

A Strategic and Integrated Approach to Human Issues in Air Traffic Management (ATM)

Úna Mellett
Human Resource Management Expert
Human Factors and Manpower Unit, EATMP, EUROCONTROL
96 Rue de La Fusée, 1130 Brussels, BELGIUM
Tel : 32 2 7293482 Fax : 32 2 7299149
Email : una.mellett@eurocontrol.int

*Tell me and I will forget
Show me and I may understand
Involve me and I will understand*

Abstract

Learn how a collaborative process has been designed and applied using systems thinking principles in implementing a system dynamics model to improve the planning of air traffic controllers (ATCOs) by Air Traffic Management (ATM) organisations. The model is called LAMPS (Long-term ATCO Manpower Planning Simulation) and the process is called CHAMP (Collaborative and Harmonised ATCO Manpower Planning). This paper describes the challenges faced in the planning of ATCOs, the LAMPS tool and the CHAMP process, application, benefits and key insights. Applying this tool and process in ATM organisations has led to new insights in the way ATM organisations think and manage the planning of ATCOs to improve their business performance. One of the key benefits is that this new perspective enables the development of integrated solutions to ATCO Manpower Planning issues for the longer term.

Key Words

Complex, collaborative, integrated, strategic, process, decision making, air traffic control, manpower planning.

The Challenge

In theory, the strategic objective of Air Traffic Controller (ATCO) Manpower Planning is easy and straightforward: to 'provide the right number of staff, with the right qualification, at the right time and in the right place to meet business requirements'. In practice, it is difficult to reach this objective. However, not getting the ATCO Manpower Planning right affects the whole Air Traffic Management (ATM) service performance. For example, a shortage of ATCOs translates into lack of capacity, air traffic delays and time pressure on the current ATCO workforce, leading to deteriorating working conditions, increasing delays even further and leading to knock-on effects in neighbouring air traffic control (ATC) sectors.

ATCO Manpower Planning is complex because:

- It requires **balancing** the number of ATCOs required with the number of ATCOs available at any point in time in the future.

- As *time horizons widen* what will be needed in terms of Human Resources (Manpower) and what will be available is less easy to answer due to uncertainty of the factors involved e.g. ATCOs required for training and projects, the number of trainees that will successfully complete their training.
- It depends on a *multiple of interconnected and interdependent variables* (see *Figure 1 below*) which means that several things have to happen which cause multiple effects in different parts on the system.
- *Decision-making involves many participants* in the ATCO Manpower Planning process and their current understanding of the causes and effects of their actions.
- Decisions are required on the number of ATCOs required five years from now rather than the number needed now influenced by a number of *factors which are difficult to determine and shorten* e.g. the number of *ab initios* who will be selected and who will successfully complete the training stage etc..
- It is dynamic in that the *cause and effect are distant in time and changes occur at many timescales*.

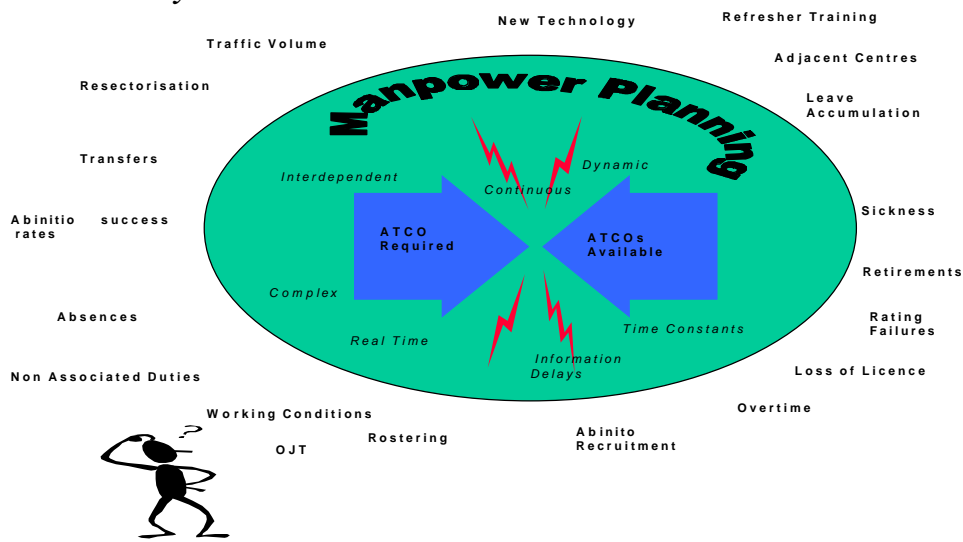


Figure 1 – Variables involved in ATCO Manpower Planning

Today, ATM organisations are not just faced with the decision to recruit and train more ATCOs to cover a shortage. The factors involved have grown more complex, for example, the challenges now include how to attract suitable young people to a career in ATC, to cope with the challenge of an older ATCO population adapting to new technology and automation, increase in workload to meet capacity increases to name but a few. Furthermore, in managing ATCO Manpower Planning issues ATM organisations need to make decisions about the future which is full of uncertainty. Past experience has shown that in many cases ATM organisations response to uncertainty about the future has lead to :

- **Quick fixes and short timeframe:** In many situations only short-term solutions are designed and implemented in response to ATCO shortage or surplus. For example, many ATM organisations are now suffering the impact of a “go and stop” approach to recruiting and training ATCOs in the 1980s. Even today, this is still not a fully abandoned practice. In addition, the planning timeframe is

usually a five year window. Five years is too short to see the impact of decisions when it takes at least four years to recruit and train an ATCO.

- **Isolated Decisions:** ATCO Manpower Planning consists of discussions (perhaps cross-functional) supported by various number-crunching analyses. Management and staff at the functional level – Human Resources (HR), training, operations (Ops) – put their respective plans together to meet the demand for future ATCOs. However, these plans do not communicate in operational terms how the various functions of the ATM organisation work in isolation or together. For example, getting a picture of the number of ATCOs available at any point in time requires an understanding of the in-flow, through-flow and out-flow of ATCOs as shown in **Figure 2** overleaf. These activities are managed by processes such as recruitment and selection, training, licensing, competency checking, personal and career development and usually considered separately. The consequences of that major opportunities for synergy go untapped.

Consequently, as an ATM organisation faces these future challenges, they confront a deeper dilemma. How to strike a balance between prediction (believing that they can see past uncertainties) and paralysis (letting the uncertainties freeze them into inactivity)?

A Strategic and Integrated Approach

To support ATM organisations in managing future uncertainty in the planning of ATCOs a strategic and integrated tool set has been developed based on systems thinking principles and system dynamics modelling which includes:

- a long-term simulation tool called **LAMPS (Long Term ATCO Manpower Planning Simulation)** and
- a collaborative process called **CHAMP (Collaborative and Harmonised ATCO Manpower Planning)**.

LAMPS Tool

(Details on the simulation output from the LAMPS tool are provided in a separate paper i.e. Cees Niesing's : "Air Traffic Controller Manpower Planning Modelling")

LAMPS is a simulation tool which models all variables influencing the in-flow, through-flow and out-flow of ATCOs over time. LAMPS also models the factors influencing the relationship between traffic demand and ATCOs required. LAMPS can simulate these variables over a fifteen-year time frame. LAMPS also has a PC based gaming interface (allowing variables to be changed during the 15 year timeframe) and uses graphs and tables to show results. LAMPS is based on system dynamics concepts and runs under VENSIM (VENtana SIMulator) software. LAMPS makes the complex process of matching air traffic demand and having adequate ATCOs available more transparent by providing a platform to examine how the various factors influencing ATCO Manpower Planning interact over time and to understand how these factors behave in response to changing circumstances. This can be achieved by :

1. Configuring data in LAMPS to reflect an ATM organisation's ATC environment (i.e. number of sectors, traffic growth, rostering policy).
2. Setting up scenarios which can be modelled over a defined timeframe. This requires decisions on what variables may change over time, like traffic increase.

3. Reviewing the results to view various graphs, reports, tables which illustrate the result of decisions (e.g. on ATCOs required and ATCOs available) and to evaluate / compare different scenarios.

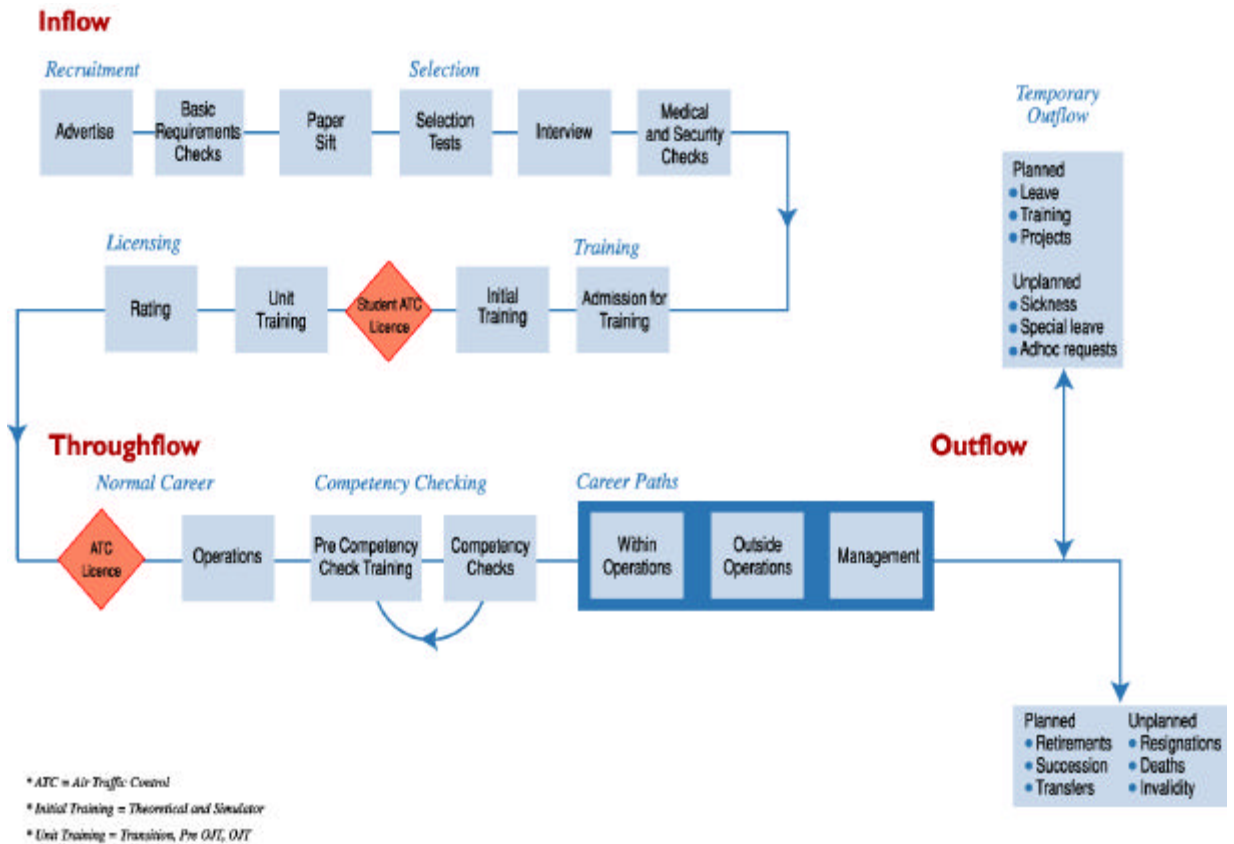


Figure 2 – ATCOs Available – inflow, throughflow and outflow process

CHAMP Process

To implement the LAMPS tool in an ATM organisation and to realise the maximum benefits of providing a "modelling and simulating for learning" platform, LAMPS needed to be embedded within a collaborative process - CHAMP -. The CHAMP process aims to bring various managers / experts together (e.g. operations, manpower planners, HR, training) to think creatively yet systematically about possible future environments, to develop scenarios, devise and evaluate strategic options for ATCO Manpower Planning and decide on implementation actions. The CHAMP process consists of six stages as outlined in **Figure 3**:

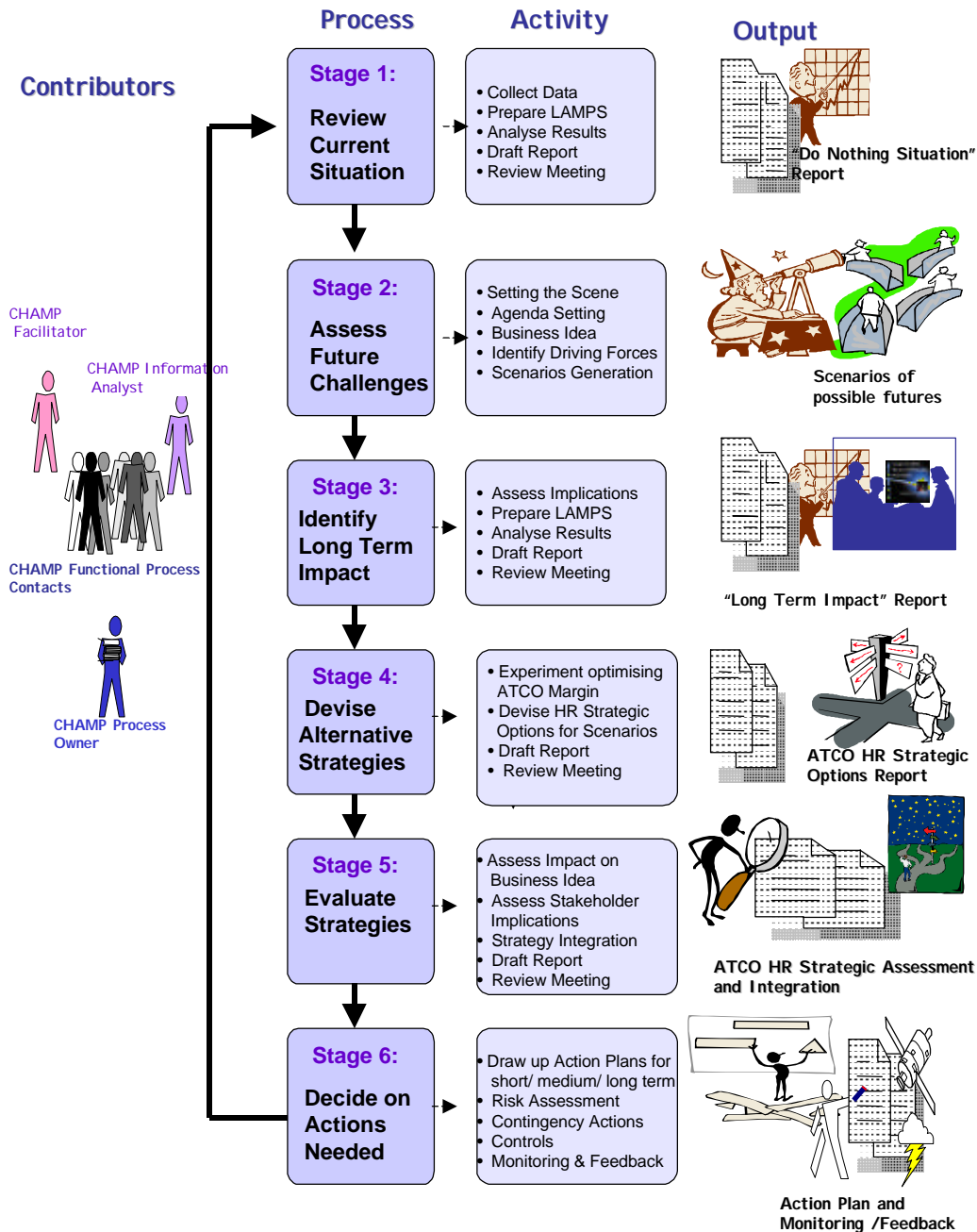


Figure 3 – Overview of CHAMP Process

The CHAMP process requires a cross functional approach with representatives from the relevant functional areas. This implies managing and reviewing ATCO Manpower Planning as a system of interrelated processes to improve the ATM organisations business and process performance. The role of the key contributors in the CHAMP process is as follows:

- CHAMP Sponsor: The CHAMP sponsor should be the ATM organisation’s management team. Management needs to be committed to implementing process improvement plans and regards process objectives as more important than functional objectives. Management should see Manpower Planning as a system of

related processes that are integrated and aligned to achieve the ATM organisation's strategic goals i.e. the provision of safe air traffic control service.

- CHAMP Functional Process Contacts: The functional process contacts are managers / expert representatives from each of the relevant functional areas and are the key players actively participating in the six stages of the CHAMP process.
- To manage the CHAMP process effectively requires a shift in role for the manpower planner from purely an information analyst to process owner and facilitator. The elements to these roles are as follows:
 - Process Owner: The process owner is responsible for managing, measuring and improving the CHAMP process and representing the process in the organisation.
 - Information analyst: This role requires gathering the relevant data to configure in LAMPS, configuring LAMPS, simulating and drawing up results in LAMPS and writing reports on findings and trends.
 - Facilitator: The role of the facilitator is to help the players in the CHAMP process when working in a group by managing the process to enable participants to share insights. The facilitator encourages full participation, promotes mutual understanding and fosters inclusive solutions.

Consequently, it is envisaged that at any point in time during the CHAMP process a manpower planner may take any of these roles. How these roles are distributed also depends on the size of the ATM organisation – e.g. these roles may be carried out by two or more persons.

- IT Support: Implementing the LAMPS tool will require making interfaces with relevant databases to retrieve statistics on ATCO data required for configuring data in LAMPS. Consequently IT support will be needed to contribute technical expertise when required.

Application and Customisation

To support the implementation of the LAMPS / CHAMP approach a two module training programme has been designed. CHAMP 1 focus is on building confidence in using the LAMPS tool and the dynamics of ATCO Manpower Planning. CHAMP 2 builds confidence and awareness in managing the CHAMP process which involves discussions with the various players involved to ensure optimum solutions to the number of ATCO Manpower Planning challenges. Between CHAMP 1 and CHAMP 2 participants complete a project which requires gathering and configuring data from their respective ATM environments for the LAMPS tool.

To date the following actions are underway in implementing the LAMPS / CHAMP approach:

- The LAMPS tool is currently used in the process of establishing the staffing needs for the CEATS (Central European Air Traffic Service) Upper ATC Centre (UAC).
- During 2002 two representatives will be trained from each of the 8 CEATS States (Austria, Bosnia and Herzegovina, Czech Republic, Croatia, Hungary, Italy, Slovak Republic, Slovenia). These states can then use LAMPS / CHAMP for their national ATCO Manpower Planning and link to CEATS UAC plans.
- During 2002, the LAMPS tool will be customised and the CHAMP process piloted for the following ATM organisations: Naviair – Denmark, LVNL – The Netherlands and Maastricht UAC, EUROCONTROL.

Benefits and Breakthroughs

By applying the LAMPS / CHAMP approach in an ATM organisation, the following benefits can be achieved:

In the short term,

- To assess and better understand the current situation on ATCO Manpower Planning methods and their shortcomings.
- To understand the long term impact of current decisions and policies on ATCO Manpower Planning issues (e.g. ATCO requirement, ATCO available, initial training, simulator and OJT capacity utilisation, working conditions and costs).
- To generate a number of scenario options related to future challenges and to investigate optimal strategies for ATCO availability, ATCO requirement, working conditions and training capacity utilisation.
- To gain an understanding that many ATCO Manpower Planning challenges tend to be unique to their point in time and have not been seen before under these conditions. Thus, considering the consequences and limitations of meeting future challenges and uncertainty on the basis of probability using prediction tables based on data from the past and statistics.

In the medium and long term

- To alleviate experiencing peaks and dips in ATCO availability and requirement and to help establish a smoother ATCO Margin (ATCO requirement - availability) for the longer term.
- To build mutual awareness amongst the many players on ATCO Manpower Planning issues, identify and evaluate strategic options to optimise decisions.
- To enable the development of integrated solutions (e.g. operations, training and working conditions) to ATCO Manpower Planning issues.

Insights

The LAMPS / CHAMP approach shifts the emphasis for ATCO Manpower Planning from short term and isolated decisions to long term thinking about the future and integrated decisions as illustrated in **Figure 4**.

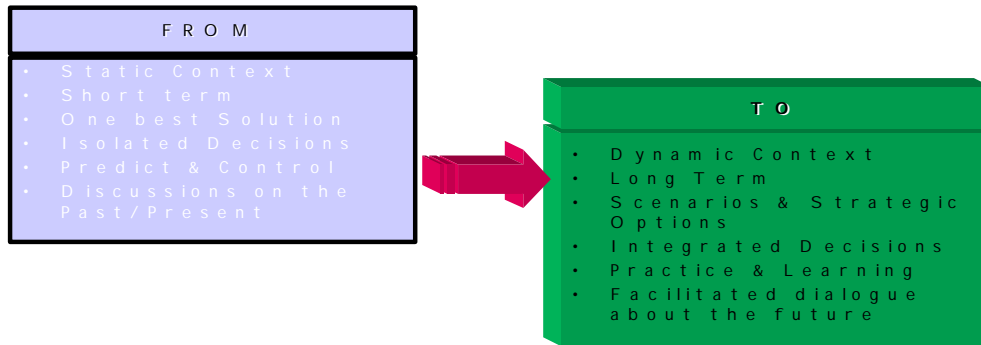


Figure 4 – Impact of LAMPS / CHAMP approach

The key insights from applying this approach in ATM organisations is as follows:

- 1) **Awareness:** At the current initial stage of implementing the LAMPS / CHAMP approach in ATM organisations, one key outcome is the awareness that this approach has generated among managers and experts on the interrelationship between the various factors involved in ATCO Manpower Planning and the necessity to integrate the various functional activities. In addition, there is recognition of the complexity of ATCO Manpower Planning.
- 2) **Improved Decision Making :** The LAMPS tool / CHAMP process facilitates the decision making process. One ATM organisation has made key decisions on ATCO Manpower Planning earlier which will have a significant impact on the long term performance of the ATM organisation e.g. reducing a significant shortage or surplus of ATCOs.
- 4) **Recognition of ATCO Manpower Planning as an ongoing process :** ATM organisations have recognised that ATCO Manpower Planning is not seen as a one-time decision but as an ongoing process. Thus, decisions on ATCO Manpower Planning are not made once and for all but must be constantly revisited and tested. There is no best strategy and there is no simple definitive set of decisions - “what may seem best today may be far from optimum tomorrow”. In addition, it forces ATM organisations to re-examine how the ATCO Manpower Planning process works, is communicated and the roles and responsibilities of the various participants. This shift requires management and staff to manage and think in terms of cross functional processes that were previously invisible. This new orientation for ATCO Manpower Planning permeates strategy, organisation, performance measures, skills, culture and systems.
- 5) **Tool and Process go hand in hand :** A system dynamics model alone, such as the LAMPS tool, even though it does provide awareness on the complexity of ATCO Manpower Planning, does not make significant impact on developing a learning environment and integrated solutions within organisations. However, by embedding the LAMPS tool within a process such as CHAMP allows cross-functional teams to come together provides the true realisation of the benefits of a systems dynamics model over time.

Summary

Using systems thinking and system dynamics principles demonstrated in the LAMPS tool and CHAMP process, enables ATCO Manpower Planning to become a continuous

collaborative process, rather than the periodic and mostly top-down exercise that it is today. It gives all parties a better view of the road ahead and allows them to generate and test different scenarios based on current information and make more confident ATCO Manpower Planning decisions possible.

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Curriculum-Vitae

Úna Mellett (MBA) has over 10 years experience in human resources management in Air Traffic Management. Nine years in the Human Resources Directorate, HQ, EUROCONTROL, initially in the manpower planning, budgeting and control and later she managed projects on redeployment, job analysis and job evaluation. She has also participated in an organisational change project. Úna joined the DIS/HUM Unit, EATMP in June 1999 where she works in the area of Air Traffic Controller Manpower Planning.