EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

This document is issued as EATCHIP Reference Material. The contents are not mandatory. They provide information and explanation or may indicate best practice.

First Report on Air Traffic Controller Manpower Quantitative Requirements in ECAC States

HUM.ET1.ST02.1000-REP-01-01

Edition	**:**	**1.0**
Edition Date	**:**	**27/03/1998**
Status	**:**	**Released Issue**
Class	**:**	**EATCHIP**

EUROPEAN AIR TRAFFIC CONTROL HARMONISATION AND INTEGRATION PROGRAMME

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION

Document Title

First Report on Air Traffic Controller Manpower Quantitative Requirements in ECAC States

EWP DELIVERABLE REFERENCE NUMBER: HUM.ET1ST02.1000-DEL03

PROGRAMME REFERENCE INDEX	**EDITION :** 1.0
HUM.ET1.ST02.1000-REP-01-01	**EDITION DATE :** 27/03/1998

Abstract

This document reports on the Air Traffic Control Officer (ATCO) manpower quantitative requirements and expectations in the European Civil Aviation Conference (ECAC) States updated for 1993 - 1997 and perceived for 1998 - 2002.

Keywords

Air Traffic Control, Air Traffic Controller, Air Traffic Services, Delays, ECAC, Manpower, Staff planning, Staffing requirements, Training

CONTACT PERSON : C. Niesing	**TEL :** 3336	**DIVISION :** DED5/1

AUTHORS : Cees Niesing and Zvi Golany

DOCUMENT STATUS AND TYPE

STATUS		CATEGORY		CLASSIFICATION	
Working Draft	☐	Executive Task	☐	General Public	☐
Draft	☐	Specialist Task	☐	EATCHIP	☑
Proposed Issue	☐	Lower Layer Task	☑	Restricted	☐
Released Issue	☑				

ELECTRONIC BACKUP

INTERNAL REFERENCE NAME : x:/current/planning/sgami9.doc

HOST SYSTEM	MEDIA	SOFTWARE(S)
Microsoft Windows	Type : Hard disk	
	Media Identification :	

DOCUMENT APPROVAL

The following table identifies all management authorities who have successively approved the present issue of this document.

AUTHORITY	NAME AND SIGNATURE	DATE
Manpower Planning Expert DED5/1	C. NIESING	26/03/1998
Chairman EATCHIP Human Resources Team (HRT)	C. P. CLARK	26/03/1998
Senior Director Operations and EATCHIP (SDOE)	W. PHILIPP	27/03/1998

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
0.1	15/07/1997	Original Version	All
0.2	01/08/1997	Working Draft	All
0.3	01/09/1997	Working Draft for Study Group consideration	All
0.4	18/02/1998	Proposed Issue	All
1.0	27/03/1998	Released Issue	All

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This document is a first report on Air Traffic Controller (ATCO) Manpower Quantitative Requirements in the European Civil Aviation Conference (ECAC) States; it continues the work started by the Select Group for Assessing Manpower Issues (SGAMI) in December 1992.

The document provides information on ATCO requirements and expectations for the period 1998 to 2002 and evaluates ATCO requirements and expectations for the period 1993 to 1997.

Chapter 1, “Introduction” gives the background, the scope and purpose of the document. The work method used is also described.

Chapter 2, “Analysis of Manpower Data for the Period 1993 - 1997” is based on the planning data gathered in 1993, and on adjusted data gathered in 1997. Analyses are made regarding the accuracy of the data, the relationship between traffic handled and numbers of controllers, and the connection between traffic delays and controller shortages or surpluses.

Chapter 3, “ATCO Manpower Assessment for the Period 1998 - 2002” gives the expected shortages or surpluses in percentages. A comparison is made between the future figures and the past prediction.

Chapter 4, “Training” gives the pass rate in *ab initio* training for the period 1 January 1992 to 30 June 1993.

Chapter 5, “Planning” provides information on the Manpower Planning (MP) process with reference to published and forthcoming European Air Traffic Control Harmonisation and Integration Programme (EATCHIP) deliverables within the European Organisation for the Safety of Air Navigation (EUROCONTROL).

Chapter 6, “Conclusions” summarises the results and gives conclusions.

Annex A, “Data Collection Questionnaire” presents the questionnaire as dispatched to the ECAC States in March 1997.

Annex B, “Telephone Interview” shows the schedule used in the telephone interview.

Further Annexes contain references, glossary, a list of abbreviations and acronyms used and a list of contributors.

Intentionally left blank

1. INTRODUCTION

This document forms part of the Human Resources (HUM) Business Plan contained within the EATCHIP Work Programme (EWP), (EATCHIP, 1996a) under Specialist Task (ST) ST02.1000, 'Database on ATCO Manpower Quantitative Requirements'.

1.1 Background

In March 1992, the Directors General of ECAC Member States presented a working paper to the 3rd Meeting of ECAC Ministers held in London. Among the subjects discussed in the paper was an item on Human Resources, which the Ministers considered and, in recognising the importance of what had been written and discussed, "....commissioned a report to be prepared, in consultation with EUROCONTROL, on the Air Traffic Control (ATC) personnel that will be needed to implement the remaining phases of the en route strategy, and also the scope for making the best use of scarce available Human Resources" (EATCHIP, 1993).

To that effect, the SGAMI was created at the 7th Meeting of the EATCHIP Project Board in November 1992.

The Group started its work in December 1992 and submitted its report (EATCHIP, 1993) to the 9th Meeting of the EATCHIP Project Board held in Brussels on 15 July 1993. That report, *inter alia,* suggested that regular surveys should be conducted to assess manpower availability in ECAC States.

1.2 Scope and Purpose

The present report gives an update of the information provided in the SGAMI report. It is a first report, and regular updates are intended to follow, reassessing the findings on the ATCO shortages / surpluses as initially reported in 1993, based on an update of the ATCO requirement and expectation figures for the period 1993 - 1997, and providing a preview on the predicted ATCO figures for the period 1998 - 2002.

For reasons of confidentiality, the data contained in this report is non-specific; only percentages in a specific grouping are reported.

The Manpower Planning Study Group (MPSG) established by the Human Resources Team (HRT) in its 8th meeting decided that the detailed information on a single State basis should be included in a separate document. The percentages for the individual States are contained in a separate document to be restrictively distributed to Manpower Planners in Air Traffic Services (ATS) organisations in ECAC States only (EATCHIP, 1998a).

1.3 Work Method

A follow-up questionnaire was designed to collect data on controller quantitative manpower requirements and expectations:

- to update planning figures for the period 1993 - 1997;
- to collect planned (or projected) figures for the period 1998 - 2002.

In addition, some information was requested on *ab initio* trainee intakes. Only those candidates who had, due to the time given, a realistic chance of going through all stages of training were included in the calculation of the pass rate, even if they failed at some stage during their training and had to be re-coursed. Therefore, only intakes between 1 January 1992 and 30 June 1993 were considered.

The follow-up questionnaire (see Annex A) was dispatched to all ECAC States in March 1997. The final deadline for replies was 31 July 1997.

Out of 34 States, 28 replied, meeting the deadline. The others were not included. The EUROCONTROL Maastricht Upper Area Control Centre (UAC) is referred to as 'Maastricht UAC'.

During July 1997, telephone interviews were conducted among selected States to gather additional details and background information regarding their situation. The standardised interview report form is reproduced in Annex B.

1.3.1 Data Analysis

The analysis of the figures is based upon one aspect of the applied research method in MP. This aspect of the method calls for the data to be transformed into meaningful information by posing questions relevant to certain objectives of the MP system. The questions addressed in this report are:

1. Were MP systems capable of accurately grasping the planned manpower requirements on time?
2. What were the expected shortages or surpluses in 1993?
3. What was the accuracy of predictions between 1993 - 1997?
4. What were the real shortages or surpluses in the period 1993 - 1997?
5. Is there a relationship between the number of Instrument Flight Rules (IFR) flights handled and the number of ATCOs employed?
6. Is there a relationship between delays and the number of ATCOs employed?
7. Are ATS organisations at present understaffed or overstaffed?

8. Based on past performance of MP - what are the expectations for the next five years?

9. What was the pass rate in training?

1.3.2 Derivation of Conclusions

These questions have been carefully prepared in such a way that appropriate statistical analysis of the data gave answers to the questions.

Generally, reports arising from this applied research method can lead to suggestions for modifications to MP systems, because differences between two sets of data would lead to questions as to the reasons for the differences, which might lead onto the identification of potential improvements.

The differences that are found to significantly affect decisions related to MP would be highlighted, along with recommendations for further action.

This report could have asked other questions which, by using the applied research method, might be transformed into answers affecting the formal decision-making “utility figure” which could lead to improved MP systems. However, a cost-benefit analysis of the potential gain achievable by such improvements should be completed before full implementation.

This relates to the principal question whether one should plan for a staff shortage (within certain limits), plan to cover the requirement exactly or plan an overcoverage of staff (also within certain limits). This question is addressed in depth in EATCHIP (1998b).

Information bearing on the relative efficiencies of each State compared to a multi-State average standard could be illuminated. However, one has to take into account that it may be misleading to use one European average when very large differences in traffic volumes appear between States.

Therefore this report adopted the approach of presenting statistics (average, standard deviation) for each relevant question in a group of States (see Table 1 for the States in a group) with reference to three baselines:

- **Group 1**: States with a high number of annual IFR flights (>900,000);
- **Group 2**: States with a medium number of annual IFR flights (500,000-900,000);
- **Group 3**: States with a low number of annual IFR flights (<500,000).

It should be noted, however, that a relationship between the number of controllers and the number of IFR flights is not the only one that is relevant.

Safety, as a result of technical systems, procedures, work organisation and delays all play an important part in relation to the number of controllers - as do political and regional peculiarities.

However, there is not enough data currently available to investigate the relationships these factors might have with the number of ATCOs needed.

Table 1 shows the 1996 IFR flights recorded per State. 1996 was the latest year where comprehensive statistics were available. This data was originally recorded in an area called “EURO/96” (Vandenberghe and Nicolas, 1997) and represent a total of 6.161.000 IFR flights, which covers most of the States included in this report.

Table 1: Annual number of IFR flights in 1996 (in thousands)

Reporting State	Annual Number of IFR flights (in 000's)
Germany	2071
France	2033
United Kingdom	1680
Italy	920
Spain (Incl. Canary Islands)	965
Maastricht UAC	932
Switzerland	853
Belgium/Luxembourg	773
Austria	687
Netherlands	627
Sweden	567
Denmark	538
Norway	437
Hungary	433
Turkey	386
Ireland	373
Greece	355
Portugal (Lisboa & Santa Maria FIR[1])	309
Czech Republic	223
Finland	170
Cyprus	166
Slovak Republic	116
Latvia	90
Slovenia	58
Malta	38
Bulgaria	n/a
Croatia	n/a
Estonia	n/a
Iceland	n/a
Lithuania	n/a
Monaco	n/a
Poland	n/a
Romania	n/a

[1] Flight Information Region (FIR)

Intentionally left blank

2. ANALYSIS OF MANPOWER DATA FOR THE PERIOD 1993 - 1997

Although the SGAMI follow-up questionnaire (please refer to Annex A) permitted States to respond for 1992, 1993, 1994, 1995 1996 and 1997, there was only sketchy data made available to EUROCONTROL for 1992. Accordingly, the more solidly reported data subset between 1993 and 1997 has been used as the basis to proceed.

In question 2 (Q2), States were asked to **update** the figures for **required staff** for the period. In Q3, they were asked to report the **expected** and **actual** staff figures for the period.

An exact match of these figures may imply retroactive or post hoc figure-fitting. However, this may not be the case and a perfect prediction may have occurred at the time, although this is considered highly unlikely. Between 1994 and 1997 the figures have shown variations between the requirement and actual, largely depending on the moment when they were updated, showing the dynamic nature of a complex planning process.

In three States, the figures entered under Q3 as the **actual** figures for 1993 - 1997 and the figures entered for Q2 (updates) for the past **planned** manpower requirements were exactly the same.

In one State, the **expected** manpower requirement figures (as reported in the SGAMI report) were exactly the same as the **actual** figures reported for the period in review (1993 - 1997).

2.1 Accuracy of Establishing Manpower Requirements

Q1. Were MP systems capable of accurately grasping the planned manpower requirements on time?

A comparison of the **planned** figures (manpower requirements as reported to the SGAMI survey) and the **updated** planned figures (in the current survey) indicates the differential effective understanding of planned manpower requirements.

In summary, five States had no need to amend their previous planned figures, four States had fairly accurate previous planned figures, ten States needed to revise their figures downwards (decrease) and five States needed to revise their figures upwards (increase).

Note: In addition to the statistical average or mean, the Standard Deviation (SD) is reported. The standard deviation is the deviation of scores from the group mean, in other words, it indicates the bandwidth in which the individual percentages can be found. A small SD indicates that the individual scores from States in this group were close to each other, whereas a big SD indicates the opposite.

The reasons for these differences could be manifold. Sub-chapter 2.7 presents some of the reasons that might explain the differences found.

The **Overall** average change (across all States) on requirements was	**- 4.87%**	SD = 14.49
For **Group 1**, the average change on requirements was	**- 0.44%**	SD = 4.79
For **Group 2**, the average change on requirements was	**+ 0.94%**	SD = 7.93
For **Group 3**, the average change on requirements was	**- 9.84%**	SD = 18.3

2.2 Future Shortages or Surpluses as Expected in 1993

Q2. What were the expected shortages or surpluses in 1993?

A comparison of the **planned** figures and the **expected** figures (as reported in the SGAMI survey in 1993) is given in the following. It gives the expected shortage for the period 1993 - 1997.

This may also establish a **first** baseline of expected shortages or surpluses for the period 1998 - 2002 reported in Chapter 3.

The **overall** average expected shortage between 1993 - 1997, **as expected in 1993**, was (across all States)	**- 7.58%**	SD = 13.27
For **Group 1**, the average expected shortage was	**- 3.80%**	SD = 5.38
For **Group 2**, the average expected shortage was	**- 3.80%**	SD = 7.42
For **Group 3**, the average expected shortage was	**- 11.09%**	SD = 16.62

2.3 Accuracy of Prediction in the Period 1993 - 1997

Q3. What was the accuracy of prediction in the period 1993 - 1997?

A comparison of the **expected** figures (as reported in the SGAMI survey in 1993) and the **actual** figures (as reported in the current survey) may indicate the ability of manpower systems to accurately predict shortages or surpluses.

This may also establish a **second** baseline with regard to the expected shortages or surpluses for the period 1998 - 2002 reported in Chapter 3.

The **Overall** average underestimation in the expected number of ATCOs, which resulted in shortages between 1993 - 1997 (across all States) was	**- 3.13%**	SD = 10.1
For **Group 1**, the average overestimation between 1993 - 1997 was	**+ 0.46%**	SD = 5.54
For **Group 2**, the average overestimation between 1993 - 1997 was	**+ 1.74%**	SD = 6.69
for **Group 3**, the average underestimation between 1993 - 1997 was	**- 7.35%**	SD = 11.49

An excessive overestimation of expected number of ATCOs is of course expensive, but might have good grounds. The same and / or other reasons however, could explain the outcome of a less than sufficient number of expected ATCOs against the estimated required number (see Sub-chapter 2.7 for an overview).

Eight States managed to accurately predict the number of expected ATCOs by a period of one year and seven States managed to accurately predict the number of expected ATCOs by a period of three years, which may be reflecting their training cycles. Usually such variations in prediction accuracy tend to cause an increase for expectation in the fourth or fifth year. However, two States managed to remain accurate to around one percent during the whole period between 1993 and 1997.

2.4 Real Shortages or Surpluses in the Period 1993 - 1997

Q4. What were the real shortages or surpluses in the period 1993 - 1997?

A comparison of the **past planned** figures (as reported in the SGAMI survey in 1993) and the **actual** figures (as reported in the current survey) may indicate the real shortage or surplus in comparison to that expected.

The reason for using the requirements as established in 1993 for the forthcoming period 1993 - 1997 is, that ideally a manpower plan should be able to predict as accurately as possible five years ahead.

This may also establish a **third** baseline with regard to the **expected** shortages or surpluses for the period 1998 - 2002, as reported in Chapter 3.

Since the updated requirements, as stated in the current survey, are post hoc, they could obscure the results and are therefore not used to calculate the real shortage or surplus.

The **Overall** average real shortage of ATCOs between 1993 - 1997 (across all States) was	**- 8.91%**	SD = 15.87
For **Group 1**, the average real shortage between 1993 - 1997 was	**- 3.70%**	SD = 4.55
For **Group 2**, the average real shortage between 1993 - 1997 was	**- 3.17%**	SD = 7.79
For **Group 3**, the average real shortage between 1993 - 1997 was	**- 14.2%**	SD = 20.07

If, as an example, a range of -4.5% to +5.5% is considered to be a reasonable limit of variation in prediction allowing effective operation, only six States fall within this range in 1997 - two of them belonging to Group 1.

By showing quite a variance in under- and overestimation, this clearly indicates the difficulties in planning ahead over a five year period.

2.5 Relationship Between Traffic Handled and Number of Controllers

Q5. Is there a relationship between the number of IFR flights handled and the number of ATCOs employed?

To establish this relationship, the correlation between the number of ATCOs in **1995 / 1996** and the number of annual IFR flights in **1995 / 1996** was calculated. It shows, as expected, almost the largest possible value one can obtain in a correlation.

A similarly large correlation was also established between the number of controllers planned in the years **1997 / 1998** and the predicted number of IFR flights for those same two years.

This means that in both cases, a strong relationship exists between the number of flights and the number of controllers employed. This relationship holds for all three levels of predicted traffic:

- low,
- baseline,
- high increase.

Although non-IFR flights and other factors are not taken into account, this high degree of correlation may reflect the re-sectorisation practices employed to keep up with the ever increasing level of air traffic.

Assuming further re-sectorisation is not possible, and airspace capacity increases continue to be demanded in the future, one might reasonably expect that even by advancing technology (or similar strategies), without increasing the number of controllers, there might be a weakening of the correlation figure.

On the other hand, the number of controllers is also related to a number of other factors - such as the number of hours per watch, Visual Flight Rules (VFR) or military air traffic (or other non-IFR), type of operation, complexity of sectors, etc.

A note of caution must therefore be made to avoid misinterpretation of the relationship between IFR traffic and the number of controllers (with regard to the workload of ATCOs). Reference is also made to the earlier comments in Sub-chapter 1.3.2 concerning the relationship that external factors may have with the number of ATCOs needed.

The only clear point at this moment in time is that the number of IFR flights and the number of controllers is not the only relationship to be considered in this complex equation.

2.6 Relationship Between Traffic Delays and Controller Shortages (or Surpluses)

Q6. Is there a relationship between delays and the number of ATCOs employed?

At present, a computation of correlation is difficult due to the small number of States where data on delays is available. No results can therefore be given in this report. However, this situation will change in the future when more data on delays becomes available.

The relationship is not easy to test because Air Traffic Flow Management (ATFM) delays are not necessarily a good gauge of the influence exerted by a shortage or surplus of ATCOs.

Technical failures, bad weather conditions, industrial actions of other personnel all exert some influence over delays.

Another feature to consider is the capacity of the infrastructure in relation to the amount of traffic it is handling. In some States, the infrastructure is constantly improving in an attempt to keep up with increasing traffic demands (this mechanism is comparable to car traffic jams on workdays at certain hours, a situation to which everybody is familiar with[2]) and in other States, a complete renovation programme is being employed to provide some extra capacity against the projected traffic in future years (inflation-proofing).

2.6.1 Current Findings on Delays

The volume of traffic and its relation to delays in so far as en route traffic is concerned, should be examined in terms of the smallest possible unit. That unit is the sector, because at least part of the overall delay figure may well emanate from difficulties being experienced in just one or two specific control sectors.

Although further investigation has to be carried out on this subject, it seems that a shortage of ATCOs, when within reasonable limits, do not have much bearing on traffic delays.

The major findings of a recent study (Dalichampt et al., 1997) on capacity shortfalls in Europe were as follows:

- Airports are the major bottlenecks in Europe. In 1996, they were responsible for almost 70% of the delays.
- En route delays are more sensitive to capacity shortfalls than airport delays. En route delays could overtake the airport delays in 5 - 10 years.
- The Central Flow Management Unit (CFMU) covers (manages) approximately 65% of the total delays, 100% of the en route delays and less than 50% of the airport delays throughout Europe.
- The network effects are low in 1996 conditions (average interference is significantly smaller than 10%) but could become a significant factor in the future if delays increase.
- In Europe, the overall European Air Traffic Management System (EATMS) is currently working at non-optimised operating points. A European common investment strategy operating at optimum capacity / demand ratios and minimum Air Traffic Management (ATM) costs has the potential to reduce the total European ATM costs by some 400m ECU per year.

[2] For the Netherlands, an expense of 1.6 billion Dutch Guilders (= 718m European Currency Unit (ECU)) caused by traffic jams in 1996 was calculated by the *Nederlands Instituut voor Economische Argumentatie* (NEA) (for the Dutch Ministry of Transport and Waterstate).

- Delay reduction can be achieved at lower European en route ATM costs.
- Minimum ATM costs can be expected at very low delays (probably less than 40% of the 1996 delay).

2.7 Reasons for Under- or Overstaffing of ATS Organisations

Q7. Are ATS organisations at present understaffed or overstaffed?

A comparison (for any State) between the percentage of the number of annual IFR flights in 1996 and the percentage of the number of ATCOs actually available may serve as a first indicator to either understaffing or overstaffing in an ATS organisation.

Tabulation of IFR flights (in descending order) in 1996 for each State against the number of controllers (in 1996) indicates that eight States are overstaffed with ATCOs - of those, four are in Group 1.

Of course, this comparison is very simplistic since data on traffic other than IFR is not available and in some States military traffic (which is not covered in this report) is controlled by civilian ATCOs. As mentioned previously, there are other (sometimes complex) relationships that need to be taken into account when trying to arrive at a final figure - as outlined in the following.

There may be good reasons for overstaffing in anticipating some forthcoming changes, whereas other occurrences may cause an understaffing. The following factors were given by the States in the follow-up questionnaire (see Annex A) and during a telephone interview (see Annex B) in considering their anticipated manpower needs:

- high increase in traffic in the coming year based on average traffic growth;
- new Air Traffic Control Centres (ACCs) becoming operational soon;
- a surplus of ATCOs in anticipation of a retirement wave (and therefore a net outflow of ATCOs from the ATS organisation as they retire);
- insurance against reduction of personnel due to loss of licence, additional training requirements and On-the-Job Training (OJT) failures;
- qualified ATCOs being employed outside the Operations Room (OPSroom) on other duties / posts / projects;
- introduction of new shift systems;
- integration of military ATCOs into the civil ATS;
- a change in retirement law;
- restructuring of airspace and / or planned sectors;

- implementing automation and / or new advanced simulators in training centres;
- agreements with unions;
- budgetary reasons;
- overtime policy to cover lack of staff;
- changes in Human Resources Management (HRM) regulations;
- changes in the structure of *ab initio* courses.

3. ATCO MANPOWER ASSESSMENT FOR THE PERIOD 1998 - 2002

Q8. Based on past performance of manpower planning - what are the expectations for the next five years?

A comparison of the **required** figures and the **expected** figures as reported in the current survey for the period 1998 - 2002 gives a preview of the expected manpower shortage in the foreseeable future. These figures are provided in Table 2 under the column heading 'Forecast 1998 - 2002'.

As was mentioned in Chapter 2, three baselines can be established in order to serve as a reference in reading these future expectations for 1998 - 2002. Sub-chapter 2.2 provided the results of a comparison of **planned** figures and **expected** figures (as reported in the 1993 SGAMI survey) giving the expected shortage for the period 1993 - 1997. These figures are included in Table 2 under the column heading 'Forecast 1993 - 1997'.

Sub-chapter 2.3 gave the results of a comparison between **expected** figures as reported in the 1993 SGAMI survey (for the period 1993 - 1997) and the **actual** figures for the same period (as they were reported in the current survey). These figures, which were described in Sub-chapter 2.3 in terms of under- and overestimations are included in Table 2 under the column heading 'Under/Over Estimations 1993 - 1997'.

In addition, Sub-chapter 2.4 gave the results of a comparison between **planned** figures as reported in the 1993 SGAMI survey (for the period 1993 - 1997) and the **actual** figures for the same period (as they were reported in the current survey). These figures are also included in Table 2 under the column heading 'Real Shortage 1993 - 1997'.

Table 2: Manpower requirements and expectations

State Groups	Forecast 1998 - 2002	Forecast 1993 - 1997	Under/Over Estimations 1993 - 1997	Real Shortage 1993 - 1997
Overall	**- 3.52%** (SD = 6.71)	**- 7.58%** (SD = 13.27)	**- 3.13%** (SD = 10.1)	**- 8.91%** (SD = 15.87)
Group 1	**- 2.41%** (SD = 6.16)	**- 3.80%** (SD = 5.38)	**+ 0.46%** (SD = 5.54)	**- 3.70%** (SD = 4.55)
Group 2	**- 2.04%** (SD = 3.34)	**- 3.80%** (SD = 7.42)	**+ 1.74%** (SD = 6.69)	**- 3.17%** (SD = 7.79)
Group 3	**- 4.61%** (SD = 7.75)	**- 11.09%** (SD = 16.62)	**- 7.35%** (SD = 11.49)	**- 14.2%** (SD = 20.07)

In some States the **planned** (forecasted) manpower requirements were actually too high and in others the **expected** figures were too low (pessimistic).

In other words, in order to have an optimal balancing of the MP, one must not only use the **planned** figures but also the **expectations** - which should be based on realistic assumptions.

The forecast for the future (1998 - 2002) shows (in comparison to the forecast for 1993 - 1997) more moderate figures and an overall decrease in the range of the figures (see Table 2, 'Forecast 1998 - 2002' column, SD figures).

In the SGAMI report it was noted that this type of data could be interpreted to give three major contrasting hypotheses:

1. They are a realistic estimation of the manpower situation.

2. An accurate estimation is almost impossible for more than 2 or 3 years hence due to a variety of unpredictable factors influencing the number of ATCOs.

3. The data show "wishful thinking" rather than a realistic estimation.

From the data presented in Table 2, a fourth hypothesis may be added to the three above as follows:

4. The data presented forms a deliberately pessimistic estimation of the manpower situation.

Analysis of the figures given in the past (as now updated), gives rise to the conclusion that the overall planning process receives proper attention.

As the past figures may have been any mixture of the four hypotheses given above, the expected output of *ab initio* training courses could be disappointing if realistic attrition rates are not taken into account. This tends to leave the hypotheses unanswered and the current figures for the future may therefore represent a mixture of those four hypotheses as well.

Seeing that important decisions such as starting or continuing *ab initio* training depends heavily - if not totally - on these figures, there is clearly an urgent requirement for improved accuracy in this field.

4. TRAINING

Q9. What was the pass rate in training?

One measure of the effectiveness of a MP system is the ratio of personnel who enter the training system (intake) against those who achieve a final qualification (output). By themselves such ratios will not indicate how to optimise the system. Any attempt at optimisation needs to be exercised with care due to the effects of change (in selection methods, training scenarios and OJT procedures), with the notion that some effects will have an impact (and therefore can only be measured) after some (lengthy) period of time.

Table 3 presents some results of *ab initio* training. Only those *ab initio* trainees who had a realistic chance of completing all stages of training in the period under consideration (due to the time allowed in their training programme) were included in the calculation of the pass rate.

This should also accommodate those trainees that might have failed at some stage during their training and were re-coursed. Therefore, only intakes between 1 January 1992 and 30 June 1993 were considered.

Table 3: Training pass rates, 1 January 1992 to 30 June 1993

Training Pass Rate	Number of States
0% - 9.99%	2
10.00% - 19.99%	0
20.00% - 29.99%	1
30.00% - 39.99%	3
40.00% - 49.99%	0
50.00% - 59.99%	2
60.00% - 69.99%	4
70.00% - 79.99%	3
80.00% - 89.99%	1
90.00% - 99.99%	4
100%	7
Total	27[3]

In reading Table 3 it must be borne in mind that different selection policies have been adopted in different States with regard to the approaches to be followed. Several States, for example, do not follow *ab initio* schemes, but different approaches.

[3] From the 28 replies, which are mentioned in Sub-chapter 1.3, three had no intakes of *ab initio* training between 1 January 1992 and 30 June 1993. However, two additional replies gave data only concerning the training question but not for the other questions, which explains the total of 27.

A differential analysis of the results obtained produced the following results:

The **Overall** (across all States) average pass rate in training was	**69.7%**
For **Group 1**, the average pass rate in training was around	**74%**
For **Group 2**, the average pass rate in training was around	**52%**
For **Group 3**, the average pass rate in training was around	**75%**

The pass rates of *ab initio* trainee intakes for the period under consideration is 90% or above for eleven States. Sixteen States have lower pass rates.

Both this figure and the overall result of close to 70% pass rate in training is very much in line with the results obtained from a 1995 survey, which reported on an earlier time period and referred to previous trainee groups, other than those included in the current survey (see EATCHIP, 1996b).

It should also be mentioned that it will probably be more difficult for States with low success rates in training to fulfil higher levels of need for ATCOs due to limited training capacity. The problem is then further compounded by the natural attrition rate of the trainees. In this context, see also EATCHIP (1998b).

5. PLANNING

Shortages (or surpluses) of ATCOs might occur because of deficiencies in the planning process - or be caused by reasons beyond the manpower planners control. For example, the start-up of new projects involving ATCOs without informing the MP department, more retirements due to medical reasons than foreseen etc. A closer examination of the special characteristics surrounding the planning process would therefore be very beneficial.

Constant change is the main characteristic of the planning process. It must be understood that planning figures entered in business plans or five-year forecasts may already be imprecise because of changes that have occurred in even the short period of time since that plan was first written.

A permanent information flow on ‘what’s going on’ in the ATS organisation on all levels is of paramount importance to the MP in order to fully assess the likely consequences of a decision on the manpower figures.

The planning of Human Resources is concerned with the flow of people into, through and out of an organisation. The objectives and policies addressing this flow should be formulated at a strategic level. Some of the objectives and policies to be adopted were addressed earlier in EATCHIP (1996c). One of the conclusions in EATCHIP (1996d) was, that a plan must contain all the dynamic factors covering this flow on a short, medium and long term basis.

It remains to be seen, for example, how far the reported shortages are real shortages in terms of operational ATCOs, and are not including shortages (or perceived shortages) for functions conducted outside the OPSroom, that are normally fulfilled by ATCOs.

It is therefore desirable to move towards a common presentation of ATCO MP to achieve a consistent and unambiguous picture of the ECAC ATCO manpower requirements and expectations. In the framework of EATCHIP (1998d), such a common MP sheet will be worked out in more detail.

Intentionally left blank

6. CONCLUSIONS

The data gathered through the 1997 questionnaire gives some insight into the planning processes of the ECAC States. Nevertheless, it should be borne in mind that this data, like the data collected by SGAMI, are only snapshots of a certain moment in time. In themselves, the figures show quite a differentiation in the prediction of shortages or surpluses and may only be useful in indicating a trend.

If, as an example, a range of -4.5% to +5.5% is considered to be a reasonable limit of variation in prediction allowing an effective operation, only six States fall within this range in 1997, two of them belonging to Group 1.

The MP systems of four States were found to be very solid in predicting requirements within an average deviation margin of less than 1%.

This success appears to be connected to the ability to review current requirements and assess a future time frame in terms of technical development, traffic development and related personnel needs. These factors, together with a perfect match between newly qualified staff coming into the organisation to replace staff leaving the organisation, (for example due to retirement), give a reliable picture of staff requirements and expectations for the future time frame under consideration.

It is sensible, therefore, to use the MP Systems of the States with the best performance as paradigms for the development of Best Practices in MP.

However, certain factors can disturb this somewhat idealistic picture as outlined in the following Sub-chapter.

6.1 Factors in Manpower Planning

6.1.1 *Ab Initio* Training

If the perceived number of *ab initio* trainees reaching full qualification at the end of the training programme is not met, difficulties arise in replacing outgoing staff, e.g. those retiring. It is therefore important to select trainees in such a way that the highest possible outcome may be expected. Indeed, training places occupied by trainees who fail during the course of training cannot be recovered and are consequently lost.

6.1.2 Current Controller Training

During the inquiry by telephone it was noted that an increased need exists to train the current ATCO workforce in how to cope with new developments.

Unfortunately, the training capacity for these clearly identified needs appears to be insufficient. Current training tends to be more focused on *ab initio*

trainee controllers. Even when there is sufficient physical training capacity, it may not always be possible for staff to be scheduled to provide this training because both the trainer and the staff member have to be relieved of their live ATCO workload first.

Training capacity - be it for *ab initio* trainees or qualified controllers - is a potential bottleneck, both for the anticipated influx of new controllers and the retraining of current ATCOs. In this context, the ageing of controllers should be addressed.

According to Brehmer (1996), there are indications that by the time age exceeds about 30 years, some people are already experiencing difficulty in adapting to increasingly automated systems. This may indicate that either additional training time is needed by those so affected and / or a certain loss of ATCO capacity has to be taken into account when considering MP.

6.1.3 Future Uncertainty

Changes to future concepts and the implication of uncertainty in terms of personnel requirements is a major contributor to imbalance within MP. Better coordination between technical developers and MP staff could overcome this.

6.1.4 Controller Involvement in Planning and Decision-making

Further to the SGAMI findings, it is again noted that ATCOs in general, feel dissatisfied with management and the way they are valued as professionals.

Their influence in the development of future systems is perceived to be either nil or very minimal.

It should be borne in mind that ATCOs are committed and identify strongly with their profession rather than their organisation. They tend to be proud of the work they do and would not normally allow their work to be affected by the relationship they have with the local management. It is often felt that “relations with management could be better”.

Nevertheless, management should pursue good relations as it is obvious that overstretched motivational factors may have a negative impact on the overall capacity figure.

In the relationship between managers and ATCOs, confidence building needs to be an ongoing process. ATCOs and other staff are increasingly involved in new developments and teamwork practice is becoming more common as more staff become involved in the wider business of ATS.

The core task of an ATCO is to deliver ATS from the working position. Next to this, *ab initio* trainees are trained by ATCOs in the OJT programme.

In addition, controllers are often requested to get involved in all kinds of other activities such as *ab initio* training itself, participation in working groups or simulations, where their professional experience is needed.

It is therefore necessary that the ATCOs workload outside the OPSroom is accurately assessed and fully taken into account for the purposes of MP.

6.1.5 Organisation of Working Time

The way in which the ATCOs work is organised is important in terms of optimal workforce efficiency - whether it be achieved by team rosters, individual rosters or a hybrid of both. Time leaking away by overlapping duties, for example, is time that simply cannot be recovered.

The European Union (EU) Council Directive (1993) concerning certain aspects of the organisation of working time, translated into national law by most of the EU Member States, places restrictions on the organisation of working time. These restrictions constrain the scheduling process to provide cover for continuous working over 24 hours a day, 7 days a week.

For example, constraints are imposed by the statutory number of working hours per week because the operational time during which ATCOs are needed can never match this statutory figure.

Practice shows that in a normal control environment, a working week of 32 to 34 hours, including break times, can be achieved.

Use of automated scheduling and time management systems could, to a certain extent, increase the efficiency of the available workforce as all absences from the working position would be recorded, including the reasons for them. With the complement of ATCOs present, it then becomes a matter of managing those absences. The necessary and justifiable overhead in staff should be established in relation to the balancing of this (otherwise lost) time.

6.1.6 Manpower Planning Figures

As mentioned in the last paragraph of Chapter 5, a more detailed representation of MP figures may improve the relationship between expected shortages (or surpluses) of ATCOs and the expected demands of air traffic.

Further work is needed (and will be carried out within EATCHIP) to help States develop an enhanced planning process which will take into account these (and other) relevant planning factors.

The data in this report clearly indicates the need for (and the benefits to be derived from), enhanced MP. In this respect it could be beneficial to pay attention to work which is going on in other industrial sectors and / or services, which is addressing models for MP. This could all contribute to better views and / or means of improving MP.

Intentionally left blank

ANNEX A: DATA COLLECTION QUESTIONNAIRE

Data Collection in Regard to Controller Quantitative Manpower Requirements and Expectations in ECAC States

- SGAMI Follow-Up / EATCHIP -

1. In your organisation who can be contacted for further inquiries and / or updates?

Name : .....

Directorate / Department : .....

Full address : .....

Telephone : .....
Fax : .....
E-mail address : .....

2. Past Manpower Requirements

Past Manpower Requirements: This is the total number of appropriately qualified Air Traffic Controllers your organisation **planned** to man all operational positions in order to fulfil the operational requirements (e.g. traffic demand) in that year. *Note: There are several means to calculate these figures. However you should give the figures as you have calculated them according to your method. Please indicate, if possible, the date, if the date at which these figures in the years given were established is not 31 December.*

The figures hereafter have been provided by your Organisation in reply to the questionnaire of 1993 of the Select Group for Assessing Manpower Issues (SGAMI).

Year end	1992	1993	1994	1995	1996	1997
Requirement						

However, due to its nature, the figures above have probably been updated in the course of the years. Please give the updates in the boxes below.

Year end	1992	1993	1994	1995	1996	1997
Updates						

3. Past Manpower Expectations.

Past Manpower Expectations: This is the total number of appropriately qualified Air traffic Controllers your organisation **expected to get actually** to man all operational positions in order to fulfil the operational requirements (e.g. traffic demand) in that year. *Note: This figure reflects the fact, that it is not always possible to balance selection, training and integration of new controllers with a.o. retirement of controllers, career advancement of controllers outside the Operations Room, implementation of new sectors / positions, etc.*

The figures hereafter have been provided by your Organisation in reply to the questionnaire of 1993 of Select group for Assessing Manpower issues (SGAMI).

Year end	1992	1993	1994	1995	1996	1997
Expected						

Please actualise these figures in the boxes below.

Year end	1992	1993	1994	1995	1996	1997
Actual						

4. Manpower requirements for the next five year period.

Manpower requirements: This is the total number of appropriately qualified Air traffic Controllers your organisation **plans for the coming years** to man all operational positions in order to fulfil the operational requirements (e.g. traffic demand) in that year. *Note: There are several means to calculate these figures. However you should give the figures as you have calculated them according to your method. Please indicate, if possible, the date, if the date at which these figures in the years given were established is not 31 December.*

Year end	1997	1998	1999	2000	2001	2002
Requirement						

5. Manpower expectations for the next five year period.

Manpower Expectations: This is the total number of appropriately qualified Air traffic Controllers your organisation **expects to get actually** to man all operational positions in order to fulfil the operational requirements (e.g. traffic demand) in that year.

Year end	1997	1998	1999	2000	2001	2002
Expected						

***6. Ab Initio* Trainee Intake**

***Ab Initio* Trainee Intake.** The intake of individuals, with no previous relevant qualifications, who are selected to be given basic instruction and training to become a fully qualified Air Traffic Controller.

How many *ab initio* trainees were taken in during the periods indicated below?

Ab Initio's	1.1-31.12.1992	1.1-30.6.1993
Number of *ab initio* trainees intake		

How many *ab initio* trainees from the intakes mentioned before have reached full qualification in which year?

Intake 1.1-31.12.1992	1994	1995	1996	1997
Fully qualified				

Intake 1.1-30.6.1993	1994	1995	1996	1997
Fully qualified				

7. Remarks

Thank you for filling in this update; your answers will be treated in confidence.

Please return the completed form **before 31.03.97** to:

Mr. Cees NIESING
EUROCONTROL AGENCY
DED5/1

Rue de la Fusée, 96
B - 1130 BRUSSELS
BELGIUM

marking the outside of the envelope “IN CONFIDENCE”.

Tel. : +32-2-729 3336
Fax : +32-2-729 9149
E-mail : cees.niesing@eurocontrol.be

ANNEX B: TELEPHONE INTERVIEW

STATE: .....

CONTACT PERSON: .....

INTERVIEWER: .....

DATE: .....

Introduction

This is ..... from EUROCONTROL in Brussels speaking. I am from the Human Resources Domain within EATCHIP. Is that Ms/Mr ..... ?

A questionnaire was sent to you in February this year which intended to gather data on the manpower requirements and expectations in your organisation. We thank you for providing us with the requested information.

We would like to ask you some more questions about your situation. The interview will only last for about 10 minutes. Do you have 10 minutes now to answer the questions or should I call you back later?

If postponed: When should I call you back? Date: .....Time: .....

The aim of this interview is to gather some more details and background information with regard to the situation in your organisation.

We will ask you if there were any special events in the **past** that are related to controller manpower requirements in your organisation.

I will go through a list of possible items, that is events, and ask you **whether these events were happening in the years 1992-1996 or not or if you do not know about these events.**

		yes	no	?	considered
1.	Organisational change (e.g. privatisation)	☐	☐	☐	☐
	Details/Remarks:.....				
2.	Increase of service offered	☐	☐	☐	☐
	Details/Remarks:.....				
3.	Union strike(s)	☐	☐	☐	☐
4.	Changes in working conditions	☐	☐	☐	☐
	e.g. official duration of working week:.....hrs.				
	Details/Remarks:.....				

		yes	no	?	considered
5.	Changes in the rostering schemes	☐	☐	☐	☐
	Details/Remarks:.....				
6.	(Unexpected) high failure rate in training	☐	☐	☐	☐
7.	Higher than normal need to recruit students	☐	☐	☐	☐
	Details/Remarks:.....				
8.	Less than normal success of recruitment campaign	☐	☐	☐	☐
9.	Less than normal student training capacity	☐	☐	☐	☐
	Details/Remarks:.....				
10.	Higher training needs for staff	☐	☐	☐	☐
	Details/Remarks:.....				
11.	Changes in retirement policies	☐	☐	☐	☐
	Details/Remarks:.....				
12.	Unexpected requests for early retirement	☐	☐	☐	☐
	Details/Remarks:.....				
13.	High increase in air traffic	☐	☐	☐	☐
	Details/Remarks:.....				
14.	Changes in route structure	☐	☐	☐	☐
15.	Re-structuring of units	☐	☐	☐	☐
16.	Re-structuring of sectors	☐	☐	☐	☐
17.	Re-structuring of licensing groups	☐	☐	☐	☐
18.	Changes in the licensing requirements	☐	☐	☐	☐
19.	Technological changes (e.g. new equipment)	☐	☐	☐	☐
	Details/Remarks:.....				
20.	These items have been taken into account for the updated figures for 1993 - 1996; do you see other items possibly influencing your estimates for 1997 - 2002?				
	Details/Remarks:.....				

Thank you very much for your support !

REFERENCES

Brehmer, B. (1996). *Recruitment, selection and training of air traffic controller students, Reliability and discriminant validity of the FAA EUROCON TEST.* Report No. 21, Norrköping: Luftfartsverket.

Dalichampt, M., Flynn, G., Hickling, R., Mahlich, S. and Tibichte, A. (1997). *FAP Future ATM Profile Capacity Shortfalls in Europe (1996 - 2006),* EEC Task R13, Brétigny-sur-Orge: EUROCONTROL.

EATCHIP Project Board (1993). *Report by the EATCHIP Select Group for Assessing Manpower Issues (SGAMI).* Unpublished Working Paper, WB/PB/93/92 dated 22.06.1993, Brussels: EUROCONTROL.

EATCHIP Work Programme (1996a). Level 2 Document*. Human Resources Business Plan,* Edition 3.0, Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1996b). *Guidelines for Selection Procedures and Tests for Ab Initio Trainee Controllers,* (HUM.ET1.STO4.10000-GUI-01), Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1996c). *Awareness of Human Aspects in Air Traffic Services,* (HUM.ET1.ST13.1000-REP-01), Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1996d). *Report on Issues in ATCO Manpower Planning,* (HUM.ET1.STO3.1000-REP-01), Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1998a). *First Report on Air Traffic Controller Manpower Quantitative Requirements in ECAC States: Supplement,* (HUM.ET1.ST02.1000-REP-01-02), Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1998b). *Heuristic Modelling and Policies in ATCO Manpower Shortage or Surplus Management,* HUM.ET1.ST03.1000-REP-02. Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1998c). *A Framework for Applying Cost-Benefit Considerations in the Recruitment and Selection Process for Ab Initio Trainee Controllers,* (HUM.ET.ST11.4000-REP-01), Brussels: EUROCONTROL.

EATCHIP Human Resources Team (1998d). *ATCO Manpower Planning: The Staffing Methodology and the Planning Process in Practice,* (HUM.ET1.STO2.2000-REP-01), Brussels: EUROCONTROL (in press).

EU (1993). Council Directive 93/104/EC of 23 November 1993, concerning certain aspects of the organisation of working time, *Official Journal of the European Communities,* No L 307/18 (dated 13.12.1993).

Vandenberghe, C. and Nicolas, B. (1997). *Air traffic Statistics and Forecasts Number of Flights by Region 1994 - 2003, 2015 (Total Airspace),* EATCHIP Doc N°97.70.11, Division DED.4 - STATFOR June 1997.

GLOSSARY

For the purposes of this document the following definitions shall apply:

***Ab initio* Trainee Controllers**: Selected individuals, with no previous relevant qualifications, who are given basic instruction and training to enable them to obtain theoretical qualifications.

Air Traffic: All a/c in flight or operating on the manoeuvring area of an aerodrome (ICAO Doc 9569 Definitions).

Air Traffic Flow Management (ATFM) Departure Delay: The difference between the scheduled off block time and the calculated off block time, taking into account slot time and estimated taxi time (CODA[4], 1997).

Air Traffic Service (ATS): A generic term meaning variously, flight information service, alerting service, air traffic advisory service (area control service, approach control service or aerodrome control service). (ICAO Doc 9569 Definitions).

Area Control Centre (ACC): A unit established to provide ATC service to controlled flights in control areas under its jurisdiction.

Human Resources Management (HRM): The conscious and specific direction of effort towards the quality and quantity of the workforce in the short and long-term. It involves all processes and activities aimed at managing the human resources of an organisation: manpower planning, recruitment, training and development, career management and human performance.

Licence: An ATC licence indicates a controller's qualifications and includes a record of his competence at a particular unit together with his medical classification.

Manpower: The total supply of individuals available and qualified for service.

Model: A description or analogy of a real or hypothetical situation, usually formal and simplified, which is used to develop understanding.

Off Time: The hours a particular individual or group of individuals are not normally required to be at the workplace (Tepas and Monk[5], 1987).

[4] Central Office for Delay Analysis (CODA) (1997). *Delays to Air Transport in Europe, July 1997*. Brussels: EUROCONTROL.

[5] Tepas, D. I. and Monk, T. H. (1987). Work Schedules, in: G. Salvendy, (Ed.) *Handbook of Human Factors*, Chapter 7.3, p. 819-843. New York: John Wiley and Sons.

On-the-Job Training (OJT): The integration in practice of previously acquired job related routines and skills under the supervision of a qualified coach in a live traffic situation (EATCHIP Human Resources Team (1995). *Air Traffic Controller Training at Operational Units*, HUM.ET1.ST05.4000-GUI-01. Brussels: EUROCONTROL).

The training enables student controllers to checkout as operational controllers at a specific operational unit.

Operational Controller: The holder of a certified qualification which permits the individual to control air traffic at a specific operational unit.

Overtime: The time during which a person works at a job in addition to the regular (statutory) working hours.

Rostering: The allocation of human resources in order to ensure service for the scheduled working hours in accordance with legal and local procedures.

Schedule: The sequence of consecutive shifts and off time assigned to a particular individual or group of individuals as their usual work schedule (Tepas and Monk, 1987).

Shift: The time of day on a given day that an individual or a group of individuals are scheduled to be at the workplace (Tepas and Monk, 1987).

Shift Break: Time within a shift when work is not required, usually a time period of less than 1 hour in duration. This includes lunch breaks, rest breaks, relief breaks, and all other forms of workplace release from work (Tepas and Monk, 1987).

Shift Roster / Shift Schedule: The sequence of consecutive shifts and off time assigned to a particular individual or group of individuals as their usual work schedule.

Task: A piece of work, performed by an individual or individuals, which has a definite beginning and end, and results in a product or a service.

Training: The planned systematic development of the knowledge, understanding, skill, attitude and behaviour pattern required by an individual in order to perform adequately a given task or job.

ABBREVIATIONS AND ACRONYMS

For the purposes of this document, the following abbreviations and acronyms shall apply:

ACC	Air Traffic Control Centre
ATC	Air Traffic Control
ATCO	Air Traffic Controller / Air Traffic Control Officer (US, UK)
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
CFMU	Central Flow Management Unit
DED	Directorate EATCHIP Development
DEL	Deliverable
EATCHIP	European Air Traffic Control Harmonisation and Integration Programme
EATMS	European Air traffic Management System
ECAC	European Civil Aviation Conference
ECU	European Currency Unit
EEC	EUROCONTROL Experimental Centre
ET	Executive Task
EU	European Union
EUROCONTROL	European Organisation for the Safety of Air Navigation
EWP	EATCHIP Work Programme
FAA	Federal Aviation Administration (USA)
FIR	Flight Information Region
HRM	Human Resources Management
HRT	Human Resources Team

HUM	Human Resources
IANS	Institute of Air Navigation Services
IFATCA	International Federation of Air Traffic Controllers' Associations
IFR	Instrument Flight Rules
MP	Manpower Planning
MPSG	Manpower Planning Study Group
n/a	not available
NEA	Nederlands Instituut voor Economische Argumentatie
OJT	On-the-Job Training
OPSroom	Operations Room
Q	Question
REP	Report
SD	Standard Deviation
SDOE	Senior Director Operations and EATCHIP
SGAMI	Select Group for Assessing Manpower Issues
ST	Specialist Task
UAC	Upper Area Control Centre
VFR	Visual Flight Rules

CONTRIBUTORS

NAME	ORGANISATION / COUNTRY
Chairman of Manpower Planning Study Group	
Mr Chris Clark	EUROCONTROL, DED5
Secretary / Rapporteur	
Mr Hermann Rathje	EUROCONTROL, DED5
Members	
Mr Krassimir Atanassov	Bulgaria
Ms Lena Boman	Sweden
Mr Johan Delauré	Belgium
Mr Paul Haselup	United Kingdom
Mr Henry Hauglie	Norway
Mr Alexey Leshov	Latvia
Mr Ognian Matev	Bulgaria
Mr Cees Niesing	EUROCONTROL, DED5
Mr Pat O'Doherty	EUROCONTROL, IANS
Mr Pascal Planchon	France
Mr Alexander Skoniezki	Germany
Mr Marco Stoové	The Netherlands
Mr Roger Thacker	EUROCONTROL, DHR
Observers	
Mr Hannes Ziegler	IFATCA
Others	
Mr Zvi Golany	EUROCONTROL, DED5
Mr Andy Digby	EUROCONTROL, DED5

The ECAC States which completed the questionnaire and the ECAC State Representatives who participated in the telephone interview.

Intentionally left blank