costs whereas, at the other extreme, MET service providers are set up exclusively for aviation and recover 100% of the costs. The latter case limits the scope to exploit economies of scale.

In some States, national MET costs allocated to civil aviation would appear to be disproportionately high, compared to other MET users. According to the Final Report from the EUROCONTROL Enlarged Committee Task Force on the Allocation of MET Costs to Civil Aviation Users (MET/TF) in 2001, civil aviation MET costs typically represent 25% of the total national MET costs, a share ranging from 10% to 50% among States.

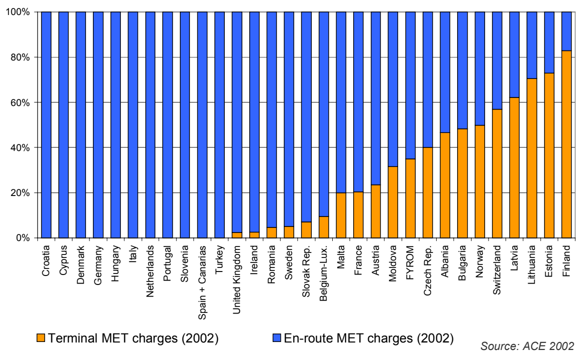
Despite WMO recommendations, MET users are often not effectively consulted concerning product improvements and developments, nor are they given the opportunity to understand or question the MET costs they have to pay. It seems that there is scope for improving the relationship between the aeronautical users groups and the aeronautical MET service providers.

MET cost allocation and recovery

Once the aeronautical MET cost base is established, the costs need to be attributed to 'service areas' (en-route and terminal) and aeronautical user groups (IFR/VFR and others), according to the ICAO cost-reflectiveness principle.

Failure to correctly determine and reflect the en-route and terminal MET cost drivers in the cost base of the respective 'service areas' most likely results in cross-subsidy between aeronautical user groups.

Although ICAO recommends that allocation of ANS costs should be in accordance with operational boundaries, some 89% of the aeronautical MET costs were allocated to en-route services in 2002. Of the 31 countries analysed, only 20 attributed MET costs to terminal ANS services.



MET cost allocation to en-route and terminal charges by State (2002)

Whereas the EUROCONTROL Route Charges System is a harmonised and effective European system to recover en-route ANS costs, including associated MET costs, there is no such system for the recovery of costs allocated to terminal MET services.

The high share of aeronautical MET costs that is currently allocated to en-route services suggests that the existing system for the recovery of en-route ANS costs might be used as a convenient way for the recovery of total aeronautical MET costs.

Whatever recovery scheme is used, the systems generally lack transparency for the users because the MET costs are passed on through consolidated en-route, and occasionally terminal, ANS charges.

More generally, it is difficult for aeronautical users to determine the exact share of MET costs and thus to assess value for money.

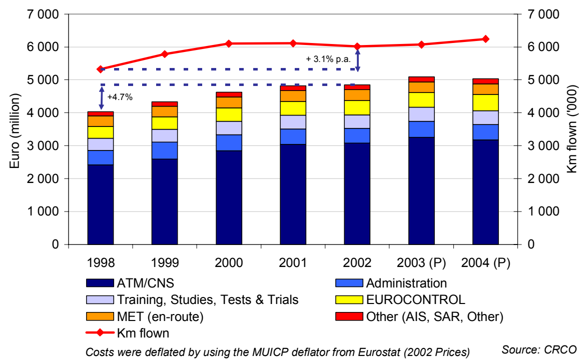
Meaningful and reliable data on aeronautical MET services in Europe are still scarce, reducing the scope for qualitative analysis. For the calculation of the national unit rate only one single figure for en-route MET costs is supplied. Increases in aeronautical MET costs are usually not commented.

The Single European Sky regulations are expected to have a significant influence here, as aeronautical MET services are part of ANS (c.f. Art.2 (4) 'Framework Regulation'). SES requirements, e.g. for transparent charging schemes and accounts (c.f. Art. 12 & 14, 'Service Provision Regulation'), will therefore apply to aeronautical MET services.

European aeronautical MET costs development (en-route)

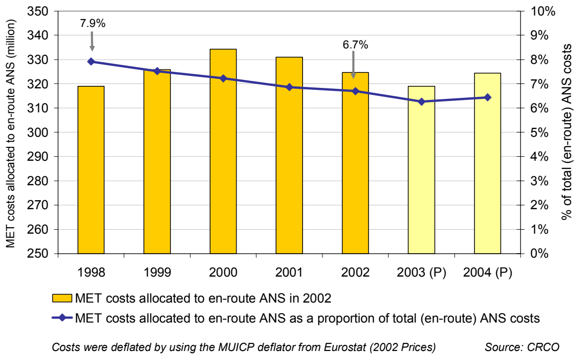
Total en-route ANS costs show a considerable growth over the 1998-2002 period but are expected to decline slightly in 2004 after reaching a peak in 2003.

Between 1998 and 2002, the average annual growth rate for ANS en-route costs was 4.7%. The distance flown grew at an average annual growth rate of 3.1% during the same period.



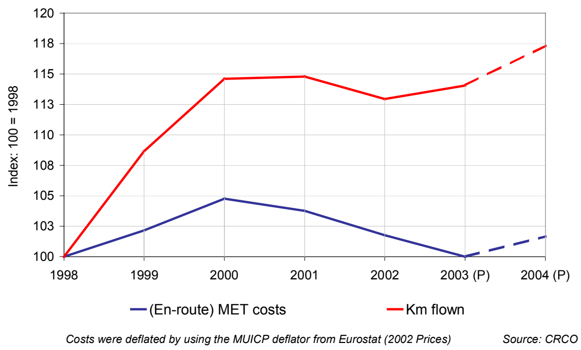
Development of en-route ANS costs and traffic (1998-2004)

Due to the relatively high growth rate of ATM/CNS costs, the share of aeronautical MET costs within the total en-route ANS costs decreased from 7.9% in 1998 to 6.7% in 2002. However, the share of MET costs within the total (en-route) ANS costs is expected to rise again between 2003 and 2004.



En-route MET costs as a proportion of en-route ANS costs (1998-2004)

Aeronautical en-route MET costs remained fairly stable over the past five years at a European level and appear to follow traffic patterns.



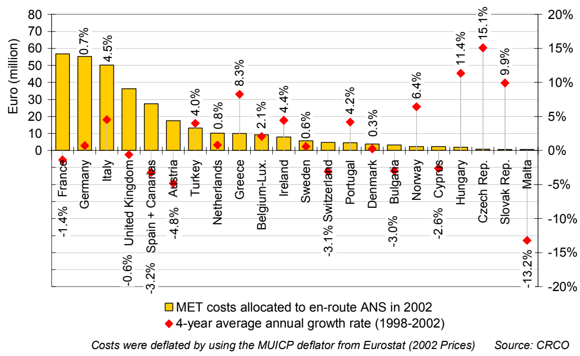
Development of en-route MET costs and traffic (1998-2004)

Development of national aeronautical MET costs

The available data only enables high-level analysis and does not provide an understanding of MET cost drivers nor does it help aeronautical users to understand the MET costs they are asked to pay for.

At a national level, the Czech Republic (+15.1%), Hungary (+11.4%), Slovak Republic (+9.9%), Greece (+8.3%), Norway (+6.4%), and Italy (+4.5%) show the highest average annual growth rates between 1998 and 2002.

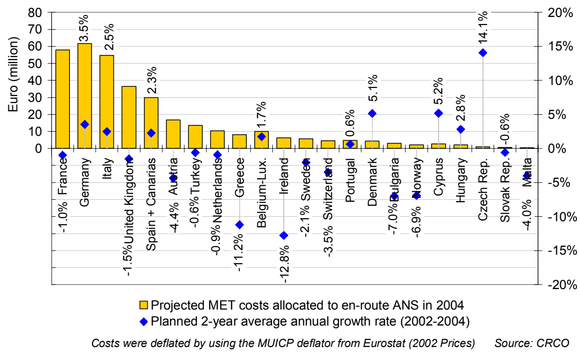
The high growth rates for some States might be an indication that those States are still in the process of developing a policy for the recovery of aeronautical MET costs.



En-route MET costs in 2002 and average annual growth rate (1998-2002) by State

A number of States succeeded in reducing the en-route MET costs over the analysed period. States with a notable negative growth rate are Malta (-13.2%), Austria (-4.8%), Spain (-3.2%), Switzerland (-3.1%) and Bulgaria (-3%).

The planned development of en-route MET costs between 2002 and 2004 indicates a contrasting picture.

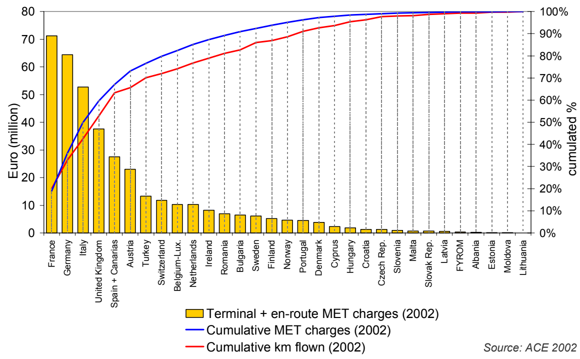


Planned en-route MET costs (2004) and average annual growth rate (2002-04) by State

Whereas the Czech Republic plans to maintain a high growth rate for aeronautical MET costs (+14.1%), Ireland, Greece, Bulgaria and Norway plan to reduce their en-route MET costs substantially between 2002 and 2004.

It should be noted that Germany announced a restructuring programme to considerably reduce aeronautical MET costs which is not yet reflected in the chart above.

The five States with the highest overall aeronautical MET costs (France, Germany, Italy, UK, and Spain) accounted for almost two thirds of the total MET costs allocated to civil aviation.



Total (en-route + terminal) MET costs by State in 2002

Comparisons of aeronautical MET

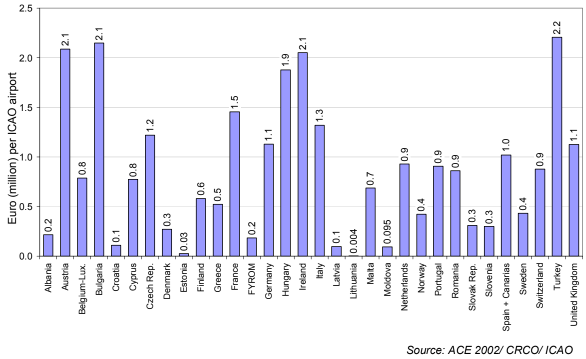
Comparing performance and identifying best practices is key in an international context where aeronautical MET charges are levied on airspace users in an environment which generally lacks transparency.

There are a number of elements which make the assessment and comparison of performance particularly difficult in the context of aeronautical MET service provision.

- MET service providers in most States have a monopoly for aeronautical services and at the same time often the duty to provide services to a broad spectrum of users, including the public;
- The interdependent nature of national MET infrastructures in a global network with multiple actors;
- The broad range of aeronautical MET products and services and different levels of service quality;
- The lack of binding guidance on cost allocation and recovery, resulting in heterogeneity of practices throughout Europe; and,
- The lack of relevant information to compare performance on the basis of meaningful metrics relating to MET service provision.

No aeronautical MET service providers are alike and therefore national MET characteristics such as geography, input prices, aeronautical infrastructure and the quality of service should ideally be considered in comparisons of aeronautical MET service providers.

A high level analysis of the aeronautical MET costs per ICAO airport suggests that there are major differences between aeronautical MET infrastructures and the way they are managed and operated within Europe.



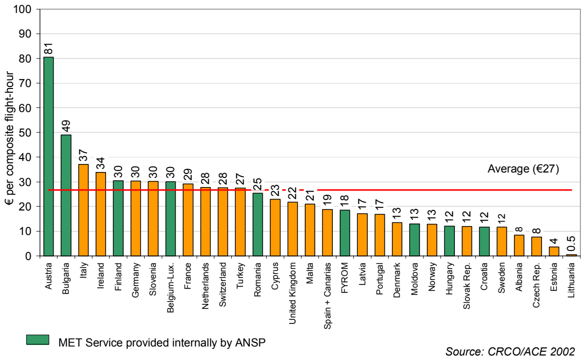
Aeronautical MET costs (2002) per ICAO airport where MET services are required

With only limited data available, it is difficult to infer whether the variations observed are an indication that there are allocation and/or efficiency issues, and/or that the tasks, quality, and the organisation of aeronautical MET services differ among States.

To compare cost-effectiveness, information on 'genuine' costs and quantifiable output measures is required. Instead of the genuine costs of MET services, only the MET charges that are imposed on aeronautical users are available which are usually the results of differing allocation mechanisms and policies, and therefore only a reflection of the Member States' interest and ability to recover MET costs from civil aviation.

The 'MET charges per composite flight-hour' is used here to assess the relative weight of MET charges for users. It is important to keep a gate-to-gate perspective because the allocation of MET charges among en-route and terminal ANS varies between States and might introduce a bias in the analysis.

Austria has the highest unit MET cost per composite flight-hour (€81), followed by Bulgaria (€49). In both States, MET services are provided internally by the ANSP. The lowest unit MET costs are charged by Lithuania (€0.5), Estonia (€4) and the Czech Republic (€8).



Total ANS MET charges per composite flight-hour (gate-to-gate) in 2002

If the five MET service providers with the highest gate-to-gate MET charges were able to improve their MET related charges to the European average level, total MET costs to civil aviation could be reduced by as much as 10% per annum (i.e. the equivalent of €35 million).

PRC recommendations

Following an open Consultation Meeting held on 11 May 2004, where the views of interested parties could be expressed, the PRC, meeting in a closed session on 12 May 2004, developed the following recommendations to be submitted to the EUROCONTROL Provisional Council (PC 20) in July 2004.

The Provisional Council is invited:

1. to note the PRC's Report on Aeronautical Meteorology Costs and to submit it to the Permanent Commission;

2. to note the wide variations in the provision of European MET Services and to encourage sharing of best practice amongst the MET Providers;

3. to request the Director General to develop common requirements for aeronautical MET products and services, in consultation with interested parties, by July 2005;

4. to request the Director General to ensure that clear cost-allocation rules for MET costs relating to:
   - (i) en-route /terminal costs
   - (ii) core costs
   - (iii) IFR/VFR costs

   are included in the Single European Sky implementing rules being developed;

5. to request Member States to ensure that aeronautical MET authorities actively adopt a more customer-oriented approach, including effective and regular consultation with all MET stakeholder groups;

6. to urge EUROCONTROL Member States:
   - (i) to make the most effective use of the existing national and international aeronautical MET infrastructure (e.g., World Area Forecast Centre - WAFC) and to avoid duplication without challenging any aspect of civil aviation safety; and,
   - (ii) to optimise the efficiency of the aeronautical MET system through increased rationalisation and automation.

7. to request the Director General to explore to what extent MET services and products could be employed to improve European ATM performance;

8. to invite the Director General to explore the common financing of joint European aeronautical MET services and products (e.g. WAFC, VAAC).

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1 INTRODUCTION

1.1 Objectives and scope of the study

According to ICAO, ANS can be divided into:

- Air Traffic Management/Communications, Navigation and Surveillance (ATM/CNS);
- Aeronautical Information Services (AIS);
- Search and Rescue Services (SAR); and,
- Meteorological Services for Air Navigation (MET).

Meteorology has always played a vital role in aviation. There has been a long mutually beneficial relationship between the aviation industry and meteorological services. According to ICAO, the "*objective of meteorological service for international air navigation shall be to contribute towards the safety, regularity and efficiency of international air navigation.*"[2]

Meteorological services have been established by States for the protection of life and property and the well-being and safety of their citizens. Today, National MET Services (NMS) fulfil a large variety of tasks and functions and have a multitude of user groups with different needs and requirements. Amongst others, vital industries such as energy, agriculture, transportation, fishery, construction, tourism, the media, and users such as the military and the general public, benefit from MET services and products.

Over the past decade, the field of meteorology has evolved significantly. World-wide meteorological satellite systems, ever increasing computer power at affordable costs, and new communications technologies such as the Internet, have significantly changed the provision and distribution of MET services and products.

The formation of global and regional MET organisations and systems and new technologies with the potential to aid and automate labour intensive observational tasks suggest scope for a centralisation and automation of operations and thus a reduction in overall costs for the benefit of a growing number of MET users.

Aviation is traditionally one of the few industries directly charged for MET services. The costs for aeronautical MET services are usually included in ANS charges and subsequently recovered from aeronautical users. However, over the past years, the MET user profile shifted from originally state-owned airlines to increasingly commercial entities with a different focus on cost and service levels.

Triggered by the pressure on airlines to cut costs, aeronautical MET charges have repeatedly given rise to discussion as to whether civil aviation pays a fair share of national MET costs and whether it subsidises other commercial MET users.

In 2002, aeronautical MET costs represented approximately 6% of the total (en-route and terminal) ANS costs. Overall, aviation paid some €380 million for en-route and terminal MET services in Europe in 2002.

Civil aviation MET costs typically represent 25% of the total national MET costs, a share ranging from 10% to 50% among States[3].

[2] *ICAO Annex 3 – Meteorological Service for International Air Navigation.*

[3] *Final Report from the EUROCONTROL Enlarged Committee Task Force on the Allocation of MET Costs to Civil Aviation Users (MET/TF), November 2001.*

In order to assess whether the large contribution of civil aviation towards the recovery of national MET costs is justified, a need to analyse the provision of MET services in Europe was identified.

For this reason, the EUROCONTROL Performance Review Commission (PRC) decided to further investigate the issue of aeronautical MET costs in order to include the key findings in Performance Review Report 7 (PRR7), to be published in April 2004. In support to the PRC, the Performance Review Unit (PRU) was asked to prepare this report which analyses publicly available information on aeronautical MET costs.

This report is not intended to be fully comprehensive. Indeed, it is beyond its scope to address issues relating to MET service quality, and indirect costs such as delays, that could be attributed to weather and related MET services[4].

1.2 Organisation of the report

The report is organised as follows:

Chapter 2 outlines the regulatory framework of aeronautical MET service provision at a global and regional level. The chapter starts by looking at ICAO's regulatory framework before highlighting the key points of the Single European Sky regulations relating to the provision of aeronautical MET services.

Chapter 3 provides an overall description of the institutions and organisations involved in the ‘production’ of aeronautical MET services at a global, regional, and national level.

Chapter 4 gives a broad overview of the most commonly supplied MET products and services and their primary user groups.

Chapter 5 explains the different elements of the aeronautical MET cost base and attempts to identify the main cost drivers within it.

MET cost allocation among 'service areas' and user groups and the recovery mechanisms for the collection of MET charges are examined in Chapter 6.

The relationship between MET service providers and aeronautical users is examined in Chapter 7 by looking at the level of user consultation and the information on aeronautical MET costs that is currently available to aeronautical users.

Chapter 8 analyses the development of aeronautical MET costs between 1998 and 2002 at European and State level and provides an outlook for the years 2003 and 2004.

Some comparisons of aeronautical MET with a focus on MET charges are proposed in Chapter 9.

The report concludes with a summary of the main findings in Chapter 10.

1.3 Working method and data sources

The report is predominantly based on desk research and the analysis of documents, presentations and previous studies relating to the provision of aeronautical MET services. Additionally, comments and supporting materials supplied by industry experts contributed to this report.

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[4] *For an analysis of weather related delays at selected airports see Performance Review Report 7 (Chapter 5 - "ATFM Delays at Airports").*

The data for the analysis of MET costs was drawn from the following four sources [5]:

1. EUROCONTROL Central Route Charges Office (CRCO):

   A vast amount of historical data at the en-route level was gathered from the Reporting Tables presented by States at the EUROCONTROL enlarged Committee for Route Charges. Member States provide information on en-route ANS costs as a basis for the calculation of the unit rates for Route Charges. This data enables a time series analysis of aeronautical MET costs which were recovered through the EUROCONTROL Route Charges System.

2. EUROCONTROL Performance Review Commission (PRC):

   According to the "Specification for Information Disclosure", Air Navigation Service Providers (ANSPs) in EUROCONTROL Member States are required to disclose economic information. The information is provided in compliance with Decision No. 88 of the Permanent Commission of EUROCONTROL, which makes annual disclosure of economic information mandatory for all EUROCONTROL Member States from 2001 onwards. As part of this requirement, ANSPs are asked to provide a breakdown of MET costs for both en-route and terminal ANS.

3. EUROCONTROL Enlarged Committee Task Force on "The Allocation of MET Costs to Civil Aviation Users (MET/TF)":

   In 2000, a Task Force, - consisting of EUROCONTROL State authorities (aviation and MET representatives), ANSPs, NMSs, airspace users, ICAO, WMO, EC and EUROCONTROL Agency experts - with the aim of creating a dialogue/mutual understanding and to identify and recommend best practices for the allocation of MET costs to civil aviation was set up. The main focus of the MET/TF was on the mechanisms used to allocate a justified share of national MET costs to civil aviation. Although the MET/TF gathered a large amount of information, it concluded in its final report that *"detailed information on cost-allocation methodologies is still scarce"*[6].

4. Furthermore, a variety of studies and working papers, listed in the bibliography, were used to support this report.

With a view to encourage an open and ongoing dialogue between all the involved parties, a Consultation Meeting on "Aeronautical MET Costs" was held on 11 May 2004. The Consultation Meeting was attended by more than 80 participants, representing a wide range of aviation stakeholders. Views from MET service providers, airspace users and regulatory authorities were expressed in an open and constructive dialogue.

The outcome of this meeting has been taken into account in view of finalising this report and for the development of associated recommendations to the 20th EUROCONTROL Provisional Council (July 2004). The PRC recommendations and a summary report of the Consultation Meeting can be found in Annex 13.

[5] *See Annex 2.*

[6] *Source: Final Report from the Enlarged Committee Task Force on the allocation of MET costs to civil aviation users.*

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2 REGULATORY ENVIRONMENT

2.1 ICAO regulatory framework

ICAO's Standards (binding) and Recommended Practices (desirable) relating to the provision of aeronautical MET services are documented in ICAO Annexes (especially Annex 3), Procedures for Air Navigation Services, Air Navigation Plan publications.

ICAO provisions require that "*each Contracting State shall designate the authority, hereinafter referred to as the meteorological authority, to provide or to arrange for the provision of meteorological service for international air navigation on its behalf.*"[7]

The organisational and/or operational responsibility of providing or arranging for the provision of MET services lies with the designated MET authority, whereas the ultimate responsibility for meeting the ICAO standards remains with the State.

In order to make use of the existing national MET infrastructure, the dominant model is to have the National Meteorological Service (NMS) as the designated MET authority. In those cases the MET authority is at the same time the aeronautical MET service provider.

Within Europe however, many different arrangements have emerged. In some States, the role of the designated MET authority is undertaken by the Civil Aviation Authority (CAA) or a government department which, in turn, has delegated the actual provision of MET services to the NMS. In other States, the provision of MET services is delegated to the ANSP, which, in turn, provides aeronautical MET services 'internally' (e.g. ROMATSA, Belgocontrol) (for details see Annex 1).

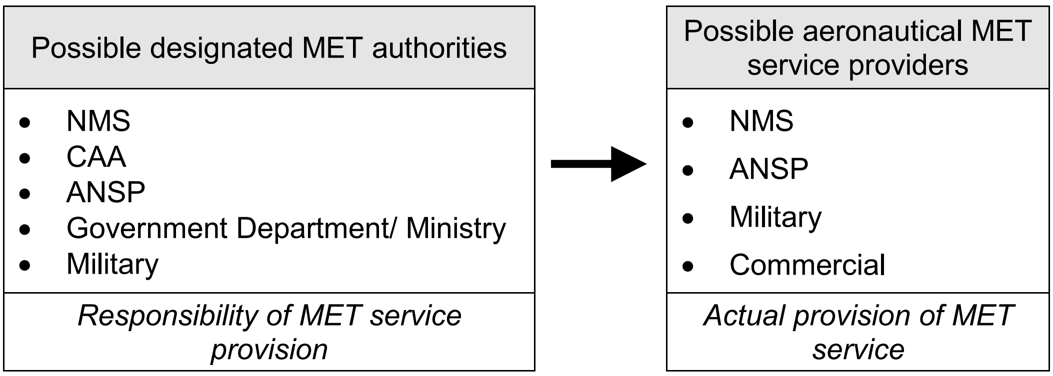

Figure 2.1: MET authorities and MET service providers

2.2 The EC Single European Sky regulations

Although the Single European Market and the common aviation policy seem to have removed much of the restrictions of national boundaries on air transport within Europe, the provision of ANS continues to be organised largely in accordance with national boundaries.

In this context, the Single European Sky (SES) initiative aims to improve and reinforce safety, to restructure European airspace with a view to creating additional capacity and to increasing the overall efficiency of ANS.

[7] *ICAO Annex 3 – Meteorological Service for International Air Navigation.*

In line with ICAO's global provisions, aeronautical MET services are part of ANS under the SES regulations (Art. 2(4) 'Framework Regulation')[8]. Within the SES legislative package there are a number of regulations governing the provision of ANS which directly affect the provision of aeronautical MET services:

- "The national supervisory authorities shall be independent of air navigation service providers. This independence shall be achieved through adequate separation, at the functional level at least, between the national supervisory authorities and such providers. Member States shall ensure that national supervisory authorities exercise their powers impartially and transparently." (Art. 4.(2) 'Framework Regulation');
- "Member States may designate a provider of meteorological services to supply all or part of meteorological data on an exclusive basis in all or part of the airspace under their responsibility, taking into account safety considerations." (Art. 9.(1) 'Service Provision Regulation');[9]
- Transparency of Accounts: "Air navigation service providers, whatever their system of ownership or legal form, shall draw up, submit to audit and publish their financial accounts. These accounts shall comply with the International Accounting Standards adopted by the Community. Where, owing to the legal status of the service provider, full compliance with the International Accounting Standards is not possible, the provider shall endeavour to achieve such compliance to the maximum possible extent." (Art. 12.(1) & (2) 'Service Provision Regulation');
- Charging Schemes: "In accordance with the requirements of Articles 15 and 16, a charging scheme for air navigation services shall be developed that contributes to the achievement of greater transparency with respect to the determination, imposition and enforcement of charges to airspace users. This scheme shall also be consistent with Article 15 of the 1944 Chicago Convention on International Civil Aviation and with EUROCONTROL's charging system for en route charges." (Art. 14 'Service Provision Regulation');

In view of the aforementioned articles, the SES regulations are expected to have a significant impact on the way aeronautical MET services are managed both at Community level and within individual Member States.

2.3 MET data exchange

The following section addresses the main issues concerning the inter-governmental exchange of MET data.

Without doubt, national weather forecasts depend to a large degree on meteorological information from neighbouring countries. The weather is one interconnected system that cannot be analysed nor predicted by using only national observational data. A multitude of observations beyond national boundaries is needed to construct models of the weather system. The awareness that it was necessary to share meteorological information and measurements to improve national weather forecasting resulted in the creation of the World Meteorological Organisation (WMO) in 1951.

In an effort to promote and facilitate the free and unrestricted international exchange of meteorological and related data and products among its Member States, WMO set up the World Weather Watch Programme (see Section 3.1.1). Although it was

[8] *Regulation (EC) No 549 /2004 of the European Parliament and of the Council laying down the framework for the creation of the Single European Sky ("Framework Regulation").*
[9] *Regulation (EC) No 550/2004 of the European Parliament and of the Council on the provision of air navigation services in the Single European Sky ("Service provision Regulation").*

acknowledged that due to variations in size and sophistication levels not all States would be able to supply the same amount of information to the system, the underlying principle was that all States would benefit from truly global MET data for weather forecasts.

Despite all efforts to encourage the free exchange of MET data, there are still major obstacles as a result of differences in national policies on the exchange of MET data today. A prime example to illustrate those differences is the comparison of the US information policy with those of countries within Europe.

2.3.1 United States information policy

In the United States, the 'Public Information Policy' postulates that all government information, including MET information, is a public good and therefore freely available to everyone without restrictions or conditions (i.e. copyright) at no more than the cost of reproduction and delivery.

The US National Weather Service is mainly responsible for operating and maintaining the national MET observation network, some large-scale modelling and analysis functions, and official weather warnings. The organisation is also responsible for the standard MET service provision for civil aviation as specified by the Federal Aviation Administration.

The 'production' of value-added MET services is left to the private sector which may use the MET data produced by the government free of charge and without copyright restrictions. This open approach acknowledges the fact that no single supplier is able to supply products to suit the needs of all user groups. Market development is left to market forces with a need to be innovative and to understand the requirements of each individual user group.

In 1999, the size of the US market for private weather services was estimated to be in the range of USD 430 million[10].

According to a survey carried out in 1999, MET services for the media (50%) and environmental services (18%) represent the largest shares of the US market for private weather services. With only 5%, aviation has a comparatively small share of the private market (see Figure 2.2).

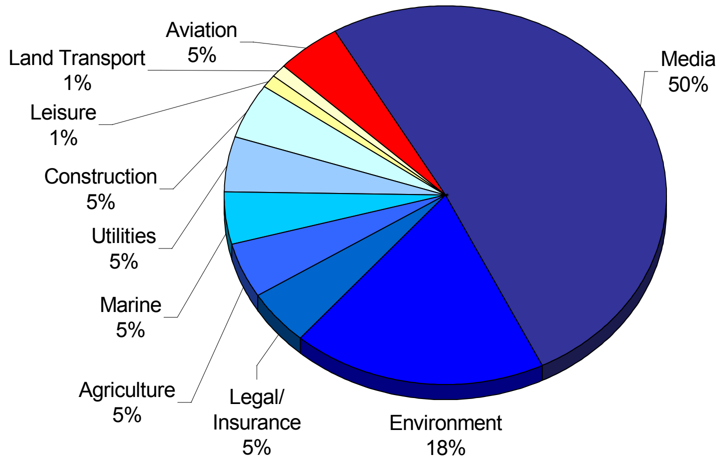

Figure 2.2: US market for private weather services

Source: U.S. National Weather Service/ Private Sector Survey 1999

[10] *U.S. National Weather Service/ Private Sector Survey 1999.*

2.3.2 Information policy of European States

Within Europe, information policies relating to the exchange of MET data vary greatly. Whereas in the United States the information policy on MET data is designed to be complementary - not competitive - the situation in most European countries is different.

Traditionally, NMSs in Europe enjoyed a monopoly for the provision of MET products and services. In order to fulfil this duty, NMS were responsible for both, the collection of MET data and the development of a broad spectrum of value-added MET products to meet the needs of different user groups.

In recent years however, pressure on national budgets has triggered a trend towards the ‘commercialisation’ of NMSs in order to recover at least a share of their costs by charging users for their services.

With the advent of private MET service providers, NMSs were facing a conflict of interests as they were required to fulfil a ‘dual function’ in a commercial environment. On the one hand, they had the monopoly of being the sole supplier of observational MET data to private MET service providers. On the other, they were competing with the same private companies in the market for value-added products.

'Commercialisation’ initiatives of NMSs did not only create a potential conflict of interest in their domestic markets. They also conflicted with the WMO framework for the free and unrestricted exchange of MET data at an international level, as private companies in the US would potentially gain free access to European MET data through the US National Weather Service.

2.3.3 Policies on MET data exchange

In 1995, the need to resolve the emerging friction at domestic and international levels resulted in two separate developments relevant for the availability and exchange of MET data today.

1. In order to resolve issues relating to the exchange of MET data at a global level, the WMO issued Resolution 40, which divided MET information into two categories[11]:
   (a) *“essential” free data and products, necessary for global forecasting - there are no restrictions on this data set;*
   (b) *“additional” data and products, supplemental data needed for local and regional forecasting (e.g. hourly data) - restrictions may apply to this data set for re-export and for commercial purposes.*

2. In order to pool their economic interests whilst enabling a 'level playing field' for competition, 20 European NMSs[12] formed the European Co-operation in Meteorology (ECOMET). The ECOMET agreement was set up to co-ordinate the exchange of MET data (public and private) within and across its Member States. In 1999, the EC Directorate General for Competition issued a ‘comfort letter’ in support of ECOMET practices. The decision was based on equal treatment for all customers (public and private), individual freedom of members, no cross-subsidisation, and the existence of an arbitration procedure.

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[11] *Aeronautical information generated specifically to serve the needs of aviation and controlled under the Convention on International Civil Aviation (Chicago, 1944) is not included.*

[12] *Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.*

According to the ECOMET agreement, Member States "*must set prices for their items at levels which are in line with the minimum target percentage contribution to infrastructure cost*."[13] The aim was that all NMSs together recover 3% of their aggregated infrastructure costs. National contributions to ECMWF and EUMETSAT are excluded.

Although Member States should, in principle, determine prices for MET products and services by direct method, the prices are not necessarily cost-reflective. "*After having calculated the full production cost, including amortization, the NMS has to decide which percentage of this cost it will recover through its commercial activities. It may adopt the above-mentioned 3% figure but may also use a higher or lower percentage. The only requirement is that all NMSs together cover 3% of their aggregated infrastructure costs.*"[13]

At the request of the EC, ECOMET members with a commercial turnover already in excess of ECU[14] 1 million per annum were asked to introduce transparent accounting systems as soon as possible. Members with commercial activities in excess of ECU 100,000 per year are to ensure that all commercial transactions are recorded and that information on associated costs can be made available.

Within Europe, the trend towards 'commercialisation' of NMSs and the aforementioned issues of allowing States to create a monopoly over the dissemination of MET data put pressure on governments to separate commercial MET activities from public MET services. Potential for a conflict of interest exists especially in countries where governments seek to 'commercialise' their NMSs.

Today, many commercial NMS units are still not independent entities with transparent accounting systems and procedures for data acquisition. There are still many issues that need to be solved at global, regional and national levels in order to enable fair competition in the market for value-added MET services. All over Europe, Independent MET Service Providers ("ISP") trying to enter the markets complain about limitations in the amount, range and quality of the data available, and pricing practices of commercial NMS units.

In this context, the policy question is to what extent a clear differentiation between operating the national observational network and the provision of value-added MET products would foster an innovative and cost-effective market of MET products that are tailored to the individual user groups.

[13] *Official Journal of the European Communities No 95/C, 29.08.95, pp 223/02-223/13 - "Notice pursuant to Article 19 (3) of Council Regulation No 17 concerning Case No IV/34.563 – Ecomet."*
[14] *(1 [official] ecu = 1 euro).*

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3 THE AERONAUTICAL MET INFRASTRUCTURE

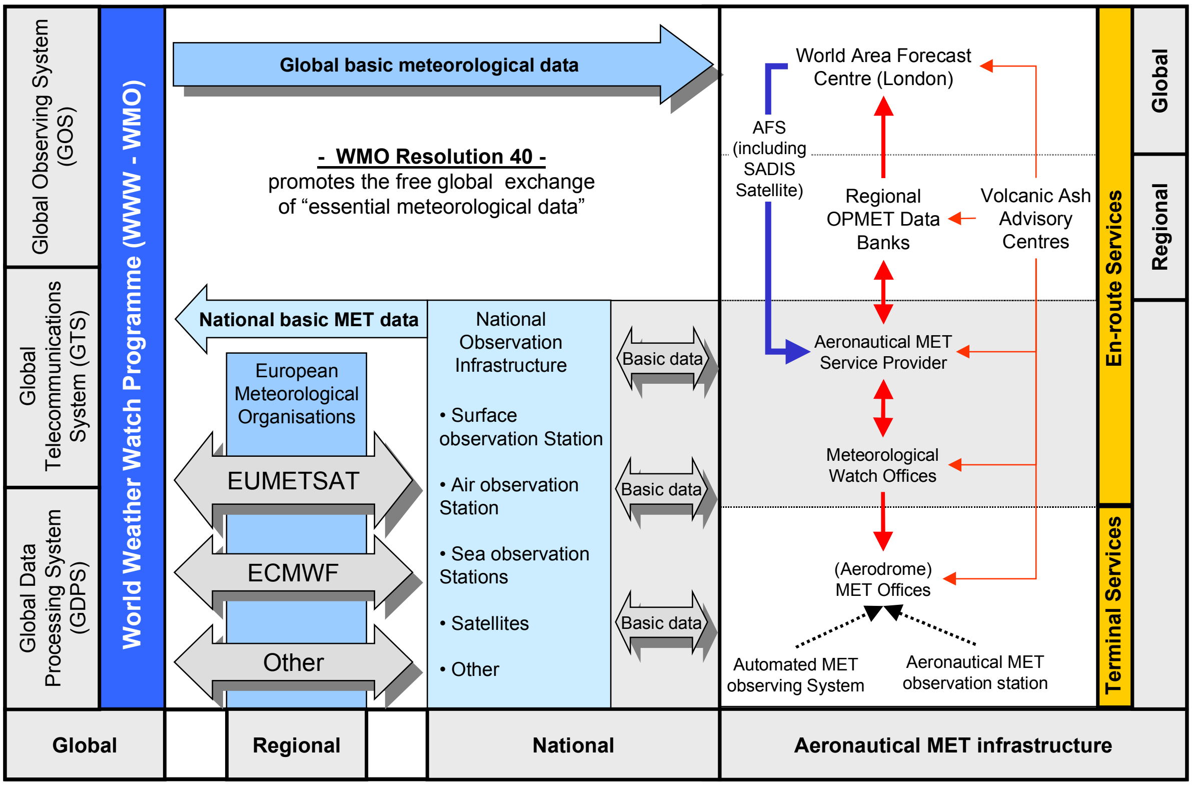
Since no aeronautical MET service providers are alike, it is necessary to examine the context in which the individual aeronautical MET service providers operate in order to compare performance, and to understand the reasons for differences.

The aeronautical MET infrastructure, and especially the data and financial flows within it, are part of a complex global MET system.

Although this report is intended to focus mainly on aeronautical MET services, the field of aeronautical MET service provision cannot be discussed without a basic introduction of the global and regional MET landscape. All forecasts and warnings are reliant upon this fundamental MET infrastructure of observational networks, data processing systems and international data exchange.

To this end, Figure 3.1 introduces the main players of the aeronautical MET infrastructure and briefly describes other relevant actors of the global and regional MET systems, relevant for the provision of aeronautical MET services.

Figure 3.1: The European aeronautical MET infrastructure



The elements of the MET infrastructure outlined in Figure 3.1 above are briefly described in the next section and, where applicable, a reference to the corresponding regulatory framework is given.

3.1 Global level

3.1.1 The WMO World Weather Watch Programme

The World Weather Watch Programme (WWW) is an integrated system co-ordinated by the Geneva-based World Meteorological Organisation[15] (WMO) which operates at global, regional and national levels. It can be divided into three core elements that are closely linked – the Global Observing System[16] (GOS), the Global Data Processing System[17] (GDPS), and the Global Telecommunications System[18] (GTS).

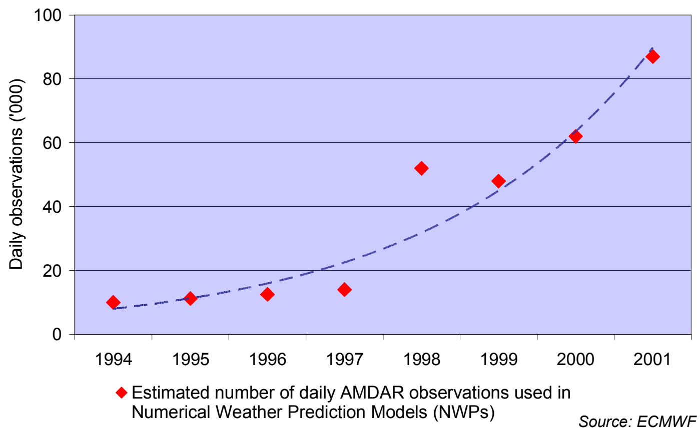
According to WMO Resolution 40, basic MET information is exchanged free of charge, e.g. from ground observation stations deployed throughout the world (see Section 2.3). The overall goal is to provide essential MET data for the protection of life and property and the well-being of nations and their citizens. WMO does not take measurements or make forecasts itself. Rather, it is a co-ordinating body, which relies entirely on national governments for the fulfilment of its objectives and projects.

WMO is funded by annual contributions from its Member States. The overall budget for 2001 was CHF 63.1 million (€41.8 million)[19].

The WMO acknowledges that the aviation community contributes a considerable amount of data to this global system: *"There has been a long mutually beneficial relationship between the aviation industry and meteorological services. One example has been the fruitful co-operation between the airline industry and meteorological services in establishing programmes for making available automated reports from aircraft, which contribute significantly to enhancing the quality of the services provided to all users, including aviation"*[20].

The WMO Aircraft Meteorological Data Reporting Programme (AMDAR) - established in 1998 to enhance the GOS - increasingly contributes to the WWW system by providing timely, high-quality MET observations (see Figure 3.2). Aircraft fitted with appropriate software make observations of winds and temperatures at cruising level, as well as at selected levels in ascent and descent.

Figure 3.2: AMDAR observations used in Numerical Weather Prediction Models



Source: ECMWF

[15] *See also Annex 5.*
[16] *The GOS is a co-ordinated system of methods, techniques, and facilities for making weather observations on a global scale. It is a composite system, which consists of land and sea stations, environmental observation satellites, and aircraft meteorological stations including automated aircraft reporting systems.*
[17] *The GDPS consists of several National MET Centres and provides processed data, analyses & forecast products.*
[18] *The GTS provides communication services for the collection and dissemination of observational data and other relevant information.*
[19] *Exchange rate: 1CHF=0.662EUR.*
[20] *Framework for Implementing Cost Recovery for Aeronautical Meteorological Services, WMO, 6 March 2003.*

Based on individual financial agreements with the NMSs, airlines are usually reimbursed for the cost of communicating AMDAR data.

The WWW programme provides a substantial share of the data for the World Area Forecast System (WAFS) described in the next section.

3.1.2 World Area Forecast System (WAFS)

The World Area Forecast System (WAFS) was developed by ICAO and WMO in the late seventies to meet the need for standardised, high quality, global MET en-route forecasts for aircraft operations. The development was triggered by the liberalisation of the airline industry, increasing consolidation of aeronautical operations, and a significant growth in air transport.

Aviation considerably benefits from the World Area Forecast Centres' (WAFC) products, which have become a vital part of the flight planning process. In particular long haul flights can adjust their operations by maximising revenue payload and minimising the fuel carried on board.

The WAFS consists of two WAFCs, located in London and Washington DC, which four times daily produce standardised global forecasts of upper winds, temperatures and humidity, as well as significant weather forecasts (SIGWX) for all regions and flight levels required in ICAO Annex 3 (see Annex 6) and the Regional Air Navigation plans. Each WAFC provides backup for the other, ensuring routine product distribution in case of one centre's failure.

The WAFC in London is operated by the UK MET Office which has put a lot of effort into the automation of forecast production. The development of a forecasting tool has enabled the production of all the WAFC significant weather charts to be carried out by a "two-man aviation bench"[21]. Although the WAFC in London supplies global en-route MET information, the direct costs of providing this service are entirely recovered through the UK en-route cost recovery process[22] (see also Section 9.2.2).

The Washington WAFC is operated by the US National Weather Service and is in fact composed of three centres: the National Centres for Environmental Prediction, the Aviation Weather Centre, and the Telecommunications Operations Centre.

Together with national operational meteorological data (OPMET), the WAFCs transmit their products to ICAO contracting States by Aeronautical Fixed Service (AFS), including three communication satellites, two of which are operated by the United States (ISCS-International Satellite Communications System) and the third operated by the United Kingdom on behalf of ICAO (SADIS-Satellite Distribution System for Information relating to Air Navigation) (see also Section 3.4).

The cost share of each State participating in the SADIS Agreement is determined on the basis of the number of available tonne-kilometres (ATKs) in scheduled services (international or domestic) performed by air carriers based in the territory of the State concerned.

Further information on the WAFS is given in Section 4.2 and Annex 6, which includes more details concerning the duties of WAFCs and their products.

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[21] *Working paper MET 02-IP "The Automation of Aviation Forecasts and Observations" submitted by the UK (Montreal, 2002).*
[22] *WMO Guide on Aeronautical Meteorological Services Cost Recovery – Annex VII.*

3.2 Regional level

3.2.1 EUMETSAT

EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites) is an organisation created through an international convention agreed by eighteen European States[23] in 1986. The objective is to establish, maintain and exploit European systems of operational MET satellites.

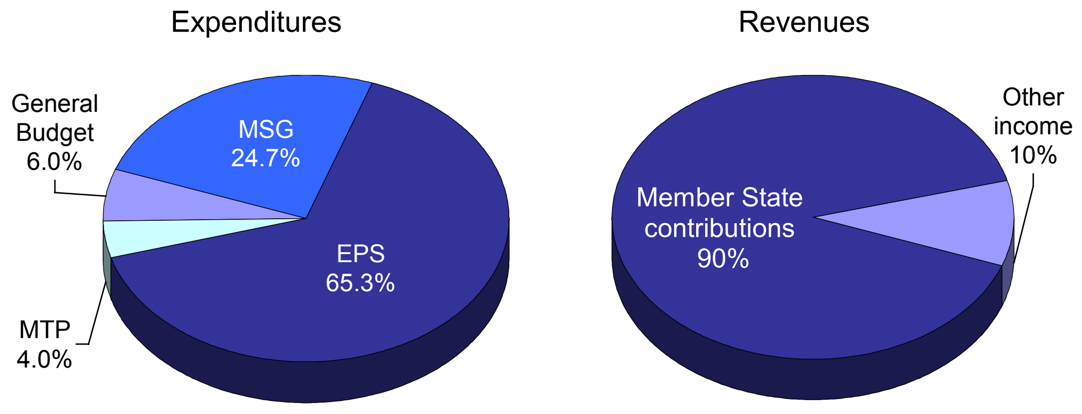
EUMETSAT's Meteosat system is intended primarily to support the NMSs of Member States. The NMSs in turn distribute the image data usually to end users, most notably through the provision of forecasts on television and the Internet several times a day.

EUMETSAT's current satellite programmes produce images of the earth from a geostationary orbit above the equator. The Meteosat Second Generation (MSG) (intended to replace the current Meteosat system) and the EUMETSAT Polar System (EPS) are currently under development. Both satellite programmes are explained in more detail in Annex 7.

EUMETSAT derives the main part of its funding from the contributions of its Member States. These contributions are calculated *pro-rata* to the Gross National Product (GNP) of the respective State. A small income is derived from licensed users but since many users (such as developing countries and many research centres) are exempt from charges, this source of income is expected to remain relatively minor for the foreseeable future.

According to the 2001 Annual Report, EUMETSAT budgets provided for a total expenditure of €301 million during 2001. The main share (90%) of the authorised budget related to the EPS (65.3%) and MSG (24.7%) programmes. The remaining 10% were allocated to the Meteosat Transition Programme (MTP) and the General Budget (see Figure 3.3 below). In 2001, other income amounted to €29 million, i.e. 10% of the total budget. The contributions of Member States and co-operating States for 2001 therefore totalled €272 million.

Figure 3.3: EUMETSAT budget 2001



Source: EUMETSAT Annual Report 2001

[23] *Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.*

3.2.2 ECMWF - European Centre for Medium-Range Weather Forecasts

The European Centre for Medium-Range Weather Forecasts (ECMWF) is an international organisation of 18 European Member States[24], based in Reading, UK. Recognising the economic and social benefits to be derived from more accurate medium-range forecasts (i.e. forecasts 4 to 10 days ahead), the States agreed to combine their scientific and technical resources in this aspect of weather forecasting, and in 1979 decided to establish the ECMWF. The ECMWF operates a global forecasting model that describes the atmosphere (wind, temperature and humidity) from the earth's surface to a height of 65 km.

The organisation's objectives include:

- *the development of numerical methods for medium-range weather forecasting;*
- *the preparation of medium-range weather forecasts for distribution to the meteorological services of the Member States;*
- *scientific and technical research directed at the improvement of these forecasts; and,*
- *collection and storage of appropriate meteorological data.*

ECMWF distributes its products to the NMSs of the Member States via a dedicated telecommunications network. The States use these products to prepare medium-range forecasts for end-users. A selection of the most useful products of the forecasting system of the ECMWF is made available to all countries world-wide via the GTS[25], operated by WMO (see Section 3.1.1).

ECMWF is funded by annual contributions from its Member States. The share is based on the average GNP of each Member State over the last three calendar years. The overall budget for 2000 was approximately €36 million.

3.2.3 Volcanic ash advisory centres and Tropical cyclone advisory centres

France and the United Kingdom are the only two States in Europe with a Volcanic Ash Advisory Centre (VAAC) in operation. VAACs are meteorological centres designated by regional air navigation agreement to provide advisory information to MET watch offices, area control centres, flight information centres, WAFCs and OPMET data banks regarding volcanic ash in the atmosphere following volcanic eruptions (see Figure 3.1). The direct costs for these centres are usually recovered through en-route charges.

Within geographical Europe, there is no Tropical Cyclone Advisory Centre in operation.

3.3 National level

At a national level, the infrastructure for the provision of aeronautical MET services is largely determined by the prevailing climatological and geographical conditions and the aeronautical infrastructure of the State concerned. For this reason, the number of MET offices and stations and the way they operate vary considerably from State to State. The aeronautical MET infrastructure also supplies basic MET data as part of the overall national and global observation network (see Section 3.1.1).

[24] *See EUMETSAT Member States.*
[25] *WWW- Global Telecommunications System.*

3.3.1 (Aerodrome) Meteorological Offices and Aeronautical MET Stations

Defined by ICAO as "*an office designated to provide meteorological service for international air navigation*"[26], meteorological offices are normally located at aerodromes, in which case they are called aerodrome MET Offices.

MET officers at the airport provide MET briefing, consultation and flight documentation. In several States the MET personnel is supported, and partly replaced, by MET self-briefing facilities.

For aerodromes without a MET Office, the MET authority has to designate another MET Office to supply MET information to aeronautical users and others concerned. Further information on MET Offices is given in Annex 8, which includes more details concerning their duties and services.

The weather observations at aerodromes are made at aeronautical MET stations which are often combined with aerodrome MET Offices. However, if necessary, stations may also be established at other points of significance to international air navigation. The observations are disseminated locally and externally as required in accordance with regional air navigation plans.

At some locations, observations are made by the use of automatic or semi-automatic observing equipment. Those systems bear the potential to considerably reduce MET staff costs. It should however be pointed out that the sole use of those fully-automated observational stations (without human supervision) is presently not permitted according to ICAO.

Some States, such as the Netherlands, Sweden and the UK[27], put much effort into centralising their forecasting activities. Specially trained ATS personnel make the MET observations at the airports, supported by semi-automatic observing stations, whereas centralised offices produce the forecasts. However, the dominant model in many States, is to have dedicated MET personnel on site at the airports with responsibility for MET observations and forecasts. Clearly, the structural and operational differences impact on the number of aeronautical MET staff required for the provision of aeronautical MET services, and thus on MET costs allocated to aviation (see also Chapter 9).

3.3.2 Meteorological Watch Offices (MWO)

Whereas Aerodrome MET Offices are mainly responsible for aerodromes and the surrounding area, MWOs are generally responsible for watching weather conditions in flight information regions (FIRs) and Upper Flight Information Regions (UIRs). According to ICAO, MWOs, "*issue information on the occurrence or expected occurrence of specified hazardous 'en-route' weather conditions which may affect the safety of aircraft and low-level aircraft operations (SIGMET and AIRMET information, respectively) and supply this and other weather information to their associated ATS units, usually a flight information centre (FIC) or an area control centre (ACC) and for worldwide distribution as the basis for pre-flight planning and in-flight re-planning*."[26]

MWOs should use, as far as practicable, WAFCs products (see Section 3.1.2 and Annex 6) to fulfil this task. However, as is the case for Aerodrome Meteorological Offices, the extent to which WAFC products are used is the decision of the designated MET authority. Further information on MWOs including duties and products is given in Annex 9 of this report.

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[26] *ICAO Annex 3, Meteorological Service for International Air Navigation.*
[27] *Note that also other States put effort into centralising their forecasting activities.*

3.4 Selected means of communication for aeronautical MET information

In view of the complexity of the aeronautical MET infrastructure and the short life cycle of the information, an efficient and reliable communication system is vital for the dissemination of the latest information to all users. According to ICAO, "*for the dissemination of operational meteorological information beyond the aerodrome, the AFTN*[28] *is the primary communication means. That network is part of the aeronautical fixed service (AFS) which embraces all telecommunication systems used for international air navigation (including SADIS), except ground-to-air transmissions*."[29]

The exchange of aeronautical operational MET information (OPMET) among States is currently being done via AFS (including SADIS). OPMET data include aircraft observations (AIREP) as well as different types of forecasts and warnings. The relevant data is usually uploaded and stored in regional OPMET data banks where it can be accessed and downloaded by authorised users such as NMSs and airlines. The direct costs for operating OPMET data banks are usually recovered through en-route ANS charges.

It is worth mentioning that ICAO currently does not recognise the Internet as a primary means of delivering aeronautical MET data.

The transmission of MET information to aircraft in-flight is usually the responsibility of ATS units. Often ATS units disseminate routine aerodrome reports for selected aerodromes to aircraft in-flight through VOLMET broadcast[30].

For arriving and departing aircraft, airport authorities often provide MET information through Automatic Terminal Information Service (ATIS) broadcast. ATIS broadcasts are used to notify aircraft of the current surface weather conditions, landing and departing runways, runway and taxiway conditions, and other information of importance. The broadcasts are regularly updated as weather and runway conditions change.

[28] Aeronautical Fixed Telecommunication Network.
[29] ICAO Manual of Aeronautical Meteorological Practice.
[30] The details are specified in the ICAO Manual on Co-ordination between Air Traffic Services and Aeronautical Meteorological Services (Doc 9377).

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4 AERONAUTICAL MET PRODUCTS AND SERVICES

Regulations regarding objectives, determination and provision of MET services to international civil aviation are detailed in ICAO Annexes (especially Annex 3), Procedures for Air Navigation Services, Air Navigation Plan publications (EUR Region), WMO technical regulations and National legislation requirements. In support to the aforementioned publications, the ICAO Manual of Aeronautical Meteorological Practice (not binding) is also available. The latter is intended as a meteorological guide to be used by pilots and other aeronautical personnel as well as by meteorological personnel.

For the purpose of this report, it is assumed that all MET service providers provide aeronautical MET products and services in accordance with ICAO Annexes (especially Annex 3), Procedures for Air Navigation Services and Air Navigation Plan Publications (EUR Region), and thus comply with the minimum safety and service quality requirements for international aviation.

Aeronautical MET service providers 'produce' a wide range of products to meet the requirements set out in ICAO Annex 3. The MET products are passed on to the aeronautical user groups through MET briefings, consultation and flight documentation. Generally speaking, aeronautical MET products fall into three categories:

- *Meteorological Observations and Aerodrome Reports (local reports and METARs);*
- *Aeronautical forecasts; and,*
- *Aeronautical warnings.*

An overview of the product categories is given in the following sections.

4.1 Meteorological observations and reports

Aerodrome Reports that are primarily used for aircraft operations are part of the operational meteorological (OPMET) data.

The routine Aerodrome Reports describe the current weather conditions and are issued every 30 minutes at all international European airports in the METAR code and distributed world-wide for pre- and in-flight planning. Routine reports for the transmission to aircraft just before take-off and landing are also provided, complemented by special local reports according to operational and meteorological criteria.

Figure 4.1: Example of a routine Aerodrome Report in the METAR code

```
>>> EDDM (MUNICH) <<<
2004/05/16 08:20 EDDM 130820Z 26009KT 9999 SCT020 BKN060 00/M03 Q1031
NOSIG
>>> END-OF-BULLETIN <<<
```

4.2 Aeronautical forecasts

There are different types of aeronautical forecasts designed to meet the requirements for the various stages of flight and flight planning. Broadly, the forecasts can be grouped into two categories:

- *those provided for aerodromes and the surrounding area (Aerodrome, Landing & Take-off forecasts); and,*
- *those provided for a specified area or region (En-route forecasts).*

The most common types of aeronautical forecasts are described in Table 4.1 below.

Table 4.1: Types of aeronautical MET forecasts

Forecast	Area	Issuing Authority	Validity	Stage of flight	Flight level	Main User
Aerodrome (TAF)	Aerodrome	Aerodrome MET Office, MWO	9, 12, 18 or 24 hrs	Pre-flight and In-flight		IFR, VFR
Landing (TREND)	Aerodrome	Aerodrome MET Office, MWO	2 hrs (part of METAR)	In-flight		IFR, VFR
Take-off	Runway complex	Aerodrome MET Office, MWO	Specified period	Pre-flight	<FL100	IFR, VFR
En-route	Conditions at flight levels applicable to the operation	WAFCs, Aerodrome MET Office, MWO	0600, 1200, 1800 or 2400 hrs UTC	Pre-flight and In-flight		IFR, VFR

Source: ICAO Manual of Aeronautical Meteorological Practice

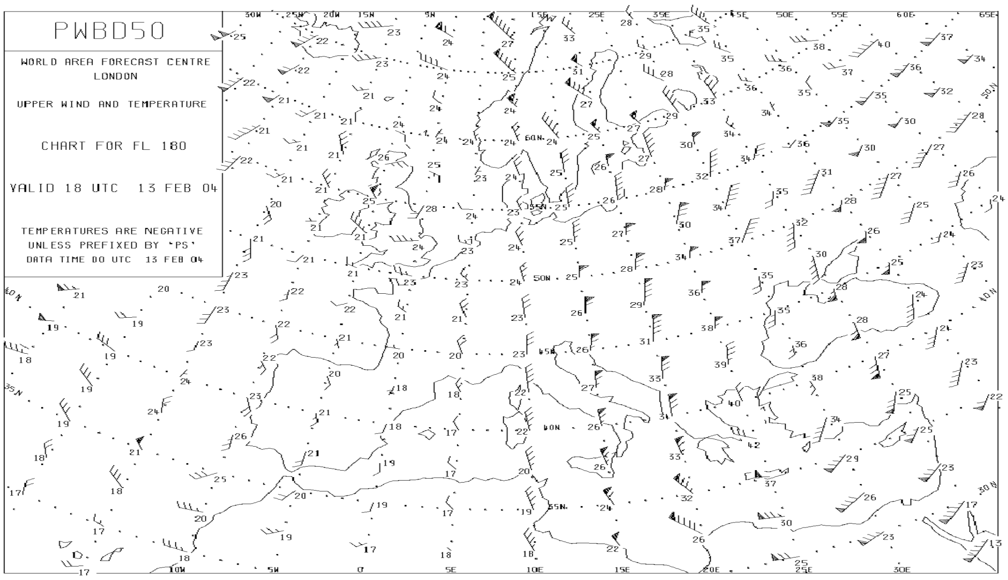
According to ICAO Annex 3, the extent to which aeronautical MET service providers make use of the WAFCs and their products is the responsibility of the designated MET authority of the State concerned. Currently, global upper wind and temperature and humidity forecasts for aircraft en-route above FL50 are provided by the WAFCs in London and Washington. Significant weather forecasts are supplied globally above FL250 and down to FL100 over limited geographical areas, e.g. over the EUROCONTROL Member States.

Figure 4.2: Example of a TAF

>>> EDDM (MUNICH) <<<
TAF (FC) 130900Z 131019 27010KT 8000 BKN020 PROB40 TEMPO 1217 4000 -DZ BKN013 PROB40 TEMPO 1012 -SNRA

TAF (FT) 130400Z 131206 25005KT 9999 BKN030
>>> END-OF-BULLETIN <<<

Figure 4.3: Example of an Upper Air and Temperature Forecast by the WAFC



4.3 Aeronautical warnings

Similar to forecasts, warnings can be broadly divided into two categories:

- *those for arriving and departing aircraft; and,*
- *those for aircraft en-route.*

Whilst forecasts refer to weather conditions expected in the future, warnings generally refer to existing as well as expected safety-related meteorological conditions. The most common types of aeronautical warnings are detailed in the table below.

Table 4.2: Types of aeronautical MET warnings

Warning	Area	Issuing Authority	Validity	Stage of flight	Flight level	Main User
Aerodrome	Aerodrome surface conditions	Aerodrome MET Office	Not more than 24 hrs	Parked aircraft	0	IFR, VFR
Wind shear	Aerodrome and approach / take-off paths between runway level and 500m	Aerodrome MET Office	For as long as it is expected to last	In-flight and prior to and during take off	0-500m	IFR, VFR
SIGMET	Flight information region or all levels used for flight operations	MWO	Not more than 6 hrs	Pre-flight and In-flight	all	IFR, VFR
AIRMET	Flight information region or control area for all flight levels up to FL100	MWO	Not more than 6 hrs	Pre-flight and in-flight	<FL100 phenomena not covered by SIGMET	IFR, VFR

Source: ICAO Manual of Aeronautical Meteorological Practice

Figure 4.4: Example of a SIGMET

>>> FIR: LIMM (MILAN) <<<
LIMM SIGMET 03 VALID 130630/131030 LIMM- MILANO FIR SEV TURB FCST MAINLY CENTRAL AND E PART ABV FL090 STNR NC

LIMM SIGMET SST 02 VALID 130830/131430 LIMM- MILANO FIR MOD/SEV TURB FCST ABV FL380 STNR NC
>>> END-OF-BULLETIN <<<

4.4 Additional MET products and services

Many aeronautical MET service providers supply MET products and services which exceed the aforementioned minimum requirements in terms of quality and range.

Additional aeronautical MET products include (but are not limited to):

- Significant weather charts for low-level flights for a defined region;
- Radar imagery tailored to Air Traffic Management needs; and
- Dedicated bulletins for Air Traffic Management.

It is acknowledged that there might be additional MET services specified and agreed by the national aviation authorities in consultation with the MET authority and users. However, any special MET services or products provided at the request of a single or limited number of users in addition to the official aeronautical MET requirements[31] should only be charged to the users concerned[32].

[31] *See beginning of this chapter.*
[32] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*

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5 THE AERONAUTICAL MET COST BASE

This chapter outlines the computation of the aeronautical MET cost base (national MET costs that are allocated to civil aviation), and the different variables and factors that are involved in this process.

General principles on charges for ANS, including aeronautical MET services are expressed in Article 15 of the Chicago Convention. ICAO regulations are geared at international civil aviation and therefore exclude domestic and military operations. However, Article 15 of the Chicago Convention states that there should be no discrimination and that it is the State's choice if it wants to apply ICAO recommendations or develop its own national practices for domestic aviation.

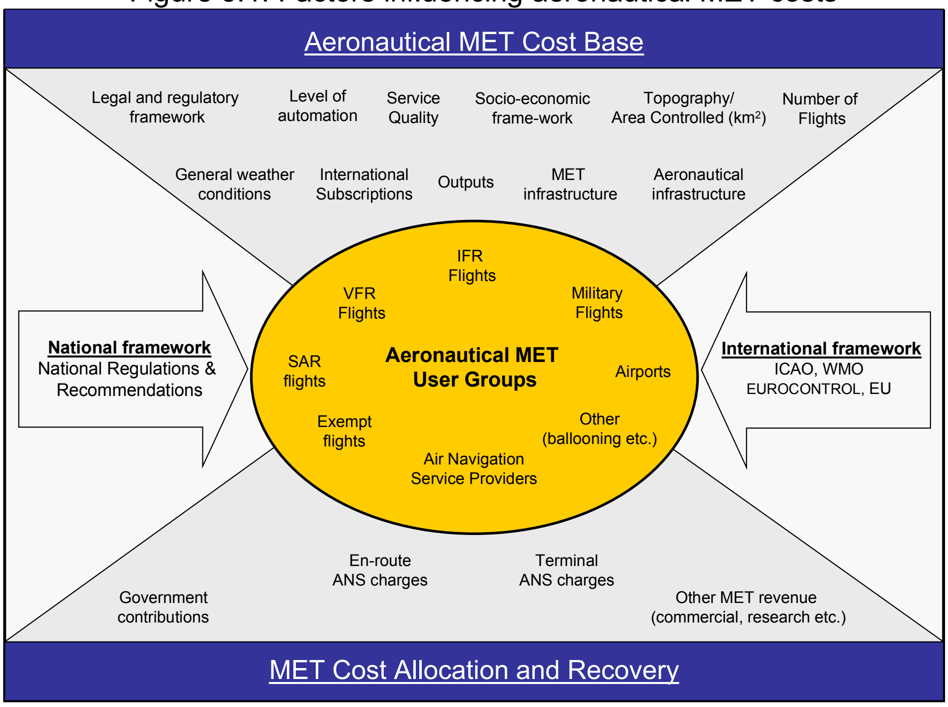
EUROCONTROL Principles refer primarily to the ICAO manuals for the calculation of MET costs. "*National meteorological costs should be determined in accordance with Appendix 6 to the "Manual on Air Navigation Services Economics" contained in ICAO Document 9161/3. It is necessary that national authorities concerned ensure that the meteorological providers are bound by the general principles contained in ICAO Document 9082/5 concerning Air Navigation Services charges, and work in consultation to implement these principles and determine the corresponding costs.*"[33]

It is important to stress that formally ICAO manuals and WMO publications merely offer financial and economic **guidance** for aeronautical MET service providers. They are not binding for the Contracting/Member States.

5.1 Factors influencing the aeronautical MET cost base

The aeronautical MET cost base is influenced by a multitude of operational, socio-economic, regulatory and other factors (Figure 5.1). The main influencing factors are usually geography, climatological conditions, the aeronautical infrastructure, and the level of service that is provided to users.

Figure 5.1: Factors influencing aeronautical MET costs



[33] *EUROCONTROL Principles for Establishing the Cost-Base for Route Facility Charges and the Calculation of the Unit Rates.*

5.2 Analytical framework for aeronautical MET cost base

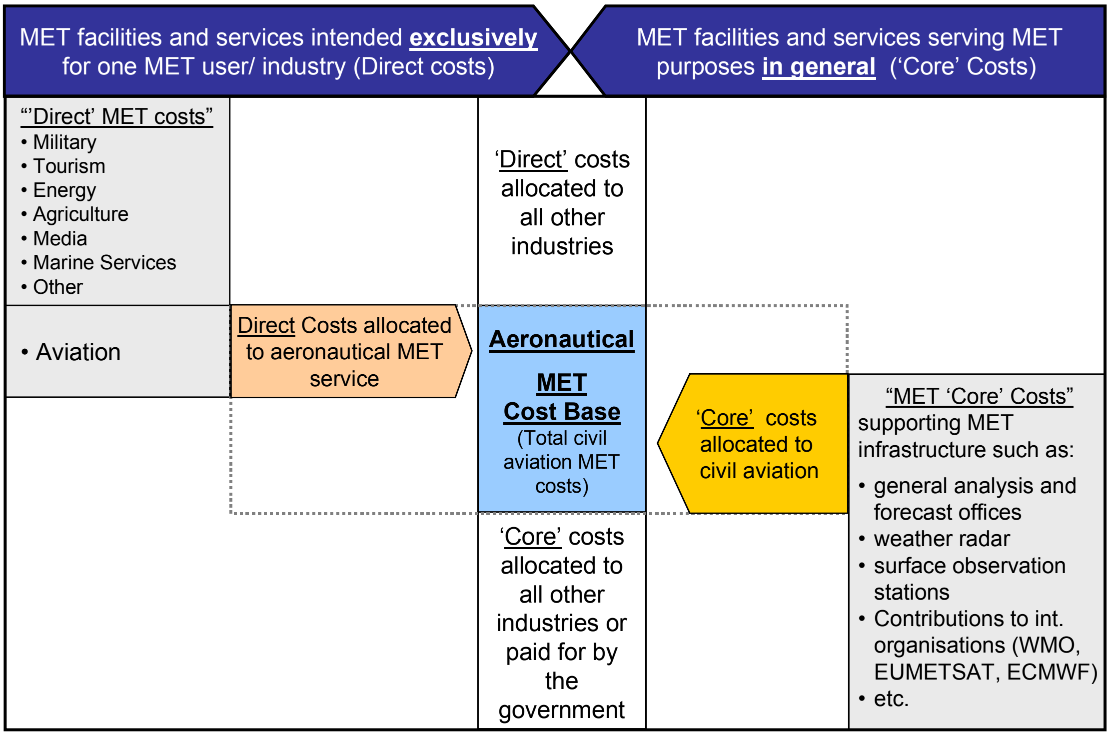
ICAO acknowledges that "*National Meteorological organisations, while they serve aeronautical requirements, operate to serve the non-aeronautical community as a whole by providing meteorological and climatological information for maritime and other surface transport, civil protection, agriculture, fishing, hydrology, air pollution control, retailing, sports and recreation, tourism, building and construction, the press and other media, and the general public.*"[34]

Although not binding, ICAO[34] and WMO[35] provide basic guidance including an inventory list for determining the aeronautical MET cost base. As a first step, ICAO recommends a division of the national MET costs into the following three categories.

MET facilities and services:

- *intended exclusively to serve aeronautical requirements;*
- *intended exclusively to serve non-aeronautical requirements; and,*
- *intended to serve both (core activities).*

Figure 5.2: Framework for determining the aeronautical MET cost base



According to ICAO guidelines[34], the aeronautical MET cost base is the sum of costs for exclusively aeronautical MET facilities plus a share of so-called 'core' costs, or common costs, which are related to more than one type of service or user.

Aeronautical MET Cost base = *Cost of facilities and services intended to serve exclusively aviation (direct costs)* + *Share of cost of facilities and services intended to serve all users (core costs)*

According to the findings of the MET/TF, the 'core' costs share typically represents more than 50% of total civil aviation MET costs (see Section 5.3).

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[34] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*
[35] *WMO Guide on Aeronautical Meteorological Services Cost Recovery.*

5.2.1 Costs directly related to the provision of aeronautical MET services

Whilst it is usually easy to identify the costs for facilities and services intended to serve exclusively individual sectors such as aviation, energy, tourism, media, agriculture, there seem to be major difficulties to calculate the fair and justified share of MET 'core' costs that is to be allocated to the individual industry sectors.

According to ICAO, facilities and services intended exclusively to serve aeronautical requirements include, among others[36]:

- World Area Forecast Centres (WAFCs);
- MET Watch Offices; and,
- Aerodrome MET Offices and aeronautical MET Stations.

However, the identification and calculation of direct costs for aeronautical MET services require a proper cost accounting system that is able to identify and allocate all direct costs to the individual user groups (e.g. aviation, media, agriculture, etc.).

5.2.2 'Core' costs allocated to aeronautical MET services

The costs for MET 'core' facilities and services cannot be allocated to one individual industry sector or user group, and include items such as (but not limited to)[37]:

- weather radar;
- the observational network;
- satellite systems;
- general forecast and data processing centres;
- research and development, and other activities.

Aeronautical users (represented by IATA) argue that 'core' costs should not be allocated to any specialised MET user group, on the grounds that[38]:

1. "*The core system forms the foundation of all applications of meteorology, and the establishment and operation of the national components of the global basic system are required in the context of international cooperation under the auspices of the WMO World Weather Watch. Without a global exchange of basic data, effective weather prediction is not possible at all.*
2. *The core system is indispensable for the primary task of the national meteorological organizations. The task of providing weather forecasts and warnings for the general public to safeguard the lives and possessions of the citizens, for the benefit of a national economy, e.g. agriculture, hydrology, tourism, fishing and shipping, and for military applications, arises from the general obligations of a State. This is recognized to the extent that these services are financed through taxes.*
3. *The core system does not rely on the existence of a single application. For instance, if aeronautical or marine meteorology were discontinued, this would have no marked impact on the costs."*

In this context, according to ICAO, "*it should be recognised that aviation contributes to the core system by providing upper air observations of winds and temperatures.*"[39] As recognised by the WMO, the aeronautical MET infrastructure contributes significantly to the overall national and global MET observation system (see Section 3.1.1) which is used for the benefit of many different user groups and the general public.

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[36] *See Annex 10 for complete list.*

[37] *The complete list of 'core' facilities and services identified by ICAO can be found in Appendix 6.*

[38] *IATA Technical Operations Policy Manual (2000) - Part B Resolutions - "Meteorology, Policies on Items not Contained in ICAO Annex 3".*

[39] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*

Aeronautical users have usually only moderate or no control over the level of MET costs that are handled and allocated through the 'core' system (see also Chapter 7). Indeed, the results of a recent EUROCONTROL Task Force suggest that MET 'core' costs represent the majority of the MET costs allocated to civil aviation.

5.3 Findings of the EUROCONTROL MET Task Force

In November 2001, the final report of the EUROCONTROL MET Task Force on "The Allocation of MET Costs to Civil Aviation" (MET/TF Report) concluded that *"core costs represent a portion of more than 50% of total meteorological costs*". Consequently, the allocation of 'core' services to the individual industry sectors is a critical step when determining the aeronautical MET cost base. The importance of this step is also stressed by ICAO: "…*since no single user requirement determines the level and cost of the core activities, the further allocation of core activity costs among aeronautical and non-aeronautical users should be approached with considerable caution."*[40]

As a result, and since the allocation of direct costs is estimated to be fairly simple, the MET/TF Report focused to a large extent on the mechanisms used to apportion the 'core' costs to the individual user segments. The report concluded that, "*core costs allocated to civil aviation typically represent a share of more than 50% of total civil aviation MET costs*."

As ICAO guidance on the recovery of MET costs is not binding, it is at the States' discretion which method they want to apply. Consequently many different mechanisms have emerged. The most common approaches identified by the MET/TF Report for the allocation of 'core' costs are briefly outlined below. Whereas it is acknowledged that this does not represent an exhaustive list of methodologies, it is intended to draw attention to the diversity of methods used to apportion 'core' costs to civil aviation.

The various approaches for the allocation of 'core' costs to civil aviation include:

- *No allocation of 'core' costs – fully government funded;*
- *A Core customer group decides the overall share of 'core' costs that each group should bear. In the UK, approximately 40% of the cost of core services are paid for by military services. Approximately 40% is paid by a combination of other Government Departments in support of the public meteorological services, while civil aviation pays the remainder (i.e. 20%).*
- *Proportionate cost allocation of 'core' costs. This method allocates 'core' costs according to the proportion of directly attributable costs (costs of exclusive use of facilities and services) for each user group. This approach is used, for example, by Portugal;*
- *Allocation according to "the degree of utilisation" of each user (level of information/frequency). This approach is followed, for example, by Romania;*
- *Allocation to cost centres or products/activities and by applying documented allocation keys. This approach is used, for example, by France, Germany and Switzerland;*
- *Full allocation of 'core' costs where MET services are provided internally by dedicated units of ANSPs. This approach is used, for example, by Austria, Belgium.*

In order to illustrate the significance of the allocation methodologies used to determine the share of the 'core' costs paid for by civil aviation, Table 5.1 displays some of the findings from the MET/TF. Unfortunately this information was only available for a very limited set of States and therefore provides an incomplete picture. However, it clearly shows the existing differences in 'core' cost allocation methodologies across Europe.

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[40] *ICAO Manual on Air Navigation Services Economics.*

Table 5.1: Breakdown of national MET costs in 2000

Country	Total MET costs in 2000 (in € '000) (A)	% directly allocated to civil aviation (direct costs) (B)	% directly allocated to all other industries (direct costs) (C)	Total share of 'core' costs (D)	% of 'core' costs allocated to civil aviation (E)	Total % of MET costs allocated to civil aviation (F)=(B)+(D) x (E)
Slovak Rep.	2 556	*25%*	*0.6%*	75%	*34%*	*50%*
Spain	81 353	*19%*	*23%*	59%	*27%*	*35%*
Turkey	51 369	*8%*	*1%*	91%	*25%*	*31%*
United Kingdom	184 533	*8%*	*36%*	58%	*22%*	*21%*
Germany	272 246	*6%*	*19%*	75%	*19%*	*20%*
Finland	32 180	*15%*	*27%*	59%	*8%*	*20%*
Denmark	36 944	*6%*	*54%*	40%	*10%*	*10%*

Source: EUROCONTROL MET/TF

There are a number of important points emerging from Table 5.1:

- 'Core' costs constitute an important share of the total MET costs (see column D). In the case of Turkey, this share is reported to be greater than 90%;
- The percentage of the 'core' costs allocated to civil aviation (see column E) varies among States from 8% for Finland to 34% for the Slovak Republic according to the sample;
- Finally, the percentage of the total MET costs allocated to civil aviation (see column F) varies equally greatly among the States that provided the information.

Clearly, the methodologies used for the calculation of the aeronautical MET cost base have a substantial impact on the level of MET costs allocated to civil aviation at State level. However, as pointed out by the EUROCONTROL MET/TF, detailed information on national allocation methodologies is still scarce. For a summary list of recommendations of the MET Task Force see Annex 12.

5.4 Transparency of allocation methodologies and accounting systems

Transparency of allocation mechanisms goes hand in hand with transparent accounting systems that attribute costs in accordance with operational boundaries, product categories, and costs centres/departments.

Implementation of such cost-reflective accounting systems would not only reduce the risk of user discrimination, but also produce valuable data that could be used for the comparison of aeronautical MET services with a view to identifying and promoting best practice (see Section 9.1).

In view of the growing importance of MET services to other industries, there is a need to ensure that aeronautical users are not asked to pay for MET services they do not require (e.g. extension of the forecast horizon/range) as the aeronautical needs might already be sufficiently served by existing MET services. It is the role of the designated MET authority to gain an effective understanding of the requirements of the civil aviation sector for MET related products and services, and associated costs.

As discussed in Section 2.2, the Single European Sky Regulation (SES) is expected to have a major impact on ANS cost transparency, including aeronautical MET costs. The SES regulation includes an obligation for cost transparency (Art. 12 'Service Provision Regulation') which requires aeronautical MET service providers to apply International Accounting Standards to the maximum possible extent in order to establish the costs for any specific kind of service and cost centre. Moreover, there is an obligation to publish annual reports comprising externally audited statutory accounts.

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6 ALLOCATION AND RECOVERY OF AERONAUTICAL MET COSTS

Once the aeronautical MET cost base is established, the costs need to be attributed to 'service areas' and user groups.

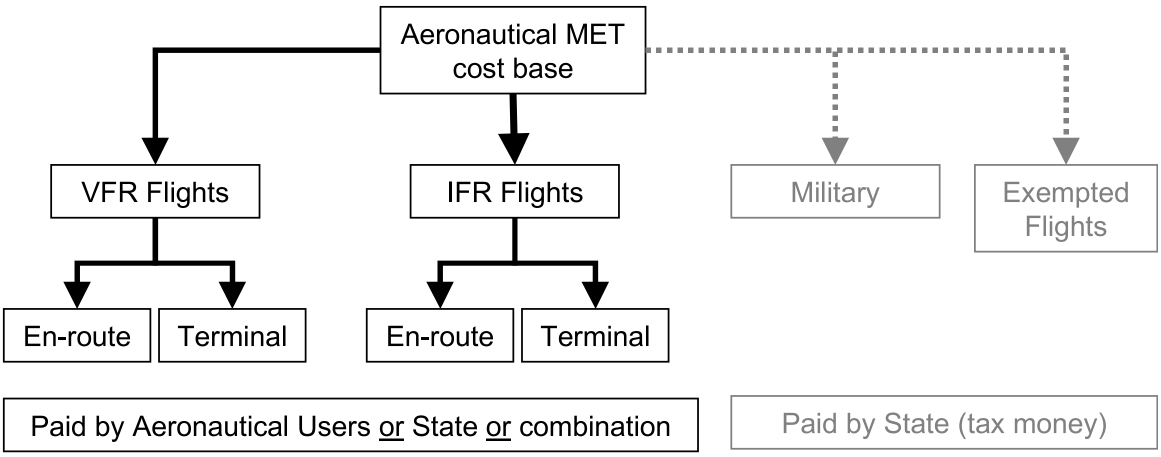
A common and key factor in the views of ICAO, EUROCONTROL and the European Commission is the principle that charges should be non-discriminatory. Only charges that are truly cost-related can be non-discriminatory. ICAO states that "*the allocation of aeronautical meteorological costs should be determined in such a way as to ensure that no users are burdened with costs not properly allocable to them*."[41]

Whereas in some States, the military uses MET products and services provided by the NMS for their flights, in other States the military operate their own independent MET services.

In those cases where the military uses MET services from the NMS, the MET costs for those services and the costs for exempted flights (i.e. government flights) need to be allocated accordingly, thus reducing the MET costs that are attributed to civil aviation (Figure 6.1).

The following section focuses consequently on the allocation of the remaining MET costs which are to be recovered from civil aviation.

Figure 6.1: Allocation among 'service area' and user groups



Whereas the products and services of aeronautical meteorology are extensively documented in various ICAO and WMO publications, there is little detailed guidance available on the allocation of MET costs among 'service areas' (i.e., en-route/terminal) and, among aeronautical user groups (i.e., IFR fights vs. VFR flights or commercial vs. general aviation).

While the level of MET charges might differ between States according to, inter alia, service quality and input prices, allocation methodologies should be consistent in order to avoid unfair discrimination between the different aeronautical user groups.

The following section examines the allocation of MET costs between terminal and en-route services, as well as the allocation among aeronautical user groups.

Due to the lack of information on exact allocation methodologies, this section is mainly intended to draw attention to the significant differences that exist in allocation practices between States.

[41] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*

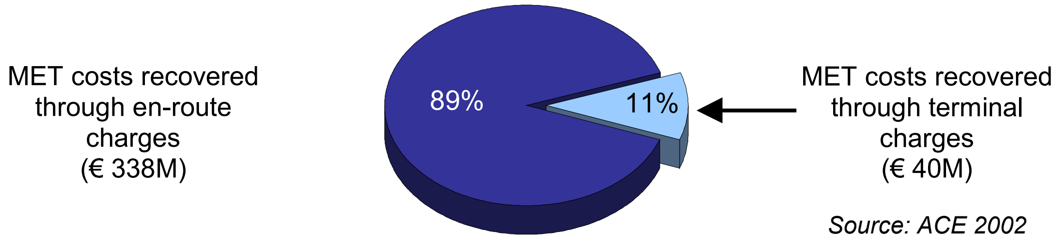
6.1 Allocation of MET costs among 'service areas'

ICAO recommends that allocation of ANS costs should be in accordance with operational boundaries: *"costs of all meteorological services provided to civil aviation should, where appropriate, be allocated between air traffic services provided for airports and air traffic services provided en-route."*[42]

Yet, no clear-cut guidance on where the boundary between terminal and en-route ANS should be is provided. If charges for MET services are to be cost-reflective, there ought to be specific charges for each flight phase reflecting the operational boundaries between these phases.

Of the €378 million of aeronautical MET costs recovered by the 31 States that supplied data in 2002[43] for the purpose of Information Disclosure, some 89% were allocated to en-route services, whereas only 11% were allocated to terminal services as illustrated in Figure 6.2.

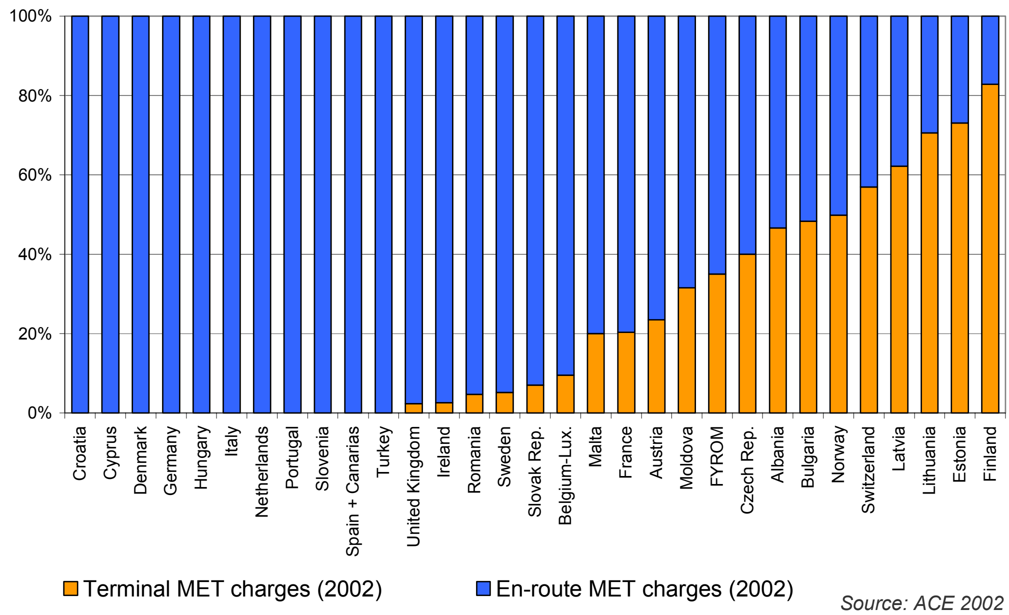
Figure 6.2: European aeronautical MET costs by 'service area' in 2002



In principle, the need to impose MET charges at the point of use implies that there should be a separate charge in accordance with operational boundaries. At a national level, most States/ANSPs allocate aeronautical MET costs entirely, or to a large proportion, to en-route ANS, as can be seen in Figure 6.3.

Only 20 of the 31 States (65%) allocated and recovered MET costs through terminal ANS charges in 2002.

Figure 6.3: Total aeronautical MET costs by State/ANSP and by 'service area' in 2002



[42] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*
[43] *See Annex 2.*

Notable exceptions were Finland, Estonia, Lithuania, Latvia and Switzerland where the share attributed to terminal ANS services exceeded 50% in 2002.

Insufficient allocation among 'service areas' bears potential risk for users discrimination because parameters used in the allocation structure usually do not accurately reflect the true cost drivers. Failure to correctly determine and reflect the en-route and terminal MET cost drivers in the cost base of the respective 'service areas', most likely results in cross-subsidy between aeronautical user groups. Allocation of terminal MET costs into the en-route cost base discriminates against users that merely fly over the country concerned, in favour of those terminating the flight in the country concerned. This would benefit, for example, domestic and/or short-haul flights.

6.2 Allocation of MET costs among aeronautical user groups

It is acknowledged that there is a variety of intermediate users of aeronautical MET information, including air traffic service (ATS) units and airport operators. For the purposes of this report, those MET users are treated as information brokers who pass on important MET information for the benefit of operating flights (end users).

ICAO recommends that ”*where the necessary basic data, including all required traffic statistics, are available, consideration should be given to allocating the aeronautical meteorological costs between IFR and VFR traffic.*” [44]

Both ICAO and EUROCONTROL principles foresee the right for States to exempt user groups and particular flights from aeronautical charges. In some States, flights operating under the Visual Flight Rules (VFR) are exempt from ANS charges, including MET charges (see also Figure 6.1).

It should be stressed again that ICAO recommendations are not binding as the States retain the sovereignty to decide whether, and to what extent, they want to recover aeronautical MET costs from VFR users.

Nevertheless, ICAO stresses that, if flights are exempt, the cost of providing services for these flights should <u>not</u> be passed on to other users. The logical consequence is that <u>all</u> MET costs need to be allocated among all identified user groups (not only paying users) in order to determine the government's contribution for exempted users.

Proportionate cost allocation which is based on the ‘use’ of the service, is the method commonly used to allocate MET costs among user groups. ICAO mentions some of the parameters that could be used for this method, which include:

- *the number of flights;*
- *the distance flown;*
- *the time in the system; and,*
- *the aircraft weight.*

In some cases the allocation is a combination of the aforementioned parameters. Without government contributions (i.e. tax money) this method may, however, result in prohibitive prices/ fees for some user groups such as VFR users.

Whatever the approach might be, ICAO points out that “*where any preferential charges, special rebates, or other kinds of reduction in charges normally payable in respect of air navigation services are extended to particular categories of users, governments should ensure, so far as practicable, that any resultant under-recovery of costs properly allocable to the users concerned is not shouldered onto other users.*”[45]

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[44] *ICAO Manual on Air Navigation Services Economics – Appendix 6.*
[45] *ICAO’s Policies on Charges for Air Navigation Services.*

6.3 Aeronautical MET cost allocation matrix

Although not exhaustive, the matrix in Figure 6.4 is primarily intended to summarise the previous two sections on cost allocation among 'service areas' and aeronautical user groups, and to draw attention to the diversity of allocation systems currently used for the attribution of MET costs by EUROCONTROL Member States. Information on the allocation of MET costs among aeronautical users (IFR/VFR) was unfortunately only available for a limited set of States from the MET/TF Report.

The matrix can also be seen as an indication to which extent the national systems of cost allocation are compliant with ICAO guidance and the SES regulations, which recommend an allocation among 'service areas' <u>and</u> user groups.

Figure 6.4: Aeronautical MET cost allocation matrix

'VFR' Allocation (User Group)	Terminal Allocation ('Service Area'): YES	Terminal Allocation ('Service Area'): NO
NO	Belgium Bulgaria Moldova Slovak. Rep.	Denmark Portugal The Netherlands
YES	Austria France FYROM Switzerland	Germany Turkey

Source: MET/ TF & ACE 2002

In order to ensure fair, transparent and cost-reflective attribution to 'service areas' and user groups, ANS cost allocation systems, including MET cost allocation systems, ought to be consistent across all EUROCONTROL Member States.

6.4 Recovery of aeronautical MET costs in EUROCONTROL member states

ICAO and EUROCONTROL charging principles are mostly based on the principle of full cost recovery. Member States have the right to recover from aviation the fair and justified costs for providing the required services and facilities for international ANS, including aeronautical MET services. The legal basis for cost recovery is Article 15 of the Chicago Convention, elaborated upon in ICAO's Policies on Charges for Airports and Air Navigation Services.

Recovery of aeronautical MET costs is usually arranged through a combination of ANS charges and government funds. However, as demonstrated throughout this chapter, cost allocation practices vary significantly among the States.

Within EUROCONTROL Member States, approximately 89% of aeronautical MET costs are recovered from en-route ANS charges. MET costs allocated to en-route services are included in the national (en-route) unit rate of the Member State and consequently recovered through EUROCONTROL route charges. The harmonised EUROCONTROL cost recovery scheme has 32 Member States (March 2004) and was primarily set up for the collection of IFR related en-route costs.

Whereas MET costs attributed to en-route services can be conveniently and effectively recovered through EUROCONTROL route charges, there is currently no European recovery scheme for MET costs allocated to terminal ANS or VFR flights. As a result, States are responsible for setting up and maintaining a recovery system for MET costs relating to terminal services and VFR flights, and it is entirely at the States' discretion when and where to collect these costs.

Finally, given that MET costs are passed on through consolidated en-route (and occasionally terminal) ANS charges, it is difficult, if not impossible, for users to determine the share of MET costs that is included in the ANS charge.

This not only results in a lack of transparency of aeronautical MET charges for aeronautical users, but also reduces visibility and accountability of the aeronautical MET service providers (see also Chapter 7).

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7 USERS CONSULTATION AND INFORMATION DISCLOSURE

7.1 Consultation process

In competitive markets, customers generally have a choice over a range of differentiated products and services from competing suppliers. Aeronautical users generally do not have this option. For this reason, user consultation is crucial to provide aeronautical users with a platform to communicate their requirements and concerns. The following section is intended to highlight this important matter of aeronautical MET service provision.

According to the WMO*, "the prime consideration should be that no users should be charged for services or facilities that they do not require. For this reason it is very necessary to have frequent discussions with all parties to agree on a full definition of "user requirements" which leads to quality of service provision and the range of products and facilities required to support the dedicated service."*[46]

WMO further highlights the importance of a dialogue with the users. "*It is necessary that the consultations should be between the meteorological service provider (usually the National Meteorological Service), the Meteorological Authority (if not the provider), the national Civil Aviation Authority and representatives of the users. The importance of this consultation cannot be over-emphasised."*[46]

Table 7.1: Aeronautical users consultation[47]

State	Annual consultation meetings?	Meetings to establish product specifications?	Negotiate on MET costs	Type of MET service provider
Austria	Yes	Yes	Yes	ANSP
Belgium-Lux.	No	No	No	ANSP
Bulgaria	Yes	Yes	Yes	ANSP
Czech Rep.	Yes	Yes	Yes	NMS
Denmark	Yes	No	No	NMS
Finland	Yes	Yes	Yes	ANSP
France	Yes	Yes	No	NMS
FYROM	Yes	No	No	ANSP
Germany	Yes	Yes	No	NMS
Ireland	No	No	No	NMS
Italy	No	No	No	NMS
Moldova	No	No	Yes	NMS
Norway	No	Yes	No	NMS
Portugal	Yes	Yes	No	NMS
Slovak Rep.	No	Yes	Yes	NMS
Slovenia	No	No	No	NMS
Spain + Canarias	No	No	No	NMS
Sweden	Yes	Yes	Yes	NMS
Switzerland	Yes	Yes	Yes	NMS
Turkey	Yes	Yes	Yes	NMS
United Kingdom	Yes	Yes	Yes	NMS
Yes	62%	62%	48%	
No	38%	38%	52%	

Source: MET/TF

As can be observed from Table 7.1 above, the results of a survey carried out by the MET/TF in 2000 show a contrasting picture in terms of the consultation process.

46 WMO Guide on Aeronautical Meteorological Services Cost Recovery.

47 Some States such as the Netherlands did not participate in the original MET/TF survey. According to the national MET service provider in the Netherlands, KNMI, annual users consultations on aeronautical MET costs and products are organised.

Of the 21 States analysed, 38% did not hold annual consultation meetings with aeronautical users. When asked for meetings to establish product specifications, 38% indicated that they do not consult with aeronautical users on products. On the other hand, the survey indicates that in 48% of the States, aeronautical MET costs are part of the issues discussed with aeronautical users during the consultation meetings.

Individual MET user groups, such as aeronautical users, usually have only moderate influence on decisions concerning the overall MET infrastructure as they are taken with respect to the national requirements and do not necessarily take individual needs (which might already be met by existing systems) into account. This is, in particular, the case for the 'core' costs and for contributions to international organisations, such as EUMETSAT, which are usually governmental subscriptions based on GNP shares and outside the direct control of MET service providers.

Three main areas usually drive additional costs to the MET ‘core’ system:

- the development of new meteorological applications;
- the forecast range (10 day forecasts will soon be the standard); and,
- the quality and accuracy of forecasts in general.

Whilst an improvement in quality and accuracy - especially in the terminal area - is highly desirable (e.g. now-casting), it is important to recognise that an improvement in the current forecast range and the development of new applications not relating to aviation is of no, or only limited, benefit for aeronautical users.

7.2 Information disclosure

In an environment where the provision of aeronautical MET services is a monopoly without choice for the users, transparency and an informed dialogue between provider and user is crucial to build confidence and to avoid user discrimination.

As already mentioned in Section 7.1 above, presently, aeronautical MET users appear to have only limited opportunities to comment on decisions concerning the national MET infrastructure and thus the level of the costs that are attributed to individual MET user groups.

Information disclosure is needed to counterbalance the statutory monopoly position of aeronautical MET service provision, to identify best practices, and to foster performance improvements through benchmarking.

Data disclosure enables an effective and informed consultation process, the development of a common understanding of aeronautical MET requirements and thus fosters a mutual understanding between MET service providers and aeronautical users.

Currently, users have difficulties in assessing value for money from the information available. An important confidence building measure would be to provide financial and operational relevant data associated with the provision of MET services (by type, by categories, by activities, etc.).

Meaningful and reliable data on aeronautical MET costs in Europe are still scarce. Two data sets support a high level analysis of MET service providers[48]. These are briefly presented in the following sections.

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[48] *See Annex 2.*

7.2.1 EUROCONTROL Enlarged Committee for Route Charges data

For the purposes of recovering en-route ANS costs, EUROCONTROL Member States are required to submit a breakdown of national en-route ANS costs by category every year (see Table 7.2). Unfortunately, not all States provided always a breakdown of MET costs and some States joined the EUROCONTROL Route Charges system only a few years ago (e.g. Finland, FYROM, and Moldova) which limits the data set, and thus the scope for a comprehensive time series analysis[49].

Table 7.2: Breakdown of ANS costs

▪ ATM/CNS ▪ Training ▪ Studies/Tests and Trials ▪ Administration ▪ AIS (Aeronautical Information Services) ▪ MET ▪ SAR (Search and Rescue Services) ▪ Other
∑ National en-route costs base

For the calculation of the national unit rate, only one single figure for total en-route MET costs is submitted to EUROCONTROL. Consequently no detailed information on MET cost drivers (e.g. staff costs, etc), or information on terminal MET costs are available from this source. Increases in aeronautical MET costs are usually not commented by Member States.

In order to improve transparency, the EUROCONTROL MET/TF (see Section 5.3) recommended an amendment to the EUROCONTROL Principles (see Annex 12). In addition to the total MET costs at State level, as of 2004, Member States will be required to provide a breakdown of the aeronautical MET costs by cost type (staff, operating costs, amortisation, interest, other) and "service area" (terminal/ en-route).

The recommended amendments are in line with the data collected by the PRU (see below) and should enable a better understanding of the structure of national MET costs allocated to civil aviation and hence assist a more effective and informed consultation process. Compared to the information on MET costs that was available in the past, this is a first important step towards more transparency.

7.2.2 EUROCONTROL Performance Review Commission (PRC) data

The second data source currently available for MET cost analysis is the data relating to the "Specification for Information Disclosure" collected by the PRU since 2001 (see Section 1.3). Whereas Route Charges data provides en-route MET charges at State level, Information Disclosure data allows for a more detailed analysis of MET costs allocated to both terminal and en-route ANS, broken down by individual cost types.

Unfortunately, as far as 2002 data are concerned, not all ANSPs were able to provide full set of meaningful data including a breakdown of MET costs by type (see Figure 9.8 in Chapter 9). This appears to be due to accounting practices of the responsible bodies for the MET part of ANS costs, which were not able to provide a breakdown of MET costs by type.

[49] *See Annex 2.*

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8 DEVELOPMENT OF MET COSTS RECOVERED THROUGH CHARGES

The sample used for the time series analysis includes data for 23 EUROCONTROL Member States for which continuous data from 1998 to 2002 was available[50]. The sample represents approximately 98% of the total en-route MET charges recovered by EUROCONTROL in 2002 (equivalent to €325 million).

The data used for the analysis in Section 8.1 and 8.2 represent 'MET costs' recovered through ANS charges. Although the term 'MET costs' is used, it should be noted that the amounts allocated to aviation are generally the results of differing allocation mechanisms and policies, and therefore only a reflection of the States' interest and/or ability to recover aeronautical MET costs (see Section 9.3). For example, one State might decide to allocate and recover 100% of the costs related to the provision of aeronautical MET services whilst another State might decide to recover only a lower percentage or a certain cost type (e.g. direct operating costs).

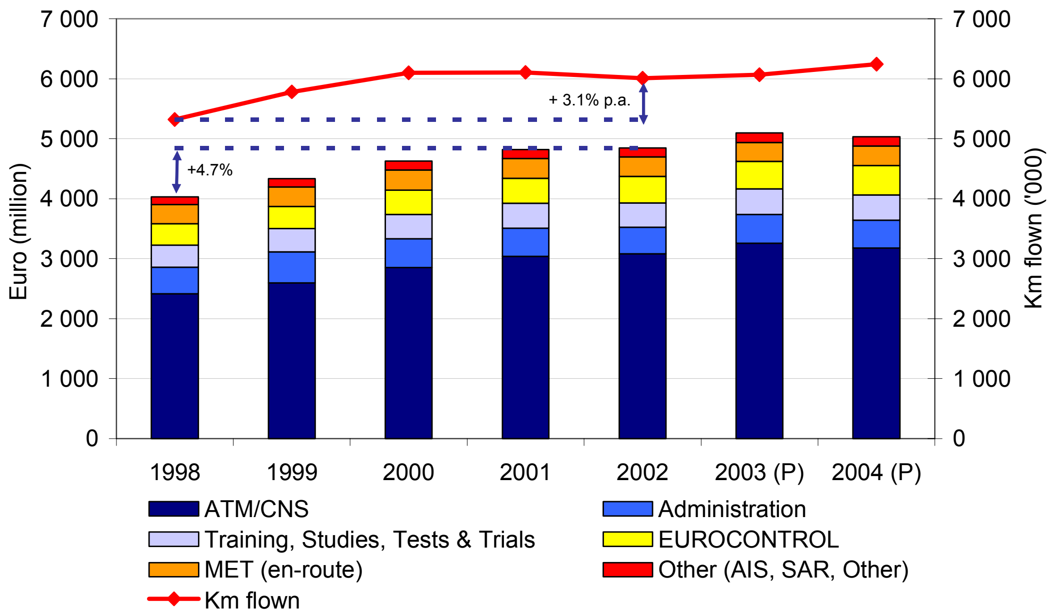
8.1 European aeronautical MET costs development

Figure 8.1 gives an overview of the development of total en-route ANS costs by category for the selected sample. Total en-route ANS costs show a considerable growth over the 1998-2002 period but are expected to decline slightly in 2004, after reaching a peak in 2003. Between 1998 and 2002, the average annual growth rate for en-route ANS costs was 4.7%. The distance flown grew at an average annual growth rate of 3.1% during the same period.

The growth of en-route ANS costs was mainly driven by a significant increase in ATM/CNS costs, which is expected to slow down between 2002 and 2004. The increase in ATM/CNS costs should be seen in the light of investments and efforts to reduce ATC delays.

The lower growth rate for controlled kilometres can be mainly attributed to the decline in air traffic following the events of September 11, 2001 and the economic slowdown in Europe in recent years.

Figure 8.1: Development of en-route ANS costs and traffic (1998-2004)

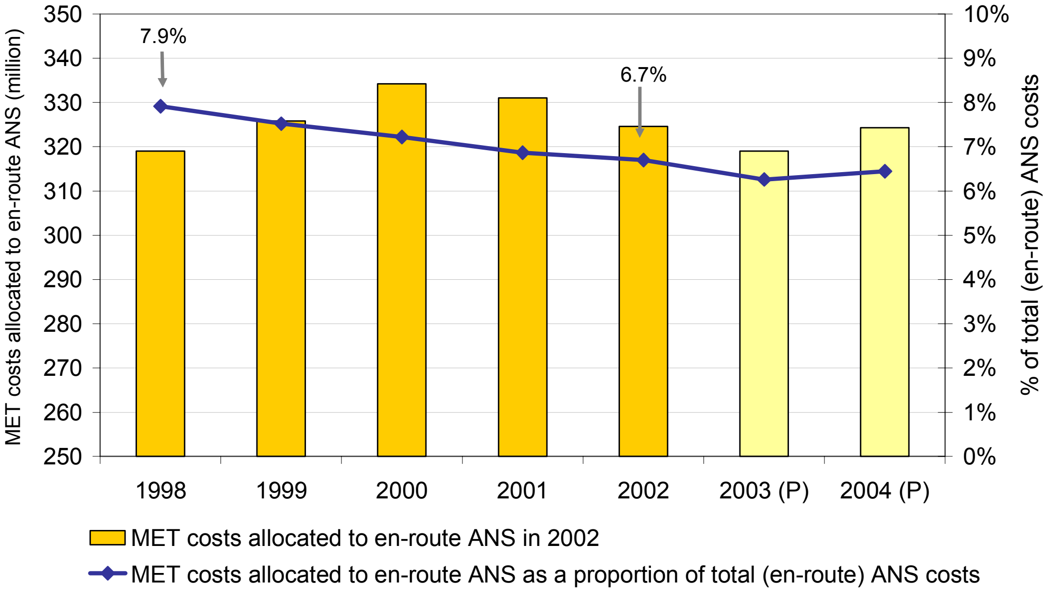


Costs were deflated by using the MUICP deflator from Eurostat (2002 Prices) *Source: CRCO*

[50] *Source: EUROCONTROL Enlarged Committee for Route Charges.*

Figure 8.2 shows the development of MET costs allocated to aviation as a proportion of total en-route ANS costs. Due to the relatively high growth rate of ATM/CNS costs driven by the lack of ATC capacity, the share of aeronautical en-route MET costs within the total en-route ANS costs decreased from 7.9% in 1998 to 6.7% in 2002. However in 2004, the share of MET costs within the total (en-route) ANS costs is expected to rise again.

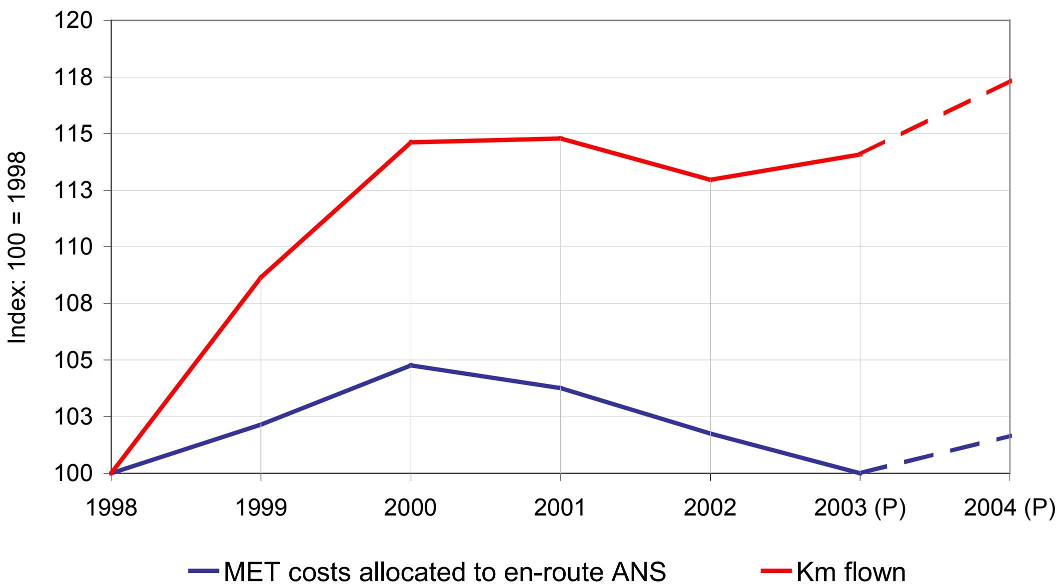
Figure 8.2: MET costs allocated to en-route ANS as a share of total en-route ANS costs (1998-2004)



Costs were deflated by using the MUICP deflator from Eurostat (2002 Prices) *Source: CRCO*

At a European level, aeronautical MET costs allocated to en-route ANS remained fairly stable over the past five years, and appear to follow traffic patterns as shown in Figure 8.3 below.

Figure 8.3: Development of en-route MET costs and traffic (1998-2004)



Costs were deflated by using the MUICP deflator from Eurostat (2002 Prices) *Source: CRCO*

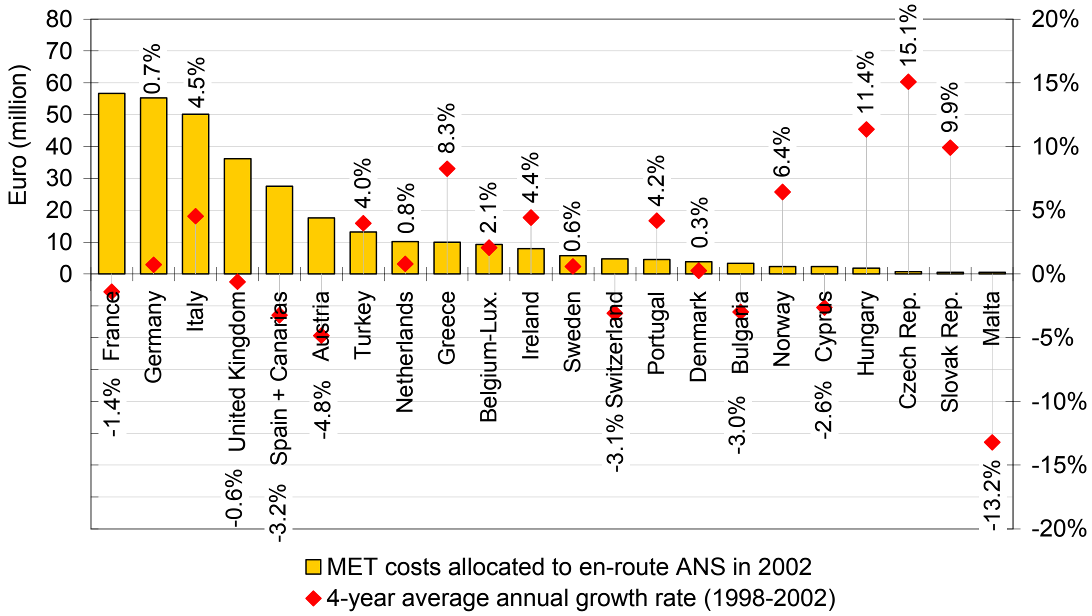
Whereas ATM/CNS service costs are closely linked to traffic levels, there are no obvious reasons for the MET costs to develop in line with traffic growth. Aeronautical MET products and services are 'produced' at given frequencies (e.g. aerodrome forecasts) and clearly defined occurrences (e.g. warnings), as defined by ICAO, none of which is directly linked to traffic demand levels. Once issued, the information can be duplicated and disseminated at marginal costs to supply a large number of aeronautical users. As a consequence, as traffic increases one would expect aeronautical MET costs to remain stable and the MET costs per unit to benefit from economies of scale.

The next section provides an analysis of the development of MET costs recovered through charges at State level (see also Annex 4).

8.2 Development of national aeronautical MET costs

At a national level, the development of MET costs varies significantly as illustrated in Figure 8.4 below. States with the most significant average annual growth rate (AAGR) for en-route MET costs between 1998 and 2002 include the Czech Republic (+15.1%), Hungary (+11.4%), the Slovak Republic (+9.9%), Greece (+8.3%), Norway (+6.4%) and Italy (+4.5%). Such high growth rates would clearly deserve further investigation.

Figure 8.4: En-route MET costs in 2002 and average annual growth rate (1998-2002) by State



Costs were deflated by using the MUICP deflator from Eurostat (2002 Prices) *Source: CRCO*

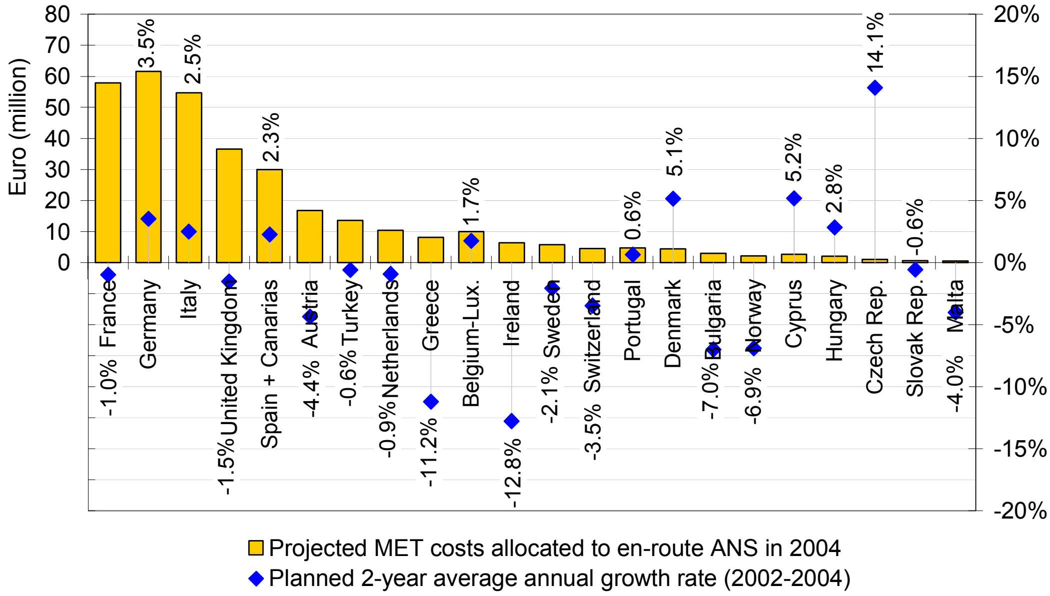
The high growth rates for some States might be an indication that they are still in the process of developing a policy for the recovery of aeronautical MET costs. For example, if a country has previously not allocated any of the costs for MET core services to civil aviation, a change in policy will undoubtedly result in a noticeable growth rate.

A number of States succeeded in reducing the en-route MET costs over the 1998-2002 period. States with a notable negative average annual growth rate are Malta (-13.2%), Austria (-4.8%), Spain (-3.2%), Switzerland (-3.1%) and Bulgaria (-3%).

Figure 8.5 illustrates the planned development of en-route MET costs between 2002 and 2004. Whereas the Czech Republic projects to maintain a high growth rate for aeronautical MET charges (+14.1%), Ireland (-12.8%), Greece (-11.2%), Bulgaria

(-7%) and Norway (-6.9%) plan to reduce their en-route MET charges substantially between 2002 and 2004.

Figure 8.5: Planned en-route MET costs (2004) and average annual growth rate (2002-04) by State

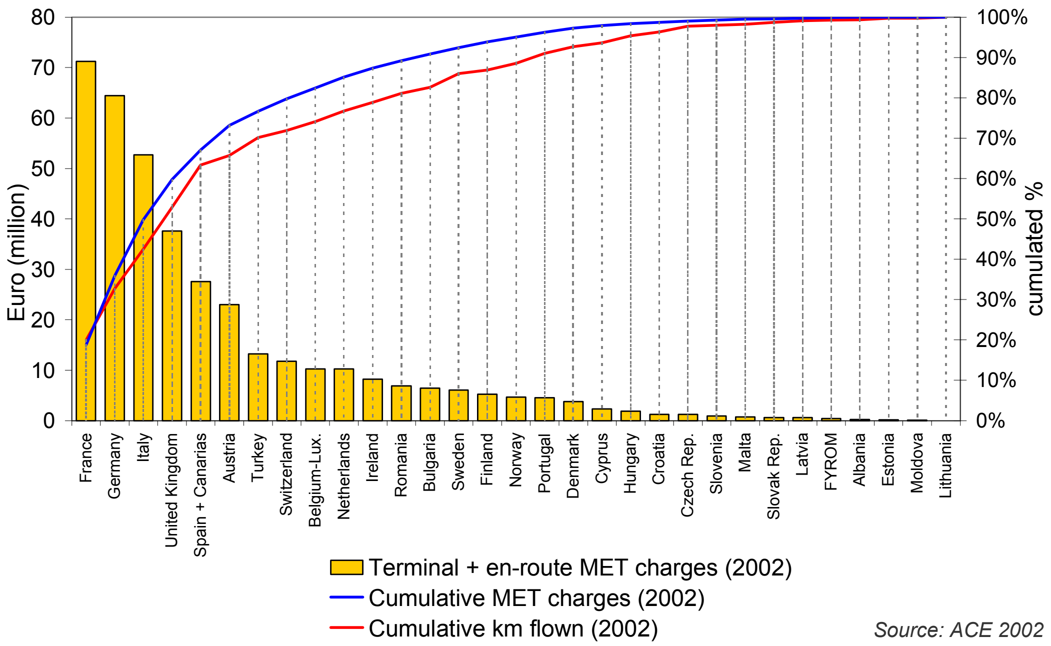


Costs were deflated by using the MUICP deflator from Eurostat (2002 Prices) *Source: CRCO*

Germany recently announced a major restructuring programme to reduce aeronautical MET costs which is not yet reflected in the projected MET costs in Figure 8.5 above.

The five States with the highest overall MET costs (France, Germany, Italy, UK, and Spain) account for almost 70% of the total MET costs allocated to civil aviation (see Figure 8.6). Despite no obvious link of MET service provision with traffic levels, this appears to be in line with the traffic measured by the cumulative share of km flown by IFR flights in those five States

Figure 8.6: Total (en-route + terminal) MET costs by State in 2002



Source: ACE 2002

9 COMPARISONS OF AERONAUTICAL MET

Transparency and performance comparisons to identify best practices are key in an international context where aeronautical MET charges are levied on airspace users.

There are a number of elements, which make the assessment and comparison of performance particularly difficult in the context of aeronautical MET service provision.

- MET service providers in most States have a monopoly for aeronautical services and at the same time the duty to provide services to a broad spectrum of users, including the public (see Chapter 2);
- The interdependent nature of national MET infrastructures in a global network with multiple actors (see Chapter 3);
- The broad range of aeronautical MET products and services (see Chapter 4) and different levels of service quality;
- The lack of binding guidance on cost allocation and recovery, resulting in heterogeneity of practices throughout Europe (see Chapters 5 and 6); and,
- The lack of relevant information to compare performance on the basis of meaningful metrics relating to MET service provision (see Chapter 7).

9.1 Data requirements versus data availability

The planned amendments to the EUROCONTROL principles, described in Section 7.2 are likely to enable a better understanding of the structure of national MET charges allocated to civil aviation. However, for a thorough analysis of aeronautical MET service performance - including productivity and cost-efficiency analysis – clearly more data is required. Table 9.1 outlines some of the data that is required for genuine and fair comparisons of aeronautical MET service providers.

Table 9.1: MET data requirements versus data availability

Data requirement	Example	Availability
Key operational data	Number of staff, assets and infrastructure	Limited information for selected providers
Aeronautical MET outputs	METARs, TAFs	No
Assumptions on cost allocation keys/mechanisms	Use of system, number of flights, etc.	Limited information for selected providers
'Genuine' MET costs	Costs centres, costs per product & services, etc.	No
Costs for international MET duties	WAFC, EUMETSAT	No
MET costs recovered through charges	En-route MET charges, terminal MET charges	Yes
Planned investments likely to affect the level of future aeronautical MET charges	EUMETSAT Polar System, etc.	No
Quality of MET services provided	Accuracy of forecasts, etc.	Limited information for selected providers

Disclosure of the aforementioned information is particularly relevant for a detailed comparison of aeronautical MET service providers and in order to develop a framework for continuous aeronautical MET performance benchmarking at European level. The following section illustrates some of the issues that should be taken into account for the comparison of aeronautical MET service providers.

9.2 Issues to be considered for the comparison of aeronautical MET

As outlined in Chapter 3, no aeronautical MET service providers are alike and therefore national MET characteristics such as geography, input prices, aeronautical infrastructure and the quality of service should ideally be taken into account. In order to create a consistent sample, it is furthermore necessary to account for international MET duties including the WAFC and contributions to international organisations.

Due to limited data availability, this section is meant to provide a basic understanding of the scope and scale of aeronautical MET operations and ought to be used as a source of reference for the comparison of aeronautical MET services at a later stage of this chapter.

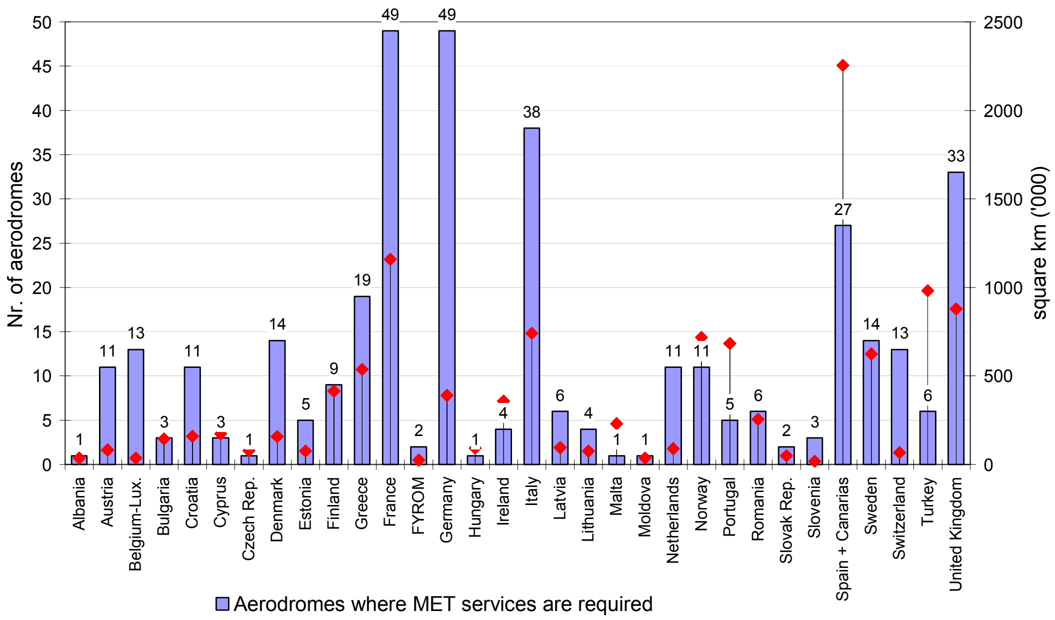
9.2.1 Airports where MET services are required and size of controlled area

Figure 9.1 illustrates the number of ICAO airports where MET services are required[51] and the size of the area controlled by the ANSP. For consistency reasons, the list of airports where MET services are required was taken from the ICAO EUR Regional Air Navigation Plan Table MET 1A (see Annex 11). ICAO Table MET 1A relates to airports designated for use by international scheduled, charter and general aviation flights[52]. In addition to this list, it is at the State's discretion to select more airports where MET services are to be provided.

The size of the controlled area was taken from the EUROCONTROL Central Flow Management Unit (CFMU). Oceanic airspace for Norway, Portugal-Santa Maria, and the United Kingdom, is not included in Figure 9.1 below.

Figure 9.1 provides a first overview of the national aeronautical infrastructure and hence the national requirements with respect to aeronautical MET services. France (49), Germany (49), Italy (38), and the United Kingdom (33) have the largest number of listed airports, whereas the Czech Republic, Hungary, Malta, and Moldova have only one airport at which, according to ICAO, MET services are to be provided.

Figure 9.1: ICAO airports where MET services are required and size of controlled area



Source: ACE 2002

[51] *See Annex 11.*

[52] *ICAO Table MET 1A - 'Meteorological Service required at Aerodromes' is currently being updated and some States such as France, Germany, Italy, Spain and Turkey have already indicated that the number of airports is likely to change considerably.*

Similar to the number of ICAO listed airports, the size of the airspace controlled by the national ANSP varies considerably. This is largely driven by the surface area of the State, and in the case of Spain by airspace covering the Canary Islands.

9.2.2 International duties

International duties can be divided into operational responsibilities for international aeronautical MET services (e.g. WAFCs) and contributions to international MET organisations (e.g. EUMETSAT).

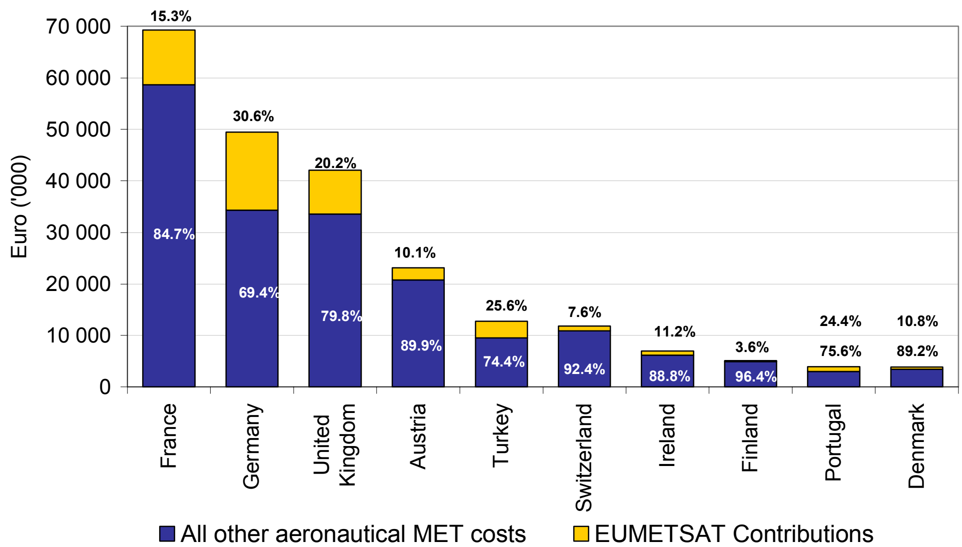
The UK operates one of the two WAFCs (see Section 3.1.2) and France and the UK run a VAAC each (see Section 3.2.3). The associated costs are included in the respective en-route MET costs and need to be identified and excluded for a fair comparison of aeronautical MET service providers.

Contributions to international organisations such as EUMETSAT, ECMWF and WMO are usually government subscriptions based on GNP and hence outside the direct control of the MET service providers. Nevertheless, MET users are often asked to pay a share of those contributions, as they are considered part of the MET 'core' system (see Section 5.2.2 on page 25).

Figure 9.2 illustrates the importance of the allocation of EUMETSAT contributions (see Section 3.2.1) to aviation at a State level for 10 States for which this information was available[53]. On average, the States for which data was available allocated some 19% of their national EUMETSAT contributions to civil aviation, totalling to some €43 million in 2001. (Note: total contributions by all EUMETSAT Member States to the EUMETSAT programme amounted to €272 million in 2001 – see Section 3.2.1).

The ICAO cost recovery guidance[54] is not clear regarding contributions to international organisations such as EUMETSAT and ECMWF[55]. The example in Figure 9.2 suggests that the EUMETSAT programme is, in fact, to a considerable extent financed through aeronautical MET charges.

Figure 9.2: Share of EUMETSAT contributions within total MET costs allocated to aviation in 2001



Source: EUMETSAT & MET/TF

[53] The data was derived from the MET/TF and the EUMETSAT Annual Report 2001.
[54] ICAO Manual on Air Navigation Services Economics – Appendix 6.
[55] Although some States attribute a share of ECMWF contributions (see Section 3.2.2) to aviation, the link between ECMWF products, which generally focus on the period from 3 to 10 days forecasts, and aeronautical MET requirements is not immediately apparent.

9.3 Conceptual framework for the comparison of aeronautical MET services

It is acknowledged that MET service quality (e.g. forecast accuracy) plays an important role for aviation and should therefore be reflected in comparisons of aeronautical MET service providers. However, due to the difficulties involved in measuring the service quality of aeronautical MET services and the lack of reliable data, for the purpose of this report it is assumed that all MET service providers comply with ICAO Annex 3, which outlines the minimum requirements for aeronautical MET services. For detailed comparisons of MET cost-effectiveness or productivity, it is desirable to develop methodologies which take the quality of MET service into account.

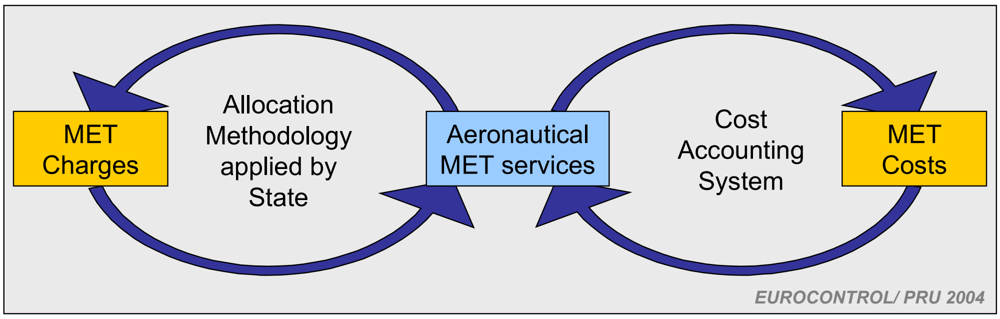
Before discussing appropriate ratios and performance indicators, a conceptual framework is introduced for analysing the “performance” of aeronautical MET service providers (see Figure 9.4).

To compare cost-effectiveness, information on "genuine" costs (as opposed to charges) and quantifiable output measures is required. Instead of the genuine costs of MET services, only the MET charges that are imposed on aeronautical users are presently readily available. The aeronautical MET charges are the results of differing allocation mechanisms and policies, and therefore more a reflection of the States' interest and/or ability to recover aeronautical MET costs from aviation than the 'genuine' costs for providing the service (see Section 5.4).

Throughout this report, the various steps of calculating and allocating the costs for the provision of aeronautical MET services were discussed. The three main steps influencing the level of aeronautical MET charges were identified as:

- the calculation of the aeronautical MET cost base, including the allocation of 'core' costs to aviation (see Chapter 5);
- allocation of costs among “service areas” (see Section 6.1); and,
- allocation of costs among user groups (see Section 6.2).

Figure 9.3: MET charges versus MET costs



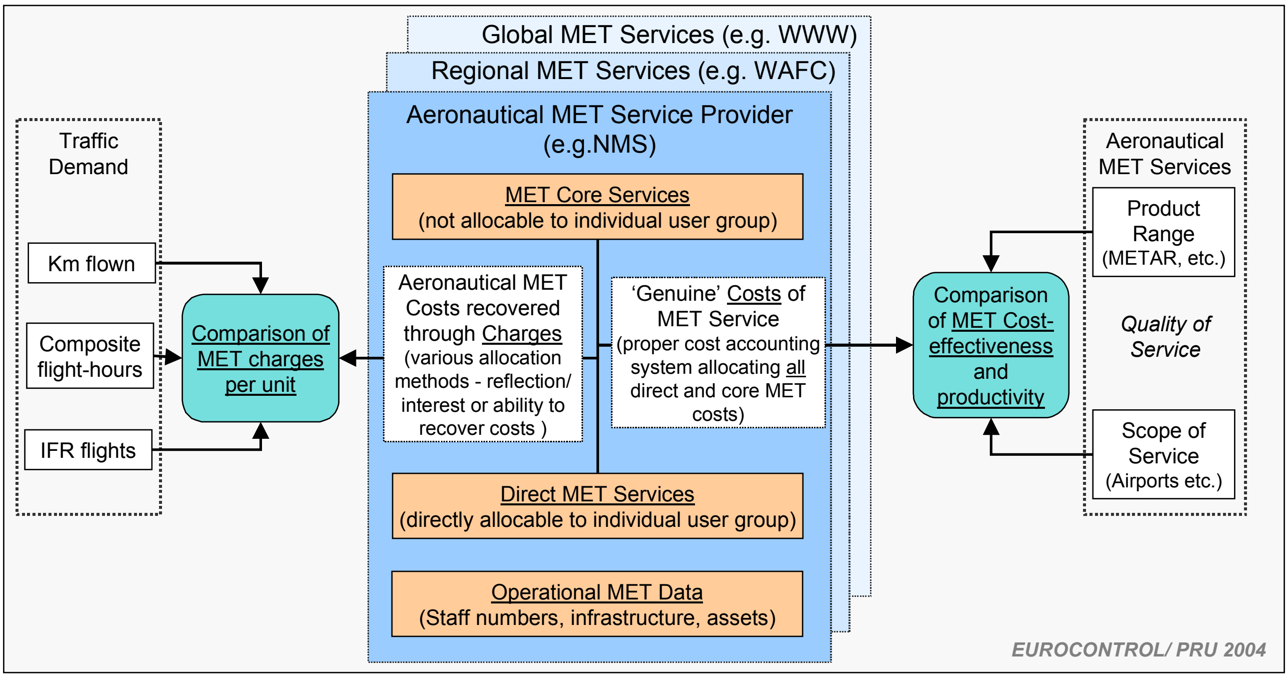
The framework (see Figure 9.4) tries to break the highly complex global MET system (see Chapter 3) down into a comprehensive form in order to establish metrics for the comparison of aeronautical MET services.

From an economic point of view, two complementary analyses could be envisaged:

(a) The cost-effectiveness of MET providers or, in other words, the 'genuine' cost of production for specific and measurable MET products and services (right side of Figure 9.4); and,

(b) “The value for money” or, in other words, how much is paid by aeronautical users for the MET products and services received per unit of traffic demand (left side of Figure 9.4).

Figure 9.4: Conceptual framework for the comparison of MET services



Possible high level aeronautical MET ratios and indicators are suggested throughout this chapter and, subject to data availability, used for comparisons.

9.4 High level aeronautical MET service ratios

Table 9.2 offers a list of high level aeronautical MET service ratios that could be used for the assessment of aeronautical MET service providers.

Table 9.2: High level aeronautical MET service ratios

High level Aeronautical MET Service Ratios	Reference	Data availability
Aeronautical MET Staff/ Airport where MET services are provided	Figure 9.5	Limited
Total aeronautical MET charges / Airport where aeronautical MET services are provided	Figure 9.6	Yes
Aeronautical 'core' costs / Total NMS 'core' costs	No	No
Direct aeronautical MET costs / Total direct NMS costs	No	No
Aeronautical MET charges / Total NMS costs	No	Available soon
Aeronautical MET charges / Total ANS costs	Figure 9.7	Yes
Aeronautical MET revenues / Total NMS commercial revenues	Figure 9.10	Limited

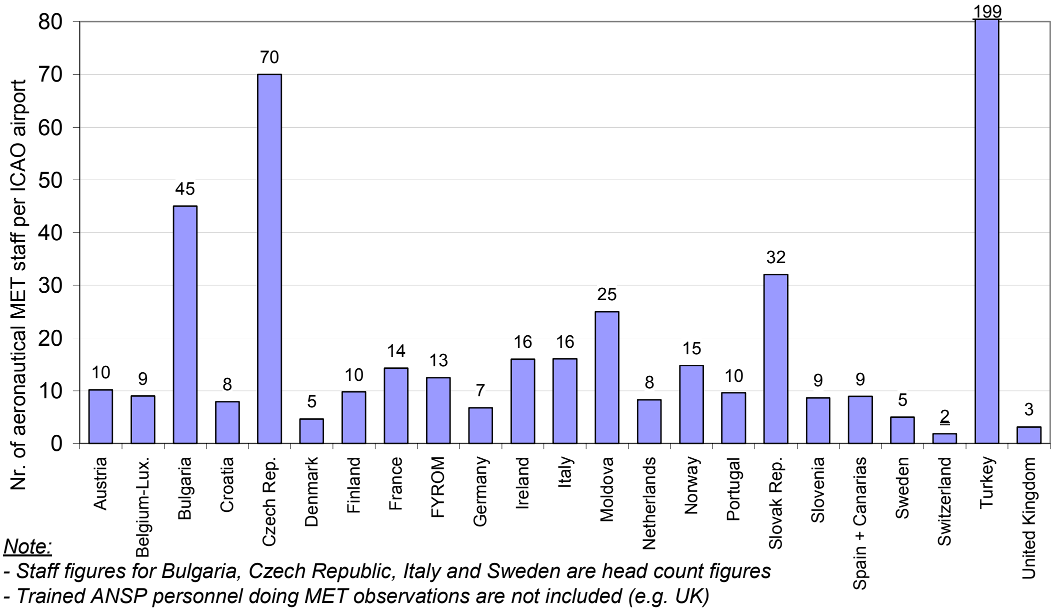
The following section applies four of the ratios outlined in Table 9.2 above. It should however be pointed out that, due to limited data availability, the analysis should be viewed with a note of caution (see Section 9.2).

Figure 9.5 shows the number of aeronautical MET personnel per airport[56] at which MET services are required, according to the ICAO EUR Regional Air Navigation Plan[57]. On

[56] The MET staff numbers were taken from the MET/TF Report and represent 1999/2000 figures. Unfortunately this data was not available for all States. Staff numbers for the Netherlands were submitted separately by KNMI.
[57] See Annex 11.

the basis of available data, Turkey (199), the Czech Republic (70), Bulgaria (45), and the Slovak Republic (32) show the highest number of aeronautical MET personnel per ICAO airport.

Figure 9.5: Aeronautical MET staff per ICAO airport where MET services are required (2000)



Note:
- Staff figures for Bulgaria, Czech Republic, Italy and Sweden are head count figures
- Trained ANSP personnel doing MET observations are not included (e.g. UK)
- Staff numbers for The Netherlands are not from the MET/TF survey but submitted by KNMI

Source: ACE 2002

At the other extreme, Switzerland (2), the United Kingdom (3), Denmark (5), and Sweden (5) appear to employ the smallest number of aeronautical MET personnel per ICAO airport[58].

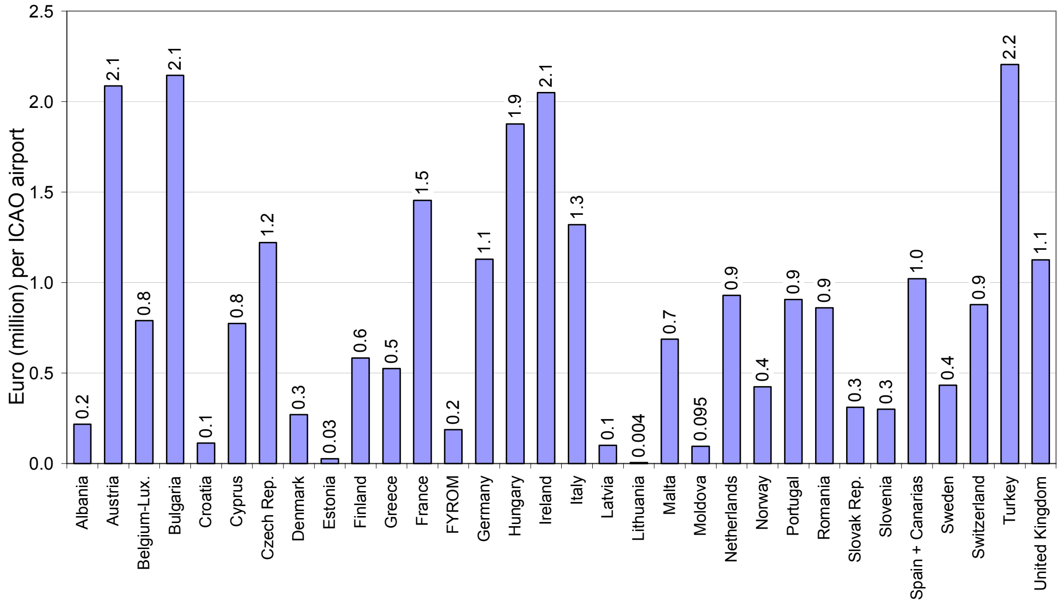
Whereas some States such as Turkey seem to require a large number of MET staff to provide MET services to aviation, other States such as the United Kingdom and Sweden use specially-trained ATS personnel to fulfil observational tasks which considerably reduces the staff costs for observations at airports. For fairer comparison of aeronautical MET service providers, it would be important to account for trained ATS personnel and to include a reasonable share of the costs for the ATS staff.

Given current data availability, it is very difficult to make any clear inference whether the differences observed in Figure 9.5 are due to allocation and/or efficiency issues, including the way of organising the provision of MET services in the different States.

Figure 9.6 shows the total MET charges (terminal + en-route) per ICAO airport where MET services are required. Austria, Bulgaria, Hungary, Ireland and Turkey have the highest MET charges per airport (i.e. some €2 million per airport). On the other end of the spectrum, Albania, Croatia, Estonia, Latvia, Lithuania, and Macedonia appear to have the lowest MET costs per ICAO airport.

[58] *Note that observations for the UK MET Office are often made by trained ANSP personnel which are not included in Figure 9.5 see also Section 3.3.1).*

Figure 9.6: Aeronautical MET costs recovered through ANS charges (2002) per ICAO airport where MET services are required



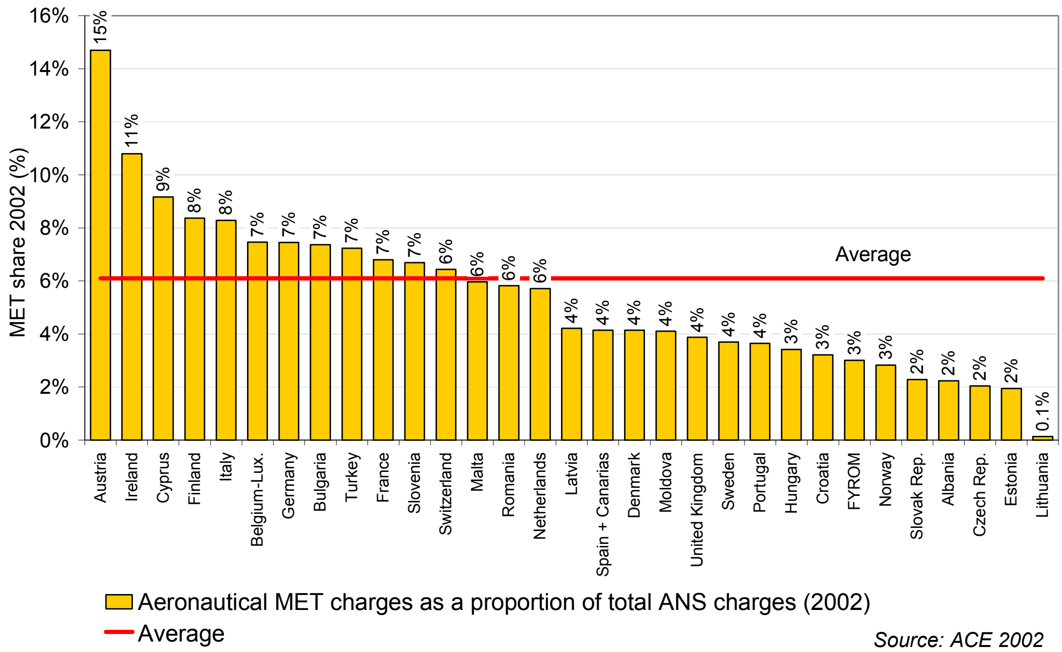
Source: ACE 2002/ CRCO/ ICAO

Clearly, Figure 9.5 and Figure 9.6 suggest that there are major differences between aeronautical MET infrastructures and the way they are managed and operated in Europe. Due to a lack of reliable and consistent operational data, it is currently not possible to perform a more detailed examination.

The significant differences illustrated in Figure 9.5 and Figure 9.6 suggest that further investigation is required given that it is not clear to what extent differences are an indication that there are genuine efficiency issues and/or that the tasks, quality, and the organisation for the provision of MET services differ among national MET systems.

Figure 9.7 shows the total aeronautical MET costs recovered through charges as a proportion of total ANS costs (terminal + en-route) in 2002.

Figure 9.7: Total aeronautical MET costs as a proportion of total ANS costs in 2002



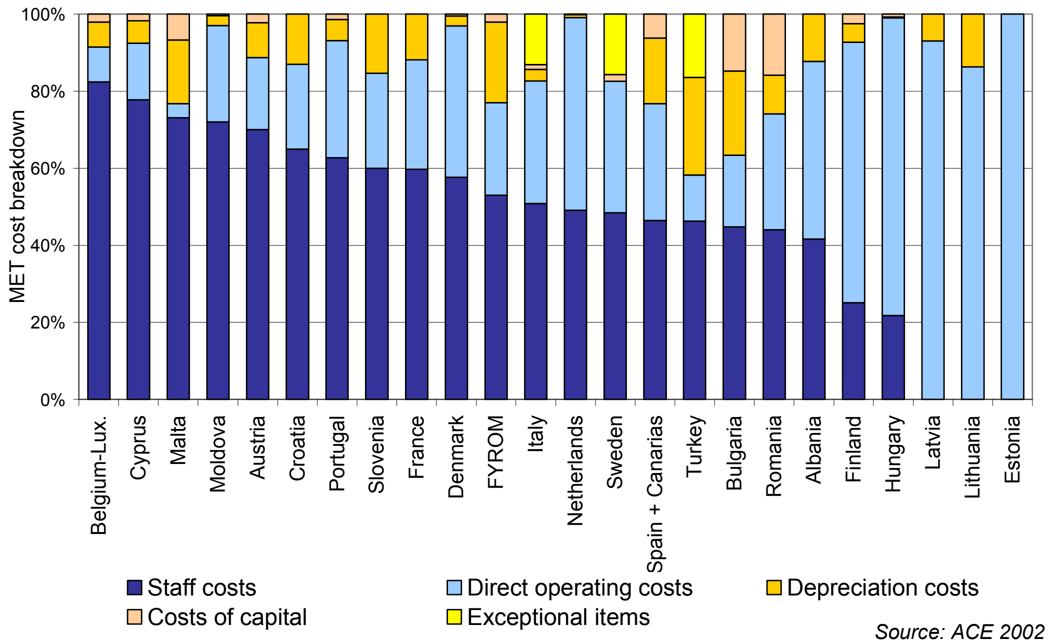
Source: ACE 2002

In the analysed sample, total aeronautical MET charges (terminal + en-route) comprise on average 6% (equivalent to €378 million) of total ANS charges in 2002 (share of en-route MET charges within the total en-route ANS charges was around 6.7% - see Figure 8.2 on page 40).

With some 15%, Austria shows the highest share of MET charges relative to total ANS charges, followed by Ireland with some 11%. The smallest share of MET costs relative to total ANS costs lies at around 0.1% (Lithuania[59]).

Figure 9.8 shows the States that have provided a breakdown of total MET charges by cost type in 2002. Only 24 of the 31 ANSPs provided a comprehensive breakdown of MET charges by cost type, enabling a more detailed analysis of the cost structure (see Annex 3).

Figure 9.8: Breakdown of MET charges (en-route + terminal) by cost type in 2002



Source: ACE 2002

On average, staff costs represent 55% of the total MET costs recovered through ANS charges. Traditionally, aeronautical MET services are provided by NMSs in order to make use of the existing national MET infrastructure and potentially to exploit economies of scale. In some countries, however, the aeronautical MET services are provided internally by specialised ANSPs (see Section 2.1).

Three of the five MET service providers (with the exception of Cyprus and Malta) with the highest staff cost shares are run internally by ANSPs. Higher staff costs are assumed to be partly driven by (1) an adjustment of MET officers' salaries to air traffic controller levels, and (2) by some staff-related costs (e.g. pensions) that are not systematically and explicitly accounted for within a NMS government department.

Overall, the second largest cost driver for aeronautical MET services were direct operating costs (29%), followed by depreciation costs (10%), exceptional items (4%) and the costs for capital (2%).

Costs for international duties like the contributions to EUMETSAT are usually included in the direct operating costs and therefore not immediately visible as a cost driver for aeronautical MET services.

[59] *Note that Estonia, Latvia and Lithuania only allocated MET-related direct operating costs and/or depreciation costs (see Annex 3)*

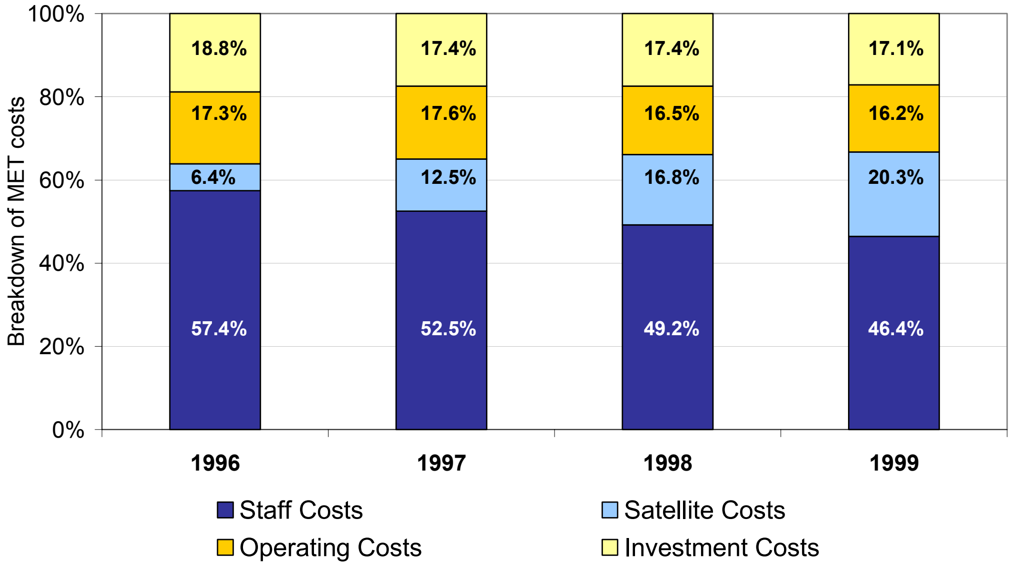
9.4.1 Breakdown of aeronautical MET costs in Germany (1996-99)

Figure 9.9 illustrates the development of aeronautical MET costs by cost type in Germany on the basis of data supplied by DWD[60]. Additional to the cost types analysed in the previous section, the data set includes also a breakdown of the costs for MET satellite systems (mainly EUMETSAT) which are usually not readily available for analysis.

Whereas the investment and operating costs remained relatively stable, there was a notable decline in staff costs. This reduction in staff costs was more than offset by the substantial growth in costs for international duties (satellite costs) attributed to civil aviation.

As suggested in Figure 9.9, the significant increase in satellite costs is a key driver to the overall growth in aeronautical MET costs in Germany.

Figure 9.9: MET costs allocated to civil aviation in German (1996-99)



Source: DWD & MET/TF

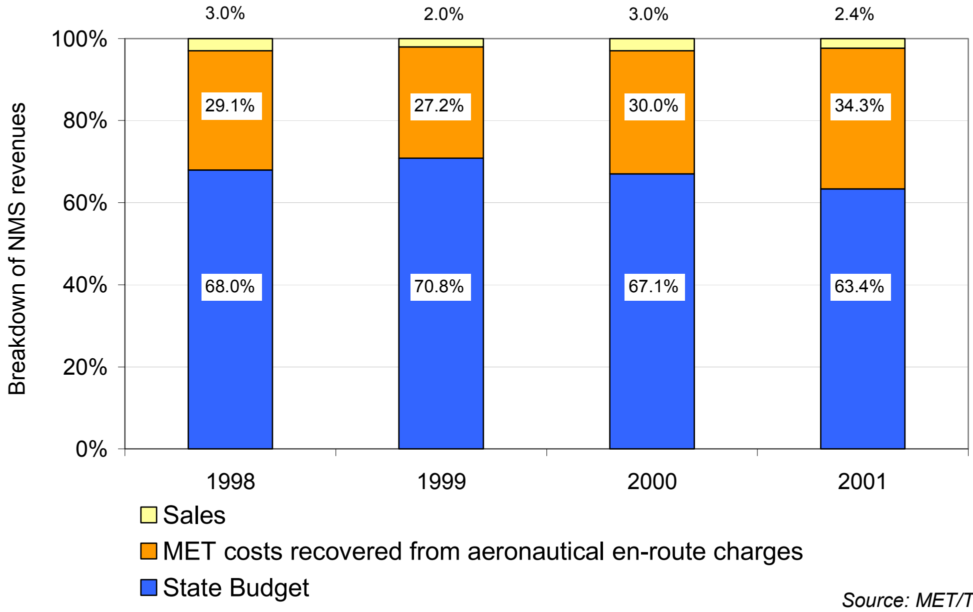
The total aeronautical MET costs as a proportion of total ANS costs were already illustrated in Figure 9.7. In order to provide a better understanding of the funding of NMS, Figure 9.10 shows the revenue from aeronautical MET charges in relation to the State funding and the commercial NMS revenues for Portugal.[61]

Although conclusive data was only available for the NMS in Portugal, Figure 9.10 suggests that revenues from aeronautical MET charges are by far the largest source of revenue for NMSs outside the State budget.

Notable is also the shift in percentage distribution of the individual sources of funding. Whereas the State budget decreased from 68% in 1998 to 63% in 2001, the revenues from en-route charges increased from 29% to 34% during the same period. Note that no MET costs were allocated to, or recovered through, terminal ANS charges.

[60] *Data source: Deutscher Wetterdienst and MET/TF.*
[61] *Note that contributions by the State for public duties (defence) are treated as revenue in Figure 9.10.*

Figure 9.10: Breakdown of NMS revenue in Portugal (%)



Source: MET/TF

9.5 High level aeronautical MET service performance indicators

Table 9.3 offers a list of high level indicators that could be used for the comparison of aeronautical MET charges and, as more data becomes available, for a cost-effectiveness/productivity analysis of aeronautical MET service providers (see Figure 9.4).

Table 9.3: MET high level aeronautical MET service performance indicators

MET High Level Performance Indicators	Reference	Data
Aeronautical MET output/ Aeronautical MET Staff	N/A	N/A
Total aeronautical en-route MET costs / Measurable en-route MET output	N/A	No output available
Total aeronautical terminal MET costs / Measurable terminal MET output	N/A	No output available
Total en-route MET charges / Flight-hours (or km flown)	Figure 9.11	Available
Total terminal MET charges[62] / Total IFR airport movements	Figure 9.12	Available
Total (en-route + terminal) MET charges / Composite flight-hours	Figure 9.13	Available

The following section applies some of the high level indicators for aeronautical MET services as described in Table 9.3 above.

9.5.1 Comparison of aeronautical MET charges

As the required information for a cost-effectiveness and/or productivity analysis of aeronautical MET service providers is currently not available (see Section 9.3), the following section focuses on a comparison of aeronautical MET charges. For aeronautical users, this is a direct representation of the charges that are imposed on them for the provision of aeronautical MET services.

A relevant measure of output generally used for en-route ATM/CNS is the number of en-route flight-hours controlled[63]. The metric has the advantage of being transparent, easily measured, and consistent across countries as the data is available from the EUROCONTROL Central Flow Management Unit (CFMU).

[62] *Not all States allocate MET costs to terminal ANS.*
[63] *See also ACE 2002 report.*

The measure of output for terminal ATM/CNS is the number of IFR airport movements controlled. In addition, it was found helpful to define a "composite" gate-to-gate output measure[64] that combines both en-route and terminal ATM/CNS.

The following section provides a high level comparison of en-route, terminal and gate-to-gate MET charges paid by airspace users. The indicator 'total MET charges per flight-hour' is used to assess the relative weight of MET charges for users[65].

It should be pointed out that the MET costs recovered though charges for France include costs relating to operating the VAAC, similarly the UK MET costs contain costs associated to operating both the VAAC and the WAFC.

As outlined in Section 9.3, MET charges are generally a reflection of a States interest and ability to recover costs associated with the provision of aeronautical MET services. Consequently a multitude of allocation mechanisms are used for the calculation of MET charges. At the one extreme, States such as Latvia only recover direct MET related operating costs whereas at the other extreme in States such as Austria, aeronautical MET services are provided internally by ANSPs which recover 100% of their costs (see Annex 2).

9.5.2 Comparison of en-route MET charges

The total flight-hours controlled are used to calculate the charge for aeronautical MET services per flight-hour at a State level (see Figure 9.11 on page 55 – top left corner). This indicator provides a first overview of the differences in charging levels for en-route MET services. Figure 9.11 displays the charge that is paid for en-route MET services for each flight-hour controlled.

Austria (€83) has the highest en-route MET charges per flight-hour controlled, followed by Italy (€49), Ireland and the Netherlands with €42 each. The results from Figure 9.11 indicate that aeronautical en-route users pay the least for MET services in Lithuania[66] (€0.2) and Estonia (€1).

It should be pointed out that there is scope for bias in this indicator. As outlined in Section 6.1, some countries do not allocate MET costs to terminal services (see blue bars on Figure 9.11) which might – compared to other States - result in disproportionately high en-route MET charges per flight-hour controlled. Furthermore, as pointed out in Section 9.3, cost allocation methods vary between States. Some States such as the Baltic States only recovered direct operating costs and/or depreciation costs relating to aeronautical MET services.

9.5.3 Comparison of terminal MET charges

Only 20 of the 31 States allocate MET costs to terminal services which considerably limits the scope of the analysis.

The total number of IFR airport movements is used to calculate the charge for MET services per IFR airport movement. Figure 9.12 (see page 55 on left bottom corner) shows the results for the 20 States which allocate MET costs to terminal ANS.

In terms of terminal MET charges per IFR airport movement, Bulgaria (€60) is the most expensive State, followed by Latvia (€21), Austria (€18) and Finland (€16).

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[64] See Performance Review Commission, ATM Cost-effectiveness (ACE) 2001 Benchmarking Report.

[65] Data available from the Route Charges Office (en-route MET costs) and Information Disclosure (terminal MET costs) was used for this analysis. In those cases where no data for en-route MET costs was available from the CRCO, data from ACE 2002 was used instead.

[66] Note that Latvia only allocated direct operating costs and depreciation relating to MET services provided.

Finland is an interesting case. Whereas Finland is one of the States with the lowest charge per flight-hour controlled (en-route MET services), Figure 9.12 identifies Finland as one of the States with the highest MET charge for terminal MET services.

The States with the lowest terminal MET costs per IFR airport movement are the United Kingdom (€0.4), Lithuania[66] (€0.5), Sweden (€0.5) and Ireland (€0.9).

9.5.4 Comparison of gate-to-gate MET charges

It is important to keep a gate-to-gate perspective because the allocation of ANS costs, including MET costs, among en-route and terminal ANS vary between Member States and hence inevitably introduce a bias in the comparison.

To this end, it was felt that it would be useful to have, in addition to the separate measures of MET charges for en-route and terminal MET services, a composite gate-to-gate indicator that combined the two. A common method of combining performance indicators where there are two distinct services is to weight the output measures ('flight-hours' and 'IFR airport movements') by the average cost of the service for the whole sample (see ATM Cost-Effectiveness (ACE) 2002 Benchmarking Report for more details[67]). Therefore, for the comparison of gate-to-gate MET charges, the total MET charges per composite flight-hour was used.

When looking at the gate-to-gate MET charges in Figure 9.13 (see page 55, right-hand side), it becomes apparent that - with the exception of Austria, Bulgaria, Italy and Ireland – all States range between €0.5 and €30 for aeronautical MET charges per composite flight-hour. To show differences in organisational structures, the Member States where the MET service is provided internally by the ANSPs are highlighted in green.

At a gate-to-gate level, Austria (€81 per composite flight-hour) is found to charge the most for aeronautical MET services, followed by Bulgaria (€49), Italy (€37), and Ireland (€34).

Further investigation would be required to analyse the cost drivers in order to determine whether the higher charges are due to a lack of exploitation of economy of scale. A first examination of MET charges by cost type in Figure 9.8 suggests that the main cost driver for MET services are usually staff costs.

The least expensive aeronautical MET services per composite flight-hour seem to be offered in Lithuania[68] (€0.5), Estonia (€4) and the Czech Republic (€8).

If the 5 MET service providers with the highest MET charges were able to improve their MET related charges to the average gate-to-gate level (some €27 per composite flight-hour), total MET costs to civil aviation could be reduced by as much as 10% per annum (i.e. some €35 million).

Overall, the results of this comparison of MET charges suggests that there are significant disparities between the different aeronautical MET service providers in Europe. As outlined in Section 9.3, for a genuine cost-effectiveness and productivity analysis of aeronautical MET service providers which could explain the observed disparities in MET charges, more data needs to be made available (see Section 9.1).

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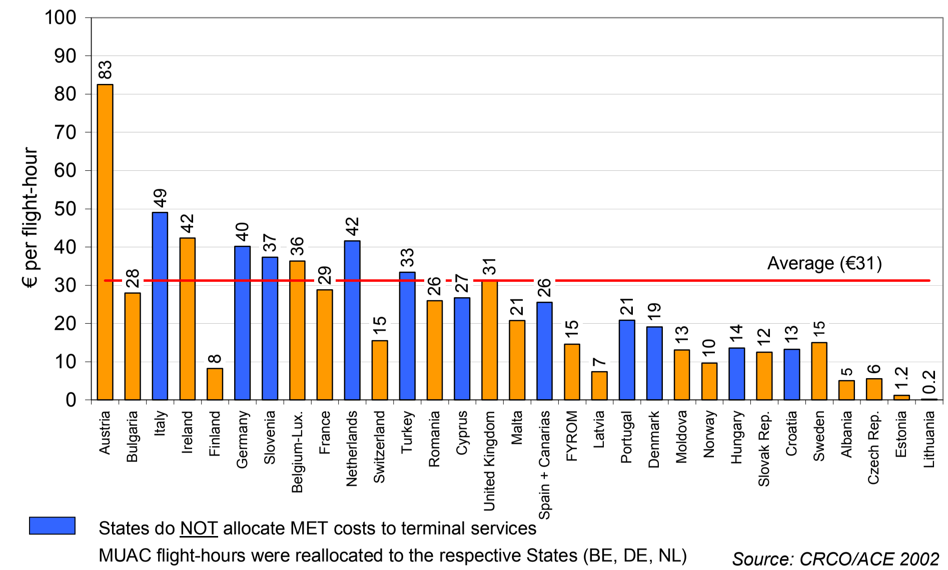
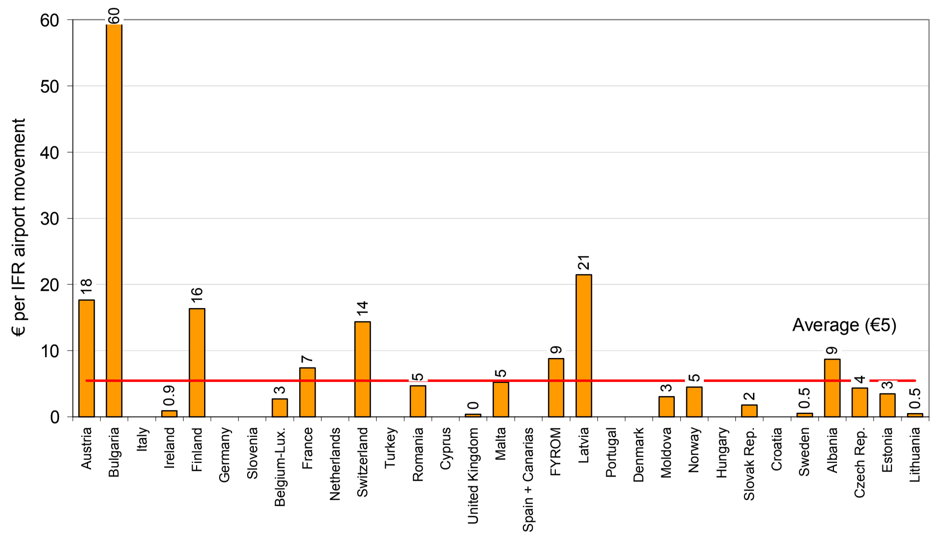
[67] EUROCONTROL – ATM Cost-Effectiveness (ACE) 2002 Benchmarking Report – Spring 2004.
[68] Note that Latvia only allocated direct operating costs and depreciation relating to MET services provided.

Figure 9.11: En-route ANS MET charges per flight-hour controlled in 2002



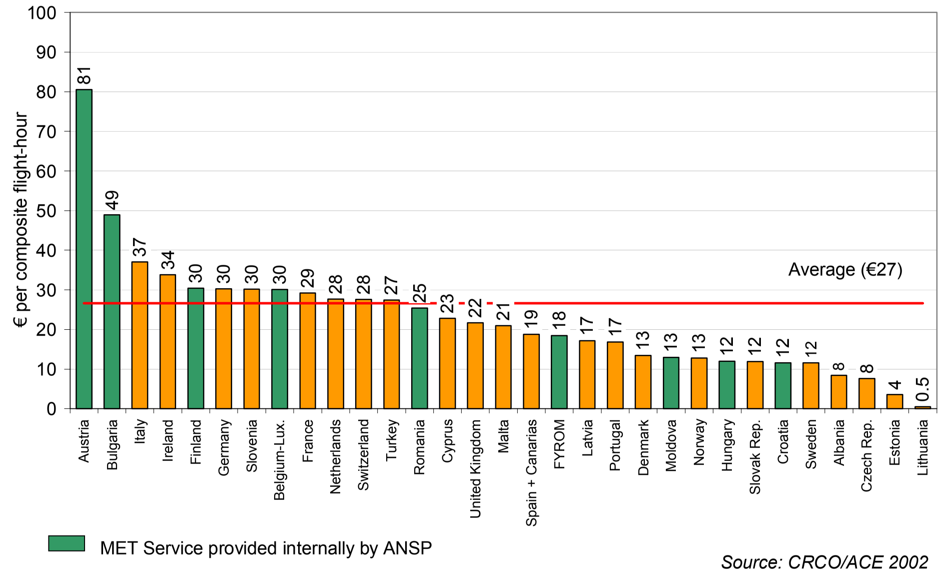
Source: CRCO/ACE 2002

Figure 9.12: Terminal ANS MET charges per IFR airport movement in 2002



Source: ACE 2002

Figure 9.13: Total ANS MET charges per composite flight-hour (gate-to-gate) in 2002



Source: CRCO/ACE 2002

10 CONCLUSIONS

Aviation is one of the few industries directly charged for MET services. In 2002, aeronautical MET costs represented approximately 6% of total ANS costs (en-route and terminal). Overall, civil aviation paid some €380 million for aeronautical MET services in Europe in 2002.

Although aeronautical MET costs seem to have remained stable at a European level between 1998 and 2002, significant variations at a national level could be observed.

Aeronautical MET costs appear to be in line with traffic patterns. As there is no apparent justification for a link of aeronautical MET costs to traffic levels, it is important that aeronautical MET costs are effectively managed and not simply adjusted to traffic increases.

In some States, national MET costs allocated to civil aviation, and in particular MET ‘core’ costs, would appear to be disproportionately high, compared to other MET users. In this context, aeronautical users (represented by IATA) argue that the costs for the meteorological 'core' system should not be allocated to any specialised MET user group as it is indispensable for the State's general obligation to safeguard the lives and property of its citizens.

In view of the growing importance of MET services to other industries and the general public, there is a need to ensure that aeronautical users are not asked to pay for MET services they do not require or that are not properly allocated to them. Instead, MET services should make the most effective use of the existing national and international aeronautical MET infrastructure (e.g. WAFC) to avoid duplication of services.

Comparing performance and identifying best practices are key in an international context where aeronautical MET charges are levied on airspace users in an environment which generally lacks transparency.

Decisions concerning the national MET infrastructure are often taken without proper aeronautical users consultation and irrespective of user requirements. There is a need to move towards a more customer-focused relationship, including more effective consultation meetings.

Disclosure of relevant information and transparency is crucial in order to build confidence, to enable justified and cost-reflective aeronautical MET charges, to avoid user discrimination, and to make any cross-subsidisation transparent.

The SES regulations apply to aeronautical MET services as they are part of Air Navigation Services (Art.2(4) 'Framework Regulation'). SES implementing rules should include requirements applicable to MET services, e.g. consultation, transparent charging schemes and accounts (c.f. Art. 12 & 14, 'Service Provision Regulation').

Within Europe, there are differences between the national aeronautical MET infrastructures, the way they are managed and operated and the quality of service provided. Even with the limited data available, the comparison of aeronautical MET charges shows that there are also significant variations in aeronautical MET charges across Europe which are most likely related to cost allocation and/or efficiency issues.

Clearly more detailed information on MET cost allocation mechanisms, MET cost drivers, operational MET data, MET outputs, and planned investments that are likely to affect the level of aeronautical MET charges is needed for continuous aeronautical MET performance benchmarking at European level. Separate reporting and consultation requirements for MET and the implementation of transparent accounting systems which allocate the costs in accordance with operational boundaries and product categories would be an important step forward.

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ANNEX 1 - AERONAUTICAL MET SERVICE PROVISION IN EUROPE

State	National MET Service (NMS) (A)	Aeronautical MET Service Provider (B)	National MET Authority (C)
Austria	Zentralanstalt für Meteorologie und Geodynamik	Austro Control GmbH	Federal Ministry for Transport, Innovation and Technology - Department of Civil aviation
Belgium	Institut Royal de Météorologie	Belgocontrol	(see column B)
Bulgaria	National Institute of MET and Hydrology	Air Traffic Services Authority (ATSA)	Civil Aviation Administration
Croatia	Meteorological and Hydrological Service	Croatia Control	(see column B)
Cyprus	MET service, Government Department	NMS (see column A)	Department of Civil Aviation
Czech Rep.	Czech Hydrometeorological Institute	NMS (see column A)	(see column B)
Denmark	Danish Meteorological Institute (DMI)	NMS (see column A)	(see column B)
Finland	Finnish Meteorological Institute (FMI)	Finnish Meteorological Institute (FMI)/ Ilmailulaitos - ANS Department	CAA-Flight Safety Administration
France	Météo France	NMS (see column A)	(see column B)
FYROM	National Institute of MET and Hydrology (NIMH)	CAA (ANS / Aeronautical MET service)	(see column B)
Germany	Deutsche Wetterdienst (DWD)	NMS (see column A)	(see column B)
Greece	Hellenic National MET Service (HNMS)	NMS (see column A)	(see column B)
Hungary	Orszagos Meteorologiai Szolgalat (OMSZ)	NMS (see column A)	(see column B)
Ireland	Met Éireann	NMS (see column A)	(see column B)
Italy	Ufficio Generale per la Meteorologia dell'Aeronautica Militare	Ufficio Generale per la Meteorologia dell'Aeronautica Militare/ ENAV	(see column B)
Malta	Malta International Airport Plc.	NMS (see column A)	(see column B)
Moldova	National MET Service HIDROMETEO	MoldATSA	(see column B)
Netherlands	Royal Netherlands Meteorological Institute (KNMI)	NMS (see column A)	Ministry of Transport, Public Works and Water Management
Norway	Norwegian Meteorological Institute (DNMI)	Norwegian Meteorological Institute (DNMI)/ AVINOR	AVINOR
Portugal	Instituto de Meteorologia (IM)	NMS (see column A)	(see column B)
Romania	National Meteorological Institute	ROMATSA	Civil Aviation Directorate (CAD) / RCAA
Slovak Rep.	Slovak HydroMET. Institute (SHMU-NHMS)	NMS (see column A)	(see column B)
Slovenia	Hidrometeorological Institute of Slovenia	NMS (see column A)	(see column B)
Spain	Instituto Nacional de Meteorologia (INM)	NMS (see column A)	(see column B)
Sweden	Swedish MET Hydrological Institute (SMHI)	NMS (see column A)	Swedish CAA
Switzerland	Meteoswiss	NMS (see column A)	(see column B)
Turkey	Devlet Meteoroloji Isleri Genel Müdürlügü (DMI)	NMS (see column A)	(see column B)
United Kingdom	UK MET Office	NMS (see column A)	UK CAA

ANNEX 2 - MET COSTS RECOVERED THROUGH ANS CHARGES IN EUROPE (2002)

State	WAFC	VAAC	MET Services provided by ANSP	Size of controlled airspace (km²)	Aerodromes where MET services are required	Civil Aviation MET Personnel (FTE)	Total MET personnel (FTE)	Total MET costs recovered through charges (en-route + terminal) (in € '000)	Aeronautical MET staff per ICAO airport where MET service is required	Aeronautical MET charges per ICAO airport where MET services are required (in € '000)	Information Disclosure en-route 2002 (in € '000)	Information Disclosure terminal 2002 (in € '000)	CRCO 2002 (in € '000)	Included in time series analysis (1998-2002)
Albania				35 979	1			216		216	115	101	n/a	
Austria			X	82 219	11	112		22 957	10	2 087	17 600	5 400	17 557	X
Belgium-Lux.			X	36 453	13	117	117	10 255	9	789	9 282	973	9 282	X
Bulgaria			X	145 120	3	**135**	n/a	6 439	45	2 146	3 332	3 107	3 332	X
Croatia			X	158 820	11	87	87	1 229	8	112	1 229		1 229	
Cyprus				173 228	3	n/a	n/a	2 324		775	2 302		2 324	X
Czech Rep.				78 866	1	**70**	**251**	1 221	70	1 221	733	488	733	X
Denmark				158 261	14	65	398	3 781	5	270	3 781		3 781	X
Estonia				76 790	5			130	0	26	35	95	n/a	
Finland			X	415 316	9	88	109	5 241	10	582	904	4 350	891	
Greece				536 887	19	n/a	**488**	9 962		524	n/a	n/a	9 962	X
France		X		1 159 347	49	700	**3 600**	71 191	14	1 453	56 721	14 470	56 721	X
FYROM			X	24 847	2	25	25	372	13	186	242	130	242	
Germany				389 895	49	333	2 713	55 307	7	1 129	64 462		55 307	X
Hungary			X	92 911	1	n/a	n/a	1 876		1 876	1 877		1 876	X
Ireland				358 411	4	64	174	8 204	16	2 051	7 994	210	7 994	X
Italy				740 828	38	**609**	**3 251**	50 110	16	1 319	52 720		50 110	X
Latvia				95 604	6			595	0	99	225	370	n/a	
Lithuania				75 409	4			15	0	4	4	10	n/a	
Malta				230 943	1	n/a	n/a	687		687	549	137	549	X
Moldova			X	37 286	1	25	25	95	25	95	70	32	63	
Netherlands				89 570	11	91	496	10 214	8	929	10 214		10 214	X
Norway				718 310	11	163		4 659	15	424	2 336	2 323	2 336	X
Portugal				683 683	5	48	131	4 534	10	907	4 534		4 534	X
Romania			X	254 186	6	n/a	n/a	5 166		861	6 547	322	4 845	
Slovak Rep.				48 658	2	64	249	622	32	311	578	44	578	X
Slovenia				17 620	3	26	**56**	899	9	300	899		899	
Spain + Canarias				2 254 763	27	241	**1 291**	27 554	9	1 021	27 554		27 554	X
Sweden				624 626	14	**70**	n/a	6 063	5	433	5 750	313	5 750	X
Switzerland				67 452	13	24	272	11 410	2	878	5 089	6 729	4 681	X
Turkey				982 282	6	1 195	3 320	13 233	199	2 205	13 233		13 233	X
United Kingdom	X	X		878 430	33	**104**	**1 800**	37 111	3	1 125	36 742	879	36 232	X
											337 655	**40 483**	**332 811**	
											378 138			

* With the exception of the Netherlands, all staff numbers were derived from the MET/TF survey. The figures for the Netherlands were separately submitted by KNMI. All staff numbers (except numbers in bold) are full time equivalents. Staff numbers in bold are head counts.

ANNEX 3 - BREAKDOWN OF EN-ROUTE AND TERMINAL MET COSTS BY STATE (2002)

State	MET cost breakdown provided	Terminal allocation	EN-ROUTE MET COSTS (2002)						TERMINAL MET COSTS (2002)						
			En-route MET costs (in € '000)	Staff costs	Direct operating costs	Exceptional items	Depreciation costs	Costs of capital	Terminal MET costs (in € '000)	Staff costs	Direct operating costs	Exceptional items	Depreciation costs	Costs of capital	Total MET costs (in € '000)
Albania	Yes	Yes	115	45%	43%		11%		101	37%	49%		13%		216
Austria	Yes	Yes	17 600	72%	19%		8%	2%	5 400	65%	19%		13%	4%	23 000
Belgium-Lux.	Yes	Yes	9 282	**83%**	9%		6%	2%	973	81%	10%		9%		10 255
Bulgaria	Yes	Yes	3 332	45%	19%		22%	15%	3 107	45%	19%		**22%**	15%	6 439
Croatia	Yes	No	1 229	65%	22%		13%								1 229
Cyprus	Yes	No	2 302	78%	15%		6%	2%							2 302
Czech Rep.	No	Yes	733						488						1 221
Denmark	Yes	No	3 781	58%	39%		3%	0%							3 781
Estonia	Yes	Yes	35		**100%**				95		**100%**				130
Finland	Yes	Yes	904	58%	41%		1%	0%	4 350	18%	73%		6%	3%	5 254
France	Yes	Yes	56 721	60%	28%		12%		14 470	60%	28%		12%		71 191
FYROM	Yes	Yes	242	53%	24%		21%	2%	130	53%	24%		21%	2%	372
Germany	No	No	64 462												64 462
Hungary	Yes	No	1 877	22%	77%		0%	1%							1 877
Ireland	No	Yes	7 994						210						8 204
Italy	Yes	No	52 720	51%	32%	13%	3%	1%							52 720
Latvia	Yes	Yes	225		99%		1%		370		90%		10%		595
Lithuania	Yes	Yes	4.3		87%		13%		10.4		86%		14%		14.8
Malta	Yes	Yes	549	73%	4%		17%	7%	137	73%	4%		17%	7%	687
Moldova	Yes	Yes	70	72%	25%		3%	0%	32	72%	25%		2%	1%	103
Netherlands	Yes	No	10 214	49%	50%		1%	0%							10 214
Norway	No	Yes	2 336						2 323						4 659
Portugal	Yes	No	4 534	63%	30%		6%	1%							4 534
Romania	Yes	Yes	6 547	44%	30%		10%	**16%**	322	47%	25%		11%	**17%**	6 869
Slovak Rep.	No	Yes	578						44						622
Slovenia	Yes	No	899	60%	25%		15%								899
Spain + Canarias	Yes	No	27 554	46%	30%		17%	6%							27 554
Sweden	Yes	Yes	5 750	46%	36%	16%		2%	313	**85%**	2%	**7%**		5%	6 063
Switzerland	No	Yes	5 089						6 729						11 818
Turkey	Yes	No	13 233	46%	12%	**16%**	**25%**								13 233
United Kingdom	No	Yes	36 742						879						37 621
Total			337 655						40 483						378 138
En-route/ terminal distribution			89%						11%						100%

Source: Specification for Information Disclosure

ANNEX 4 - EN-ROUTE MET CHARGES DEVELOPMENT BY MEMBER STATE (1998-2004)

Member State	CRCO 1998		CRCO 1999		CRCO 2000		CRCO 2001		CRCO 2002		CRCO 2003		CRCO 2004	
	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1	MET costs (in € '000)	%n/n-1
Austria	19 825	17.2%	17 998	-9.2%	20 306	12.8%	18 221	-10.3%	17 557	-3.6%	16 900	-3.7%	16 700	-1.2%
Belgium-Lux.	7 920	-8.5%	6 654	-16.0%	7 656	15.1%	8 860	15.7%	9 282	4.8%	9 330	0.5%	9 989	7.1%
Bulgaria	3 482	-2.2%	3 553	2.0%	3 561	0.2%	3 287	-7.7%	3 332	1.4%	3 072	-7.8%	2 996	-2.5%
Croatia	525	-	531	1.1%	799	50.3%	979	22.6%	1 229	25.6%	1 360	10.6%	1 354	-0.4%
Cyprus	2 396	12.8%	2 461	2.7%	2 666	8.4%	2 790	4.7%	2 324	-16.7%	2 735	17.7%	2 673	-2.3%
Czech Rep.	387	5.8%	437	13.0%	460	5.2%	659	43.3%	733	11.1%	886	20.9%	991	11.9%
Denmark	3 466	-5.0%	3 549	2.4%	3 715	4.7%	3 854	3.8%	3 781	-1.9%	4 525	19.7%	4 347	-3.9%
Finland	-	-	-	-	393	-	737	87.4%	891	20.9%	953	7.0%	953	0.0%
France	55 534	-0.3%	55 949	0.7%	56 000	0.1%	56 700	1.3%	56 721	0.0%	55 949	-1.4%	57 808	3.3%
Germany	49 755	-5.2%	54 005	8.5%	55 375	2.5%	58 442	5.5%	55 307	-5.4%	53 391	-3.5%	61 637	15.4%
Greece	6 714	-5.5%	8 311	23.8%	8 393	1.0%	7 765	-7.5%	9 962	28.3%	8 261	-17.1%	8 164	-1.2%
Hungary	1 130	15.7%	1 350	19.5%	1 351	0.0%	2 041	51.1%	1 876	-8.1%	2 062	9.9%	2 062	0.0%
Ireland	6 227	20.8%	6 526	4.8%	6 476	-0.8%	6 976	7.7%	7 994	14.6%	6 703	-16.1%	6 323	-5.7%
Italy	38 868	6.5%	43 195	11.1%	43 784	1.4%	45 559	4.1%	50 110	10.0%	52 830	5.4%	54 730	3.6%
FYROM	-	-	-	-	237	-	289	21.9%	242	-16.3%	272	12.5%	301	10.5%
Malta	896	21.7%	951	6.1%	701	-26.2%	752	7.3%	549	-27.0%	544	-1.0%	526	-3.2%
Moldova	-	-	-	-	63	-	58	-7.5%	63	8.6%	64	2.1%	63	-2.2%
Netherlands	9 166	-5.5%	8 039	-12.3%	8 393	4.4%	9 121	8.7%	10 214	12.0%	11 046	8.1%	10 423	-5.6%
Norway	1 686	-5.7%	1 948	15.5%	2 143	10.0%	2 180	1.7%	2 336	7.2%	2 523	8.0%	2 104	-16.6%
Portugal	3 565	-9.2%	4 471	25.4%	4 945	10.6%	3 948	-20.2%	4 534	14.9%	4 674	3.1%	4 775	2.2%
Romania	-	-	-	-	-	-	-	-	4 845	-	5 252	8.4%	5 332	1.5%
Slovak Rep.	367	-61.2%	329	-10.2%	611	85.6%	559	-8.5%	578	3.4%	575	-0.6%	594	3.4%
Slovenia	482	-	535	11.0%	808	51.0%	874	8.1%	899	2.9%	979	8.9%	983	0.4%
Spain + Canarias	29 095	-6.6%	29 581	1.7%	28 318	-4.3%	27 907	-1.5%	27 554	-1.3%	28 634	3.9%	29 961	4.6%
Sweden	5 199	-6.6%	5 393	3.7%	5 791	7.4%	5 428	-6.3%	5 750	5.9%	5 762	0.2%	5 734	-0.5%
Switzerland	4 912	13.2%	4 793	-2.4%	5 366	11.9%	4 982	-7.2%	4 681	-6.0%	4 768	1.9%	4 534	-4.9%
Turkey	10 480	22.6%	10 671	1.8%	15 661	46.8%	12 802	-18.3%	13 233	3.4%	13 358	0.9%	13 594	1.8%
United Kingdom	34 387	4.4%	34 847	1.3%	37 810	8.5%	41 041	8.5%	36 232	-11.7%	37 102	2.4%	36 536	-1.5%

Note: Figures are not deflated.

ANNEX 5 - THE WORLD METEOROLOGICAL ORGANISATION (WMO)

The World Meteorological Organisation (WMO) was created in 1951 as a specialised agency of the United Nations. From weather prediction to air pollution research, climate change related activities, ozone layer depletion studies and tropical storm forecasting, the Geneva-based 185-member organisation co-ordinates global scientific activity to allow increasingly prompt and accurate weather information and other services for public, private and commercial use. WMO's activities contribute to the safety of life and property, the socio-economic development of nations and the protection of the environment.

The main objectives of the organisation are:

- *To facilitate international co-operation in the establishment of networks of stations for making meteorological and hydrological observations;*
- *To promote the establishment and operation of systems for the rapid exchange of meteorological and related information;*
- *To promote the standardisation of meteorological observations to ensure consistent quality;*
- *To further applications of meteorology to aviation, shipping, water management, agriculture and other human activities;*
- *To encourage research and training in meteorology and related areas and to support the co-ordination of international research and training activities.*

WMO's major scientific and technical programmes include the World Weather Watch (WWW), which is the backbone of WMO's activities. WWW offers up-to-the-minute world-wide weather information through member-operated observation systems and telecommunication links with four polar-orbiting and five geo-stationary satellites, about 10,000 land observation and 7,000 ship stations and 300 moored and drifting buoys carrying automatic weather stations.

Data from all over the world are needed to provide weather forecasts. If there were no WMO, the nations of the world would have to conclude individual agreements with one another to ensure the exchange and availability of data to meet their national requirements, such as provision of forecasts for the public and special services for various economic sectors like agriculture, utilities (gas, electric power production),etc.

The purposes of WMO are to facilitate international co-operation in the establishment of networks of stations for making meteorological, hydrological and other observations; and to promote the rapid exchange of meteorological information, the standardisation of meteorological observations and the uniform publication of observations and statistics. It also furthers the application of meteorology to aviation, shipping, water problems, agriculture and other human activities, promotes operational hydrology and encourages research and training in meteorology.

By far the greatest proportion of funding comes from Members' own resources committed to the operation of national observing, communication and data-processing systems which are planned and implemented within the WMO framework. The maximum expenditure for the financial period 1996-1999, as approved by the Twelfth World Meteorological Congress, is Swiss francs 255 million.

The extra-budgetary resources that are expected to be available over the same period to support specific components of programmes such as technical co-operation, education and training, improvement of the World Weather Watch, and some urgent environmental and climatological monitoring, research and co-operative work amount to Swiss francs 89.7 million. The staff post ceiling is 246.

ANNEX 6 - WORLD AREA FORECAST CENTRES (WAFCs)

Extract from ICAO Annex 3 – Meteorological Service for International Air Navigation

Objectives of the world area forecast system shall be:

a) to supply meteorological offices with forecasts of en-route meteorological conditions concerning upper winds, upper-air temperatures, direction, speed and height of maximum wind, tropopause height and significant weather in pictorial and/or alphanumeric form, as far as practicable, for direct use by operators, flight crew members, air traffic services units and other aeronautical users; and

b) to supply meteorological authorities and other users with upper wind, upper-air temperature, direction, speed and height of maximum wind and tropopause height forecasts and forecasts of significant weather phenomena for grid points in digital form.

These objectives shall be achieved through a comprehensive, integrated, worldwide and, as far as practicable, uniform system, and in a cost-effective manner.
(ICAO – Annex 3 – 3.1.)

A Contracting State, having accepted the responsibility for providing a WAFC within the framework of the world area forecast system, shall arrange for that centre:

a) to prepare global forecasts for grid points in digital form for all required levels and in a standard format; the forecasts shall comprise upper winds, upper-air temperatures, tropopause heights and maximum wind speed, direction and height;
b) to prepare global forecasts of significant weather phenomena;
c) to issue the forecasts referred to in a) and b) in digital and/or pictorial form;
d) to prepare and issue amendments to the forecasts;
e) to receive information concerning the accidental release of radioactive materials into the atmosphere, from its associated WMO regional specialised meteorological centre for the provision of transport model products for radiological environmental emergency response, in order to include the information in significant weather forecasts; and
f) to establish and maintain contact with VAACs for the exchange of information on volcanic activity in order to co-ordinate the inclusion of information on volcanic eruptions in significant weather forecasts.

Recommendation 3.2.7. "The grid point forecasts prepared by a WAFC should comprise:
a) wind and temperature data for light levels 50, 100, 140, 180, 240, 300, 340, 390 and 450;
b) tropopause height, and direction, speed and height of maximum wind;
c) wind and temperature data for flight levels 530 and 600 when and where required; and
d) humidity data for flight levels 50, 100, 140 and 180.

ANNEX 7 - EUMETSAT

EUMETSAT is an intergovernmental organisation created through an international convention agreed by 18 European Member States in 1986.

The organisation is responsible for the operation and exploitation of European weather satellites. The organisation's primary objective is to establish maintain and exploit European systems of operational meteorological satellites.

EUMETSAT's Meteosat system is intended primarily to support the National Meteorological Services (NMS) of Member States. The NMS in turn distribute the image data to other end users, notably through the provision of forecasts on television several times a day. Second priority is given to the NMS of non-Member States. These are given privileged access to Meteosat data in the continuing tradition of data exchange between meteorological services. They too use the data for the preparation of forecasts and for distribution to television audiences.

As well as these two important categories there are many other users. Universities and research institutes rely on Meteosat data for research and education. Commercial organisations also use the systems, either as end-users or as service providers. In all, a few thousand systems, located in over 100 countries, are installed for the direct reception of EUMETSAT image data.

At present, EUMETSAT controls the Meteosat satellites that produce images of the Earth from geostationary orbit above the equator, and disseminates these images to users all over the world. EUMETSAT's geostationary satellite programmes include the continuation of the current Meteosat system and the development of the Meteosat Second Generation (MSG). The EUMETSAT Polar System (EPS) is also under way.

Meteosat Second Generation (MSG)

With the progression of science, and developments in the accuracy of numerical weather prediction, the need for more frequent and comprehensive data from space has arisen. Meteosat Second Generation will be a significantly enhanced follow-on system to the current generation of Meteosat. It has been designed in response to user requirements and will serve the needs of Nowcasting applications and Numerical Weather Prediction in addition to provision of important data for climate monitoring and research.

The new satellites will be spin-stabilised like the current generation, but with many design improvements. The more frequent and comprehensive data collected by MSG will also aid the weather forecaster in the swift recognition and prediction of dangerous weather phenomena such as thunderstorms, fog and explosive development of small but intense depressions which can lead to devastating wind storms

EUMETSAT Polar System (EPS)

While geostationary satellites provide a continuous view of the earth disc from an apparently stationary position in space, the instruments on polar orbiting satellites, flying at a much lower altitude, provide more precise details about atmospheric temperature and moisture profiles, although with a less frequent global coverage.

The lack of observational coverage in certain parts of the globe, particularly the Pacific Ocean and continents of the southern hemisphere, has led to the increasingly important role for polar orbiting satellite data in numerical weather prediction and climate monitoring.

EUMETSAT is currently preparing the European component of a joint European/US polar satellite system.

EUMETSAT derives the vast majority of its funding from the contributions of its Member States. These contributions are calculated as pro-rata to the Gross National Product (GNP) of the respective State. EUMETSAT is currently converting from GNP to Gross National Income (GNI) as the basis for its scales of contribution.

An income is derived from licensed users but as many users (such as developing countries and many research centres) are exempt from charges, this income will remain relatively minor for the foreseeable future.

ANNEX 8 - METEOROLOGICAL OFFICES

Extract from ICAO Annex 3 – Meteorological Service for International Air Navigation

3.4.1 Each Contracting State shall establish one or more aerodrome and/or other meteorological offices which shall be adequate for the provision of the meteorological service required to satisfy operational needs.

3.4.2 An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:

a) prepare and/or obtain forecasts and other relevant information for flights with which it is concerned; the extent of its responsibilities to prepare forecasts shall be related to the local availability and use of en-route and aerodrome forecast material received from other offices;
b) prepare and/or obtain forecasts of local meteorological conditions;
c) maintain a continuous survey of meteorological conditions over the aerodromes for which it is designated to prepare forecasts;
d) provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel;
e) supply other meteorological information to aeronautical users;
f) display the available meteorological information;
g) exchange meteorological information with other meteorological offices; and
h) supply information received on pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud, to its associated air traffic services unit, aeronautical information service unit and meteorological watch office as agreed between the meteorological, aeronautical information service and ATS authorities concerned.

3.4.5 The extent to which an aerodrome meteorological office prepares forecasts and/or makes use of products from WAFCs and/or RAFCs and other sources shall be determined by the meteorological authority concerned.

3.4.7 ***Recommendation.*** *Aerodrome meteorological offices should use as far as practicable output products of the world area forecast system in the preparation of flight documentation.*

3.4.8 For aerodromes without meteorological offices:

a) the meteorological authority concerned shall designate one or more meteorological offices to supply meteorological information as required; and
b) the competent authorities shall establish means by which such information can be supplied to the aerodromes concerned.

ANNEX 9 - METEOROLOGICAL WATCH OFFICES

Extract from ICAO Annex 3 – Meteorological Service for International Air Navigation

3.5 Meteorological watch offices

3.5.1 A Contracting State, having accepted the responsibility for providing air traffic services within a flight information region or a control area, shall establish one or more meteorological watch offices, or arrange for another Contracting State to do so.

3.5.2 A meteorological watch office shall:

- *a) maintain watch over meteorological conditions affecting flight operations within its area of responsibility;*
- *b) prepare SIGMET and other information relating to its area of responsibility;*
- *c) supply SIGMET information and, as required, other meteorological information to associated air traffic services units;*
- *d) disseminate SIGMET information;*
- *e) when required by regional air navigation agreement, in accordance with 7.3.1:*
  - *1) prepare AIRMET information relating to its area of responsibility;*
  - *2) supply AIRMET information to associated air traffic services units; and*
  - *3) disseminate AIRMET information;*
- *f) supply information received on pre-eruption volcanic activity, a volcanic eruption and volcanic ash cloud for which a SIGMET has not already been issued, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to its associated VAAC as determined by regional air navigation agreement; and*
- *g) supply information received concerning the accidental release of radioactive materials into the atmosphere, in the area for which it maintains watch or adjacent areas, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to aeronautical information service units, as agreed between the meteorological and appropriate civil aviation authorities concerned. The information shall comprise location, date and time of the accident, and forecast trajectories of the radioactive materials.*

Note. — The information is provided, at the request of the delegated authority in a State, by WMO regional specialised meteorological centres for the provision of transport model products for radiological environmental emergency response.

3.5.3 The extent to which a meteorological watch office makes use of products from WAFCs and/or RAFCs and other sources shall be determined by the meteorological authority concerned.

3.5.4 ***Recommendation.—*** *The boundaries of the area over which meteorological watch is to be maintained by a meteorological watch office should, in so far as is practicable, be coincident with the boundaries of a flight information region or a control area or a combination of flight information regions and/or control areas.*

3.5.5 ***Recommendation.—*** *Meteorological watch should be maintained continuously; however, in areas with a low density of traffic the watch may be restricted to the period relevant to expected flight operations.*

Appendix 6

GUIDANCE FOR DETERMINING THE COSTS OF AERONAUTICAL METEOROLOGICAL SERVICE

Introduction

1. Meteorological services are services that are shared by many users including aeronautical users. This generates cost savings and creates specific relationships. Aeronautical meteorology is dependent on the basic meteorological system and the meteorological provider is bound by the general policy concerning air navigation services charges. So it is necessary that the national authorities concerned work in consultation to implement this policy and determine the corresponding costs (see Chapter 1).

2. As indicated in Chapter 4, Section A, the first step in determining the costs of aeronautical meteorological service is to prepare an inventory of all those meteorological facilities and services which serve to meet aeronautical requirements stated in ICAO Annexes (e.g. Annex 3 — *Meteorological Service for International Air Navigation*), Procedures for Air Navigation Services (PANS) (e.g. *Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services* (PANS-RAC, Doc 4444) and air navigation plan publications (ANPPs). This inventory should be drawn up jointly by the national aviation authorities (such as a civil aviation administration) and the meteorological authority (designated in accordance with Annex 3, 2.1.4) in the State concerned. Meteorological services meeting aeronautical requirements are summarized in paragraphs 4.18 and 4.19 as follows:

> "4.18 Meteorological services for air navigation comprise the services provided in accordance with ICAO provisions in Annexes, Procedures for Air Navigation Services (PANS) and Air Navigation Plan Publications (ANPPs). These include meteorological observations, reports and forecasts, briefing and flight documentation, SIGMET and AIRMET information, world area forecast system (WAFS) digital grid point data for computerized flight planning, meteorological information for inclusion in broadcasts (such as VOLMET and OFIS), aeronautical meteorological telecommunications (if not included in COM) and any other meteorological data required from States for aeronautical use. The facilities required to provide such services include world area forecast centres (WAFCs), regional area forecast centres (RAFCs), volcanic ash advisory centres (VAACs), tropical cyclone advisory centres (TCACs), meteorological watch offices (MWOs), aerodrome meteorological equipment for aeronautical purposes (including observational instruments) and telecommunications equipment for aeronautical meteorological purposes. Additionally, it may be appropriate to include in the inventory various supporting facilities and services which also serve meteorological requirements in general, among these being surface and upper-air observation networks, meteorological telecommunication systems, data processing centres and supporting core research, training and administration. In the case of such general-purpose facilities and services an appropriate allocation of the costs involved between the aeronautical and non-aeronautical needs served will have to be determined.
>
> 4.19 Furthermore there are additional services specified and agreed by the national aviation authorities, in consultation with the meteorological authority and users. Any additional special facilities or services provided at the request of a single or limited number of users are deemed to be outside these arrangements and should be charged to the user(s) concerned. Further guidance on the identification of facilities and services serving aeronautical MET is contained in Appendix 6 — *Guidance for determining the costs of aeronautical meteorological service.*"

3. As indicated in 4.51 of Chapter 4, it is important to note that national meteorological organizations, while they serve aeronautical requirements, operate to serve the non-aeronautical community as a whole by providing meteorological and climatological information for maritime and other surface transport, civil protection, agriculture, fishing, hydrology, air pollution control,

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retailing, sports and recreation, tourism, building and construction, the press and other media, and the general public. Usually, meteorological organizations engage in general meteorological, i.e. core activities in fulfilment of a primary system requirement for meteorological information which is jointly used by all service recipients. Examples of core activities include general analysis and forecasting, automated data processing, weather radar and satellite observations, surface and upper air observations, telecommunications to collect and exchange basic data, training, research and development. Since no single user requirement determines the level and cost of the core activities, the further allocation of core activity costs among aeronautical and non-aeronautical users should be approached with considerable caution. The proportion of core activities used for the benefit of air navigation that it is appropriate to attribute to the requirements of aviation will vary from State to State. Furthermore, there are States which do not allocate core costs to any specific user. It should also be recognized that aviation contributes data to the core system by providing upper air observations of winds and temperatures and that there are core activities which in terms of the level of sophistication exceed the aeronautical requirements. It is therefore not possible to indicate any specific percentage allocations that would have general validity for this purpose. However, the broad description of the meteorological facilities and services required for aeronautical purposes in 2 above gives general guidance in this field, with more specific advice being provided below.

4. The proper approach for allocating aeronautical meteorological costs involves analysis of each element of the meteorological service concerned to determine the extent to which its functions are attributable to aeronautical requirements.

5. For this purpose it is necessary:

a) to establish an inventory of the facilities and services to be provided by the meteorological service provider concerned to meet the aeronautical requirements stated in ICAO Annexes, PANS, regional ANPPs and as specified and agreed by national aviation authorities;

b) to identify for each facility or service the costs (including costs of maintenance and supporting services) to be taken into account, as indicated in Chapter 4, Section B — *Determining costs*; and

c) to establish an appropriate basis for allocation (see also Chapter 4, Section C — *Allocation of costs*).

6. By the same kind of analysis, the total costs so attributed to aeronautical requirements can similarly be allocated as between airport (approach and aerodrome control) and en-route requirements.

7. The method of calculation of costs for the meteorological facilities and services provided and charged to aeronautical users should be available. Furthermore, the allocation of costs for the meteorological facilities and services should be done after consultation with the users. Such consultations between the meteorological authority, the service provider (if different from the meteorological authority) and the users should be held regularly and at least before the cost basis for charges are established or revised.

Inventory of facilities and services

8. The facilities and services comprising the inventory may be classified under the following categories:

a) facilities and services needed to serve exclusively aeronautical requirements; and

b) facilities and services which may be needed to serve both aeronautical and non-aeronautical requirements.

The above facilities and services are listed under 17 a) and 17 b) below.

Categories of costs

9. For guidance in establishing the costs of meteorological facilities and services and a description of the various cost categories involved reference should be made to Chapter 4, Section B.

Allocation of costs between aeronautical and non-aeronautical users

10. For the facilities and services needed to serve exclusively aeronautical requirements (8 a)), the costs are allocated 100 per cent to aeronautical use. (It is understood that the related services would not be provided to non-aeronautical users).

11. For any facilities or services needed to serve exclusively non-aeronautical requirements (e.g. agrometeorology, maritime meteorology, hydrology, etc., see also 3 above), the costs are allocated 100 per cent to non-aeronautical use and should not be allocated to the cost base of aeronautical charges.

12. The costs of facilities and services needed to serve both aeronautical and non-aeronautical requirements (core activities), listed in paragraph 8 b), if allocated at all (4.51 in Chapter 4 refers), may be allocated between aeronautical and non-aeronautical users using such methods as the following:

a) in proportion to the estimated aeronautical and non-aeronautical use made of the products supplied (applicable, e.g., to general analysis and forecasting offices);

b) in proportion to the estimated time of use of the computers for aeronautical and non-aeronautical purposes (applicable, e.g., to electronic data processing facilities);

c) in proportion to the estimated volume of information transmitted for aeronautical and non-aeronautical purposes (applicable, e.g., to telecommunications facilities);

d) in proportion to the personnel working on aeronautical and non-aeronautical data (applicable, e.g., to climatological services); and

e) on the basis of results from an analytical accounting system which ensures an equitable allocation of the costs concerned.

13. The aim should always be for the allocation of meteorological costs between aeronautical and non-aeronautical use to be based on one or more of the methods described above. However, in circumstances where the use made of meteorological facilities and services cannot be allocated on the basis of one of these methods, the necessary cost allocation should be approximated on the basis of the best data available. One possible approach would be to establish a ratio between the costs of those facilities and services needed to serve exclusively aeronautical requirements and the costs of those needed to serve exclusively non-aeronautical requirements; this ratio would then be applied to the costs of those core facilities which serve both aeronautical and non-aeronautical requirements (8 b)) in order to estimate the aeronautical portion of these costs.

Allocation of aeronautical meteorological costs

14. In the context of dual airport and en-route utilization of facilities or services, it is noted in Chapter 4, 4.57 that the costs of aeronautical meteorological services require particular attention. The Council Statements specifically recommend that the "costs of all meteorological services provided to civil aviation should, where appropriate, be allocated between air traffic services provided for airports and air traffic services provided en route. In States where more than one international airport is involved, consideration could be given, where possible, to allocating the costs attributable to airport utilization between the airports concerned" (Doc 9082/4, Appendix 2).

15. When developing criteria for the allocation of costs to airport and en-route, the following considerations should be taken into account:

a) the allocation of aeronautical costs among users should be carried out in a manner equitable to all users;

b) the allocation should be made in such a way that costs are recovered from the appropriate users; and

c) the allocation should be based on the phase of flight operation, in which the facilities or services are used.

Where allocation of aeronautical meteorological costs between airport and en-route utilization is required, the allocation criteria described in 10 to 13 above may be equally applied, with the terms "airport/en-route" being used instead of "aeronautical/non-aeronautical" as indicated below. As to facilities and services referred to above under Inventory of facilities and services, 8 a) and 8 b), those listed below indicate whether the requirement and utilization of the facilities or services concerned are en-route (E), mainly en-route (mE), airport (A), mainly airport (mA) or mixed en-route/airport (A/E).

16. The allocation of aeronautical meteorological costs should be determined in such a way as to ensure that no users are burdened with costs not properly allocable to them. Where deemed necessary for reasons of equity and where the necessary basic data, including all required traffic statistics, are available, consideration should be given to allocating the aeronautical meteorological costs between IFR and VFR traffic.

Inventory of facilities and services and their allocation between airport and en-route use

17. The inventory of the facilities and services and their allocation between airport and en-route use are presented below.

a) Facilities and services intended exclusively to serve aeronautical requirements.

Legend indicating utilization:

A airport;
E en-route;
mA mainly airport;
A/E airport and en-route;
mE mainly en-route.

World area forecasts centres (WAFCs) . . . . E
Regional area forecast centres (RAFCs) . . . . E
Volcanic ash advisory centres (VAACs) . . . . E
Tropical cyclone advisory centres (TCACs) . . . . . . E
Meteorological watch offices (MWOs) . . . . E
Aerodrome meteorological offices . . . . A/E
Aeronautical meteorological stations . . . . A/E
Operation of a regional OPMET data bank . . . . . . E
Telecommunications for aeronautical meteorological purposes, including VSAT stations to receive WAFS products and OPMET data (if not included in COM) . . . . A/E
Facilities to provide meteorological data-processing of WAFS products . . . . mE
Provision of VOLMET broadcasts . . . . E
Observing instruments provided for aeronautical purposes (e.g. transmissometers, ceilometers) . . . mA
Specific aeronautical meteorological research . . . A/E
Specific aeronautical meteorological training . . . . A/E
Specific aeronautical technical support (including administration) . . . . A/E

The above facilities and services provide the following products and functions. Their utilization is indicated in brackets:

Meteorological observations and reports for local ATS units . . . . (A)

Meteorological observations and reports disseminated beyond the aerodrome (METAR, SPECI) . . . . (mE)

Aerodrome forecasts (TAF, including amendments thereto) . . . . (mE)

Landing forecasts (including TREND) and forecasts for take-off . . . . (A/E)

Area and route forecasts, other than those issued within WAFS (including ARFOR, GAMET, ROFOR, WINTEM) . . . . (E)

Aerodrome and wind shear warnings . . . . (A)

SIGMET, AIRMET, volcanic ash advisories, tropical cyclone advisories . . . . (E)

Aerodrome climatological information . . . . (A)

Flight documentation (WAFS products, SIGWX charts/forecasts for low-level flights and required OPMET data) . . . . (mE)

Meteorological watch by MWOs over FIR/UIR for the issuance of SIGMETs and AIRMETs . . . . (E)

Aerodrome weather watch by the meteorological office concerned for the issuance of amendments to TAFs, aerodrome and wind shear warnings . . . . (A/E)

Volcanic ash and tropical cyclone watch by VAACs and TCACs for the issuance of VA and TC advisories . . . . (E)

Meteorological watch by WAFCs and RAFCs for the issuance of amendments to WAFS products . . . . (E)

Briefing and consultation (including display of OPMET and other meteorological information) . . . . (A)

Provision of information to meteorological information systems and local operators (including the use of remote briefing/ consultation systems) . . . . (A/E)

Provision of information for ATS and AIS units (including NOTAM) . . . . (A/E)

Provision of information for SAR units . . . . (E)

Provision of WAFS and OPMET data to operators . . . . (mE)

Note.— An ultimate goal would be the identification of the costs attributable to the individual products and functions where this is feasible.

b) Core facilities and services which may serve both aeronautical and non-aeronautical requirements.

Legend indicating utilization:

A	airport
E	en-route
mA	mainly airport
A/E	airport and en-route
mE	mainly en-route

General analysis and forecast offices	A/E
Meteorological data processing (including maintenance of climatological data base)	A/E
Commonly used meteorological telecommunications facilities and services	A/E
Surface observation stations (making synoptic and climatological observations)	mE
Upper-air observation stations	E
Weather radar	A/E
Meteorological satellite reception	mE
Core training	A/E
Core research	A/E
Core technical support (including administration)	A/E

Part VI

METEOROLOGY (MET) — FASID

INTRODUCTION

1. The material in this part complements that contained in Part I — BORPC and Part VI — MET of the Basic ANP and should be taken into consideration in the overall planning processes for the EUR region.

2. This part contains the details of the facilities and/or services to be provided to fulfill the basic requirements of the plan and/or as agreed between the provider and user States concerned. Such agreement indicates a commitment on the part of the State(s) concerned to implement the requirement(s) specified. This element of the FASID, in conjunction with the EUR Basic ANP, is kept under constant review by the EANPG in accordance with its schedule of management, in consultation with user and provider States and with the assistance of the ICAO EUR/NAT Regional Office.

METEOROLOGICAL SERVICE REQUIRED AT AERODROMES (TABLES MET 1A AND 1B)

3. The meteorological service to be provided to satisfy international flight operations is outlined in Table MET 1A. Also, the requirements for meteorological watch offices (MWO) and AIREP collecting centres, together with the service to be provided to flight information regions (FIR), upper flight information regions (UIR) and search and rescue regions (SRR) are listed in Table MET 1B.

Table MET 1A — METEOROLOGICAL SERVICE REQUIRED AT AERODROMES

EXPLANATION OF THE TABLE

Column

1	Name of the aerodrome.
2	Designation of the aerodrome: RS = international scheduled air transport, regular use RNS = international non-scheduled air transport, regular use RG = international general aviation, regular use AS = international scheduled air transport, alternate use.
3	ICAO location indicator of the aerodrome.
4	Name of the meteorological office responsible for the provision of meteorological service at the aerodrome concerned (supplementary information).
5	ICAO location indicator of the responsible meteorological office (supplementary information).
6	Areas of coverage of the charts required for flight documentation. *Note.— Maximum areas of coverage denoted by B, C, etc., are shown on Charts MET 1, MET 2 and MET 3.*
7	AFTN routing areas to which flight documentation is required to be prepared. *Note.— The AFTN routing areas are shown on Chart MET 1.*
8	Requirement for TR (trend-type forecasts).
9	Requirement for 9-hour validity aerodrome forecasts in TAF code (9H).
10	Requirement for 18/24-hour validity aerodrome forecasts in TAF code (18/24H).

Legend

*	The meteorological office is open during daytime hours as specified in the AIP; outside those hours the meteorological office listed on the following line should provide the required meteorological information.
O/R	Upon request only.
#	Subject to inclusion in Table AOP 1.

+ Closed until further notice.

*** Only during Leipziger Messe.

Note.— All of the requirements for facilities and services associated with each of the newly created States in the European region have been placed under listings associated with those new States. It is understood that some of these requirements may no longer exist and new ones may need to be added. Such amendments will be carried out through the normal amendment process in consultation with the Secretariat.

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designation	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
ALBANIA													
Tirana	RS	LATI							x			x	x
ARMENIA													
Goris	RS	UGEG*	Yerevan/Zvartnots	UGEE					x	E, L, O, U	x	x	x
Gumri/Shirak	RS	UGEL	Gumri/Shirak	UGEL					x	E, L, O, U	x	x	x
Sisian	AS	UGEC*	Yerevan/Zvartnots	UGEE					x	E, L, O, U	x	x	x
Stepanavan	AS	UGES*	Yerevan/Zvartnots	UGEE					x	E, L, O, U	x	x	x
Yerevan/Zvartnots	RS	UGEE	Yerevan/Zvartnots	UGEE			x		x	E, G, L, O, U	x	x	x
AUSTRIA													
Dornbirn	RG	LOIH	Innsbruck	LOWI									
Graz	RS	LOWG	Graz Wien	LOWG* LOWW					x	E, L	x	x	x
Innsbruck	RS	LOWI	Innsbruck Wien	LOWI* LOWW						E, L		x	
Klagenfurt	RS	LOWK	Klagenfurt Wien	LOWK* LOWW					x	E, L		x	
Linz	RS	LOWL	Linz	LOWL*					x	E, L	x	x	x
Salzburg	RS	LOWS	Salzburg	LOWS*					x	E, L	x	x	x
St. Johann in Tirol	RG	LOIJ	Innsbruck	LOWI									
Vöslau	RG	LOAV	Wien	LOWW									
Wels	RG	LOLW	Linz	LOWL									
Wien/Schwechat	RS	LOWW	Wien/Schwechat	LOWW	x	x	x	x	x	B, C, D, E, G, H, K, L, O, U, V	x	x	x
Zell am See	RG	LOWZ	Salzburg	LOWS									
AZERBAIJAN													
Akstafa	RG	UBBA	Baku/Bina	UBBB					x	E, L, O, U			
Baku/Bina	RS	UBBB	Baku/Bina	UBBB	x	x	x	x	x	D, E, F, G, H, L, O, U	x	x	x
Gyandzha	RS	UBBG	Baku/Bina	UBBB	x	x	x	x	x	E, L, O, U	x	x	
Lenkoran	RG	UBBL	Baku/Bina	UBBB					x	E, L, O, U			
Nakhichevan	RS	UBBN	Baku/Bina	UBBB					x	E, L, O, U	x	x	
Yelakh	RG	UBEE	Baku/Bina	UBBB					x	E, L, O, U			
Zakataly	RG	UBBY	Baku/Bina	UBBB					x	E, L, O, U			
BELARUS													
Brest	RNS, AS	UMBB	Brest	UMBB					x	E, L, U	x	x	
Gomel	RNS, AS	UMGG	Gomel	UMGG					x	E, L, U	x	x	
Grodno	RNS	UMMG	Grodno	UMMG					x	E, L, U	x	x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designation	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Minsk-1	RNS	UMMM	Minsk-1	UMMM					x	E, L, U	x	x	
Minsk-2	RS	UMMS	Minsk-2	UMMS			x		x	E, L, O, U	x	x	
BELGIUM													
Antwerpen/Deurne	RS	EBAW	Antwerpen Bruxelles/National	EBAW* EBBR					x	E, L	x	x	
Balen/Keiheuvel	RG	EBKH	Bruxelles/National	EBBR									
Bruxelles/Grimbergen	RG	EBGB	Bruxelles/National	EBBR									
Bruxelles/National	RS	EBBR	Bruxelles/National	EBBR	x	x	x	x	x	C, D, E, F, G, H, K, L, M, O, S, T, U, V	x	x	x
Charleroi/Gosselies	RS	EBCI	Charleroi Bruxelles/National	EBCI* EBBR				x	x	E, L	x	x	
Genk/Zwartberg	RG	EBZW	Liège/Bierset Bruxelles/National	EBLH* EBBR									
Kortrijk/Wevelgem	RG	EBKT	Bruxelles/National	EBBR									
Liège/Bierset	RS	EBLH	Liège/Bierset Bruxelles/National	EBLH* EBBR				x	x	E, L		x	
Oostende	RS	EBOS	Oostende Bruxelles/National	EBOS* EBBR				x	x	E, L	x	x	x
Spa/La Sauvenière	RG	EBSP	Bruxelles/National	EBBR					x				
St Hubert	RG	EBSH	Bruxelles/National	EBBR					x				
Tournal/Maubray	RG	EBTY	Bruxelles/National	EBBR									
BOSNIA AND HERZEGOVINA													
Banja Luka	RNS	LQBK	Sarajevo	LQSA						E, L			
Bihac	RNS	LQBI	Sarajevo	LQSA						E, L			
Mostar	RNS	LQMO	Sarajevo	LQSA						E, L			
Sarajevo	RS	LQSA	Sarajevo* Zagreb	LQSA LDZA					x	C, D, E, H, L, O, U, V	x	x	
Tuzla	RNS	LQTZ	Sarajevo	LQSA						E, L			
BULGARIA													
Burgas	RS	LBBG	Burgas	LBBG	x	x	x	x	x	D, E, F, G, H, L, O, U	x	x	x
Sofia	RS	LBSF	Sofia	LBSF	x	x	x	x	x	D, E, F, G, H, L, O, U, V	x	x	x
Varna	RS	LBWN	Varna	LBWN	x	x	x	x	x	E, L, U	x	x	x
CROATIA													
Brac	RNS	LDSB	Brac* Split	LDSB LDSP									
Dubrovnik	RS	LDDU	Dubrovnik* Zagreb	LDDU LDZA					x	E, H, L, O, U	x	x	
Losinj	RNS	LDLO	Losinj* Pula	LDLO LDPL						E, L			

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designation	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Osijek/Klisa	RNS	LDOS	Osijek* Zagreb	LDOS LDZA					x			x	
Osijek/Cepin	RNS	LDOC	Osijek* Zagreb	LDOC LDZA					x			x	
Pula	RS	LDPL	Pula* Zagreb	LDPL LDZA					x	E, L, U	x	x	
Rijeka	RS	LDRI	Rijeka* Zagreb	LDRI LDZA					x	E, L, U		x	
Split	RS	LDSP	Split* Zagreb	LDSP LDZA					x	E, L, U	x	x	x
Vrsar	RNS	LDPV	Vrsar* Pula	LDPV LDPL									
Zadar	RNS	LDZD	Zadar* Zagreb	LDZD LDZA					x		x	x	
Zagreb	RS	LDZA	Zagreb	LDZA			x	x	x	C, D, E, H, L, O, U, V	x	x	x
CYPRUS													
Larnaca	RS	LCLK	Larnaca	LCLK		x	x	x	x	E, F, H, L, O, U	x	x	x
Nicosia	AS	LCNC	-	-					x			x	x
Paphos#	RS	LCPH	Larnaca	LCLK						E, F, H, L, O, U		x	x
CZECH REPUBLIC													
Praha	RS	LKPR	Praha	LKPR		x		x	x	C, D, E, G, H, K, L, M, O, U	x	x	x
DENMARK													
Aalborg	RS	EKYT	Aalborg Karup	EKYT* EKMK					x	E, L		x	x
Aarhus/Tirstrup	RS	EKAH	Aarhus/Tirstrup Karup København/Kastrup	EKAH* EKMK EKCH					x	E, L		x	
Billund	RS	EKBI	VTC, København	EKMI					x	E, L		x	x
Bornholm/Rønne	RS	EKRN	VTC, København	EKMI					x	E, L		x	
Esbjerg	RS	EKEB	VTC, København	EKMI					x	E, L		x	
København/Kastrup	RS	EKCH	København/Kastrup	EKCH	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, P, S, T, U, V	x	x	x
København/Roskilde	RG	EKRK	København/Kastrup	EKCH					x	E, L		x	
Lolland/Falster/Maribo	RG	EKMB	VTC, København	EKMI									
Odense	RG	EKOD	VTC, København	EKMI					x	E, L		x	
Sindal	RG	EKSN	VTC, København	EKMI									
Skive	RG	EKSV	VTC, København	EKMI									
Sønderborg	RG	EKSB	VTC, København	EKMI								x	
Stauning	RG	EKVJ	VTC, København	EKMI								x	
Thisted	RNS	EKTS	VTC, København	EKMI						E, L		x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
ESTONIA													
Kardla	RG	EEKA	Tallinn/Ulemiste	EETN					x	E			
Kuressaare	RG	EEKE	Tallinn/Ulemiste	EETN					x	E			
Parnu	RG	EEPU	Tallinn/Ulemiste	EETN					x	E			
Tallinn/Ulemiste	RS	EETN	Tallinn/Ulemiste	EETN	x	x	x	x	x	E, F, G, H, L, O, U		x	
Tartu/Ulenurme	RG	EETU	Tallinn/Ulemiste	EETN					x	E, U			
FINLAND													
Helsinki/Malmi	RG	EFHF	Helsinki/Vantaa	EFHK					x			x	
Helsinki/Vantaa	RS	EFHK	Helsinki/Vantaa	EFHK	x	x	x	x	x	B, C, D, E, G, H, K, L, O, P, R, U, V, Z	x	x	x
Ivalo	RS	EFIV	Rovaniemi	EFRO						E		x	
Mariehamn	RS	EFMA	Helsinki/Vantaa	EFHK					x	E, L		x	
Oulu	AS	EFOU											
Rovaniemi	AS	EFRO											
Tampere/Pirkkala	RS	EFTP	Tampere/Pirkkala Helsinki/Vantaa	EFTP* EFHK					x	E, L, U		x	x
Turku	RS	EFTU	Helsinki/Vantaa	EFHK					x	E, L		x	x
Vaasa	RS	EFVA	Tampere/Pirkkala Helsinki/Vantaa	EFTP* EFHK					x	E		x	
FRANCE													
Ajaccio	RS	LFKJ	Ajaccio Marseille/Marignane	LFKJ* LFML					x	E, L	x	x	
Bâle/Mulhouse	RS	LFSB	Bâle/Mulhouse	LFSB	x	x			x	E, F, G, H, L, M, O	x	x	x
Bastia	RS	LFKB	Ajaccio Marseille/Marignane	LFKJ* LFML					x	L, E	x	x	
Beauvais	RNS	LFOB	Le Bourget	LFPB					x	E, L		x	
Biarritz/Bayonne-Anglet	RS	LFBZ	Bordeaux	LFBD					x	E, L		x	
Bordeaux	RS	LFBD	Bordeaux	LFBD	x	x			x	C, D, E, G, L	x	x	x
Brest	RS	LFRB	Brest	LFRB						E, L	x	x	
Caen	RG	LFRK	Rennes	LFRN									
Calais/Dunkerque	RG	LFAC	Le Touquet Paris/Le Bourget	LFAT* LFPB									
Calvi	RNS	LFKC	Ajaccio Marseille/Marignane	LFKJ* LFML					x	E, L		x	
Cannes	RG	LFMD	Nice	LFMN						L		x	
Chambéry	RG	LFLB	Lyon/Bron	LFLY									
Cherbourg	RNS	LFRC	Rennes	LFRN					x	E, L		x	
Clermont-Ferrand	RS	LFLC	Clermont-Ferrand Lyon/Bron	LFLC* LFLY						E, L	x	x	
Deauville	RNS	LFRG	Rennes	LFRN						E, L	x	x	
Dinard	RS	LFRD	Rennes	LFRN					x	E, L	x	xø	
Dôle	RG	LFGJ	Strasbourg	LFST						E, L		x	

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No. 2

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR		TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Grenoble	RNS	LFLS	Lyon/Bron	LFLY						E, L	x	x	
Lannion	RG	LFRO	Rennes	LFRN									
La Rochelle	RG	LFBH	Bordeaux	LFDB									
Le Havre	RS	LFOH	Paris/Le Bourget	LFPB						E, L		x	
Le Touquet	RG	LFAT	Le Touquet Paris/Le Bourget	LFAT* LFPB						E, L		x	
Lille	RS	LFQQ	Lille Paris/Le Bourget	LFQQ* LFPB						D, E, G, L	x	x	x
Lyon/Bron	RG	LFLY	Lyon/Bron	LFLY						E, L		x	
Lyon/Satolas	RS	LFLL	Lyon/Satolas	LFLL	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, T, U, V	x	x	x
Marseille	RS	LFML	Marseille	LFML		x	x		x	C, D, E, F, G, L	x	x	x
Metz	RG	LFSF	Metz Strasbourg	LFSF* LFST									
Montpellier	RS	LFMT	Montpellier Marseille	LFMT* LFML					x	E, L		x	
Nancy	RG	LFSN	Nancy Strasbourg	LFSN* LFST									
Nantes	RS	LFRS	Rennes	LFRN						E, L		x	x
Nice	RS	LFMN	Nice	LFMN		x			x	D, E, G, L	x	x	x
Nîmes	RG	LFTW	Nîmes Marseille	LFTW* LFML						E, L		x	
Paris/Charles-de-Gaulle	RS	LFPG	Paris/Charles-de-Gaulle	LFPG	x	x	x	x	x	C, D, E, F, G, H, K, L, M, O, R, S, T, U, V	x	x	x
Paris/Le Bourget	RG	LFPB	Paris/Le Bourget	LFPB						E, L		x	
Paris/Orly	RS	LFPO	Paris/Orly	LFPO	x	x	x	x	x	C, D, E, F, G, H, K, L, M, O, R, S, U, V	x	x	x
Pau	RG	LFBP	Bordeaux	LFBD								x	
Perpignan	RNS	LFMP	Perpignan Marseille	LFMP* LFML						E, L		x	
Poitiers	RG	LFBI	Bordeaux	LFBD						E, L		x	
Quimper	RG	LFRQ	Rennes	LFRN						E, L		x	
Reims	RG	LFSR	Reims Paris/Le Bourget	LFSR* LFPB								x	
Rennes	RS	LFRN	Rennes	LFRN						E, L		x	
St. Brieux	RNS	LFRT	Rennes	LFRN						E, L		x	
St. Etienne	RG	LFMH	Lyon/Bron	LFLY									
St. Nazaire	RG	LFRZ	St. Nazaire Rennes	LFRZ* LFRN									
Strasbourg	RS	LFST	Strasbourg	LFST					x	D, E, G, L	x	x	
Tarbes	RNS	LFBT	Bordeaux	LFBD					x	E, L		x	
Toulouse	RS	LFBO	Toulouse	LFBO		x			x	D, E, G, L	x	x	x
Tours	RG	LFOT	Tours Paris/Le Bourget	LFOT* LFPB						E, L		x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Toussus-le-Noble	RG	LFPN	Toussus-le-Noble Paris/Le Bourget	LFPN* LFPB					x	E, L		x	
GEORGIA													
Tbilisi/Novoalexeyevka	AS	UGGG	Tbilisi/Novoalexeyevka	UGGG						E, L, O, U		x	x
GERMANY													
Augsburg	RG	EDMA	München	EDDM								x	
Baden-Baden	RG	EDTB	Stuttgart München	EDDS* EDDM									
Bayreuth	RG	EDQD	Nürnberg München	EDDN* EDDM								x	
Berlin/Schönefeld	RS	ETBS	Berlin/Schönefeld	ETBS	x	x	x	x	x	B, D, E, F, G, H, L, M, O, U	x	x	x
Berlin/Tegel	RS	EDBT	Berlin/Tegel Berlin/Tempelhof	EDBT* EDBB					x	E, L	x	x	x
Berlin/Tempelhof	RS	EDBB	Berlin/Tempelhof	EDBB					x	E, L	x	x	x
Bielefeld	RG	EDLI	Hannover Hamburg	EDVV* EDDH								xø	
Bonn	RG	EDKB	Köln-Bonn Düsseldorf	EDDK* EDDL								x	
Braunschweig	RG	EDVE	Hannover Hamburg	EDDV* EDDH								xø	
Bremen	RS	EDDW	Bremen Hamburg	EDDW* EDDH					x	E, L	x	x	x
Donaueschingen	RG	EDTD	Stuttgart München	EDDS* EDDM									
Dortmund	RG	EDLW	Düsseldorf	EDDL									
Dresden	RS	ETDN	Dresden	ETDN						E, L, U	xø	x	
Düsseldorf	RS	EDDL	Düsseldorf	EDDL		x	x	x	x	B, C, D, E, L, K, P, U	x	x	x
Egelsbach	RG	EDFE	Frankfurt	EDDF									
Emden	RG	EDWE	Bremen Hamburg	EDDW* EDDH									
Erfurt	RS	ETEF	Erfurt	ETEF						E, L, U	xø	xø	
Essen	RG	EDLE	Düsseldorf	EDDL									
Flensburg	RG	EDXF	Bremen Hamburg	EDDW* EDDH									
Frankfurt/Main	RS	EDDF	Frankfurt	EDDF	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, P, R, S, T, U, V	x	x	x
Freiburg	RG	EDTF	Stuttgart München	EDDS* EDDM									
Friedrichshafen	RG	EDTY	Stuttgart München	EDDS* EDDM								x	
Hamburg	RS	EDDH	Hamburg	EDDH				x	x	E, K, L, P, U	x	x	x
Hannover	RS	EDVV	Hannover Hamburg	EDVV* EDDH					x	E, L	x	x	x

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Hof	RG	EDQM	Nürnberg München	EDDN* EDDM								x	
Karlsruhe	RG	EDTK	Stuttgart München	EDDS* EDDM									
Kassel	RG	EDVK	Hannover Hamburg	EDVV* EDDH								xø	
Kiel	RG	EDCK	Hamburg	EDDH									
Köln-Bonn	RS	EDDK	Köln-Bonn Düsseldorf	EDDK* EDDL					x	E, L	x	x	x
Konstanz	RG	EDTZ	Stuttgart München	EDDS* EDDM									
Landshut	RG	EDML	München	EDDM									
Leipzig ***	RS	ETLS	Leipzig	ETLS					x	E, L, U	x	xø	
Lübeck	RG	EDHL	Hamburg	EDDH									
Mannheim	RG	EDFM	Frankfurt	EDDF									
Mönchengladbach	RG	EDLN	Düsseldorf	EDDL									
München/II #	RS												
München/Riem #	RS	EDDM	München	EDDM	x	x	x	x	x	D, E, F, G, H, K, L, Q, U	x	x	x
Münster-Osnabrück	RS	EDLG	Düsseldorf	EDDL					x	E, L	x	x	x
Nürnberg	RS	EDDN	Nürnberg München	EDDN* EDDM					x	E, L	x	x	x
Oberpfaffenhofen	RG	EDMO	München	EDDM								xø	
Offenburg	RG	EDTO	Stuttgart München	EDDS* EDDM									
Paderborn	RG	EDLP	Düsseldorf	EDDL								x	
Saarbrücken	RS	EDRS	Saarbrücken Frankfurt	EDRS* EDDF					x	E, L	x	x	xø
Siegen	RG	EDKS	Köln-Bonn Düsseldorf	EDDK* EDDL								xø	
Stadtlohn	RG	EDLS	Düsseldorf	EDDL									
Straubing	RG	EDMS	München	EDDM									
Stuttgart	RS	EDDS	Stuttgart München	EDDS* EDDM			x	x	x	E, L	x	x	x
Trier	RG	EDRT	Saarbrücken Frankfurt	EDRS* EDDF									
Westerland/Sylt	RG	EDXW	Hamburg	EDDH								xø	
Worms	RG	EDFV	Frankfurt	EDDS									
GIBRALTAR (United Kingdom)													
Gibraltar	RS	LXGB	Gibraltar	LXGB		x			x	D, E, G, H, L	x	x	
GREECE													
Alexandroupolis	RS	LGAL	Athinai	LGAT									x
Andravida	RNS AS	LGAD	Athinai	LGAT						E, L		x	x

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designation	Location indicator	Name	Location indicator	B	C	G	H	EUR		TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Athinai/Athinai	RS	LGAT	Athinai	LGAT	x	x	x	x	x	D, E, F, G, L, O, V	x	x	x
Athinai/Elefsis	AS	LGEL	Athinai	LGAT					x	E, L		x	x
Athinai/New	RS												
Iraklion	RS	LGIR	Athinai	LGAT						E, L		x	x
Kalamata	RNS	LGKL	Athinai	LGAT						E, L		x	x
Kavala	RNS	LGKV	Athinai	LGAT								x	
Keffalinia	RNS	LGKF	Athinai	LGAT									x
Kerkira	RS	LGKR	Athinai	LGAT						E, L		x	x
Khania	RNS	LGSA	Athinai	LGAT					x	E, L		x	x
Kos	RNS AS	LGKO	Athinai	LGAT					x	E, L		x	x
Limnos	RNS AS	LGLM	Athinai	LGAT						E, L		x	
Mitilini	RNS AS	LGMT	Athinai	LGAT						E, L		x	
Rodos	RS	LGRP	Athinai	LGAT					x	E, L		x	x
Samos	RNS	LGSM	Athinai	LGAT								x	
Santorini	RNS	LGSR	Athinai	LGAT									x
Thessaloniki	RS	LGTS	Athinai	LGAT					x	E, L		x	x
Zakinthos	RNS	LGZA	Athinai	LGAT									x
HUNGARY													
Budapest/Ferihegy	RS	LHBP	Budapest/Ferihegy	LHBP		x	x	x	x	D, E, F, G, H, L, O, U	x	x	x
IRELAND													
Connaught	RS	EIKN											
Cork	RS	EICK	Cork Shannon	EICK* EINN					x	E, L	x	x	
Dublin	RS	EIDW	Dublin	EIDW	x	x	x	x	x	B, C, D, E, G, H, K, L, M, O, U	x	x	x
Shannon	RS	EINN	Shannon	EINN	x	x	x	x	x	B, C, D, E, G, H, K, L, M, O, U	x	x	x
ITALY													
Albenga	RNS	LIMG	Milano/Linate	LIMM						L		x	
Alghero	RS	LIEA	Alghero	LIEA					x	E, L		x	
Ancona	RNS	LIPY	Ancona	LIPY						E, L		x	
Aosta	RG	LIMW	Milano/Linate	LIML									
Bari	RS	LIBD	Bari	LIBD						E, L		x	
Bergamo	RNS	LIME	Bergamo	LIME					x	E, L		x	
Bologna	RS	LIPE	Bologna	LIPE						E, L		x	
Bolzano	RG	LIPB	Bolzano	LIPB						L			
Brindisi	RS	LIBR	Brindisi	LIBR					x	E, L	x	x	x

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Cagliari	RS	LIEE	Cagliari	LIEE					x	E, L	x	x	
Catania	RS	LICC	Catania	LICC					x	E, L	x	x	
Crotone	RNS	LIBC	Crotone	LIBC						E, L		x	
Elba	RG	LIRJ	Pisa	LIRP								x	
Firenze	AS	LIRQ	Firenze	LIRQ						E, L		x	
Forli	RNS	LIPK	Forli	LIPK						E, G, L		x	
Genova	RS	LIMJ	Genova	LIMJ					x	E, L	x	x	x
Lamezia	RS	LICA	Lamezia	LICA						E, L		x	
Milano/Linate	RS	LIML	Milano/Linate	LIML			x		x	A, C, D, E, F, G, H, K, L, M, O, R	x	x	x
Milano/Malpensa	RS	LIMC	Milano/Malpensa	LIMC					x	E, L, S, U, V	x	x	x
Napoli	RS	LIRN	Napoli	LIRN					x	E, L	x	x	x
Olbia	RS	LIEO	Olbia	LIEO					x	E, L		x	
Palermo/Punta Raisi	RS	LICJ	Palermo/Punta Raisi	LICJ					x	E, L	x	x	x
Pantelleria	RNS	LICG	Pantelleria	LICG						L		x	
Perugia	RG	LIRZ	Perugia	LIRZ									
Pescara	RNS	LIBP	Pescara	LIBP						L		x	
Pisa	RS	LIRP	Pisa	LIRP					x	C, E, H, L	x	x	x
Reggio Calabria	RNS	LICR	Reggio Calabria	LICR						E, L		x	
Rimini	RNS	LIPR	Rimini	LIPR					x	E, L	x	x	
Roma/Ciampino	RNS	LIRA	Roma/Ciampino	LIRA					x	D, E, G, H, L, U	x	x	x
Roma/Fiumicino	RS	LIRF	Roma/Fiumicino	LIRF	x	x		x	x	A, C, D, E, F, G, H, K, L, M, O, R, S, U, V	x	x	x
Roma/Urbe	RG	LIRU	Roma/Fiumicino	LIRF						L			
Torino	RS	LIMF	Torino	LIMF				x	x	C, E, K, L, S	x	x	x
Trapani	RNS	LICT	Trapani	LICT					x	E, L		x	
Treviso/S. Angelo	RNS	LIPH	Treviso/S. Angelo	LIPH					x	E, L		x	
Trieste/Ronchi dei Legionari	RNS	LIPQ	Trieste/Ronchi dei Legionari	LIPQ					x	E, L		x	
Venezia/S. Nicolo	RG	LIPV	Venezia/Tessara	LIPZ							x		
Venezia/Tessera	RS	LIPZ	Venezia/Tessera	LIPZ					x	E, K, L	x	x	x
Verona	RNS	LIPX	Verona	LIPX					x	E, L		x	
KAZAKHSTAN													
Aktuybinsk	AS	UATT	Aktuybinsk	UATT						U	x	x	x
Alma Ata	AS	UAAA	Alma Ata	UAAA						U, Z		x	x
Chimkent	RS	UAII								U			
Dzhambul	RS	UADD								U			
Dzhezkazgan		UAKD	Dzhezkazgan	UAKD						U			
Guryev	RS	UATG								U			
Karaganda	RS	UAKK								U			
Korchetav	RS	UACK								U			

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designation	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Kustanay	RS	UAUU	Kustanay	UAUU						U			
Kzyl-Orda	RS	UAOO											
Pavlodar	RS	UASP	Pavlodar	UASP						U			
Semipalatinsk	RS	UASS	Semipalatinsk	UASS						U			
Shevchenko	RS	UATE	Shevchenko	UATE						U			
Tselinograd	RS	UACC	Tselinograd	UACC						U			
Ust-Kamengorsk	RS	UASK	Ust-Kamengorsk	UASK						U			
KYRGYZSTAN													
Bishkek/Manas	RS	UAFM	Bishkek	UAFM						U			
Osh/Osh	RS	UAFO								U			
LATVIA													
Daugavpils	RS	EVDA	Riga	EVRA					x			x	
Jekabpils	RS	EVKA	Riga	EVRA					x			x	
Jelgava	RG	EVEA	Riga	EVRA					x			x	
Liepaja	RS	EVLA	Riga	EVRA					x	E, L, U		x	
Riga	RS	EVRA	Riga	EVRA	x	x	x	x	x	C, D, E, F, G, H, K, L, O, U, V	x	x	x
Ventspils	RG	EVVA	Riga	EVRA					x			x	
LITHUANIA													
Kaunas		EYKA	Vilnius	EYVI					x	E, L, U	x	x	
Palanga		EYPA	Vilnius	EYVI					x	E, L, U	x	x	
Siauliai (Zokniai)		EYSA	Vilnius	EYVI					x		x	x	
Vilnius		EYVI	Vilnius	EYVI	x	x	x	x	x	E, L, U	x	x	x
LUXEMBOURG													
Luxembourg	RS	ELLX	Luxembourg	ELLX		x	x	x	x	B, E, K, L, U	x	x	x
MALTA													
Malta	RS	LMML	Malta	LMML		x	x		x	D, E, H, L		x	x
NETHERLANDS													
Amsterdam	RS	EHAM	Amsterdam	EHAM	x	x	x	x	x	C, D, E, G, H, K, L, M, O, P, R, S, T, U, V	x	x	x
Deventer/Teuge	RG	EHTE	Amsterdam	EHAM									
Groningen	AS	EHGG	Groningen Amsterdam	EHGG* EHAM					x	E, L	x	x	
Hilversum	RG	EHHV	Amsterdam	EHAM									
Hoogeveen	RG	EHHO	Groningen Amsterdam	EHGG* EHAM									
Lelystad	RG	EHLE	Amsterdam	EHAM									

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR		TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
Maastricht/Zuid-Limburg	RNS AS	EHBK	Maastricht Amsterdam	EHBK* EHAM					x	E, L	x	x	
Middelburg	RG	EHMZ	Rotterdam Amsterdam	EHRD* EHAM									
Rotterdam	RS	EHRD	Rotterdam Amsterdam	EHRD* EHAM					x	E, L	x	x	x
Texel	RG	EHTX	Amsterdam	EHAM									
Weert/Budel	RG	EHBD	Maastricht Amsterdam	EHBK* EHAM									
NORWAY													
Bergen	RS	ENBR	Bergen	ENBR	x			x	x	E, L	x	x	x
Bodø	RS	ENBO	Bodø	ENBO	x			x	x	E, L	x	x	x
Kirkenes	RS	ENKR	Tromso	ENVN						E		x	
Haugesund	RS	ENHD	Stavanger	ENZV						E		x	
Kristiansand	RS	ENCN	Oslo/Fornebu	ENFB	x					E			
Oslo/Fornebu	RS	ENFB	Oslo/Fornebu	ENFB	x			x	x	E, K, L, U	x	x	x
Oslo/Gardermoen	RS	ENGM	Oslo/Gardermoen	ENGM	x			x	x	E, L	x	x	x
Stavanger/Sola	RS	ENZV	Stavanger	ENZV	x			x	x	E, L	x	x	x
Svalbard	RS	ENSB	Tromsø	ENVN						E		x	
Tromsø/Lagnes	RS	ENTC	Tromsø	ENVN	x			x	x	E	x	x	
Trondheim/Vaernes	RS	ENVA	Trondheim	ENVA	x			x	x	E	x	x	x
POLAND													
Gdansk	RS	EPGD	Gdynia							E, L, U		x	x
Krakow	RS	EPKK								E, L, U			x
Poznan	AS	EPPO	Warszawa	EPWA						E, L, U		x	x
Rzeszow	AS	EPRZ											
Warszawa	RS	EPWA	Warszawa	EPWA	x	x	x	x	x	B, C, D, E, G, H, K, L, O, R, U, Z	x	x	x
PORTUGAL													
Faro	RS	LPFR	Lisboa	LPPT					x	E, G, L		x	x
Funchal	RS	LPFU	Lisboa	LPPT					x	E, G, L		x	x
Lisboa	RS	LPPT	Lisboa	LPPT	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, S, U	x	x	x
Porto	RS	LPPR	Lisboa	LPPT	x			x	x	E, L		x	x
Porto Santo	AS	LPPS	Lisboa	LPPT						E, L		x	x
REPUBLIC OF MOLDOVA													
Chisinau	RS	LUKK	Chisinau	LUKK					x	E, L, O, U	x	x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
ROMANIA													
Arad	RNS	LRAR	Arad	LRAR					x	E, L	x	x	
Bucuresti/Baneasa	RS	LRBS	Bucuresti/Baneasa	LRBS		x			x	E, L, U	x	x	
Bucuresti/Otopeni	RS	LROP	Bucuresti/Otopeni	LROP	x	x	x	x	x	C, D, E, G, H, K, L, O, U	x	x	x
Constanta	RS	LRCK	Constanta	LRCK		x			x	E, L, U	x	x	
Timisoara	RNS	LRTR	Arad	LRAR					x	E, L	x	x	
Tirgu Mures	RNS	LRTM	Bucuresti/Otopeni	LROP					x	E, L	x	x	
RUSSIAN FEDERATION													
Abakan	RS	UNAA								U			
Astrakhan	RS	URWA								U			
Bratsk/Bratsk	RS	UIBB								U			
Chelyabinsk	RS	USCC								U			
Chita	AS	UIAA	Chita	UIAA						U		x	
Grozny		URMG											
Irkustk	RS	UIII	Irkustk	UIII						R, U, V, Z	x		x
Kalinin/Migalovo	AS	UUEM	Kalinin	UUEM						U	x	x	x
Kazan	AS	UWKD											
Khabarovsk/Novy	RS	UHHH	Khabarovsk	UHHH						P, R, U	x		x
Magadan/Sokol	RS	UHMM	Magadan	UHSS									
Moskva/Sheremetyevo	RS	UUEE	Moskva/Sheremetyevo	UUEE			x	x	x	C, D, E, G, H, K, L, M	x	x	x
Novosibirsk/Tolmachevo	RS	UNNN	Novosibirsk	UNNN						R, U	x		
Petropavlovsk-Kamtchatsky	RS	UHPP	Petropavlovsk-Kamtchatsky	UHPP							x		x
Provideniya Bay	RS	UHMP	Provideniya Bay	UHMP							x		x
Sankt Peterburg/Pulkovo	RS	ULLI	Leningrad	ULLI					x	E, L, U	x	x	x
Tumen	RS	USTT											
Ulan-Ude/Muhkino	AS	UIUU	Ulan-Ude	UIUU						U			
Vladivostok/Knevichi	RS	UHWW											
Yakutsk	RS	UEEE								U			
Yekaterinburg	RS	USSS											
Yuzhnosakhalinsk	RS	UHSS	Yuzhnosakhalinsk	UHSS									
SERBIA AND MONTENEGRO													
Beograd	RS	LYBE	Beograd	LYBE			x	x	x	C, D ,E, H, L, O, U, V	x	x	x
Titograd	RNS AS	LYTI	Beograd	LYBE					x	E, L	x	x	
Tivat	RS	LYTV	Beograd	LYBE					x	E, L		x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
SLOVAKIA													
Bratislava	RS	LKIB	Bratislava	LKIB						E, L, U	x	x	x
Poprad	RS	LKTT	Poprad	LKIB						E, L, U		x	
SLOVENIA													
Ljubljana	RS	LYLJ	Zagreb	LYZA			x	x	x	C, E, L, O, U, V	x	x	
Maribor	RNS	LYMB	Zagreb	LYZA					x	E, L		x	
Portoroz	RS	LYPZ	Zagreb	LYZA					x	E, L		x	
SPAIN													
Alicante	RS	LEAL	Alicante	LEAL					x	D, E, G, L	x	x	x
Almeria	RS	LEAM	Almeria	LEAM					x	E, L		x	
Asturias	RNS	LEAS	Asturias	LEAS					x	E, L	x	x	
Barcelona	RS	LEBL	Barcelona	LEBL					x	E, K, L, U	x	x	x
Bilbao	RS	LEBB	Bilbao	LEBB					x	E, G, L	x	x	
Gerona	RS	LEGE	Barcelona	LEBL					x	E, L		x	x
Granada	RNS	LEGR	Granada	LEGR								x	x
Ibiza	RS	LEIB	Palma de Mallorca	LEPA					x	E, L	x	x	x
Jerez	RNS	LEJR	Jerez	LEJR						L			
La Coruna	RNS	LECO	Santiago	LEST						E, L		x	
Madrid/Barajas	RS	LEMD	Madrid/Barajas	LEMD	x	x			x	C, D, E, F, G, H, K, L, M, O, P, S, T, U	x	x	x
Madrid/Cuatro Vientos	RG	LEVS	Madrid/Barajas	LEMD									
Mahon	RS	LEMH	Mahon	LEMH					x	L		x	x
Malaga	RS	LEMG	Malaga	LEMG					x	E, G, L	x	x	x
Murcia/San Javier	RNS	LELC	Alicante	LEAL						L		x	
Palma de Mallorca	RS	LEPA	Palma de Mallorca	LEPA					x	E, L	x	x	x
Pamplona	RG	LEPP	Pamplona	LEPP									
Reus	RNS	LERS	Barcelona	LEBL					x	E, L		x	
Sabadell	RG	LELL	Barcelona	LEBL									
San Sebastien	RS	LESO	Bilbao	LEBB						L		x	
Santander	RNS AS	LEXJ	Santander	LEXJ						L		x	
Santiago	RS	LEST	Santiago	LEST					x	E, L	x	x	x
Sevilla	RS	LEZL	Sevilla	LEZL					x	E, G, L	x	x	x
Valencia	RS	LEVC	Valencia	LEVC					x	E, G, L	x	x	x
Vigo	RNS	LEVX	Santiago	LEST								x	
Vitoria	RS	LEVT	Vitoria	LEVT						E, L		x	x
Zaragoza	RNS	LEZG	Zaragoza	LEZG						L		x	x

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts						Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
SWEDEN													
Göteborg/Landvetter	RS	ESGG	Göteborg/Landvetter	ESGG			x		x	B, C, D, E, G, K, L	x	x	x
Göteborg/Säve	RG	ESGP	Göteborg/Landvetter	ESGG						E			
Jönköping	RS	ESGJ	Göteborg/Landvetter	ESGG						E		x	
Karlstad	RG	ESSQ	Stockholm/Arlanda	ESSA						E			
Kiruna	RS	ESNQ	Sundsvall/Härnösand	ESNN						E		x	
Malmö/Sturup	RS	ESMS	Malmö/Sturup	ESMS			x		x	D, E, G, H, L, O	x	x	x
Norrköping/Kungsängen	RS	ESSP	Stockholm/Arlanda	ESSA						E		x	
Stockholm/Arlanda	RS	ESSA	Stockholm/Arlanda	ESSA		x	x	x	x	B, C, D, E, G, H, K, L, O, U	x	x	x
Stockholm/Bromma	RG	ESSB	Stockholm/Arlanda	ESSA						E, L			
Sundsvall-Härnösand	RS	ESNN	Sundsvall-Härnösand	ESNN						E, L		x	
Umea	RS	ESNU	Sundsvall-Härnösand	ESNN						E		x	
Västeras/Hässlö	RS	ESOW	Stockholm/Arlanda	ESSA						E		x	
Växjö/Kronoberg	RS	ESMX	Malmö/Sturup	ESMS						E			
Visby	AS	ESSV	Stockholm/Arlanda	ESSA						E		x	
SWITZERLAND													
Altenrhein	RG	LSZR	Zürich	LSZH								ø+	
Ascona	RG	LSZD	Zürich	LSZH									
Bern	RS	LSZB	Zürich	LSZH					x	E, L	x	x	
Genève	RS	LSGG	Genève	LSGG	x	x	x	x	x	C, D, E, F, G, H, K, L, M, O, S, U, V	x	x	x
Grenchen	RG	LSZG	Zürich	LSZH								ø+	
La Chaux-de-Fonds	RG	LSGC	Genève	LSGG								ø+	
Lausanne	RG	LSGL	Genève	LSGG								ø+	
Locarno	RG	LSZL	Zürich	LSZH								ø+	
Lugano	RS	LSZA	Zürich	LSZH								ø+	
Neuchâtel	RG	LSGN	Genève	LSGG									
Samedan	RG	LSZS	Zürich	LSZH								ø+	
Sion	RG	LSGS	Genève	LSGG								ø+	
Zürich	RS	LSZH	Zürich	LSZH	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, P, S, U, V	x	x	x
TAJIKISTAN													
Dushanbe	AS	UTDD	Dushanbe	UTDD						O, U			x
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA													
Ohrid	RNS	LWOH	Ohrid Beograd	LWOH* LYBE					x	E, L		x	
Skopje	RS	LWSK	Beograd	LYBE					x	E, L	x	x	

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR	AFTN routing areas of destination	TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
TURKEY													
Adana/Sakirpasa	RNS	LTAF	Adana/Civil	LTAF						H, L, O		x	
Ankara/Esenboga	RS	LTAC	Ankara/Esenboga	LTAC			x		x	E, H, L, O, U, V	x	x	x
Antalya	RNS	LTAI	Antalya	LTAI					x	E, H, L, O	x	x	x
Istanbul/Atatürk #	RS	LTBA	Istanbul	LTBA		x	x	x	x	E, H, L, O, U, V	x	x	x
Izmir/Adnan Menderes	RS	LTBJ	Izmir/Cumaovasi	LTBJ						E, H, L, O	x	x	x
Mugla/Dalaman	RNS	LTBS	Mugla/Dalaman	LTBS						H, L, O	x	x	
TURKMENISTAN													
Ashkhabad	RS	UTAA	Ashkhabad	UTAA						U	x		x
Krasnovodsk	RS	UTAK								U			
Tashauz	RS	UTAT								U			
UKRAINE													
Kyiv/Borispol	RS	UKBB	Kyiv/Borispol	UKBB						E, L, U	x	x	x
Kyiv/Zhulyany	AS	UKKK	Kyiv/Zhulyany	UKKK						E, L, U	x	x	
Lvov	AS	UKLL	Lvov	UKLL						E, L, U	x	x	
Odessa/Tsentralny	RS	UKOO	Odessa/Tsentralny	UKOO						H, L, O, U	x	x	x
UNITED KINGDOM													
Aberdeen	RS	EGPD	Aberdeen	EGPD			x	x	x	E, L	x	x	x
Belfast	RS	EGAA	Belfast	EGAA					x	C, E, K, L	x	x	
Biggin Hill	RG	EGKB	London/Bracknell	EGRR					x	E, L		x	
Birmingham	RS	EGBB	Birmingham City	EGBB			x	x	x	B, C, D, E, G, K, L	x	x	x
Blackpool	RNS	EGNH	Manchester City	EGRC						E, L		x	
Bournemouth	RS	EGHH	London/Bracknell	EGRR					x	E, L		x	
Bristol	RS	EGGD	Cardiff City	EGRG					x	E, L		x	
Cardiff	RS	EGFF	Cardiff City	EGRG					x	E, L		x	
East Midlands	RS	EGNX	Birmingham City	EGBB			x	x	x	C, D, E, K, L		x	
Edinburgh	RS	EGPH	Glasgow City	EGRA			x	x	x	E, L	x	x	
Exeter	RS	EGTE	Plymouth (MET)	EGRP						E, L		x	
Glasgow	RS	EGPF	Glasgow City	EGRA			x	x	x	B, C, E, K, L	x	x	x
Guernsey	RS	EGJB	Jersey	EGJJ					x	E, L		x	
Humberside	RS	EGNJ	Leeds City	EGRY						E, L		x	
Isle of Man	RS	EGNS	Isle of Man	EGNS						E, L	x	x	
Jersey	RS	EGJJ	Jersey	EGJJ			x	x	x	E, L	x	x	
Leeds and Bradford	RS	EGNM	Leeds City	EGRY			x	x	x	E, L		x	
Liverpool	RS	EGGP	Manchester City	EGRC			x	x	x	E, L		x	x
London/Gatwick	RS	EGKK	London/Bracknell	EGRR	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, S, T	x	x	x
London/Heathrow	RS	EGLL	London/Bracknell	EGRR	x	x	x	x	x	B, C, D, E, F, G, H, K, L, M, O, P, S, T, U, V	x	x	x

Aerodrome where service is to be provided			Responsible MET office		Area(s) of coverage of charts					AFTN routing areas of destination	Forecasts to be provided		
Name	Designa-tion	Location indicator	Name	Location indicator	B	C	G	H	EUR		TR	9H	18/ 24 H
1	2	3	4	5	6					7	8	9	10
London/Stansted	RNS	EGSS	London/Bracknell	EGRR			x	x	x	B, C, D, E, K, L, O		x	x
Luton	RNS	EGGW	London/Bracknell	EGRR			x	x	x	C, D, E, G, K, L		x	
Lydd	RG	EGMD	London/Bracknell	EGRR						E, L		x	
Manchester	RS	EGCC	Manchester City	EGRC			x	x	x	B, C, D, E, G, K, L	x	x	x
Newcastle	RS	EGNT	Leeds City	EGRY			x	x	x	E, L		x	
Norwich	RS	EGSH	Norwich (MET)	EGRN					x	E, L		x	
Plymouth	RS	EGHD	Plymouth (MET)	EGRP								x	
Prestwick	RS	EGPK	Glasgow City	EGRA				x	x	B, C, E, K, L	x	x	x
Shoreham	RG	EGKA	London/Bracknell	EGRR						E, L			
Southampton	RS	EGHI	London/Bracknell	EGRR					x	E, L		x	
Southend	RS	EGMC	London/Bracknell	EGRR					x	E, L		x	
Sumburgh	RNS	EGPB	Sullom Voe (MET)/ Glasgow City	EGPB/ EGRA					x	B, E, L	x	x	
Tees-side	RS	EGNV	Leeds City	EGRY			x	x	x	E, L		x	
UZBEKISTAN													
Bukhara	RS	UTSB								U			
Fergana	RS	UTKF								U			
Karshi	RS	UTSK								U			
Nukus	RS	UTNN	Nukus	UTNN						U	x		
Samarkand/Samarkand	AS	UTSS	Samarkand	UTSS						U		x	x
Tashkent/Yuzhny	RS	UTTT	Tashkent	UTTT			x			E, O, U, V	x	x	x
Urgench	RS	UTNU								U			

ANNEX 12 - SUMMARY LIST OF RECOMMENDATIONS OF THE MET/TF

For amendment of the EUROCONTROL Principles:

(i) States shall reinforce the co-ordination between the National Authorities concerned (Civil Aviation Authority and MET Authority -when different-) and the service providers concerned (aeronautical MET service provider and Air Navigation Service Provider – when different) in order to ensure that MET costs charged to civil aviation users are justified and properly established.

(ii) States shall ensure that their aeronautical MET service provider draws a comprehensive inventory of the MET facilities and services (direct and core) and of the aeronautical MET products and functions exclusively needed to meet aeronautical requirements. Furthermore this inventory shall be supplemented by the relevant references in ICAO Annexes (especially Annex 3), Procedures for Air Navigation Services and European Air Navigation Plan as well as by the references of national regulations concerned.

(iii) Information shall be disclosed to civil aviation users at the product/function level. States shall introduce transparent cost-accounting systems as soon as practicable. When implemented, States shall ensure that detailed documentation on these cost-accounting systems (starting with the inventory) can be made available to civil aviation users relevant representatives.

(iv) A breakdown of the MET costs by 'input categories' (Staff, Operating costs, Amortisation, Interest, Other), shall be disclosed at multilateral level as an annex to the existing EUROCONTROL reporting tables.

For amendment of the EUROCONTROL Principles or Guidance:

(v) Consultations on aeronautical MET services and their related costs should be held on both long-term and short-term developments. Technical/operational aspects should be dealt with together with economic/financial aspects. Consultation with users on short-term developments of aeronautical MET should be combined with consultation on air navigation services. The minimum financial information required at such consultation meetings shall include: total MET costs of the State; total civil aviation MET costs; costs allocated to en-route and terminal navigation for both IFR and VFR flights; costs of core items and their related proportions of total MET core costs allocated to civil aviation users.

For action by the EUROCONTROL enlarged Committee for route charges:

(vi) Within the context of the comprehensive review of EUROCONTROL Guidance material, taking into account the EUROCONTROL Principles, the "FIFU Task Force" shall address, in particular, the issue of MET cost allocation between aeronautical users, i.e. between en-route and terminal navigation for both IFR and VFR traffic.

ANNEX 13 - SUMMARY CONSULTATION MEETING ON AERONAUTICAL MET COSTS AND ASSOCIATED PRC RECOMMENDATIONS

Outcome of the Performance Review Commission's consultation meeting with interested parties to consider the draft report commissioned by the PRC on Aeronautical MET costs

Tuesday 11 May 2004

1. Introduction

1.1 The seventh Performance Review Report (PRR 7) of the Performance Review Commission (PRC), which was published in April 2004, devoted a chapter to the costs of aeronautical MET products and services in Europe. This chapter was based on a special report commissioned by the PRC to be published in support of PRR 7.

1.2 At the PRR 7 consultation meeting, held on 1 March 2004, considerable interest in the subject of MET costs was shown by the participants. Accordingly, the PRC decided to hold a special consultation meeting on this report, before its finalisation and submission of associated recommendations to the Provisional Council. More than 80 participants attended the consultation meeting held on 11 May 2004, and chaired by Mr K. Williams, Chairman of the PRC.

1.3 The PRC wished to hear the views of European Institutions, airspace users, MET service providers, and their regulators. Accordingly, Mr. D. Huet (European Commission), Mr. K. Reid (EUROCONTROL), Ms. A. Laaksonen (IATA/ FINNAIR), Mr. D. Lambergeon (Météo France), Dr. E. Lorenzen (Deutscher Wetterdienst) and Mr. B. Perry (UK CAA) were invited to give briefings in support of the discussion.

2. Outcome

2.1 The meeting was conducted in a very constructive atmosphere, and several participants expressed their appreciation for the meeting. The Chairman's summary of the meeting is contained in the following paragraphs.

2.2 Representatives of the airspace users argued strongly that the discrepancies between national MET service providers shown by the report are such that the priority should be first to establish the most efficient means of providing meteorological services to users, taking account of the ample opportunities that exist for centralisation of services and economies of scale.

2.3 There was a widely shared view that a thorough review of aeronautical MET was needed, addressing what products and services are required, how they are provided as well as the quality and costs.

2.4 EUROCONTROL should be actively involved in this review. As the Single European Sky Regulations require that charges be fairly distributed (including MET costs), the European Commission should also be involved in this review.

2.5 Many participants expressed a willingness to identify and learn from best practice. The Chairman invited MET providers to take a lead in this domain. The PRC was not in a position to allocate resources in this area. Items to be considered included:

- transparent cost accounting systems producing meaningful and comparable data for airspace users in support of more effective and informed consultation meetings; and,
- the importance of governance arrangements at national level.

2.6 The meeting agreed that it was difficult to draw performance comparisons based on the data contained in the report. There would be value, therefore, in developing Europe-wide MET performance indicators (cost-effectiveness and service quality) for benchmarking purposes. There was no known European or worldwide work being done in this direction, apart from work within the ICAO ANSEP Panel. Several participants indicated willingness to contribute.

2.7 Several participants drew attention to a number of errors or out-of-date data contained in the draft report. In particular, reference was made to Appendix 11 which lists the aerodromes contained in the EUR Regional Air Navigation Plan, FASID, (DOC 7754 - Table VI-MET 1A) for which meteorological services are required. The Chairman advised that these data came via ICAO from the States themselves. He understood that ICAO was currently updating this document and that Table VI-MET 1A is therefore likely to change considerably. To this effect, a specific comment will be added in the final version to stress that the current list in Table VI-MET 1A might in some cases not reflect the present situation.

2.8 The meeting agreed that there was a need for clearer guidance material on the allocation of MET costs. Accordingly, cost-allocation rules for MET costs relating to: (i) en-route/terminal costs, (ii) core costs, (iii) IFR/VFR costs should be included in the Single European Sky implementing rules being developed.

2.9 Participants generally considered that the costs of common services (e.g. WAFC and VAAC) should be commonly funded, and not included in national cost bases (e.g. UK, France) as was presently the case.

2.10 In closing, the Chairman thanked the presenters and participants for their excellent inputs. The PRC will correct material errors in the final report and use comments received when developing its recommendations to the Provisional Council. He emphasised that the recommendations are the sole responsibility of the PRC. The summary report and slides presented at the meeting will be made available on the PRC web site http://www.eurocontrol.int/prc.

3. Follow-up action

3.1 At its meeting held the next day, in closed session, the PRC developed the following set of recommendations to be submitted, together with the final Report on Aeronautical MET Costs, to PC 20 (July 2004):

The Provisional Council is invited:

1. *to note the PRC's Report on Aeronautical Meteorology Costs and to submit it to the Permanent Commission;*

2. *to note the wide variations in the provision of European MET Services and to encourage sharing of best practice amongst the MET Providers;*

3. *to request the Director General to develop common requirements for aeronautical MET products and services, in consultation with interested parties, by July 2005;*

4. *to request the Director General to ensure that clear cost-allocation rules for MET costs relating to:*
   (i) en-route /terminal costs
   (ii) core costs
   (iii) IFR/VFR costs
   are included in the Single European Sky implementing rules being developed;

5. *to request Member States to ensure that aeronautical MET authorities actively adopt a more customer-oriented approach, including effective and regular consultation with all MET stakeholder groups;*

6. *to urge EUROCONTROL Member States:*
   - *(i) to make the most effective use of the existing national and international aeronautical MET infrastructure (e.g., World Area Forecast Centre - WAFC) and to avoid duplication without challenging any aspect of civil aviation safety; and,*
   - *(ii) to optimise the efficiency of the aeronautical MET system through increased rationalisation and automation;*

7. *to request the Director General to explore to what extent MET services and products could be employed to improve European ATM performance;*

8. *to invite the Director General to explore the common financing of joint European aeronautical MET services and products (e.g. WAFC, VAAC).*

GLOSSARY

ACC	Area Control Centre
ACE	ATM Cost-Effectiveness
AFS	Aeronautical Fixed Services
AFTN	Aeronautical fixed telecommunication network - A world-wide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics.
AIREP	Aircraft Report
AIRMET	Significant Weather Warning for flights below FL100
AIS	Aeronautical Information Services
AMDAR	WMO Aircraft Meteorological Data Reporting Programme
ANPPs	Air Navigation Plan Publications
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
APP	Approach Control Unit
ATIS	Automatic Terminal Information Service
ATKs	Available Tonne Kilometres
ATM	Air Traffic Management
ATM/CNS	Air Navigation Management/ Communications, Navigation and Surveillance
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CRCO	EUROCONTROL Central route charges office
ECMWF	European Centre for Medium-Range Weather Forecasts
ECOMET	European Cooperation in Meteorology
EPS	EUMETSAT Polar System
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FIR	Flight Information Region
Flight documentation	Written or printed documents, including charts or forms, containing meteorological information for a flight.
GDPS	WWW Global Data Processing System
GNP	Gross National Product
GOS	WWW Global Observing System
GTS	WWW Global Telecommunications System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
km	Kilometre
MET	Meteorological Services for Air Navigation
METAR	Meteorological Aerodrome Report
Meteorological authority	The authority providing or arranging for the provision of meteorological service for international air navigation on behalf of a Contracting State.
Meteorological Office	An office designated to provide meteorological service for international air navigation.
MSG	Meteosat Second Generation
MTP	Meteosat Transition Programme
MWO	Meteorological Watch Office
NMS	National Meteorological Service
OPMET	Operational Meteorological Data
PANS	Procedures for Air Navigation Services
PRC	EUROCONTROL Performance Review Commission
PRU	EUROCONTROL Performance Review Unit
RAFCs	Regional Area Forecast Centres
SADIS	Satellite Distribution System for Aeronautical Information Relating to Air Navigation
SAR	Search and Rescue Services

SARPs	ICAO Standards and Recommended Practices
SES	EC Single European Sky Regulations
SIGMET	Significant Weather Warning
SIGWX	Significant Weather Forecasts
TAF	Terminal Area Forecast
TCACs	Tropical Cyclone Advisory Centre
TWR	Traffic Controlled Tower
UIR	Upper Flight Information Region
VAACs	Volcanic Ash Advisory Centre
VFR	Visual Flight Rules
VOLMET	VOLMET broadcast**.** Provision, as appropriate, of current METAR, SPECI, TAF and SIGMET by means of continuous and repetitive voice broadcasts.
VSAT	Very Small Aperture Antenna
WAFC	World Area Forecast Centre
WAFS	World Area Forecast System
WMO	World Meteorological Organisation

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