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# Characteristics of Recruitment and Pre-selection of *Ab Initio* Trainee Controllers (Revised)

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<b>Abstract</b>			
<p>The document intends to assist managers and personnel in national Air Traffic Service (ATS) administrations in the development and implementation of procedures in recruitment and pre-selection of applicants based on identified basic requirements and pre-assessment characteristics, with the aim to identify applicants with a high potential to pass the formal selection (e.g. ability assessment and interview). The general principle that should be followed is to assure that the profile of suitable applicants for the selection process consists of those characteristics that discriminate between accepted and rejected candidates in the later selection processes. This document contains tentative proposals with regard to specific applicant pre-assessment characteristics (e.g. education) which may predict the outcome of a subsequent selection. It will always be necessary to conduct a validation study to provide the necessary evidence that supports the use of such predictors in each State on an individual basis.</p>			
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## EXECUTIVE SUMMARY

This document reflects part of the work of the second Selection Task Force (STFII) of the Human Resources Team (HRT) of the European Air Traffic Harmonisation and Integration Programme (EATCHIP), now known as the European Air Traffic Management (EATMP).

The document intends to assist managers and personnel in national Air Traffic Service (ATS) administrations in the development and implementation of procedures in recruitment and pre-selection of applicants based on identified basic requirements and pre-assessment characteristics, with the aim to identify applicants with a high potential to pass the formal selection (e.g. ability assessment and interview).

From the perspective of quality management recruitment, pre-selection and final selection is a service which is delivered both to the organisation and to applicants. The quality of activities in the recruitment and selection process is measured by the extent to which these activities satisfy stated or implied needs of the organisation and the applicants.

The management of the recruitment and pre-selection process is concerned with the definition of the activities within the process, with setting goals, defining the target population in recruitment, deciding on how to attract this target population, and which information should be issued to them, designing pre-selection methods and applying them, monitoring the activities in the process and evaluating the outcome. For this purpose and for any change necessary within the recruitment and pre-selection process all feedback needs to be valid and reliable.

Information must be clear on the requirements for health, vision and hearing. Potential applicants should as early as possible be encouraged to assure themselves and the organisation that they fulfil these requirements.

Basic requirements with regard to medical fitness, education and age of applicants are necessary conditions and therefore need to be established and used in recruitment and pre-selection. But they are certainly not sufficient for an efficient and cost-effective recruitment and pre-selection.

“Self-selection” is a first, powerful means to get suitable applicants. This can be assured by giving relevant, realistic and clear information about the requirements in selection, training and the Air Traffic Controller (ATCO) job.

Other effective influences on the career decisions of potential applicants for controller training are ATCOs at about the same age as the applicants. By addressing themselves directly towards the potential applicants and talking about themselves, their job, job satisfaction as well as hardships, how to apply, the probability of being accepted, and how the training is designed, they can serve as identification objects. This can also be done by showing on video films ATCOs addressing themselves to potential applicants.

ATS organisations' home page on the Internet should make it possible to search for fact information on how to become an ATCO.

Some characteristics of applicants that are predictive for success in later stages of selection and training can be identified by application forms and/or biographical questionnaires. These are further powerful means to pre-select suitable candidates.

The application form must contain both items on facts as well as on qualitative information which give opportunities for applicants to give subjective information in writing about themselves. When comparing applicants in pre-selection a scale should be used. The scale should be criteria-related and give some expectancy on who will succeed in the future selection and training.

The general principle that should be followed is to assure that the profile of suitable applicants for the selection process consists of those characteristics that discriminate between accepted and rejected candidates in the later selection processes. It seems reasonable to require that applicants have completed secondary education. In addition to this there is evidence that ATCO students learning abilities are at their peak between the age of 20 to 30.

A group of selection experts (Selection User Group) has reviewed the original document to identify areas in need of update / revision and amendments. The Group based its considerations on developments since the document was released in 1998 and with a view towards new developments of the Selection Core Drafting Group (CDG). The CDG was established by the HRT Manpower Sub-Group (MSG) as the Expert Working Group in the Human Resources Programme (HRS), Manpower Sub-Programme (MSP), for the Work Package "First European ATCO Selection Test" package (FEAST) (HRS/MSP-002).

This document reflects the changes adopted by the Group.

Chapter 1, "Introduction", describes the background, purpose and scope of the document and details the activities of the STF tasked with the work package.

Chapter 2, "International Civil Aviation Organization (ICAO) Requirements", gives reference to these International Standards and Recommended Practices (SARPs) for Personnel Licensing, Annex 1 (ICAO, 1988).

Chapter 3, "Guidelines on Recruitment and Pre-selection Management", describes the general framework for a rational management approach in recruitment and pre-selection.

Chapter 4, "Policies and Best Practice in Recruitment: Basic Requirements", outlines policy guidelines and recommended practices with regard to basic requirements in medical, educational and age of applicants.

Chapter 5, "Policies and Best Practice in Recruitment: Attraction and Self-selection", addresses policy guidelines and recommended practices with regard to activities in recruitment which help to better target and obtain suitable applicants for later pre-selection.

Chapter 6, "Relevant Applicant Characteristics", describes the characteristics of applicants which could be relevant in the pre-selection stage to identify suitable candidates for further testing and interviewing.

Chapter 7, “Policies and Recommended Practices in Pre-selection: Assessment of Applicant Characteristics”, describes the activities and tools which could be used in pre-selecting applicants.

Chapter 8, “Evaluation of Outcomes”, outlines the approach that could be used to control, evaluate and validate the procedures used in recruitment and pre-selection.

Chapter 9, “Summary of Guidelines”, summarises the guidelines for the development and implementation of recruitment and pre-selection procedures.

Additional information regarding the tools which can be used in recruitment and pre-selection are given in Annexes A-F.

Further information is listed as References, Further Reading, Glossary of Terms, Abbreviations and Acronyms, Contributors and Review Group Members.

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## 1. INTRODUCTION

The second Selection Task Force (STFII) was established under the direction of the Human Resources Team (HRT) in spring 1996 and reported directly to the HRT.

Within the scope of the assigned work programme the STF undertook the tasks in conjunction with Specialist Task (ST) HUM.ET1.ST04.1000. The original document was part of the work programme of the STF. Other Task Force activities were:

- to collect and dispense information on available and emerging tests and methods for the selection of *ab initio* trainee controllers together with criteria and methods for evaluating them;
- to consider the scope and content of guidelines for selection tests, interview procedures and assessment centres;
- to consider and give feedback / advice to the scope and content of a document on cost-benefit considerations in selection development.

The work described in the first two bullets is reported under EATMP (2000a), EATMP (2001), EATMP (2002) and EATCHIP (1998a and b).

A group of selection experts (Selection User Group) have reviewed the original document in June 2001 to identify areas in need of update / revision and amendments. The Group based its considerations on developments since the document was released in 1998, and with a view towards new developments of the Selection Core Drafting Group (CDG). The CDG was established by the HRT Manpower Sub-Group (MSG) as the Expert Working Group in the Human Resources Programme (HRS), Manpower Sub-Programme (MSP), for the Work Package "First European ATCO Selection Test" package (FEAST) (HRS/MSP-002).

This document reflects the changes adopted by the Group.

### 1.1 Purpose

The primary purpose of this document is to provide guidelines for self-selection, for paper sifting, and to present pre-selection characteristics of applicants to managers and other personnel responsible for recruitment and selection in national Air Traffic Control (ATC) administrations and ATS organisations.

As a secondary purpose, this document aims to provide cost-effective methods in recruitment and pre-selection. In financial terms, a lot can be gained if recruiters concentrate on those individuals who have high probability to succeed as Air Traffic Controllers (ATCOs). More details on cost and

benefits in this matter were provided in a separate document (EATCHIP, 1998a).

## **1.2 Scope**

The scope of this document is to outline guiding principles, policies and recommended practices in order to recruit and select candidates with the most potential for *ab initio* ATC training. This will be done along the continuum from early activities in recruitment (e.g. addressing and attracting applicants) to pre-selection of applicants on the basis of identified pre-assessment characteristics (e.g. paper sifting).

This document contains tentative proposals with regard to specific applicant pre-assessment characteristics (e.g. education, subjects, grades, certain age limits, professional experiences, etc.) which may predict the outcome of a subsequent selection. It will always be necessary to conduct a validation study to provide the necessary evidence that supports the use of such predictors in each State on an individual basis.

## **2. INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) REQUIREMENTS**

ICAO (1988) International Standards and Recommended Practices (SARPs) for Personnel Licensing, eighth edition, contains standards and recommended practices adopted by ICAO as the minimum standards for personnel licensing. It incorporates all amendments and supplements to its Annex 1.

The guiding principles, policies and recommended practices for recruitment and selection of the most potential candidates for *ab initio* ATC training, outlined in the following chapters, are in conformity with ICAO SARPs for Personnel Licensing and their amendments.

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### **3. GUIDELINES ON RECRUITMENT AND PRE-SELECTION MANAGEMENT**

The guidelines presented in the following sub-chapters should be read as a kind of “road map” pointing towards the direction recruitment and selection should follow.

Recruitment and selection is intended to match the need of ATS organisations, which is to attract and obtain suitable *ab initio* ATC trainees in sufficient numbers, with the need of young individuals, who are looking to make career decisions.

Air Traffic Service (ATS) organisations are seeking *ab initio* trainees who can contribute to the organisation, who can benefit from internal training, who stay within the organisation and are successful in their career.

From the individuals’ perspective, their career decisions are, first of all, should they join an ATS organisation, second, is there a high chance of being admitted to the organisation, and third, is the organisation offering something in line with their needs. Wanous (1980) advocates strong scientific evidence for this expectancy theory view of organisational choice.

#### **3.1 Recruitment Strategies and Organisational Choice of Young Persons**

Along a continuum of recruitment and selection strategies one can identify two extremes. On one extreme there is a strategy which can be called “shot gun strategy”. In following this strategy an ATS organisation would inform about the need of personnel (*ab initio* trainees) by some sort of announcements and would try to get as many applications as possible.

Experiences with this strategy within some European Civil Aviation Conference (ECAC) States show that the distribution of school grades and test scores on ability tests are similar to the distribution curve of the specific population. The applicants are more or less a random sample of a specific population.

Among the many applicants there will be a segment of applicants who are identified by selection procedures as being suitable for ATC work. As a result of this, the ratio between the number of applicants and those finally accepted is very small.

At the other extreme a strategy can be identified that demands a specific knowledge of what kind of abilities are needed in ATCO work, and to succeed in ATC training.

This strategy can be called “head hunting strategy” and aims to attract and select only from that segment within a population, those that have the highest potential for the training and the job as a controller.

A difference between the two strategies is the ratio needed between the number of applications and the number of applicants who are selected for ATC training. Both strategies are used within ECAC States.

The “head hunting strategy” is cost-effective and reaches its objectives if

- there exists a known association or probability between specific applicant characteristics and success;
- there is a small number of applicants who are successful in the selection system;
- the target segment perceives the ATCO work and the ATS organisation to be attractive.

## **3.2 Image and Service Quality**

Any experience potential applicants have with the ATS organisation, affects their image of that organisation.

The main direction in all activities regarding recruitment and pre-selection is therefore to regard them as service deliveries and to perceive any recipient of a service delivery as a customer. This principle should apply not only to those applicants that are accepted but also to those rejected.

## **3.3 Customer Needs of Pre-selection Service Delivery**

In general terms, the service delivery in recruitment and pre-selection includes all supplier activities which are necessary to provide the service.

The quality of the service concerns the totality of features and characteristics of a product or service that have a bearing on its ability to satisfy stated or implied needs of customers. In order to reach this state the customer needs have to be identified and specified.

### **3.3.1 Need of the Organisation**

The primary need of ATS organisations is to fill anticipated controller vacancies with licensed ATCOs, and to have certain numbers of trainees who possess the necessary skills, knowledge, abilities and desire to learn to become licensed controllers.

### **3.3.2 Needs of the Potential Applicants**

Potential applicants need:

- a job description including goals and the relevant features, requirements or characteristics of the work of controllers (i.e. monitoring visual and auditory information directly or indirectly by displays and headsets, processing information, making decisions, working under time constraints, working together in a team and during irregular working hours);
- to know the formal criteria in terms of education, age limits and other restrictions, as well as the profile of suitable candidates;
- to be aware of selection procedures and the chances of being accepted as an ATCO trainee;
- to know how and when to apply;
- to know when training starts;
- to know the duration and the content of the training;
- ideally to know the most likely placement for On-the-Job Training (OJT) and later assignment;
- to know the variety of different jobs within ATC they might enter, e.g. Area Control Centre (ACC) or Tower (TWR).

**Guideline 1: Define the Process of Service Delivery and Customer Needs**

Recruitment and pre-selection is a service delivery to the applicants and to the organisation. The quality of the recruitment and pre-selection process depends on its ability to satisfy stated or implied needs. This includes the needs of the organisation as well as the needs of potential applicants.

### **3.4 Managing the Recruitment and Pre-selection Process**

To satisfy the need of a sufficient number of applicants during pre-selection, is to manage all resources and activities allocated to planning and decision-making, defining the most suitable candidates, communicating with them, administer application forms and perform pre-selection.

#### **3.4.1 Planning and Decision-making**

Manpower planning predicts a certain number of future vacancies. The decision to recruit *ab initio* trainees in order to fill the anticipated vacancies has to be taken. Data on earlier suitable candidates might depict the profile of the candidates or a segment of a population.

Data on the validity of test batteries and experiences from past recruitment and pre-selection lead to a decision on the number of applicants needed.

Decisions have then to be taken on how to attract and to communicate with suitable persons (i.e. promotion and advertisements).

### **3.4.2 Decisions Regarding Pre-selection**

Decisions have to be taken on how and to what level applicants will fulfil the stated requirements and on what rules decisions regarding acceptance or rejection should be based.

### **3.4.3 Applying a Quality Assurance System**

Haglund, et al. (1996a) describe a quality assurance system intended to satisfy the supply of a sufficient number of ATCOs. The quality assurance system shall guarantee that management decisions are to be executed in the most reliable way. The principal component of the quality assurance system is the quality manual. Its main purpose is to provide an adequate description of the quality system, i.e. the organisational structure, responsibilities, procedures, processes and resources required for the implementation of quality management in recruitment and pre-selection.

In the chapter on recruitment and pre-selection the quality manual contains the specific routines to be followed and in which order actions shall be taken. The specific routines are supplemented by work instructions. In the manual, within a dedicated chapter, are to be found routines for evaluation of the procedures.

#### **Guideline 2: Define the Activities and Decisions to Take**

Management needs to divide and specify all activities involved in manpower planning, recruitment and pre-selection. This includes decisions as to how to target, attract and identify applicants with the most potential.

The steps that should be taken, and the responsibilities within the ATS organisation need to be clarified. In addition to this, competencies needed by the staff involved in the recruitment and pre-selection work should be described.

All policies, decisions, procedures and actions regarding recruitment and pre-selection should be documented in a quality manual or business plan.

### **3.5 Monitoring and Control**

In order to control the recruitment and pre-selection process specific achievement goals need to be identified.

These goals should be:

- specific (S),
- measurable (M),
- attractive to reach (A),
- realistic (R),
- time restricted (T).

Goal setting is important because it reflects the differences between future states and current states. By monitoring the information from the recruitment and pre-selection process, feedback is obtained. Reflecting on the feedback information and comparing it with expectancies (goals) gives a higher comprehension of the process, which can lead to new or revised decisions and strategies.

### **3.5.1 Goals for the Recruitment and Pre-selection Service**

Goals should focus on relevant and important achievements and the level of achievements that should be reached.

Goals should be set for the various steps in the process and should follow the responsibilities within the ATS organisation.

#### **Guideline 3: Setting Goals**

Specific achievement goals should be set in a quantifiable way so the goal achievement is easy to measure. Measurement can either be done by a survey directed to the applicants, or by examining the applications or by monitoring and evaluating the outcome of the recruitment and pre-selection process.

### **3.5.2 Examples of Recruitment and Pre-selection Goals**

The following list gives examples on some quality goals within ECAC States with regard to recruitment and pre-selection:

- increase the conversion rate of enquiries to applications;
- increase the number of applicants who score above the cut-off level on ability tests, without lowering the cut-off level;
- decrease the number of applicants who do not have sufficient knowledge in the English language;
- improve the knowledge of ATCO work among the applicants;

- improve the timing between advertising, selection and start of training;
- decrease the number of applicants who do not pass the medical examination;
- improve the balance of male / female applications for trainee ATCOs.

The list should include an examination of the financial consequences of the decisions that need to be taken.

### **3.6 Following a Rational and Systematic Management Approach**

Goals always generate strategies on how to attain them. Strategies make it possible to ascertain if changes are made, for example changes in formal requirements, changes in desired characteristics of applicants, changes in advertising media, changes of cut-off scores in the selection battery, etc.

#### **3.6.1 Learning from Feedback**

Learning can come from testing empirically certain hypotheses and/or using empirical experiences and knowledge from neighbouring fields.

Feedback from monitoring the recruitment and pre-selection process will lead to new and better knowledge and comprehension about the process and can in turn generate new hypotheses which can be tested. This strategy conforms to learning with regard to the variables that are changed, and their relationship to the desired outcome.

A limiting factor in achieving changes in the process and attainment of the goal is of course the extent to which the variables are manageable and can be manipulated.

#### **3.6.2 Criteria and Predictors in Recruitment and Pre-selection**

The following criteria (dependent variables) to be predicted should be taken into consideration in recruitment and pre-selection:

- success in the assessment of ability;
- success in the selection interview;
- success in the final selection;
- success in medical examination;
- success in security check;
- success in Initial Training;
- success in OJT which finally leads to a personnel licence in ATC.

The predictors (independent variables) that should be considered are attributes or 'organismic' variables (Kerlinger, 1973). These variables are part of the characteristics that individuals have in varying degrees and can be compared between individuals.

Some of these characteristics can be identified, measured or assessed in the recruitment and pre-selection phase as will be described in more detail in Chapter 6.

The general approach in any improvement of a given selection system is to collect a variety of reliable data from candidates during successive stages of the recruitment and pre-selection process and to combine these data in such a way that candidates with the highest probability of success can be chosen for the institutional and advanced training.

**Guideline 4: A Rational Management Approach**

Any action directed towards improvement should be based on rational, openly stated ideas expressed in some reasonable and manageable form. Outcome feedback should be obtained by monitoring the recruitment and pre-selection process and should conform to the changed variables and their relationship to the outcomes.

**3.6.3 Evaluation and Validation of Procedures Used**

If it is assumed that, for example, a certain level of education, a certain age range or certain professional experiences correlate with

- scores on some standardised test battery;
- the outcome of the selection interview;
- the final decision on acceptance or rejection.

It will always be necessary to conduct a validation study to provide the necessary evidence that supports the use of this procedure.

Requirements for, or evaluation of, personal history variables such as prior specific training, professional experience or achievements can be justified on the basis of an existing relationship between the content of the personal history experience and the content of the training or job for which they are evaluated or required (content validity).

To provide evidence for the assumption that such a relationship exists, something more than "face validity", i.e. a resemblance between the content of the personal history variables (e.g. performance in school) and the content of the training (e.g. training performance) or job is required.

### 3.6.4 Reliability

No selection procedure, be it self-selection, pre-selection, testing or interviewing, can be valid without an acceptable reliability and a consistent approach. There is always the danger that inconsistency in the application of procedures might occur or that the procedures are changed ad hoc. This will lead to systematic errors and might guide the decision maker towards wrong future decisions (see also EATCHIP, 1998b, Chapter 6.1).

#### **Guideline 5: A Rational and Systematic Approach**

Information feedback will lead to new knowledge about the recruitment and pre-selection process.

Striving for constant improvements will always generate new hypotheses. It is necessary before any changes within the recruitment and pre-selection process are deemed to be effective, that these hypotheses are shown to be supported by feedback information, and that information is valid and reliable.

It might be necessary to conduct a full content-related validity study before a pre-assessment design is put into operational use.

#### **Guideline 6: Managing the Recruitment and Pre-selection Process**

To manage the recruitment and pre-selection process means to define the activities within the process, to set goals, to define the target population, to decide on how to attract the target population, to apply pre-selection methods, to monitor and control the process and to always evaluate the outcome.



## 4. POLICIES AND BEST PRACTICES IN RECRUITMENT: BASIC REQUIREMENTS

Thousands of young people in each ECAC State perceive themselves to fulfil the requirements on age, mental stability, physical health, vision and hearing as required in ICAO Standard and Recommended Practices (SARPs), Annex 1. However, despite their self-perception, it is not certain that they would pass the medical examination.

The following sub-chapters outline policy guidelines and recommended practices with regard to medical, educational and age requirements.

### 4.1 Medical and Security Requirements

One of the objectives of the recruitment and pre-selection process is to exclude the applicants who do not fulfil the medical requirements of SARPs, Annex 1, and the requirements with regard to security.

Applicants should provide certificates on their vision and hearing ability. It would be advisable to require, if possible, applicants to enclose a statement from the national security bodies (i.e. police) regarding any known criminal background.

#### **Guideline 7: Medical Requirements**

Information to applicants must be clear on the requirements for health, vision and hearing. Potential applicants should as early as possible be encouraged to assure themselves and the organisation that they fulfil these requirements and enclose certificates with their application.

### 4.2 Educational Requirements

The content of SARPs, Annex 1, Sub-chapter 4.4, regarding the requirements for an ATC licence and ratings, concentrate on knowledge, skills and experiences acquired through training. There is a considerable amount of knowledge to acquire during *ab initio* ATC training. High demands are also put on knowledge in languages, particularly the English language.

Aviation law, regulations and air traffic rules are often written in complex language. A synonym to knowledge acquisition is learning. In order to obtain an ATC licence learning abilities, learning experiences and level of education are important.

It seems logical to state that applicants should have completed secondary education.

**Guideline 8: Educational Requirements**

Most theoretical subjects in ATC training demand a certain level of education, as well as proven learning abilities. Therefore a minimum level of education should be stated as a prerequisite to attend an ATC Academy.

Annex A gives information about the relationship between ability tests, general ability and educational achievement.

## **5. POLICIES AND BEST PRACTICES IN RECRUITMENT: ATTRACTION AND SELF-SELECTION**

This Chapter outlines policy guidelines and recommended practices in the recruitment process to attract and obtain suitable applicants.

The following decisions must be made before any recruitment campaign starts:

- the number of vacancies;
- when to recruit;
- decisions on the job profile suitable candidates are required to fit;
- decisions on the number of candidates needed (the empirical ratio between the number of applicants and the number of accepted and successfully trained candidates);
- decisions on how to attract and to communicate with suitable persons (i.e. promotion and advertisements).

### **5.1 Attraction and Motivation**

Motivation is actually what causes people to decide to:

- ask for more and detailed information about the job of a controller;
- fill in an application;
- post it before closing date;
- do the different test forms being used in the ability assessment;
- strive for good results (success) in these tests.

A distinction can be made between intrinsic and extrinsic motivation. In the former, motivation is perceived to come from within the person to achieve something, or to be part of something. In the latter, motivation is perceived to be created by external forces like salary or other rewards or avoidance of something adverse.

Intrinsic motivation is supposed to be more persistent over time and independent from external forces. Intrinsic motivation can be developed by giving information about the content of the ATCO job including responsibilities, autonomy, variation in workload, the problem solving aspect, etc. Potential applicants are able to match this information with their own preferences on job content.

**Guideline 9: Attraction and Motivation**

Formal information about ATC work and the training must be presented in such a way that all potential applicants can make a fair judgement and that the desired motivational source is addressed.

The information given must be realistic and clear. Both positive and negative sides of ATC training and the controller job should be highlighted and should not be biased towards extrinsic motivational factors.

**5.1.1 Influencing Potential Applicants: Attraction and Self-selection**

EATMP (2001) shows that the target population, within the population of all career seekers, are males and females in the age range of 20-30, where many ECAC States have an upper age limit of 25 years or less and many ECAC States require a university entrance level of education.

However, most of these adolescents who fulfil the requirements do not know or have even reflected on applying for ATC training. In order to attract them to apply to a trainee program, they need to be motivated in their career decision by information and to identify themselves with operational controllers, i.e. vicarious reinforcements.

**Guideline 10: Active Search for Applicants**

Recruiters should interact with potential applicants by visiting them in their normal environment, such as schools, clubs, and career, aviation and computer exhibitions.

**5.1.2 Air Traffic Controllers (ATCOs) as Role Models**

Career decisions are examples of behaviours that can be shaped by social learning, or modelling.

The prerequisites are that the role model has to be perceived as successful, and resembles the observers to some extent. The observers must perceive the actions or behaviours of the role model to be

- appropriate,
- rewarded,
- powerful,

and the observers must image themselves actually performing in a similar way and commit themselves to take these actions.

**Guideline 11: Role Models**

The most effective influences of career decisions are ATCOs about the same age as the target group. By addressing themselves directly towards the potential applicants and talking about themselves, their job, job satisfaction as well as hardships, how to apply, the probability of being accepted, and how the training is designed, ATCOs can serve as identification objects.

**5.1.3 Video Films as Information Media**

Haglund, et al. (1995) report how video programmes can be used to influence attitudes and decisions of the observers.

The video programme should make the viewers think about and accept the information given and decide that they would like to behave in a similar fashion.

Due to the enormous amount of information a short video programme contains, the observer must be coached in advance on what to look for and reflect about.

Annex B contains more information on how to produce a modelling video film.

**Guideline 12: Video Films**

A video film of ATCOs talking to an audience can substitute for live ATCOs. Recruitment personnel who use video films about the ATCO profession should have a specific training on the use of films as a media to influence the viewers' behaviour.

**5.1.4 CD-ROMs**

First experience with the use of interactive CD-ROMs as marketing tools for applicants for *ab initio* controllers has recently shown that this media could increase awareness and provide information to potential candidates. Further information on other marketing and communication means can be found in EATMP (2000b).

**5.1.5 The Internet as Information Media**

In the modern marketing era, one of the goals could also be to attract the potential applicants to phone a toll-free number or read the relevant World Wide Web (WWW) page. The toll-free line or the WWW site can present different information options including descriptions of mandatory basic requirements, procedures for progressing through the selection system, the training program, controller working conditions and success rates.

The site can invite the callers to leave their details in order to receive an application form together with some additional information brochure. It can

also invite the callers to attend an information session to be held in a public venue from time to time. Annex C contains more information on the use of the Internet for career exploration, and Annex D contains explicit information on the design of Web sites.

**Guideline 13: Using the Internet**

The ATS organisation's home page on the Internet should make it possible to search for factual information on how to become an ATCO. Live pictures as well as some low fidelity exercise on a computer game will make it possible to image oneself as being an ATCO. It should also be possible to download an application form. The pages do not need to be interactive in the sense that an applicant can apply directly from his computer. Any magazine or newspaper advert should be cross-referenced to the WWW home page.

**5.1.6 Magazines, Newspapers and Brochures**

When magazines or newspapers are used as advertisement media one can use market research on the readers in order to reach a niche group and present sufficient and realistic information. The information can serve self-selection purposes by discouraging potential candidates who lack for example basic knowledge of English. Some persons select themselves out by a self-appraisal of the obstacles ahead.

A brochure for applicants can provide some additional information on the different Air Traffic Services rendered by the organisation, the abilities and skills identified by selection tests, examples of questions asked in tests, skills to be achieved in institutional and OJT training, important social attitudes of successful job incumbents and how to fill the application form. Some States within ECAC also use a knowledge test on the content of their recruitment brochures.

**Guideline 14: Magazines, Newspapers and Brochures**

Most publishing companies can provide market research on their readers. A comparison should be made to see if the potential applicants match any of the readers of these magazines.

Sufficient, relevant and realistic information should be presented in an advertisement. The information can serve for self-selection purposes by discouraging potential candidates who do not meet the prerequisites.

## **6. RELEVANT APPLICANT CHARACTERISTICS**

### **6.1 Background**

The ultimate goal in pre-selection is to select those candidates who have a high enough chance to be successful in the ability assessment, in the selection interview and in the final stage after selection when a decision is made concerning whether an applicant is to be accepted as a candidate for controller training or not.

The characteristics of applicants should be related to selection success but also to success in the initial training or even OJT training.

A rationale behind some of the suggestions made in the following is, that intentionally overt behaviour is based or supported by certain cognitive processes and motivational structure. It is further assumed that a relation exists between the frequency, intensity and duration of specific behaviour and those cognitions. To give an example, one can hardly argue that a good perspective designer probably scores low on a spatial ability test. However, a person who has good spatial abilities does not necessarily have perspective drawing as his/her main hobby or field of interest.

### **6.2 Characteristics**

#### **6.2.1 Experiences with Computers and Computer Interfaces**

Much of today's design of computer interfaces, such as the use of icons and pull-down menus, and the use of multimedia facilities relies on the spatial ability of the person using it.

Mayer and Sims (1994) showed by an experimental study that people with high spatial ability benefit more from these popular computer interfaces than people with low spatial ability. The explanation given is that these interfaces allow high spatial ability people to devote more cognitive resources to building referential connections between visual and verbal representations of the presented material.

It is also worthwhile to check the effects of different experiences with computer software, e.g. educational or computerised training packages, war games, strategic games, adventure games and input devices as joysticks, keyboards, etc.

## 6.2.2 Intentions towards Mastery Goals

A person's achievement goals can be divided into performance goals or mastery goals. Persons with performance goals are concerned primarily with demonstrating their own capabilities and with competing with others, particularly if success is achieved with little effort.

Persons with mastery goals or learning goals want to develop their competence on a task or to increase their understanding of a subject and anticipate that this end will be achieved by hard work.

Archer (1994) demonstrated in a study of first year university students that there exists strong positive correlation between mastery goal and reported use of thinking strategies, a positive approach and choice of hard tasks. A negative correlation was found with the choice of an easy task. For those with performance goals, these correlations with learning strategies and positive approach are in the same direction but less pronounced than those with mastery goals.

## 6.2.3 Experiences with Instructor Dependence

One of many differences between traditional higher education and ATC *ab initio* training is the dependence on the instructor. In *ab initio* ATC training, the single student is doing both simulations and OJT with one or more instructors, tutoring the trainee on a one-to-one relationship.

For many students this kind of tutoring is a new experience. They might have difficulties adjusting themselves to this close person-to-person-training situation. There might be others which are more used to this kind of tutoring due to their experiences in other fields (e.g. in certain sports, acting).

## 6.2.4 Experiences with Continuous Assessments

A typical feature of the ATC work and particularly the ATC training is that the students are continuously assessed while they are performing training sessions on simulators or in OJT. In ATC training it is an advantage to be used to continuous assessments.

For example, having an instructor seated next to a trainee may also cause some test anxiety, induced by being monitored while performing a complex task. To split the attention between an ongoing task and at the same time wondering about the assessment of an instructor is not uncommon to *ab initio* trainees. Persons who are used to the fact that they are continuously assessed while performing because of earlier experiences will have fewer difficulties in coping with this situation and paying full attention to the ongoing task.

Possibly self-confidence and assertiveness contribute positively to coping with continuous assessments.



**Guideline 15: Choice of Predictors**

The specific characteristics of the applicants are predictors of success in ability assessment or in ATC training. Any variable known to discriminate between good performers and poor performers in a selection test and/or in ATC training and which can be assessed in the pre-selection process should be used as a predictor in the pre-selection if this is not prohibited by national law.

The profile of suitable applicants for the selection process should contain those characteristics that have been proven to discriminate between the accepted ones and rejected ones in the later stages of the selection process.

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## **7. POLICIES AND RECOMMENDED PRACTICES IN PRE-SELECTION: ASSESSMENT OF APPLICANT CHARACTERISTICS**

The best practices stated here are either practices already applied in many ECAC States, and proven to work, or practices applied in other fields and made public through various publications.

### **7.1 Application Form and Information Exchange**

One objective of the organisation is to obtain all requested information with enclosed certificates in such a convenient way that it is easy to see if applicants fulfil the requirements.

The objective of applicants is to present their qualifications and arguments in a personal and favourable way, hopefully without lying or exaggerating too much.

For these two objectives to meet, a kind of forum is needed. One forum for information exchange is the application form. The application form must make it possible for both parties to exchange information, both regarding questions on requirements and responses on their fulfilment.

#### **Guideline 16: Application Form**

The application form must contain items on facts, facts that are easy for the applicant to quantify and easy for the recruiter to evaluate.

There also has to be room for qualitative information which gives opportunities for applicants to make subjective responses.

The items in the application form must be clear and must be expressed in a straightforward way so that there is no mistake with regard to their meaning.

#### **7.1.1 Design of the Application Form**

The application form should be divided into different parts. One part should be concerned with the biography of applicants such as name, age, nationality, marital status, educational exams and graduation year, present occupation, fulfilment of military service, etc. This information should be certified by enclosed official documents, or capable to being certified at a later stage.

Another part could go deeper into level and kind of education, learning experiences and learning ability.

Items can be designed for the different levels and the marks achieved in the subject's home language and mathematics. The choices with regard to the core subjects can be asked as well. Items on additional learning subjects

outside the educational system as, for example, in the English language as well as in information technology (e.g. use of computers) can be constructed. As one item, an open question can be put on the greatest achievements at secondary school.

An additional part of the application form might be on hobbies and interests.

The application form should contain questions about why the applicant wants to become an ATCO.

When paper sifting is done, the items in the application form must reflect and must be designed to enhance scoring on the assessment scale used for this purpose.

#### **Guideline 17: Design of the Application Form**

In designing an application form it is important to make items easy to understand. It is also very helpful, both for applicants and pre-selectors, to have many items asking for quantifiable answers.

This can be achieved by asking the applicant to state the frequency, duration, intensity, etc., of relevant behaviour (e.g. number of hours spent per week, month / year attending classes, level of performance). This approach can be used with items on formal education as well as for items on interests and hobbies.

## **7.2 Pre-selection of Applicants**

Pre-selection means to decide on who will be accepted for further selection and who will be rejected. There is only one decision to take on each applicant: "GO" or "NO GO".

Some applicants will be rejected at an early stage in the pre-selection process if they cannot certify their visual ability or do not fulfil the basic requirements stated as a prerequisite by national regulations.

### **7.2.1 Paper Sifting**

Applicants who pass the initial stage of checking for basic requirements (e.g. on age, education) are in some ECAC States further considered and assessed by paper sift.

The purpose of paper sifting is to pre-select at first only those applicants who have the highest chance to pass the selection procedures. When paper sifting is done, for example by giving all applicants a rank order, it should always be done by a validated procedure. This means that each applicant is judged on some measurement scale.

## 7.2.2 Measurement of and Comparison between Applicants

To make comparison between applicants possible, a scale is needed to measure the individual differences. It should be borne in mind that, independent of choice of the scale, the scale itself is only an indicator of the specific characteristic which is measured by the scale.

When several items are used to measure relevant characteristics, the item scores can be summed to a total score. All applicants can then be given a rank order according to their summed score, preferably in raw scores. Further information on how a scale can be constructed for paper sifting is given in [Annex E](#).

### **Guideline 18: Comparison between Applicants**

If a scale is used for comparison between applicants, it should be criteria-related and give some expectancy on who will succeed in the future selection and training. Items on the comparison scale have to spread the applicants.

The items on the scale shall not be too highly interrelated and the summed scores must spread all applicants towards a normal distribution. To transfer the information from the application form to a measurement scale, it is convenient to use a software product. This software product should be in such a format to enable statistical calculations on reliability and validity.

The procedures to be applied in paper sifting and pre-selection are described in the following sub-chapters.

## 7.2.3 Setting Cut-off Scores

The decision on who will proceed to the next phase in selection and who will be rejected has to take into account both the utility for the applicant and the utility for the organisation. It is a prediction under uncertain conditions.

The most favourable outcome of this prediction would be that an applicant accepted for further selection passes the next selection stages. An unfavourable outcome would be that a rejected candidate would have passed the following phases if he/she would have had this opportunity.

## 7.2.4 Selecting from the Top

An alternative to accepting all applicants for further selection and a more conservative approach would be that the group who are selected for further selection testing are chosen from the top of the list in paper sift marks according to the number of candidates needed to fill the testing vacancies.

### 7.2.5 Planning of Subsequent Selection Stages

On the basis of an expectancy table the subsequent testing stages can be planned as well. This is important because there might be limits to the capacity in Phase 2 testing and/or in the interview.

If, for example, on average one would expect that about 18 applicants with a certain paper sift scores would pass Phase 1 at each testing session and enter Phase 2. However, the capacity at this stage might be less than 18 and therefore a solution has to be found. This could, for example, be done by decreasing the number of applicants to be sent to the selection centre.

It is also possible to find the optimal mix of applicants with different paper sift scores in order to gain a more even distribution of successful applicants after Phase 1. If, for example, all applicants with the highest paper sift score were sent for testing, the selectors might find it very difficult to cope with that expected number of applicants in Phase 2 and/or with too many applicants for the interview.

### 7.2.6 Planning of Intakes

In addition to this, the number of candidates who are expected to enter training after selection can be better planned on the basis of an expectancy table.

Given the numbers as indicated in the example in Annex F it can be expected that about 74 candidates with paper sift scores 13 and above will pass the selection and enter the training institution. Given a training capacity of 25 per intake this number would be just sufficient for three intakes (not taking into account a certain no-show rate in selection and before training starts).

#### **Guideline 19: Rank order of Applicants and Setting Cut-off Scores**

The effectiveness of pre-selection is dependent on the validity of the assessment scale. The objective for the pre-selection is to reject those who would be rejected by the ability assessment or the selection interview, and select those who would score above the cut-off line on the ability assessment and pass the selection interview.

In setting a cut-off score one has to consider the number of applicants, number of vacancies for ATC training to be filled and the cost for the ability assessment and the selection interview.

A conservative approach could be only to choose from the top applicants downward according to their paper sift marks. An expectancy table should be used to plan further testing and selection.

### **7.3 Enclosed Questionnaires**

Even though it is not done very often within the ECAC States one can consider in the pre-selection enclosing questionnaires, e.g. on learning strategies, with the application form. After the decision to enclose a questionnaire, it is important to remind the potential applicant that it is a questionnaire which asks for personal preferences and that there are no “right” or “wrong” answers.

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## 8. EVALUATION OF OUTCOMES

The outcome of every decision can be described as a “Go” or “No Go” to the next step. Each decision has two positive outcomes: when the rejected ones would not have passed the next step and when the accepted ones would pass the next step. These two categories can also be stated as valid negatives and valid positives.

There are also two categories where the decisions taken are false: when the accepted ones would fail in the next phase and when the rejected ones would have passed the next phase.

The four possible outcomes are presented in the following:

	Go	No Go
Pass next step	<i>Valid Positives (VP)</i>	False Negatives (FN)
Fail next step	False Positives (FP)	<i>Valid Negatives (VN)</i>

The goal for all strategies in decision-making is of course to maximise the probability of favourable outcomes (i.e. to be right as many times as possible). See also [Annex F](#).

### 8.1 Discriminative Efficiency

The discriminative efficiency means to what extent the pre-selection assessment can separate and classify correctly valid positives and valid negatives on the ability assessment and the selection interview. Comparison between the two categories’ frequency distribution will yield information regarding the size of overlap that exists between the distributions.

When no overlap between the two categories exists, there exists a cut-off score on the pre-selection assessment, which will make it possible to completely separate the two categories and consequently make a perfect and accurate prediction.

**Guideline 20: Evaluation of Outcomes**

The discriminative efficiency of the pre-selection assessment is of great importance.

In order to get this information one has to compare the distributions on the pre-assessment scale between those being accepted for ATC training with those being rejected. This follow-up study will give information on the size of overlap between the two groups, and hence information on the effectiveness and the utility of the pre-selection procedures.

## **9. SUMMARY OF GUIDELINES**

The following is a summary of the guidelines contained in Chapters 3 to 8 of this document.

### **9.1 Recruitment and Pre-selection Management**

#### **Guideline 1: Define the Process of Service Delivery and Customer Needs**

Recruitment and pre-selection is a service delivery to the applicants and to the organisation. The quality of the recruitment and pre-selection process depends on its ability to satisfy stated or implied needs. This includes the needs of the organisation as well as the needs of potential applicants.

#### **Guideline 2: Define the Activities and Decisions to Take**

Management needs to divide and specify all activities involved in manpower planning, recruitment and pre-selection. This includes decisions as to how to target, attract and identify applicants with the most potential.

The steps that should be taken, and the responsibilities within the ATS organisation need to be clarified. In addition to this, competencies needed by the staff involved in the recruitment and pre-selection work should be described.

All policies, decisions, procedures and actions regarding recruitment and pre-selection should be documented in a quality manual or business plan.

#### **Guideline 3: Setting Goals**

Specific achievement goals should be set in a quantifiable way so the goal achievement is easy to measure. Measurement can either be done by a survey directed to the applicants, or by examining the applications or by monitoring and evaluating the outcome of the recruitment and pre-selection process.

#### **Guideline 4: A Rational Management Approach**

Any action directed towards improvement should be based on rational, openly stated ideas expressed in some reasonable and manageable form. Outcome feedback should be obtained by monitoring the recruitment and pre-selection process and should conform to the changed variables and their relationship to the outcomes.

#### **Guideline 5: A Rational and Systematic Approach**

Information feedback will lead to new knowledge about the recruitment and pre-selection process.

Striving for constant improvements will always generate new hypotheses. It is necessary before any changes within the recruitment and pre-selection process are deemed to be effective, that these hypotheses are shown to be supported by feedback information, and that information is valid and reliable.

It might be necessary to conduct a full content-related validity study before a pre-assessment design is put into operational use.

#### **Guideline 6: Managing the Recruitment and Pre-selection Process**

To manage the recruitment and pre-selection process means to define the activities within the process, to set goals, to define the target population, to decide on how to attract the target population, to apply pre-selection methods, to monitor and control the process and to always evaluate the outcome.

### **9.2 Basic Requirements**

#### **Guideline 7: Medical Requirements**

Information to applicants must be clear on the requirements for health, vision and hearing. Potential applicants should as early as possible be encouraged to assure themselves and the organisation that they fulfil these requirements and enclose certificates with their application.

#### **Guideline 8: Educational Requirements**

Most theoretical subjects in ATC training demand a certain level of education, as well as proven learning abilities. Therefore a minimum level of education should be stated as a prerequisite to attend an ATC Academy.

### **9.3 Attraction and Self-selection**

#### **Guideline 9: Attraction and Motivation**

Formal information about ATC work and the training must be presented in such a way that all potential applicants can make a fair judgement and that the desired motivational source is addressed.

The information given must be realistic and clear. Both positive and negative sides of ATC training and the controller job should be highlighted and should not be biased towards extrinsic motivational factors.

#### **Guideline 10: Active Search for Applicants**

Recruiters should interact with potential applicants by visiting them in their normal environment, such as schools, clubs, and career, aviation and computer exhibitions.

### **Guideline 11: Role Models**

The most effective influences of career decisions are ATCOs about the same age as the target group. By addressing themselves directly towards the potential applicants and talking about themselves, their job, job satisfaction as well as hardships, how to apply, the probability of being accepted, and how the training is designed, ATCOs can serve as identification objects.

### **Guideline 12: Video Films**

A video film of ATCOs talking to an audience can substitute for live ATCOs. Recruitment personnel who use video films about the ATCO profession should have a specific training on the use of films as a media to influence the viewers' behaviour.

### **Guideline 13: Using the Internet**

The ATS organisation's home page on the Internet should make it possible to search for factual information on how to become an ATCO. Live pictures as well as some low fidelity exercise on a computer game will make it possible to image oneself as being an ATCO. It should also be possible to download an application form. The pages do not need to be interactive in the sense that an applicant can apply directly from his computer. Any magazine or newspaper advert should be cross-referenced to the WWW home page.

### **Guideline 14: Magazines, Newspapers and Brochures**

Most publishing companies can provide market research on their readers. A comparison should be made to see if the potential applicants match any of the readers of these magazines.

Sufficient, relevant and realistic information should be presented in an advertisement. The information can serve for self-selection purposes by discouraging potential candidates who do not meet the prerequisites.

## **9.4 Relevant Applicant Characteristics**

### **Guideline 15: Choice of Predictors**

The specific characteristics of the applicants are predictors of success in ability assessment or in ATC training. Any variable known to discriminate between good performers and poor performers in selection test and/or in ATC training and which can be assessed in the pre-selection process should be used as a predictor in the pre-selection if this is not prohibited by national law.

The profile of suitable applicants for the selection process should contain those characteristics that have been proven to discriminate between the accepted ones and rejected ones in the later stages of the selection process.

## 9.5 Assessment of Applicant Characteristics

### **Guideline 16: Application Form**

The application form must contain items on facts, facts that are easy for the applicant to quantify and easy for the recruiter to evaluate.

There also has to be room for qualitative information which gives opportunities for applicants to make subjective responses.

The items in the application form must be clear and must be expressed in a straightforward way so that there is no mistake with regard to their meaning.

### **Guideline 17: Design of the Application Form**

In designing an application form it is important to make items easy to understand. It is also very helpful, both for applicants and pre-selectors, to have many items asking for quantifiable answers.

This can be achieved by asking the applicant to state the frequency, duration, intensity, etc., of relevant behaviour (e.g. number of hours spent per week, month / year attending classes, level of performance). This approach can be used with items on formal education as well as for items on interests and hobbies.

### **Guideline 18: Comparison between Applicants**

If a scale is used for comparison between applicants, it should be criteria-related and give some expectancy on who will succeed in the future selection and training. Items on the comparison scale have to spread the applicants.

The items on the scale shall not be too highly interrelated and the summed scores must spread all applicants towards a normal distribution. To transfer the information from the application form to a measurement scale, it is convenient to use a software product. This software product should be in such a format to enable statistical calculations on reliability and validity.

### **Guideline 19: Rank order of Applicants and Setting Cut-off Scores**

The effectiveness of pre-selection is dependent on the validity of the assessment scale. The objective for the pre-selection is to reject those who would be rejected by the ability assessment or the selection interview, and select those who would score above the cut-off line on the ability assessment and pass the selection interview.

In setting a cut-off score one has to consider the number of applicants, number of vacancies for ATC training to be filled and the cost for the ability assessment and the selection interview.

A conservative approach could be only to choose from the top applicants downward according to their paper sift marks. An expectancy table should be used to plan further testing and selection.

## **9.6 Evaluation of Outcomes**

### **Guideline 20: Evaluation of Outcomes**

The discriminative efficiency of the pre-selection assessment is of great importance.

In order to get this information one has to compare the distributions on the pre-assessment scale between those being accepted for ATC training with those being rejected. This follow-up study will give information on the size of overlap between the two groups, and hence information on the effectiveness and the utility of the pre-selection procedures.

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## **ANNEX A: ABILITY TESTS, GENERAL ABILITY AND EDUCATIONAL ACHIEVEMENT**

EATMP (2000a) reported that from the test batteries in use for selection of *ab initio* trainee controllers, 21 include specific ability tests for spatial orientation, mental arithmetic and memory capacity, 29 include some sort of personality assessments, 16 States use written English language tests and 20 batteries include verbal English language tests.

Some of the above-mentioned cognitive ability tests are tests of a common factor called “**g**” or “general ability”. Carroll’s (1993) studies of the structure of human cognitive abilities show that particularly visualisation (spatial tests), quantitative reasoning, verbal ability, flexibility of closure (embedded figure tests), numerical facility (the ability to handle simple problems in addition, subtraction multiplication or division with speed as well with accuracy) and associative memory as well as memory span are all correlated with the **g** factor.

### **General Ability and Educational Achievements**

Testing for the **g** factor is closely related to a person’s ability to learn from written information and solve complex problems, particularly those kinds of problems that students have to solve during more theoretical secondary education.

Therefore, there may be room for considering achievements in school (grades in several subjects), provided that they are comparable, in paper sifting of applicants, with the aim to select those who have a higher chance of passing selection testing (ability testing).

Hopkin (1995) also supports this view and advocates that general ability seems to be the most important human ability regarding selection of *ab initio* trainee controllers. For intelligence well above average it is necessary not only to be a controller but to learn to become one, and it is reasonable to expect that intelligence above average correlates with education and paper sift marks.

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## ANNEX B: THE DESIGN OF MODELLING VIDEO FILMS

### Authenticity

To make a video film that actually shapes audience behaviour demands authenticity requiring:

- a limited number of persons presenting themselves and their work on the film, e.g. one to three persons;
- the persons must actually be what they are presenting themselves to be;
- age wise, the person should match the target population.

The reasons to limit the number of persons, are that the audience must connect to these people and identify with them. It is easier to connect to a few people than to many.

To enhance identification, the persons performing in the video film must appear to be competent and have a certain degree of success in their work. They must also appear to have achieved their status by something that can also be achieved by the audience. The focus is on the central persons character's behaviours in, for example, a career decision.

### Attention and Identification

Audience attention is kept by:

- keeping the duration of the film to a maximum of twenty minutes;
- including a short dramatic episode, something that stimulates the audience to anticipate what the central character will do;
- letting the central character solve a problem or presenting something that reinforces the impression of competence.

The use of a role model in recruitment is based on Bandura's (1977) ideas concerning the development of social behaviour through observation and imitation. Along with giving trainees prior behavioural objectives, and advance organisers, role modelling is one of the interventions that occurs before the desired behaviour, unlike the behaviourist approach, where intervention is always after behaviour, e.g. feedback and knowledge of results.

Bandura showed that several features of role modelling have been shown to affect its efficiency:

1. The **appropriateness** and **relevance** of the model's behaviour. For example, aggressive male models are more readily imitated than aggressive female models, due to society's view of the relative

appropriateness of aggressive behaviour. A video film might show an ATCO stressing safety aspects, and appearing to be attentive to detail, in line with the audience's presumed view of appropriate behaviour.

2. The similarity between the model and the audience. Hence, the ATCO model should be close to the age of the audience, and of the same nationality, etc. The gender of the model should also be the same, but this is clearly problematic with mixed groups. The similarity effect could be stronger for minority groups, which could be important if a State has a policy of increasing numbers of under-represented groups.
3. **Warm and friendly** models are more likely to be identified with.
4. More **successful / powerful** models are identified with quicker. This is important as a video is not very long compared to most social learning situations (e.g. growing up).
5. If the model's behaviour is rewarded, it is more likely to be imitated. It is difficult to portray this (and the previous variable) in a video about ATC. The model should be shown to be succeeding and rewarded, perhaps by promotion.
6. The behaviour of the model should be **consistent**.

Not all of the above features can be easily depicted in a short video, but the most important thing is that the audience can identify with the model. It is easier to identify with one person than with many, so the number of models should be small.

It is also important that the audience considers the model to be authentic, so an actor must be convincing if used.

### **Advance Organisers**

The amount of information presented in a short visual film, forces the audience to be selective in their attention. Some sorts of advance organisers are needed to guide the audience. These advanced organisers may be a speaker telling the audience what will be depicted in the coming scenes, or a coach who uses the video to highlight certain aspects.

The notion underlying the use of advance organisers is that in order to learn new information, the trainee has to have relevant concepts or schemata with which to integrate it, and make it meaningful (Ausubel, 1960, 1963). The advance organiser is at a "higher level of abstraction, generality and inclusiveness than the learning task". In a video film, an advance organiser could be in the form of a diagram showing the relations between elements of the training content, plus cueing the audience about what to attend to in following sections.

It is vital to be focused upon either specific actions or to be told to imagine the picture afterwards. For these reasons a short introduction of what will be depicted on the video could start a video presentation.

Some of the audience might be interested in aviation; others might have an interest in advanced technology, while others might have more diffuse interests. The advance organisers serve to induce some thinking patterns, for example compare the depicted work environment with their own school environment, look for what kind of technology that is depicted, study the age range of the ATCOs depicted, or reflect about what benefits the ATCOs in the programme contribute to aviation safety.

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## **ANNEX C: USING THE INTERNET FOR CAREER EXPLORATION**

Career exploration and job seeking can be seen as information processing and decision-making. When it comes to such a new media as the Internet one has to rely on research from Computer-Based Training (CBT) to explain and enhance the concept of computer-based advertising and recruitment.

### **Different Level of Human Information Processing**

The human information processing takes place on unconscious and conscious levels.

Any stimulus that in any respect deviates from the background, elicits signals from the sensory systems used for human information processing. This is the attention and perception level.

The amount of information that the sensory systems have to process is infinite. Not only is the amount of information infinite, the information is also constantly changing. In order to deal with this information, the brain has to process it on an unconscious level. Most sensory information will be perceived as non-significant, i.e. background noise leaves no footprint or trace that can be retrieved on a conscious level.

### **Limitations in Human Information Processing**

It is very easy to overload (short circuit) the human information processing system. Humans might misinterpret information because it is too

- vague,
- ambiguous,
- much,
- intense,
- weak.

One general rule to reinforce information is to make people react to it on a conscious level by some sort of action. Actions might be to answer questions, point, underline, repeat the information, come up with questions, etc. Another general rule is to let people use more than one modality in responding to information. This might also lead to a deeper level of processing of a higher order.

### **Higher Order Mental Information Processing**

The distinction between perception of information and cognition of information has to do with the interaction between the individual and the information. In perception, humans interpret information to a meaning, and in cognition

humans expand the meaning of the information by processing it through existing knowledge, give the presented information a new meaning, and recode the information into one's own store of language and experiences.

### **Human Decision-making**

Human decision-making as a judgement process has to do with using information cues, to predict an outcome and then to evaluate the outcome against some expectancies. Even the information search process on the Internet is a decision task. There are basically three decisions the Internet visitor can make:

- exit from the Web site,
- random or structured search for more information,
- go to a specific page or site.

This means that the job search and associated career decisions can be described as a distributed dynamic decision task.

Each piece of information on a Web site is both an outcome of a decision the visitor makes, and an input for the next decision to be made. The pieces of information are distributed at various locations hidden from the visitors' eyes.

Part of the problem in using the Internet as a recruitment media is the need to control the visitors' decisions and the need to let them respond to the information of their own immediate situations.

The objective of having a Web site is to try and improve the ratio of applicants to successful candidates. At the moment, the applicant attrition rate is rather high when compared to the number of successful *ab initio* trainees.

For this reason, the visitors are asked to match the presented information comprising:

- different responsibilities,
- tasks,
- tools,
- work environment,

with:

- formal and basic requirements,
- abilities,
- skills,
- motivation,



and get the visitors to match that information with their own job preference and self-perception of:

- knowledge,
- skills,
- abilities.

This means that some visitors can, by self-selection, exit from the Web site, while others will stay longer and search for more or expanded information. The length or frequency of visits is NOT necessarily proportional to the probability of the visitor becoming an applicant!

### **Reinforcement of the Information Search Process**

Since the presented information is an outcome of a decision of the visitor, the presented information should reinforce the decision taken. Positive reinforcements are generally something people feel good about. Positive reinforcement is also something that happens unexpectedly on an intermittent basis. Even some stimuli with a very high value of interest decrease the interest, if it is presented too often. The novelty as well as the number of exposures are critical in information presentation.

The objective of a Web site or Web page should be to give the visitors interesting information as well as entertainment. This can be done by using:

- animation,
- pictures,
- sounds,
- metaphors,
- humour.

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## **ANNEX D: WHAT MAKES A GOOD WEB SITE?**

As there are many factors involved in producing a “good” Web site, this Annex will outline first some of the more general statements and then come down to the specific individual points and summarise all these at the end.

For the time being a Web site does not replace existing marketing strategies, but rather augments them. Any adverts should be linked to a Web page. A recent survey<sup>1</sup> carried out by EATMP in 2001 within six ATS organisations in the European core-area shows, that on average 11.4% of applicants for the ATCO job have first learnt about the ATCO job through an Internet site. The range of those applicants between the six ATS organisations was 8-19%. When examining the group of applicants who were 17 years old and more when first learned about the ATCO job, on average 14.1% of those applicants learnt it through the Internet. See also EATMP (2000b).

A Web site is no more than a computer attached to the WWW. It has a specific address, just like a regular postal address. When somebody wants to visit a specific site, they type in its address using a specific format.

So the first general point has to be concerning the speed of the site. One can have an excellent site but if it is very slow any visitors will simply leave and not bother to come back. It is a fact of life that people become bored. Young people become bored somewhat more quickly than older ones, and as the target audience of candidates to become ATCOs is late-teens to mid-twenties, speed is an important issue. Speed is broadly governed by three technical aspects of the Web site:

- Speed of the telecom interface unit, be it a MODulator-DEModulator (modem), Integrated Services Digital Network (ISDN) adapter or high-speed Internet access technology - see below for explanations. Modems are not commonly used anymore. ISDN modems can be, if there is a specific target audience for the server (i.e. a specific group of people that uses the Web server, and apart from that nobody). In that case, ISDN lines are still commonly used. In many cases, however, Web servers are connected to the Internet with a high speed connection (fiber cable mostly);
- Speed and general specifications of the ATS organisation computer system;
- Size of the files (especially the pictures) one is trying to make appear on the visitor's screen and the Web site language used<sup>2</sup>.

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<sup>1</sup> The results of this survey, as part of a follow-up Marketing and Communication Study – Phase 2, will be published under EATMP in 2002.

<sup>2</sup> Web sites making use of Hyper Text Mark-up Language (HTML) can be downloaded much quicker than Web sites that contain ‘dynamic’ features using for instance ‘Flash’. However, technology has advanced such that small Flash presentations can be viewed without too much speed drawbacks.

The second general point is being able to find the site in the top five pages of site listings - such as those provided by the major search engines – Google, Yahoo, Alta Vista, Excite, etc. This may be achieved by either employing a company to circulate the Web site details to each of the search engines and/or directories which is a costly solution - or by doing the same work oneself.

The third general point is the validity of the information being offered to visitors. If a site is visited in mid-2001, there is little point in finding information relating to early 2000 - for example. This suggests that one or two persons within the ATS organisation should be made responsible for the uploading and maintenance of the site generally.

As far as the actual construction and relationship of the site pages is concerned, there is general consensus that the optimal method is to have a hierarchical system, where the first page (the 'Index' page) has an opening statement and some simple graphics to allow the visitors to navigate their way around the site as easily as possible. Normally, this will mean having the name (or some other unique identifier) of each second-level page on the index page. This identifier will usually be underlined (known as an internal hyperlink) and the visitor only has to click their mouse on this word or sentence to be moved immediately to the destination page. The second-level pages can have as many of these internal hyperlinks as necessary to permit the continued downward movement into greater and greater levels of detail as appropriate to each individual site. One should be aware that too much detail and/or too rigid a hierarchy would also tend to bore the visitor. As a general guide three levels should be sufficient except in special circumstances.

Hyperlinking can also be used to great effect for navigating to other sites (external hyperlinks) and the browser (a program used for looking at the pages) usually has a 'BACK' button to permit the visitor to reverse the hyperlinking process at will.

Web sites need to be planned carefully and logic should be applied to the content of each page or contextual area. If we are dealing with recruitment issues for example, there will be a 'RECRUITMENT' internal hyperlink on the index page leading to a second-level page, which outlines **all** the recruitment requirements. That second-level page will have internal hyperlinks leading to several third-level pages - one for each specific area, such as:

- ATCOs,
- Flight Information Service (FIS),
- Aeronautical Information Services (AIS),
- other vacancies.

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In fact, some Flash files may even load quicker than some graphic files, provided that the Flash animations are kept small.

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Each of those third-level pages will detail the exact academic requirements for the post and give the potential candidate (visitor) a good, realistic overview of the likely duties involved, career prospects, training facilities and so on, perhaps with hyperlinks (internal and/or external) to show examples of work centres, training and recreational facilities, etc.

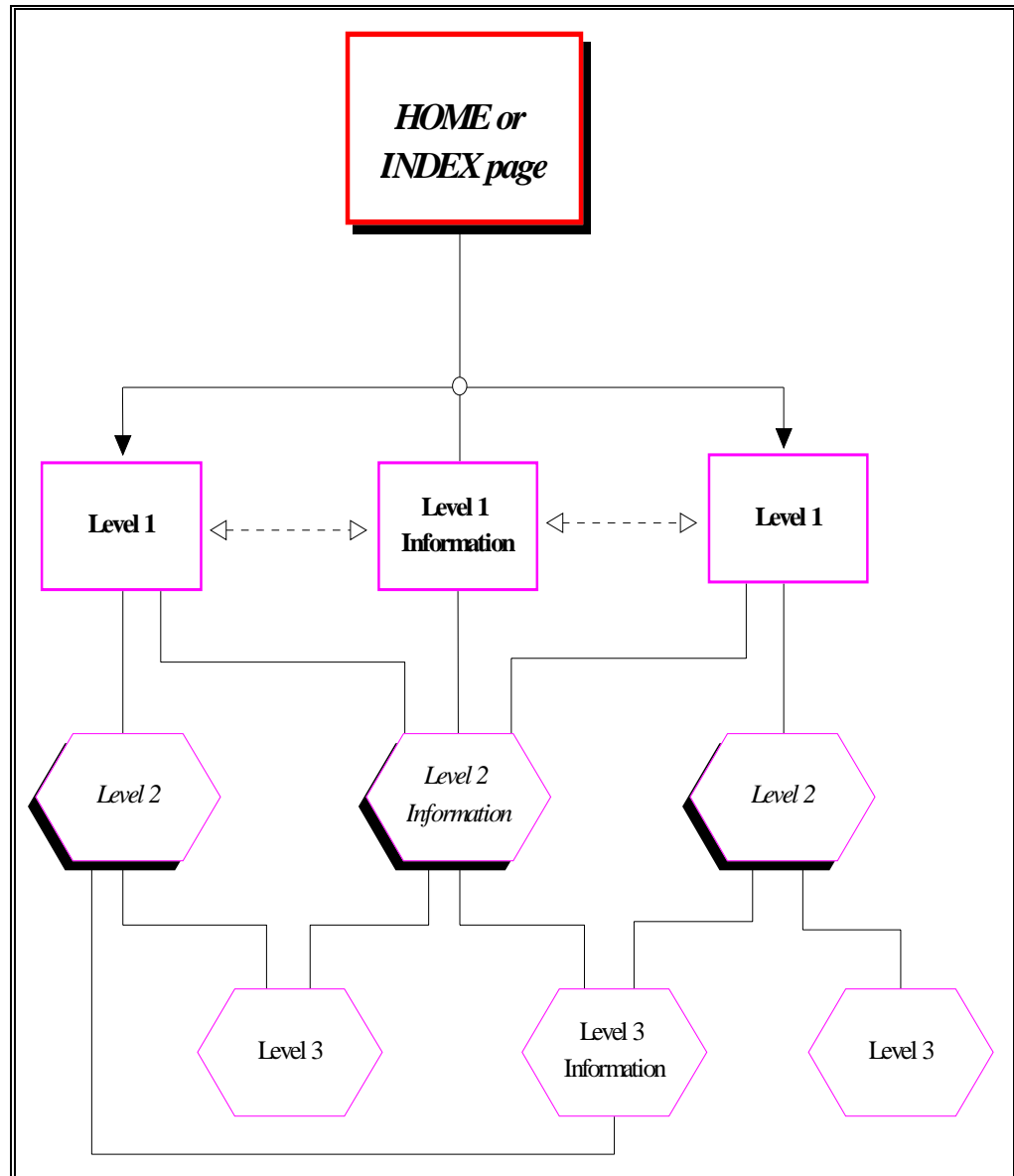


Figure 1: A typical Web site page relationship layout

Several specific (rather technical) points which were mentioned earlier on, will now be enlarged upon:

### **Speed of the Telecom Interface Unit**

The speed of the analogue dial-up modem or digital ISDN adapter is a crucial factor in the speed of access to a WWW site. Currently, modems are operating at speeds of between 9600 bits per second (bps - or baud) to a blistering 921600 bps. Common speeds are 14400 bps, 28800 bps and 33600 bps. By comparison, most fax machines operate at speeds of between 4800 and 14400 bps (9600 bps is the norm).

It would be beneficial first to provide a short clarification on the terminology that is in common use. A byte consists out of 8 bits. Therefore, 16 bit is equal to 2 byte. When speaking of **Megabit** (Mb) connections, this is not to be confused with **Megabyte** (MB) connections, of course.

It is generally acknowledged that ISDN provides a much faster connection than the standard analogue dial-up modem that connects to a standard telephone line. Therein lies a problem - special ISDN terminal equipment and ISDN lines need to be available at one's premises. These are normally provided by the local telecom provider (at some considerable cost), but the savings can be significant over a standard dial-up service if the lines are used enough (and they would be with a Web site running). ISDN speeds vary from 64,000 bps (64 Kilobits [Kb/s]) or 8 KiloBytes [KB/s] to a staggering 45,000,000 bps (45 Megabits [Mb/s]), or 5.6 MegaBytes [MB/s]). For a small-to-medium size Web site, ISDN service speeds are likely to be from 64 Kb/s to 2 Mb/s.

As far as the visitor to the Web site is concerned, there is no difference, except that the ISDN Web site is very quick to respond and that one fact will help persuade them to stay a while and explore the whole site. Web sites using high-speed analogue modems (28800 to 57600 bps) will be quick, but not as quick as ISDN equipped sites.

### **Speed of the Computer System**

The computer system itself needs to be able to respond to several tasks at almost the same time. This is called multitasking and may be achieved by connecting a couple of ISDN lines to provide several telecom channels or several high-speed analogue modems (each with a separate telephone line). Sites are likely to have more than one visitor at a time - and the pattern of access is frequently one of the most useful statistical indicators.

So the machine must multitask successfully. This requires a high specification machine of at least an 80486 (486)<sup>3</sup> processor type, preferably a Pentium Pro or Pentium II processor, operating at as high a clocking speed as possible. The 486 operated at speeds of up to 100 Megahertz (MHz) or 100 million

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<sup>3</sup> However, it should be noted that from an Internet Point of view, a 486-based computer is not an option anymore for a Web server (not one that is supposed to attract a certain amount of visitors anyway).

cycles per second, but the Pentium Pro operates at speeds of up to 200 MHz. The Pentium II processor is already clocking at speeds up to 266 MHz.

In general terms, the size of the hard disk the computer relies on to operate from should be as big as possible. Figures of 1000 MB or 1 Gigabyte (GB) are common today, ranging up to several dozen GB capacity.

Random Access Memory (RAM) is even more crucial. All one can say here is the more the better. 16 MB is the absolute minimum if one is operating a single line with a single analogue modem. 32 MB should be fitted as the absolute minimum for ISDN use and the entire system will run far more smoothly with 64 or 128 MB of RAM fitted.

### **Size of the Files to Appear on the Visitors Screen**

The file sizes need to be kept as small as possible - **especially** the pictures or graphics one includes on the index page - as most visitors will be calling the site from their homes on a standard telephone-and-analogue-modem set-up operating at a modest speed of perhaps 14400 bps (see also [Footnote 2](#)).

The page loading-speed factor is important. If a site looks interesting in the space of the first few seconds of a connection, there is a good chance the visitor will stay and have a comprehensive look around the whole site - perhaps for several minutes - and will probably come back again for another look later on.

If, on the other hand, the site has several huge graphics to load on the index page, rather than several small ones, there is a good probability of the transfer being aborted and the visitor leaving the site without having even got to see the whole of the index page - let alone anything else.

To conclude this Annex, a summary of the best and worst points for a Web site:

### **Recommendations**

1. Three main concepts must be borne in mind: reference, recreation and reward. People must be brought to the page(s), they must be kept there and they must be brought back. In order to bring them back, links to other pages should be considered along with useful help.
2. It is necessary to ensure that recruitment appears on the front page of the ATS organisation Web site.
3. A frequently asked questions page should be available for reference.
4. If an advertising agency site is used, it should be hyperlinked to the ATS organisation Web site.
5. Banner advertisements with the search engines should be considered. These should be linked to particular search words, e.g. ATC. News groups should also be taken into consideration.

6. Web sites need careful planning. One should create a “model” of the site layout before attempting any implementation procedure.
7. Consider use of an ISDN adapter and high-speed digital lines - for the fastest possible multiple access.
8. Consider using a high speed, high specification computer to run the Web site on - for fastest possible multiple access while:
  - keeping the size of graphics modest or small - especially on the initial index page;
  - using a fair sprinkling of in-context “clickable” graphics in the pages to help maintain interest.
9. One should circulate the site details to all the search engines, directories and databases possible because:
  - the site needs to appear in the top five pages of any directory listings;
  - the site needs to be **visible** to the outside world.
10. A Web site must be regularly updated. One should maintain the validity of the information on the site - last year’s information is no good to anyone. An update involves the rapid removal of old pages and extinct hyperlinks.
11. Consider using (and maintaining) a hierarchical relationship between the pages and allow the pages to be fully interlinked.
  - Keeping to three (or possibly four) levels of page - as attention span is limited.
12. One should keep the index page relatively simple and provide hyperlinks back to this “home page” from every other page.
13. Consider the use of “headline style writing” to convey maximum information with minimum words.
14. Use of colour and/or pictures help maintain interest.
15. One could use tables of information where appropriate, but keep the page size in mind for printing.
16. Hyperlinking is a very effective “instant navigation” tool. Consider incorporating integrated graphics with hyperlinks wherever possible.
17. There exists no firm opinion as yet as regards the possibility of placing an application form on the Internet.



### **Problems and Concerns**

1. Changing the site address and failing to amend **all** external hyperlinks that point towards the site.
2. This results in the dreaded "ERROR 404" message being received by the visitor, i.e. site not found / not existing.
3. The speed of the net requires a quick response from the ATS organisation. A dialogue channel is opened up and the applicant may not take 'no' for an answer.
4. A limited bandwidth causes lengthy downloads if the graphics are too complicated and this results in a loss of interest of the user. Having such huge graphics that the visitors become bored after waiting two or three minutes for the index page. Therefore, it is best to keep the page(s) simple.
5. Having a **mass** of text that is too small and perhaps difficult to read.
6. Failing to test the internal and external hyperlinks - do they work as expected?
7. Beware of problems associated with security of the site include spoofing of the site and data mining.
8. Failing to remember that the Internet is global. What may be a true statement in one State may be completely illegal or incorrect in another. There is a danger of breaking local laws with global information, e.g. age restrictions.
9. Failing to maintain the pages / forgetting about the site once it is established.
10. Hits should be ignored as a measure of the site effectiveness as the same person may visit several times. Instead, it is better to consider applications and hires as a more useful statistic.

Examples of Web sites of some Air Traffic Service Provider Organisations (ATSPs) are:

Name of ATS Agency	Location (URL)
Australia - Air services	<a href="http://www.airservices.gov.au">Http://www.airservices.gov.au</a>
Austria - Austro Control	<a href="http://www.austrocontrol.co.at">http://www.austrocontrol.co.at</a>
Belgium - BELGOCONTROL	<a href="http://www.belgocontrol.be">http://www.belgocontrol.be</a>
Canada - NAV CANADA	<a href="http://www.navcanada.ca">http://www.navcanada.ca</a>
Czech Republic - Air Navigation Services (ANS)	<a href="http://www.ans.cz">http://www.ans.cz</a>
Denmark - Danish Civil Aviation Authority ( <i>Statens Luftfartsvæsen</i> [SLV])	<a href="http://www.slv.dk">http://www.slv.dk</a>
Danish Air Navigation Services (Naviair)	<a href="http://www.naviair.dk">http://www.naviair.dk</a>
EUROCONTROL	<a href="http://www.eurocontrol.int">http://www.eurocontrol.int</a>
Finland - Finish CAA	<a href="http://www.ilmailulaitos.com">http://www.ilmailulaitos.com</a>
France - <i>École nationale de l'aviation civile</i> (ENAC)	<a href="http://www.enac.fr">http://www.enac.fr</a>
Former Yugoslav Republic of Macedonia - CAA	<a href="http://www.dgca.gov.mk">http://www.dgca.gov.mk</a>
Germany – Germany's navigation service provider, <i>Deutsche Flugsicherung GmbH</i> (DFS)	<a href="http://www.dfs.de">http://www.dfs.de</a>
Hong Kong – CAA	<a href="http://www.info.gov.hk/cad/index.htm">http://www.info.gov.hk/cad/index.htm</a>
Hungary – Air Traffic and Airport Administration (LRI)	<a href="http://www.lri.hu">http://www.lri.hu</a>
Iceland - Icelandic Civil Aviation Administration	<a href="http://www.caa.is">http://www.caa.is</a>
Ireland - The Irish Aviation Authority	<a href="http://www.iaa.ie">http://www.iaa.ie</a>
Italy – Italian ATS, <i>Ente Nazionale di Assistenza al Volo</i> (ENAV S.p.A.)	<a href="http://www.enav.it">http://www.enav.it</a>
Latvia - Latvian Air Navigation Enterprise, <i>Latvijas Gaisa Satiksme</i> (LGS)	<a href="http://www.ans.lv">http://www.ans.lv</a>
Netherlands - <i>Luchtverkeersleiding Nederland</i> (LVNL)	<a href="http://www.lvnl.nl">http://www.lvnl.nl</a>
New Zealand – Airways New Zealand	<a href="http://www.airways.co.nz">http://www.airways.co.nz</a>
Norway - Norwegian Air Traffic and Airport Management ( <i>Luftfartsverket</i> )	<a href="http://www.luftfartsverket.no">http://www.luftfartsverket.no</a>
Portugal – <i>Empresa Pública Navegação Aérea de Portugal</i> (NAV-EP)	<a href="http://www.nav.pt">http://www.nav.pt</a>
Romania - Romanian Air Traffic Services Administration (ROMATSA)	<a href="http://www.romatsa.ro">http://www.romatsa.ro</a>
Slovenia – Civil Aviation Authority	<a href="http://www.caa-rs.si/">http://www.caa-rs.si/</a>
Spain - Spanish CAA, <i>Aeropuertos Españoles y Navegación Aérea</i> (AENA)	<a href="http://www.aena.es">http://www.aena.es</a>
South Africa - Air Traffic and Navigation Services (ATNS)	<a href="http://www.atns.co.za">http://www.atns.co.za</a>
Sweden - Civil Aviation Administration (CAA) <i>Luftfartsverket</i>	<a href="http://www.lfv.se">http://www.lfv.se</a>
Switzerland - skyguide	<a href="http://www.skyguide.ch">http://www.skyguide.ch</a>
Turkey - General Directorate of State Airport, <i>Genel Müdürlüğü</i>	<a href="http://www.dhmiata.gov.tr">http://www.dhmiata.gov.tr</a>
UK – National Air Traffic Services Ltd. (NATS)	<a href="http://www.nats.co.uk">http://www.nats.co.uk</a>
USA – Federal Aviation Administration (FAA)	<a href="http://www.faa.gov">http://www.faa.gov</a>

## **ANNEX E: SCALES FOR PAPER SIFTING**

### **Procedures for Assessment of Applicants from Application Forms**

It may be possible to identify characteristics that are good predictors of success in subsequent selection stages and might be used in a second stage after applicants have been pre-selected on basic requirements. Paper sift procedures could then be developed to assess applicants in these characteristics on a scale. The aim would be to arrive at a rank order of applicants according to their score in the paper sift.

The following outlines some of the characteristics that might be considered.

### **Sampling**

It is virtually impossible to pre-assess applicants on all conditions, facts or experiences expressed in an application form. Instead, a sampling approach needs to be applied, with the aim to obtain a sample of items of sufficient number to ensure that the scale allows for a stable assessment of the suitability of applicants.

In doing this it is important to sample in particular those Knowledge, Abilities, Skills and Other characteristics (KASOs) which are basic for ATCO training and ATC work. The scale developed should reflect the differences between characteristics in terms of content criticality. This can be achieved by sampling more heavily from areas that are more critical and less from areas that are of lesser importance (see Chapter 4 of EATMP [2002] and Sub-Chapter 4.2 of EATMP [1998b]).

The following areas among others might be considered in sampling items for assessing applicants in paper sift:

- age,
- level of education,
- subjects studied,
- marks or grades,
- third level education,
- experiences of spatial ability tasks,
- intentions towards mastery goals,
- experiences of instructor dependence,
- experiences of continuous assessments,
- miscellaneous.

## Age

EATMP (2001) particularly stresses the importance of not accepting older applicants. Around half of ECAC States have an upper age limit of 25 years or less. In assessing age as an indicator for suitability, applicants in the age range between 20-30 years should be more favourably judged than older applicants, if these are not rejected at an earlier stage in the pre-selection.

## Level of Education

In assessing the educational levels required, the particularity / specific features of the existing educational system should be taken into account.

**Example:** If a university entrance level is the preferred level applicants should have achieved, applicants could be assessed whether they have reached this level. The development of an assessment procedure needs to take into account that in some ECAC States entrance into university is not guaranteed by the length of secondary education but depends also on courses taken and the grades achieved in specific subjects.

## Core Subjects

Where the existing educational system allows freedom to choose the direction of studies and the specific subjects according to personal preferences or vocational interests, it might be worthwhile to assess applicants whether they have chosen a certain subject or combination of subjects that have been identified as being related to ATC. The rationale is that core subjects are generally in line with or directly related to a certain vocational field.

**Example:** The core subjects of students could have been languages or social sciences, business administration, natural sciences, mathematics or core subjects that are directly related to a vocation or profession. The extent to which these core subjects have a bearing on ATC could possibly be assessed.

## Grades

Grades are supposed to represent the amount of knowledge students have acquired from education and the motivation and effort they have invested.

The level of achievement might be expressed in some countries in terms of an existing national standard. The problem to be taken into account is that in States where no one national standard exists, grades fail to convey the whole picture accurately because of regional differences or differences in grading systems used, type of schools, teachers, etc.

**Example:** Where a national standard exists, a comparison between applicants concerning their school grades in identified core subjects can be done. Considering the steps on the grade scale, it can be stated whether a given grade is "low", "medium" or "high".

### **Experiences with Spatial Ability Tasks**

Spatial ability is crucial for an ATCO, and hence any evidence of good spatial ability should be considered.

**Example:** Applicants might have mentioned perspective drawing, construction of miniature models, etc., as their favourite part time hobby. Other activities that demand a high spatial ability are those which involve map reading, for instance orienteering.

As shown by Mayer & Sims (1994) in an experimental study, people with high spatial ability benefit more from computer interfaces than those with low spatial ability. If we can assume that people prefer to do what they are good at, then we might expect that people who use computers have higher spatial ability than those who do not. Has the applicant:

- experience with word processing, or other computer applications,
- experience of the Internet,
- played computer or video games,
- used computer programming languages?

### **Experience with Computers**

The ATCO work and its work environment have changed and will in the future change even more. Computerised information tools and decision aids have been introduced and will be expanded in ATC. Experience with and understanding of computer technology may in the near future be an essential and critical skill factor for ATCOs. Therefore, applicants' experience of computer technology could be assessed in the pre-selection. The assessment can be made on type, purpose, frequency, duration and level of experience.

**Example:** Type can be assessed by the applicants' experience of word processing, or multimedia such as CD-ROMs or the Internet. Purpose can be assessed as habits of using computers for entertainment such as computer games or video games or for school's work or recording data. Frequency and duration is measured by time spent and the level of the experience can be measured by the applicants' use of programming language.

### **Intentions and Goals**

Haglund et al. (1996b) mention on principles of Institutional Training for ATCO students in TWR and Approach Control (APP), that students who are performance-oriented tend to believe that their abilities are fixed and attribute failures in training to non-manageable factors, while students who set more learning-oriented goals tend to attribute failures to predictable factors, e.g. that they did not practise enough or did not spend enough time on the assignment.

**Example:** It should be possible to judge the single applicant's intention from the application form, whether the intention is to reach some performance goal or is more in line with learning or mastery of a task.

### **Continuous Assessments**

From the field of social psychology it is a well-known fact that performance is negatively affected by others' observation. Applicants might in their applications mention that they exercise hobbies where observations or direct assessments from others come as a natural part of those hobbies.

**Example:** Amateur acting, team sport, debating clubs, chess playing, solo instrument playing, etc., are examples of hobbies where performance is directly evaluated and judged by others.

### **Miscellaneous**

The first impression and judgement of an applicant comes from the application form. Application forms which are completed in a correct way and returned within time create a positive first impression. This piece of information may also indicate whether or not applicants have put some effort and seriousness into their application to become an ATCO trainee.

## ANNEX F: PAPER SIFTING, CUT-OFF SCORES AND PRE-SELECTION

When considering a cut-off in the pre-selection, one has to take into account:

- the number of applicants in each category of suitability as assessed in pre-selection (e.g. paper sift marks or value range in a composite score);
- the calculated probability with which each category of applicants actually passed the stages in subsequent selection stages (e.g. percentage of applicants who passed paper and pencil tests, percentage of applicants who pass the interview);
- the costs per applicant in subsequent selection stages (e.g. costs of testing, travel and accommodation costs, costs of staff involved).

### Probability

Probability is the calculated expectancy for an event to occur / not to occur, for example, to pass the next step in a multi-stage selection. The probability of these events occurring can only be calculated by empirical data.

With regard to the different outcomes as described in [Chapter 8](#), these probabilities can be calculated as follows:

Actual (pos.)	Positives	$P(VP)=VP/(pos+neg)$	$P(FN)=FN/(pos+neg)$
Actual (neg.)	Negatives	$P(VN)=VN/(pos+neg)$	$P(FP)=FP/(pos+neg)$

From a practical point of view the number of correct decisions made by the pre-selection assessment procedures (recruitment and pre-selection assessment) is a more important piece of information than the degree of association which exists between predicted and obtained scores on the ability assessment as, for example, by a validity coefficient.

A validity coefficient does not tell the whole story of predictive success, and it is therefore also necessary to consider the discriminative efficiency of the pre-selection assessment in terms of the four possible outcomes of prediction. This information is of great importance to obtain in evaluating pre-selection methods.

### Establishing the Cut-off Score

The problem then becomes one of determining the optimal cutting score on the assessment scale. This can be done by using an expectancy table which has been established on the basis of figures established in earlier selection campaigns. [Table 1](#) below is an example of such an expectancy table.

Table 1: Example of expectancy table based on results from earlier pre-selection of applicants (success in percentage)

Paper sift scores	Number of applicants assessed in paper sift	Success rate in Phase 1 (in %)	Success rate in Phase 2 (in %)	Success rate in interview (in %)	Overall success rate (in %)	Expected number of successful applicants
15	48	60.0	66.7	87.5	29.2	14
14	156	45.5	57.7	71.7	18.6	29
13	282	31.2	58.0	60.8	11.0	31
12	245	27.3	52.2	62.9	9.0	22
11	132	26.5	37.1	46.2	4.5	6
10	160	26.9	58.1	64.0	10.0	16
9	28	28.6	50.0	50.0	7.1	2
	Total: 1051					Total: 120

**Note:** The columns headed 'Success rate' indicate, in percentage terms, the success (pass) rate of those who enter the respective phase in selection. For example: 66.7 % of applicants with paper sift score 15 who enter Phase 2 were successful in Phase 2. Column "Overall Success Rate" gives the average success rate across all three phases (Phase 1, Phase 2, Interview). For example: 29.2 % of applicants with a paper sift score of 15 passed all three phases. The last column gives the expected number of successful applicants. For example: It can be expected that 14 of the 48 applicants with paper sift score 15 will pass all three selection phases.

Table 1 shows that raising the cut-off score will decrease the probability of being rejected in the ability assessment and the interview. Lowering the cut-off score will increase the probability to be rejected in the ability assessment and the selection interview.

This information should be used to establish the cut-off score in paper sift and to plan subsequent selection campaigns and the intakes in training.

For example, if ten testing sessions with a maximum of 50 applicants each need to be filled, the applicants with paper sift scores of greater or equal 13 could be pre-selected and come closest to the requested number of a maximum of 500 applicants.



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## GLOSSARY

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

**Ability**<sup>4</sup>: What a person brings to the job situation without specialised, job specific training, education or experience. There are many kinds of abilities. As regards ATCO selection, the focus is on relatively broad mental abilities.

**Ability Test**: A standardised and controlled method for measuring abilities in different areas (e.g. memory, spatial, perception, attention). Ability test covers speed or power test, paper-and-pencil- or computer-based. Ability tests are developed in order to predict future performance in areas in which individuals are not currently trained. Ability tests used in selection of ATCO candidates cover a more or less broad range of abilities pertinent to the job of an ATCO.

**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.

**Applicant**: A person who applies for an *ab initio* training vacancy.

**Application Form**: Form to be filled in when applying for *ab initio* training.

**Candidates**: Individuals whose applications have been accepted for further consideration in the selection process but have not yet been selected finally as *ab initio* trainee controllers.

**Composite Score**: A score that combines several scores by a specific formula (CDSEPT, 1999).

**Customer**: Any person or unit receiving a service or a product.

**Cut-off Score**: A score in a predictor distribution of test scores below which candidates are rejected.

**Discriminant Analysis**: The procedure of classifying the individuals into two different groups on the basis of a test.

**Initial Training**: The training phase in ATC Training that includes technical subjects, ATC theory and practice including practical training conducted on simulators. The object of initial training is to prepare a trainee for pre-On-the-Job Training (pre-OJT) at an ATC unit.

**Job**: A group of a certain number of core tasks, direct support tasks and indirect support tasks which require a certain level of abilities, knowledge and skills.

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<sup>4</sup> There is yet no final position in the professional literature with regard to the question whether abilities are 'innate' qualities or have been already partly shaped by general education and experience.

**Knowledge:** The job-specific content or information which a person has gained through training, education and/or experience. Knowledge is built upon the foundation of mental abilities that a person brings to the situation.

**Manpower Planning:** A planning process to ensure that the appropriate number of qualified controllers and other staff categories is available at the right time in all work locations and their associate functions in order to match the changing requirements of Air Traffic Management (ATM) and to cover operational requirements.

**Mental Abilities:** The operations of the mind which are the fundamental, basic, and to some degree abstract, capacities and processes of perceiving, thinking and deciding.

**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 (see "Air Traffic Controller Training at Operational Units" [EATMP, 1999]). The training enables student controllers to check out as operational controllers at a specific operational unit.

**Paper Sift:** The sift of application forms and attached application material in order to pre-select candidates according to previously defined criteria.

**Predictor:** A measure used to predict criterion performance.

**Predictive Validity:** A demonstrated relationship between judgements of applicants and some future performance.

**Pre-On-the-Job Training (Pre-OJT):** The training phase in ATC Training of locally based training during which extensive use of simulation using site-specific facilities will enhance the development of previously acquired routines and abilities to an exceptionally high level of achievement.

**Pre-selection:** The process of rejection or acceptance of applicants on the basis of application forms and other material from applicants in an early stage of selection.

**Quality Assurance:** All planned and systematic measures required to create the necessary confidence in the ability of a product/service to meet agreed quality requirements or standards.

**Recruitment:** The process of searching applicants to staff vacancies in an organisation.

**Reliability:** A measure of consistency or dependability or repeatability. The results of a particular testing session should be replicated if the same individuals were re-tested under similar conditions. Reliability of a test means that the test behaves the same way under a variety of circumstances (e.g. the test yields similar results when different persons administer it, when the test is administered on different occasions, when alternative forms of the test are used, etc.).

**Self-selection:** The result of person's self-assessment of his/her capabilities and character in comparison to job requirements.

**Skill:** Competence to perform the work required by the job (SIOP, 1987).

Skill refers usually to the combination of ability and knowledge after training and practice which is required to perform a specific job.

**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.

**Validation:** The effort through which the appropriateness and meaningfulness of interpretations from scores on a measure can be estimated (SIOP, 1987).

**Validity:** The degree to which inferences from scores are justified or supported by evidence (SIOP, 1987).

The extent to which predictor samples of behaviour effectively overlap with performance domains could serve as an operational definition of validity.

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## ABBREVIATIONS AND ACRONYMS

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

ACC	Area Control Centre
AIS	Aeronautical Information Services
APP	Approach Control
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer / Air Traffic Controller (UK/US)
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSP	Air Traffic Service Provider
bps	bit per second
CAA	Civil Aviation Authority / Administration
CBT	Computer-Based Training
CDG	Core Drafting Group (Selection)
CD-ROM	Compact Disk-Read Only Memory
CDSEPT	Committee to Develop Standards for Educational and Psychological Testing
DIS	Directorate Infrastructure, ATC Systems and Support (EUROCONTROL, Headquarters; EATMP)
DIS/HUM	Human Factors and Manpower Unit (EUROCONTROL, Headquarters; EATMP; also known as HUM [(Unit)])
EATCHIP	European Air Traffic Control Harmonisation and Integration Programme
EATMP	European Air Traffic Management Programme
ECAC	European Civil Aviation Conference
ET	Executive Task

EUROCONTROL	European Organisation for the Safety of Air Navigation
FEAST	First European ATCO Selection Test package
FIS	Flight Information Service
FN	False Negatives
FP	False Positives
GB	Gigabyte
GUI	Guidelines
HRS	Human Resources Programme
HRT	Human Resources Team
HTML	Hyper Text Mark-up Language
HUM	Human Resources (Domain)
HUM (Unit)	See 'DIS/HUM'
IANS	Institute of Air Navigation Services ( <i>EUROCONTROL, Luxembourg</i> )
ICAO	International Civil Aviation Organization
ISDN	Integrated Services Digital Network
KASOs	Knowledge, Abilities, Skills and Other characteristics
KB	Kilobyte
Mb	Megabit
MB	Megabyte
MHz	Megahertz
MSG	Manpower Sub-Group
MSP	Manpower Sub-Programme
OJT	On-the-Job Training
RAM	Random Access Memory
REP	Report
SARPs	Standards And Recommended Practices

SDE	Senior Director, Principal EATMP Directorate ( <i>EUROCONTROL, Headquarters</i> )
SIOP	Society for Industrial and Organizational Psychology
ST	Specialist Task
STF	Selection Task Force
TWR	Tower
VN	Valid Negatives
VP	Valid Positives
WWW	World Wide Web

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