AIRPORT DEVELOPMENT, PLANS AND PROCESSES: A CASE STUDY OF DORVAL INTERNATIONAL AIRPORT

BY

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A Practicum
Submitted to the Faculty of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of

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In memory of my grandmother Antonia Aiello

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Abstract

This study explores the future expansion possibilities at Dorval International Airport in Montreal. The purpose of this study was four fold: (1) To investigate the theory and planning procedures that are involved in the development of airports, and (2) to examine the actual planning process that took place and is presently taking place in the current expansion and development of Dorval International Airport. (3) A parallel research theme was an exploration into all the components that are present in the passenger terminal building and the general layout of airports. (4) Lastly, to investigate the choice of layout, internal components and configuration of the new terminal development at Dorval as well as evaluating these selections in comparison to the theoretical material presented in the thesis.

In-conjunction with texts, literary works and original documents, qualitative research methods were used to gain insight into the participatory roles and complex interactions of the stakeholders in the planning and development of this expansion project.

The results of the study demonstrated that although Aéroports de Montréal did initially stumble in its planning process with reference to social responsibility to its community and its partners, they did make strides in constructing a planning process that included a major substantive element along with the classical rational explorations.

The study also demonstrated the decisions and choices of layout and internal configurations are balanced with the type of facility and overall airport system that ADM and its partners envision for the future of Dorval. The practicum introduced some recommendations that can improve on the established plans. It presented elements and components that better the physical layout for both the airport user as well as service providers.

Foreword

My "professional" career has allowed me to be a full participant in the daily operations at both Montreal airports Dorval and Mirabel. I have spent the last five years working at the airport in various job functions ranging from a check-in agent, an aircraft cleaner, a ramp agent, an operations agent, and an operations/ramp supervisor. These duties have allowed me to gain "hands-on" experience and meet and speak to many players at all levels in the airport environment. The information gathered through the past years was an essential part of this practicum.

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Chapter 1 Introduction

1.1 STATEMENT OF PURPOSE

The objective of this thesis is to analyze the final plans as well as the planning methodology associated with the planning and redevelopment of the passenger terminal building at Dorval International Airport in Montreal, Quebec. Five main questions frame the research for this thesis. (1) What type of terminal layout will the expansion consist of? (2) Why was this layout chosen? (3) What planning theory is most prevalent in this case study? (4) Who are the main players (major/minor) in the decision making process? (5) What is the overall impact on the passenger terminal as a whole?

1.2 BACKGROUND

In the past number of years, the airline transportation industry has changed significantly. Globally, the airline hub and spoke system, the commercialization of the passenger terminal building, the introduction of the regional jet, air traffic control, and airport congestion have been the leading factors in the redevelopment attempts at airports. Other major factors such as the rapid growth of travelers, the evolving airline demands coupled with new non-aviation revenue policies of airports have propelled airport planners to come up with more contemporary solutions to airport layouts and designs.

The Canadian airport landscape is coping with these global issues as well as two other major local factors that are forcing the revamping of Canadian airports. The two issues are: (1) The privatization of Canadian airports; (2) The Canada-U.S.A. open skies

agreement. Recently a third issue of one major national carrier has changed the future development plans of Canadian airports.

Over the past number of years, Transport Canada the government division that oversaw all the Canadian airports began to relinquish its administrative duties at the individual airport level. These duties have been transferred to local semi-public authoritative entities. This factor itself has thrust the airports into a new market of competition, commercialism and unprecedented growth. The role of administration of these airports is no longer based solely upon the overseeing of aviation operations, but now includes the administration of competitive enterprises within an extremely competitive market. The new objective of profit making and growth has changed the outlook of the terminal building.

The second factor, the Canada-U.S.A. "Open skies" agreement has led to a rapid growth of routes, airlines and passengers in the Canada-U.S. transborder market. This agreement lifted the restrictions at Canadian airports with regards to new transborder routes, individual airline access to Canadian airports, and competition on previously monopolized routes. This has affected the growth rate of the transborder sector at the four main Canadian Airports (Toronto, Vancouver, Montreal, and Calgary) as well as other airports such as Halifax.

The Montreal airport system took on a brand new outlook on February 20th, 1996. On this date, an announcement pertaining to the liberalization of all scheduled flights into

Montreal was made. This cleared the way for the consolidation of all scheduled flights into Montreal's Dorval Airport. Prior to this decision all flights were allocated to either Mirabel Airport, or Dorval Airport according to destination. Mirabel handled all international traffic, while Dorval served the domestic and transborder (U.S.) routes. This drastic change in the Montreal airport scenario attempted to jump-start a slumping airline industry in Montreal that was increasingly hampered by the two-airport system. This system virtually excluded Montreal from any international connection traffic. This limited passenger numbers and airlines serving the Montreal market.

The airport that is to handle all the traffic, Dorval International Airport, is closer to Montreal, thus more convenient, however is extremely outdated, and small. Problems therefore arise about the size of the passenger terminal building, the facilities within the terminal building, the passenger convenience levels, and the size and nature of the population that it will serve. This will lead to questions on the need for expansion, the type of expansion, and what results the redevelopment will have on the overall passenger terminal building.

1.3 RESEARCH METHODOLOGY

To properly analyze the Dorval case study in comparison with the theoretical material tabled in the thesis, various research methods were used to accumulate the necessary quantitative and qualitative data. Apart from the texts, journals, newspapers, and other printed material, the Dorval situation was researched via four main avenues.

Focused interviews (Zeisel 1984, p.137) were used on four main participants in the airport development process. Interviewees included:

1. Vice President of Planning for Aeroports de Montreal
2. Two airline General Managers
3. Manager for Ramp and Airline Services

All these participants were interviewed on multiple occasions during the ongoing planning process. See Appendix 6 for a detailed list of questions that framed the interview sessions.

Another avenue of information gathering was a participant-observation study (Zelditch 62, p.568). In order to observe the concerns/actions of the local population Town council meetings of neighbouring municipalities were attended. A non-active role observing the meetings was maintained at these sessions. Some non-structured interviews were performed on the attendees at the conclusion of the meetings. In conjunction with personal observations a local townsperson was used as an "Informant" (Zelditch 1962, p.570) into the local social system.

Statistical and enumerative data was accumulated via ADM's own user surveys and IATA's Global Airport Monitor results (see Appendix 7 for survey results). This information was obtained in the interviews with the airport authorities.

As mentioned in the foreword, being an employee at the airport for numerous years has allowed for the gathering of valuable information.

A substantial amount of the literature on airport planning is outdated, and is encompassed in literature dedicated to airport engineering and/or architecture. As late starters in this field, airport planners must continue to research and provide better insight into airport planning processes and development.

1.4 CHAPTER OUTLINE

The objective of Chapter 2 is to examine the theories that are involved with airport planning. This chapter lists and gives a synopsis of the prevalent planning theories and planning procedures that shape modern airports. In this section, a theoretical concept is assembled that combines the attributes of various models as well as additional issues that are vital to the development of passenger terminal buildings and airport planning in general.

Chapter 3 is a comprehensive investigation of all the elements that are contained within an airport passenger terminal building. The objective of the chapter is to introduce to the reader to all the elements that are present on the airport landscape, more specifically, all the elements and facilities that combine to produce the passenger terminal building. The chapter is divided into three (3) broad sections:

(1) General Airport Planning: This section is an introduction into airport planning. It describes the factors, systems, and components that are present in the airport

landscape. It further sub-divides the levels of airport planning from general aviation service, down to precise project level planning and depicts the planning issues that arise at each level.

(2) The Planning of the Passenger Terminal Building: This section deals solely with investigating all the elements that are present within the passenger terminal building. The section disseminates the different classifications of terminals, and the characteristics of the population using these terminals. Operational functions and relations with the passengers are also described in this chapter. Chapter 3 also depicts the passenger processing stages and space planning at the passenger terminal building.

(3) Terminal Designs: This section lists and analyses the four (4) classic terminal layouts. Each design is illustrated and described including the advantages and disadvantages of each particular layout.

Chapter 4 of the practicum is the introduction into the case study of Dorval International Airport in Montreal. The chapter begins with a brief historical summary of both Dorval and Mirabel airports and the general Montreal airport scenario.

A facts and figures section lists all the specifications of Dorval airport. Included in this section are listings of the landuses, airport runway configurations, number of boarding

gates etc. The section continues with passenger and aircraft data that is presented in comparison with other Canadian and international airports.

Chapter 5 introduces the airport authority, Aéroports de Montreal. The initial section describes the administrative structure of ADM; its role, values and mission. The second section lists the changes in policy at ADM with regards to the vocation of each of Montreal's airport and the effects on Dorval Airport. The first section of the chapter describes the decision-making steps and theoretical process that ADM went through in developing its master plan for Dorval airport.

Chapter 6 investigates the physical changes at Dorval. The first section lists the recent renovations that have taken place within the terminal building at Dorval. The second section of the chapter lists what ADM's actual plans are ranging from its involvement on a regional level, the programming of its new master plan for Dorval airport and specifications of the current expansion plans (Phase 2).

Chapter 7 concludes the practicum with a critical analysis and evaluation of the overall plan and the actual planning processes as well as recommendations with regards to the planning process, the overall redevelopment plan, and the airport authority.

1.5 SCOPE AND LIMITATIONS

The focus of this practicum is the redevelopment of the passenger terminal building at Dorval International Airport. The development of any airport component affects the

other sectors therefore sections of the practicum do discuss major airport planning issues such as runway development and land-uses, however details on these sectors are limited.

Chapter 2 Airport Planning Theory

2.1 CLASSIC AIRPORT PLANNING THEORY

One of the major similarities between airport planning and city planning is the application of the Rational Comprehensive Theoretical Model as the guiding framework behind the majority of planning decisions. Many theories have evolved challenging the rational model. Criticisms and shortcomings of the process are widely publicized, however the rational model certainly does have its place in any planning process. Perhaps not the dominance and conviction it once possessed over planning, however, it remains a significant part.

> "Though planning practice is changing and recent theories have shown sensitivity to many issues which the 'Classical' rational model fails to address, this model of what should be done has yet to be superseded" (Alexander 1992, p.86).

This statement reigns true in general urban planning practice, and is as evident in the airport planning domain. Unlike general urban planning projects, airport planning is guided by domestic and international bodies that oversee development. As such, some type of framework is needed in order to "govern" and create standards for the industry. This is one of the main factors that has maintained the rational model as the base in airport development. Internationally, airport planning is guided by manuals and publications issued by the International Civil Aviation Organization (ICAO), and International Air Transport Association (IATA), which are partially based on the rational model (Dempsey et al. 1997, p.25). In addition to the publications of materials, these

organizations and others such as Transport Canada oversee any airport development projects in Canada. (The FAA oversees any airport development projects in the U.S.).

> "In planning rationality implies that a plan, a policy or a strategy for action is based upon valid assumptions, and includes all relevant information relation to the facts theories and concepts on which it is based" (Levin 1976, p.225).

Contemporary publications and policies of all major aviation sources are now not limited to rational information. Airport planners are constantly working toward the inclusion of other planning theories to complement the rational model and provide a better end product.

For explicit purposes airport planning will be divided into two major factions. The first being general airport planning, this includes all aspects of the airport and associated areas. The second is the planning of the terminal building. It is necessary to make the distinction between the two elements in order to properly describe issues and elements that are pertinent to only one domain of airport planning. In the following text airport planning will describe the planning of the airport as a whole and references to the planning of the passenger terminal building will be listed as such.

Table 1 compares a standard airport planning process (Ashford;Wright 1992) with a generic rational process as contextualized by Gerald Hodge (1992, p.173).

Table 1 : Comparison Chart of Rational and Airport Planning

Airport Planning Process	Rational Planning Process
1. Organization and preplanning	1. Identify problem and articulate goals
2. Inventory of existing conditions	2. Survey community conditions and make predictions
3. Aviation demand forecasts	
4. Requirement analysis and concept development	3. Design alternative plans to suit future conditions
5. Airport site selection	4. Compare and evaluate alternative plans
6. Environmental procedures and analysis	5. Adopt one plan
7. Simulation	6. Develop a program to implement plan
8. Airport plan	7. Monitor current trends and review outcome plan
9. Plan implementation	

It is evident that the airport planning procedures follow the same vein as the rational process dictates for urban planning.

Standard airport planning revolves around the procedural and normative aspects of planning theory. Normative aspects reflect questions such as: How do we plan and why should we plan. Procedural aspects include questions such as: What do we know about how planning takes place and how plans are implemented (Alexander 1992, p.18).

Exhaustive amounts of airport planning literature are focussed on these aspects, however, many airport planners feel that concerning themselves only with these planning domains leaves major issues unresolved and produces lackluster final projects. "Some writers have challenged the procedural emphasis of planning theory by saying that it has provided explanations and prescriptions which are contentless and contextless" (Darke 1983, p.16).

However, the quality of the procedural texts is essential in developing a network of airports that conform to international and national standards. Acceptability of a project by the industry can be judged by means of an investigation into the planner's procedural process and not just the end product.

Although accepted as a standard by airport planners, the quest for a better measure continues. A harsh outlook is given by Richard Deneufville who cites the following weaknesses (De Neufville 1976, p.91):

- Information requirements are unrealistic
- Seldom are value preferences known or agreed upon
- It ignores the role of power and other political variables
- It assumes the existence of a powerful unitary actor on the applied level
- It makes the assumption that it is possible to accurately forecast demand projection, an assumption that has been widely discredited

A good airport planning procedure can be described as the inclusion of rational analysis, social interaction and political context, thus planning with the sensitivity of the airport's dynamic environment. This planning procedure would not only involve the skill and expertise associated with rational planning but the art and ability to plan within the described limits and be responsive to the intricacies of each particular job.

2.2 ALTERNATIVE THEORETICAL MODELS

Dempsey, Goetz and Szliowicz (1997) in their recent publication cite a number of alternative theoretical models that to some degree are being used in airport planning projects. One of the theories listed is Allison Graham's Organizational Behavior and Bureaucratic Politics (Dempsey et al. 1997, p.473). In this text they describe how the

decision-making process can be split into organizational behavior decisions and bureaucratic decisions. The organizational decisions are based upon the established procedures with the individual organization. The bureaucratic side is where the plans develop as a result of political bargaining involving both government and non-governmental players. This type of dissection of the decision making process is especially relevant to airport planning due to the fact that politicians usually are proponents or staunch opponents of the project. As such, some decisions may end up being played out in the political arena more so than the proper organizational structure in place for the project.

This leads to Harold Linstone's project analysis. He states it is necessary to analyze any project on three levels: (1) A technical level (rational model); (2) An organizational model (organizational model, incrementalism, and bureaucratic politics); (3) Personal, cognitive models on the basis of values, beliefs and the mindset of actors (Dempsey et al. 1997, p. 473).

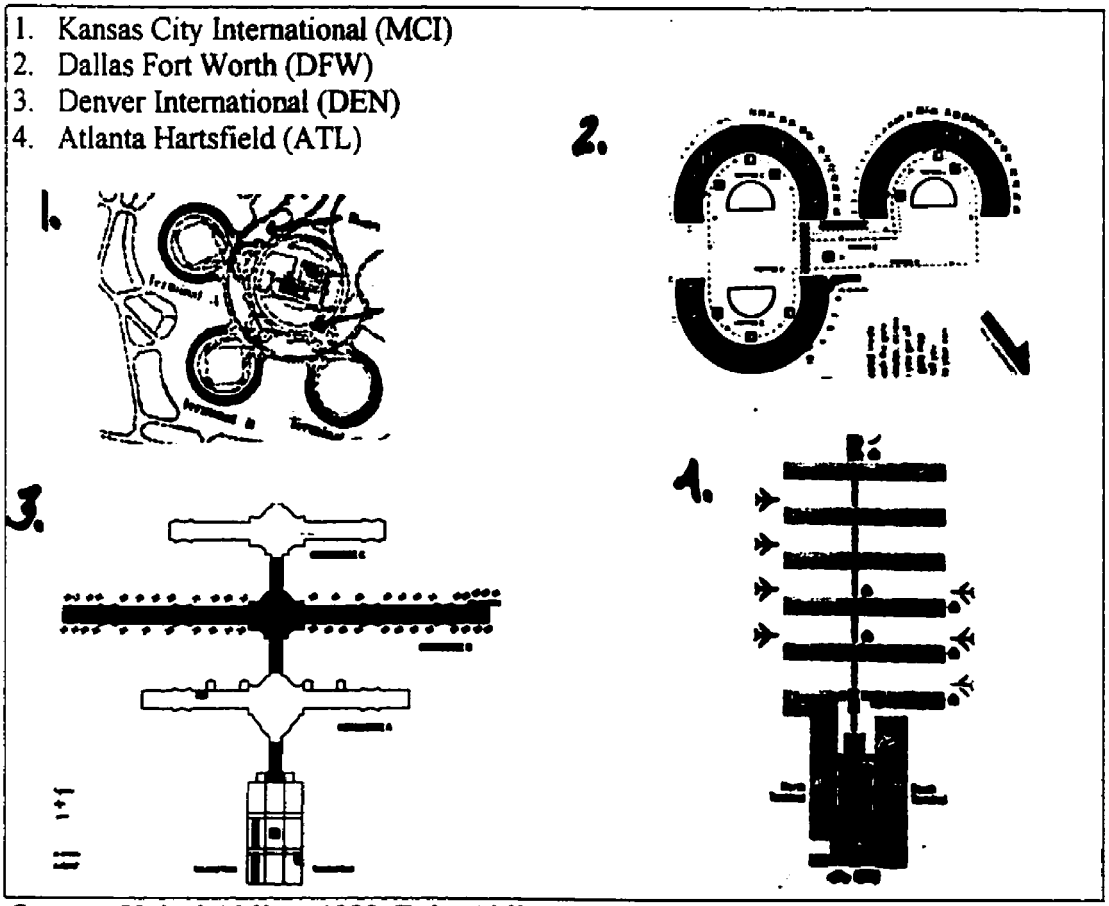
Two of the planning theories that play roles in airport development are Charles Lindblom's Disjointed Incrementalism and Amatai Etozioni's Mixed Scanning Approach. In the Incremental Theory planners only develop a few possible strategies never straying very far from the precedent.

> "Because of budgetary constraints, plans and decisions makers can not consider all possible alternatives in the process and instead engage in making 'successive limited comparisons' by a branch method based on previous related experiences"(Dempsey et al. 1997, p. 472).

Amatai Etozioni's Mixed Scanning Approach scans the environment in order to divide issues into two decision making levels. The lower level fields don't require in-depth analysis, saving time and effort. The focus is retained to produce in-depth analysis on a smaller number of "higher level" issues (Alexander 1991, p.56; Dempsey et al. 1997, p.473). Both of these theories are quite evident in airport development. All the commercial airport terminals in the world can be categorized into only 4 terminal concepts. This demonstrates that while certain issues are dealt with in an exhaustive manner, many design features are only slightly modified from project to project (see figure 1).

Figure 1: Airport Layout Comparisons

1. Kansas City International (MCI)
2. Dallas Fort Worth (DFW)
3. Denver International (DEN)
4. Atlanta Hartsfield (ATL)



Sources: United Airlines 1999; Delta Airlines 1999; DFW intl airport; MCI intl.Airport.

2.3 SUBSTANTIVE THEORY IN AIRPORT PLANNING

An extremely important aspect of terminal planning is the elaboration of the Substantive category of planning. Substantive planning is concerned with what do we know about what we are planning for and whom we are planning for (Alexander 1991, p.7). This type of planning bases itself on an in-depth analysis of the subject.

This form of comprehensive analysis, into what and whom we are planning for, is essential in order to develop a terminal that serves the type of passengers that are using that airport. Distinguishing between transit passengers and originating/arriving passengers is as important as knowing the volume of passengers. Different types of passengers utilize different areas and components within the terminal building, thus placing pressure on different links in the system. Designing a terminal complex that is incompatible with the type of passengers using the airport can lead to serious processing and flow problems within the terminal system.

As a result, it is of utmost importance to know whom you are designing the terminal building for. What are the characteristics of these users? Can they be properly accommodated within the system? Another range onto which substantive planning is necessary is the understanding and adjustments according to local population issues such as culture, civic pride, local customs etc. Generic development processes don't take into account such distinctions, however, the overall acceptance and evaluation of a project do rely heavily on a positive overall perception from the user population, travelers and locals alike.

In a continuance of who we are planning for, aviation forecasting plays a major role in the quantitative side of airport development. Forecasting volume and demand for service in the cyclical industry is extremely difficult even with modern technological aids. Over reliance on forecasts could lead to design shortcomings or misplaced funds. What may occur are expansive, overbuilt, underused and inefficient terminals. Taking into account this and other major uncertain variables, the airport planning process as well as the terminal building design must remain flexible.

2.4 FLEXIBILITY IN AIRPORT PLANNING AND DEVELOPMENT

As noted by Dempsey, Goetz, and Szyliowicz in the discussion of Denver International Airport (DIA) flexibility in the airport planning process is no easy task. "DIA and airports in general are inherently inflexible due to the high capital cost, long lead times, centralization, technical orientation and alignment of interest coalitions" (Dempsey et al. 1997, p.476). The rational theory does little to incorporate flexibility in the process and this may be one of its major flaws for airport planning. Additions to the planning process such as feedback loops or stages where new significant data may be introduced in order to influence the actual development can dramatically shed this inflexible stigma. Another solution may be an increase in the number of checkpoints to re-evaluate the scope of the project at certain stages.

Dempsey, Goetz and Szyliowicz, include an excellent quote that captures the essence of a flexible process.

> "When discrepant information begins to accumulate that challenges the assumptions on which the original project was based, the project should be

re-evaluated and new decisions reached about its critical elements" (Dempsey et al. 1997, p.486).

Instituting adaptability and flexibility into a terminal design concept is a major hurdle in airport terminal development. Dempsey, Goetz, and Szyliowicz cite Evans and Stigler in introducing more definite concepts of flexibility and adaptivity. Adaptivity represents a one-time change within an organization that permits it to function more effectively in new conditions. Flexibility is described as a more dynamic concept allowing continuing adjustments in constantly changing conditions (Dempsey et al. 1997, p.474)

Inherently, due to the nature of airports and the aviation industry in general, flexibility rather than adaptivity would be preferred. A further dissection of flexibility is given as follows (see table 2):

Table 2: Types of Flexibility

1. Robust- Degree onto which an organization is prepared to function after being subject to unanticipated events. 2. Hedging- Defensive strategy minimizing negative impacts from environment by building in redundancy and back up systems. 3. Resiliency- Ability of an organization to function after having been subject to unanticipated events. 4. Corrigibility- Ability to learn from and adapt to new conditions. 1&2 Anticipatory 3&4 Reactive

(Dempsey et al. 1997,p.474)

In designing a terminal, airport planners have an understanding of the types of obstacles and developments that can occur in the industry. As a result anticipatory measures are usually instituted to some degree. The unforeseen troubles are the ones that usually sabotage a project. The importance must lie with the planner's ability to design a

terminal that can be somewhat cross-utilized to accept and deal with unanticipated conditions.

The ultimate goal must be an understanding of the industry, its players, and its quirks. Therefore, planning not only for today, but putting in place mechanisms that will allow the terminal building to accommodate, evolve and expand (if necessary) with the airline industry.

A key to a successful airport is the inclusion of a continual planning process. The planning of the airport cannot stop once construction is complete. If research is done routinely, the life span and efficiency of the airport can be extended. This can be accomplished by monitoring the activities and manipulating the airport structure to respect and accommodate the changes. These changes can be an increase in demand, technology, percentages of connecting traffic etc.

> "The airport planner who is required to anticipate conditions 10 to 15 years it the future, must often resort to guesswork. Even if the guess is correct initially, conditions change and result in a mismatch between terminal architecture and the traffic to be served. To guard against this, airport planners now tend to favor flexible designs that can be expanded modularly or offer the opportunity for low-cost, simple modifications as future circumstances might demand" (Wells 1992, p.153).

2.5 THE TERMINAL PLANNING PROCESS

The terminal planning process can be divided into four stages: 1. Programming, 2. Concept Development, 3. Schematic Design, 4. Design Development (Horonjeff and McKelvey 1994, p.447).

1. Programming

This stage encompasses the initial introduction into the project. For any terminal development the goals are functionality, flexibility, and convenience. This stage defines the objectives of the particular project with respect to these general goals. Other main components of this phase are the project scope and the rationale. This stage also involves the establishment of preliminary schedules, capital and operating costs and the initial space requirement program (Horonjeff and McKelvey 1994, p.448).

2. Concept Development

In this stage the space program developed in the programming stage are allocated in a general way to the terminal complex. At this phase, the main type of terminal concept is decided upon. The characteristics of the terminal building are developed. Other essential planning decisions such as degree of centrality for services are decided (Horonjeff and McKelvey 1994, p.466).

3. Schematic Design

In this step the terminal begins to take form. The many components that make up a terminal building are given general location and size. The functional relationships between the components are analyzed. The size of the facility is determined with regards to the desired level of convenience (Horonjeff and McKelvey 1994, p.481). A main element of this phase is an initial examination into the passenger and baggage flows within this pre-built terminal. Computer simulation can be used to demonstrate the potential problem areas.

4. Design Development

   The schematic ideals are refined into detailed plans. The exact sizing of the facility and its components are established. The plans evolving from this stage are the ones sent for acceptance from the necessary authorities. Details on the capital budget, and operating costs are established.

A detailed list of the decisions made in the schematic and design level is given by Jeff Horonjeff and McKelvey (1994, p.448):

1. Processing cost per passenger
2. Walking distances for various types of passengers
3. Passenger delays in processing
4. Occupancy levels and degree of congestion
5. Aircraft maneuvering delay and costs
6. Aircraft fuel consumption in maneuvering between runways and terminals
7. Construction costs
8. Administration, operating and maintenance costs
9. Potential revenue sources and the expected level of revenue from each

2.6 SYNOPSIS OF AIRPORT PLANNING THEORY

To place these theories in perspective, the rational theory although limited, is certainly a reliable framework onto which we can build a contingent theory that combines "operational prescriptions with situational realism"(Alexander 1991, p.57). In the airport planning field, the rational theory manuals can provide a prescriptive element however, more emphasis must be placed on the actors involved, the decision team and the situational context. The introduction of flexibility (to allow for the cyclical changes in

the business to be properly dealt with) and an ingression into to the substantive (to be properly informed), are essentials to proper airport and terminal planning.

Chapter 3 A Compendium of Airport Components

3.1 INTRODUCTION

Chapter three is an introduction into the fundamentals of airport plans and planning. The chapter presents the theoretical material that is associated with airport and terminal planning. The chapter begins with an introduction to the key elements of airport planning. It then explores airport planning at a macro regional level and narrows its focus to the planning of the passenger terminal building. At this stage it investigates the varying types of characteristics and internal components that the passenger terminal encompasses. The final section of the chapter lists and describes the four physical layouts that model all passenger terminal buildings.

3.2 GENERAL AIRPORT PLANNING

3.2.1 Key Elements of Airport Planning

All airport terminal-planning operations can be incorporated into one of two major categories: physical planning or operational planning. A third element in the planning structure is the time element. Due to the nature of the airline business and on-time performance, the time element is fixed therefore modifications must lie within the physical or operational elements. Physical planning is comprised of the terminal design, general layout and size of facility. Operational planning includes all activities within the terminal building (human and mechanical), as well as the functions and flows within the terminal building. Understanding and planning in accordance to operational activities is the most important step towards an accepted and efficient airport design.

A barrage of systems and interests intersect at the terminal complex:

- Physical systems; landside, airside elements compete for landuses.
- Passengers, airlines, and airport managers/operators compete for systems and physical form that best services their needs.
- Economic goals vs. passenger convenience also play a major role in sizing and layout of the facility.

> "The role of the planner is to determine the relations between passengers convenience and cost throughout the terminal's life and find, for any level of convenience, the plan that costs the least, or, for any level of cost, the plan that provides the most convenience." (Elek and Bienhaker 1972, p.323)

A major influencing factor in the design of the terminal complex is the interface of both landside and airside functions at this location. Landside functions include; land transportation, road network, parking, pedestrian access to building, and availability of curb space. Airside functions include all aircraft operations and requirements, taxiways, runways, aprons, and gates. The airside network has a larger space requirement than the landside element, therefore there is a geometric conflict at the confluence of these two systems, which is the terminal building. A goal of airport planning is to design an efficient and seamless passenger flow between the landside and airside elements via the passenger terminal building. However, there is a fine line in the degree of interdependence of these three systems (landside, terminal and airside). A level of integration is desired, however, the flexibility for expansion of one element without physically affecting the other two elements is necessary in order to limit economic costs and efficiency in the future. The different terminal concepts have come about from the attempts at designing the most appropriate system for present and future needs of the particular airport.

The essence of layout designs lies within the function and flow element of airport planning. The operational side of airports can benefit or be hampered by the overall layout of the terminal building. In analyzing the terminal functions and flows we may be able to alter the operational systems within the already built environment creating a more suitable and efficient operational system. This could be an important factor in deciding the future plans for an airport.

Operational activities are affected by such elements as type of passenger flow (originating, terminating, and in-transit) as well as the actual number of passengers. A task of the planner is to organize the functional elements of the terminal building to accommodate the type of passengers that are readily using that particular airport. Understanding and respecting the characteristics of the actual operation is key to laying out a terminal that is responsive to the needs of the parties represented in the airport environment.

Characteristics such as type of passengers, number of passengers, number of airlines serving the site, government customs/ immigration processes, facility costs and passenger convenience, can be translated directly to the type of terminal design. Therefore, function and flow can and should be leading factors in designing terminals and determining the actual size of the terminal. Planning from the inside out is the appropriate method in this domain.

The element of airport planning that is a definite requirement to produce a "good" or successful airport is the allowance of flexibility within the terminal system. Although very intense forecasting systems are currently used for analyzing airport activities, the future remains unpredictable to a certain extent. An airport designed solely as a "hub" (for the use of transiting passengers) may encounter some major physical obstacles if this scenario is altered and the airport is removed from the national hub system of a particular airline. In order to avoid such catastrophic planning practices, flexibility within the network is essential. Flexibility can be evident in many forms: number of gates available, types of gates, processing of passengers, as well as the flexibility of the total system between the three major elements of the airports system (landside, terminal, airside). With flexibility in place an airport can be "reborn" and expand its effective lifespan by means of the original planner's vision not to control the future but to plan accordingly.

A break down of the general airport planning domain can be divided into three levels of concentration. These are the System Planning Level, The Master Planning Level, and The Project Planning Level (Horonjeff and McKelvey 1994, p.186).

3.2.2 The System Level

The System Level encompasses an analysis of the aviation facilities required by a large geographical area. This is an overview of what the total aviation service will be for an entire area, how this service will be provided, and where the service will be provided.

This is an evaluation of aviation transportation on a macrolevel. Proper investigation at this stage requires input and participation from numerous variables. These variables may include political representation from a national and provincial level as well as local authorities from a wide-ranging area. Other elements studied at this level include the road transportation network, geographical development trends, population analysis etc. Although not affected by the immediate workings of the airport(s), the aviation infrastructure will be used by a wide ranging public and therefore an attempt to include all parties at this introductory stage should be made.

In areas that encompass multiple airports, the establishment of the roles of each individual airport must be done in order to institute a harmonious aviation system.

3.2.3 The Master Plan Level

The Master Plan is a concept of the ultimate development for the specific airport (Hornonjeff and McKelvey 1994, p.186). All uses and elements that are part of the airport and or directly physically affected by the airport are included at this stage.

As mentioned previously, there are three distinct categorical separations within an individual airport system: The landside, the terminal building, and the airside. Landside elements include; land transportation (public, private), the road network, parking facilities, pedestrian access to the terminal building, and the access curb (the latter two usually being included in the terminal building category as well). The airside functions include all elements that deal with the movement and maneuvering of aircraft. This

includes all taxiways, runways, aprons and docking gates. Also included in this are cargo areas, hangars and technical facilities dealing with the aviation operations.

When dealing with the master plan, other land use elements must also planned for. Included in this are general aviation areas, industrial and commercial areas within the airport limits as well as bordering areas. Existing neighbouring residential zones and residential expansion areas are crucial elements to the master planning process.

These issues can be translated into 4 components that guide the layout of the facility.

1. Airport layout - configuration of runways, taxiways.
2. Land uses - Designation of areas for the terminal building, maintenance, commercial buildings, ground access, industrial sites and noise buffer zones.
3. The Terminal Area – land and airside.
4. Airport Access – private/public. (Wells 1992, p.108)

The main goal of an airport is to operate at maximum efficiency at all sectors of the airport. Maximum efficiency is also sought at the linkage points within the three systems (landside, airside, and terminal) in order to maintain capacity throughout the airport. If capacity at the terminal building is less than the capacity of the airside system the entire system remains undercapacity in order to reduce delays. A single element that is inadequate holds the whole airport network hostage. Analysis of the interaction of these elements is necessary in determining the combination and size of the facilities that best serve the heterogeneous, fluctuating traffic (Deneufville 1976, p.169).

The airport master plan must include the following elements as compiled by Walter Hart (1985, p.9).

1. Complete documentation of existing and proposed airport development supported by traffic forecasts.
2. An airport layout plan.
3. A land use plan incorporating land-use compatibility showing effects and consequences on the environment.
4. Airport noise compatibility program.

In order to achieve these four simple goals many studies and analyses must take place to properly prepare a master plan that is current as well as validated by sufficient data.

An extremely important starting point in airport planning is a report on the inventory that is occupying the existing airport site. Identification of these facilities as well as an accurate description of the real usage is imperative. The collection of socioeconomic and demographic data, such as population, employment, industrial and commercial activities, and land uses for the service area of the airport are valuable in the demand forecasting as well as in predicting the consequences of the development.

Forecasting remains one of the most important pre-construction studies for airport planning. Modern techniques can relate demand to a number of social, economic, and technological factors that effect air travel (Horonjeff and McKelvey 1994, p.189). Once a forecast is complete, an analysis of capacity and delay as well as geometric and other standards governing the design of airports provides data for determining the extent of the required facilities. At this point the planner has the first approximations of the overall size and shape of the new project and can begin with impact analysis on the surrounding land uses, the environment and the infrastructure (Horonjeff and McKelvey 1994, p.192).

The ability of the airport access roads to mesh within the existing road network is essential in assuring an optimal level of accessibility for all users. This can dramatically reduce the costs associated with constructing an extended new road network at the same time as the building of the airport itself. Redevelopment of the neighboring road network to accommodate the increase in traffic is standard practice.

The land use planning of the airport area is a major variable in deciding the actual location of terminals, cargo areas etc. Two types of zoning are effective within the airport vicinity; height and hazard. These are used in order to protect the approaches to the runways. The land uses include aviation locales and land dedicated to non-aviation uses.

Collaboration between the airport planners and the planners of the adjacent municipalities is essential in assuring mutual acceptance of projects as well as ensuring compatible uses on either side of the airport boundary. The airport master plan and the municipal master plans and policies must be in harmony.

Environmental impact assessments have become an essential part of airport development. In addition to the obvious noise level standards, air and water quality issues have come to the forefront in airport development. More stringent regulations in acceptable noise levels and new modern quieter aircraft have reduced noise contours significantly (see appendix 5 for information pamphlet on noise regulations).

The inclusion of all members of the community (citizens, organizations, special interest groups etc.) during the planning process helps alleviate the perception that the planning authorities are attempting to pass a development project that will negatively affect them. Secrecy can create the misconception of deceitful planning practices. This is something that should be dealt with in order to create an aura of a community project from which all can benefit.

3.2.4 The Project Planning Level

In this particular case, the Project is the development of the terminal building. This is covered in the following section.

3.3 THE PLANNING OF THE PASSENGER TERMINAL

Walter Hart (1985, p.35) contextualizes the overall goals and objectives of the passenger terminal.

1. Aircraft must operate with maximum efficiency at terminal gates, on apron taxilanes, and at entering and exiting points of the runway/taxi system.
2. Flow of originating, terminating and transferring passengers, baggage and vehicles must be uncomplicated, with the shortest distances possible and least number of horizontal and vertical movements.
3. Plans must have expansion capabilities to accommodate growth in passenger and baggage volumes and growth in overall apron frontage.
4. Plan must provide for future changes in traffic characteristics such as a change form mostly originating (+75%) to an increase in transfer (+30%).
5. Plan must provide for an increase in vehicular traffic and for changes in ground traffic distribution.
6. Plan must provide maximum opportunities for efficient use of staff and equipment.
7. Plan must be cost effective.

These goals are extremely simplified and require intense studies to achieve and match the conditions set out by these objectives. The following is a break down of the studies and steps in a terminal design process.

The majority of terminal development projects as well as general airport development project work within a 20-25 year planning horizon. This allows for estimates in travel demand to be incorporated within the current study. Other approximations and estimates for the time frame include airline aircraft firm orders for the first five years of the plan. Accurate approximations for the next five years can be made from this data. Prototype aircraft are likely to see service in the second ten years of the plan (Beinhaker 1972, p.85).

The projection of the demand for air travel is an extremely important stage in the terminal development. The numbers that are accrued from this study set the guidelines and framework on which the overall airport facility and the passenger terminal design are based. Over-reliance on unsubstantiated or erroneous data can lead to over-development.

Forecasts are usually prepared to reflect three possible future scenarios. These would include low, medium and high projects for passenger travel. Two measures are used to identify passenger volumes and types. Annual passenger volumes are accumulated for preliminary sizing of the terminal building. The second measure used is a detailed hourly volume. These numbers are used to create a typical-peak hour volume scenario. This volume is usually in the range of 0.03-0.05% of the annual volume (Horonjeff and

McKelvey 94, p.441), but is significantly affected by the scheduling practices and fleet mix of the airlines.

The fluctuation in passenger and aircraft traffic throughout the day is the most difficult challenge for airport planners. Modern technology through computer simulation allows us to investigate the effects of layouts on operational systems and monitor flow throughout the entire network. This allow for changes to designs prior to the actual construction, an opportunity that saves the high cost of redesign once construction has begun.

When discussing the flow and operating systems, many of the problems occur only at peak hours and are not relevant for the majority of the day. Therefore, we are faced with the issue of what we should we plan for. Do we plan to accommodate the capacity at peak hour, resulting in inefficient use of space and system elements for the remainder of the day? Do we plan to accommodate 80% of the peak hour numbers hoping to reduce inefficiency? Or do we plan for the median daily numbers etc.? Organizing our planning efforts and understanding the planning goals can regulate many system problems as well as provide a lead on how to alleviate some of the problems that our design can create.

P.H. Beinhaker (1972, p.89), breaks down the projections into three categories. The distinctions of these categories are important to allocate resources to the appropriate stations in the terminal. These distribute the quantitative aspects of the travel demand.

- Originating/ departure forecasts which are related to ground transportation needs.

- Enplaned times two (2), forecasts which include all the originating/destination passengers plus passengers on connecting flights.
- Arriving and departing forecasts which includes all enplaned plus passengers on same aircraft in and out.

Analysis of what type of passenger uses the terminal is important at this stage. The types of passengers i.e. originating or connecting are of utmost importance since the varied types place pressure on different components in the system.

Table 3 demonstrates how different passenger loads affect different stations/components within the terminal system.

Table 3: Demand for Passenger Services

	Passenger type *i*, arriving			Passenger type *i*, departing			
Facility *j*	Domestic, no bags, auto driver*	Domestic, with bags, auto passenger†	International, with bags, auto passenger	Domestic, with bags, auto passenger	Domestic, no bags, auto driver	International, with bags, auto driver	Total volume *V*
Curb, arrivals	—	V_{ij}‡	V_{ij}	—	—	—	
Curb, departures	—	—	—	V_{ij}	—	V_{ij}	
Domestic lobby	—	V_{ij}	—	V_{ij}	V_{ij}	—	
International lobby	—	—	—	—	—	V_{ij}	
Ticketing counter	—	—	—	V_{ij}	—	V_{ij}	
Assembly	—	—	—	V_{ij}	—	V_{ij}	
Baggage check-in	—	—	—	V_{ij}	V_{ij}	V_{ij}	
Security control	—	—	—	V_{ij}	V_{ij}	V_{ij}	
Customs, health	—	—	V_{ij}	—	—	—	
Immigration	—	—	V_{ij}	—	—	V_{ij}	
Baggage claim	—	V_{ij}	V_{ij}	—	—	—	

*Auto driver = passenger driving a car to and from airport.

†Auto passenger = passenger driven to and from airport.

‡V_{ij} = design volume of passenger type *i* using facility type *j*.

Source: Horonjeff and McKelvey 1994, p.443.

3.3.1 Facility Classification

In order to plan appropriately the planner must plan for the operations that take place in that particular locale. As mentioned previously the type of passenger is as important as the amount of passengers. The following is a brief description of the different types of facilities (Horonjeff and McKelvey 1994, p.442).

- Originating/Terminating Station: 70 to 90% of total passengers. High level of processing. High demand for parking, ticket counters, and baggage claims.
- Transfer Stations: High percentage of connecting passengers. Focus on concourses and inter gate access, flow circumvents main terminal area.
- Through Station: High percentage of originating passengers on aircraft originating at another destination. Less passenger service facilities than at an originating station. Smaller departure lounges.

3.3.2 Intransit Passengers

Transit passengers usually don't have an alternative but to proceed in the manner of a regular arrival passenger and then proceed as a regular departing passenger. Some newer airports have provided a system to better the transiting procedures of passengers. As transiting passengers provide a major percentage of traffic at some airports, the treatment of these passengers is essential to maintaining that airport as a primary choice of the travelling public. Busier international airports provide lounges for passengers without the proper travel visa/documents to enter the country in which they are travelling through on route to another country. Vancouver International has maintained itself as a gateway to Southeast Asia by providing an almost unimpeded transit process for international passengers (Hughes 1996, p.9).

As mentioned earlier flows of transfer passengers and baggage are becoming a very important contemporary planning issue. As the "Spoke and Hub" system becomes the

norm around the industry, the planning of the hubs must pay particular attention to the role of the transfer or connecting passengers. Some airports boast up to 80% transfer passengers. If these airports are designed to operationally process originating and terminating passengers, the physical layout might not properly serve the majority of the passengers.

Terminating and originating passenger flows can be viewed as vertical systems running from landside to airside. A transfer passenger system may be viewed as moving horizontally. An unaccommodating system might force the passenger to move along the vertical terminating system, then horizontally through the terminal building and once again vertical as an originating passenger. This is a time consuming process as well as inefficient, frustrating and inconvenient for the passenger.

3.3.3 Processing Stages

The main goal of the terminal building is to transfer passengers and baggage from the landside to airside and vice versa. The passenger terminal encloses all the functions and systems that enable this flow of passengers and baggage. This results in flows and systems through all the three elements as well as some functions that are exclusive to individual elements. Each station in the processing of passengers departing and arriving is described below.

3.3.3.1 Departure Level

Access Curb

This is the primary access point for the majority of the passengers and people entering the airport terminal. There is usually a fairly quick turn around time for the unloading of the passengers and baggage. An estimate of 1 to 2 minutes per private auto is given (taxis can be included in this time estimate). Buses and limousines are estimated at 5 to 15 minutes for offloading (Horonjeff and McKelvey 1994, p.448). The actual layout of the curb is dependent on the amount of traffic and types of vehicles. Many curbs surpass the actual frontage of the terminal building. Busier centres can implement systems of dedicated lanes; either private/ public separation or departing/ arriving split. Vertical separation for individual activities is also common.

The Terminal Lobby Area

As the first sight upon entering the airport the terminal lobby is usually aesthetically appealing and architects dedicate a lot of time to this main area. The main function of the lobby area is to process the passengers and baggage. This is done at the individual airlines check-in counters. This area should provide ample space for queuing as well as passenger and visitor movement about the terminal.

The role of the terminal lobby area is quite different in the Canadian context from its U.S counterpart. As Canadian regulations permit only passengers into the concourses and gate areas, the passenger terminal lobby area becomes the focal point of any Canadian airport. This results in the majority of commercial and other services being provided at this location. It also concentrates a large percentage of the passengers in this area until shortly prior to departure. The U.S. system allows for well-wishers and passengers alike

to proceed into the gate areas, thus increasing the amount of people in these areas, providing a better economic threshold for the introduction of commercial activities. This can also reduce the amount of time spent in the terminal lobby area as well as the need for such expansive lobby areas.

Security Screening

Different terminal types and configuration have the security screening at different points in the terminal. This stage usually consists of x-ray machines and operators who individually check all ticketed passengers prior to access to the concourses and gate areas (Many U.S. airports allow well-wishers into gate areas upon screening). Many older airport were designed prior to the implementation of screening check-points, therefore resulting in a poor location for the check-points resulting in an impediment to passenger traffic.

U.S. Customs and Immigration Pre-clearance

This is a stage that provides entrance into the U.S. prior to departure rather than going through the procedures once arrived in the U.S.. All major Canadian airports have this service in place. The implementation of the system adds the requirement of having a sterile area at the access gates for U.S. bound aircraft. This forces the airport authorities to dedicate a certain amount of space and gates for the exclusive use of U.S. bound passengers usually referred to as transborder passengers.

Departure Lounges

Lounges are located in immediate proximity to the aircraft. They are used to accommodate and seat passengers while waiting to board the aircraft. The ticket lift function and the boarding of the aircraft via the "bridge" or boarding device is located at this point. Sizes and functions of the lounges are again dependent of the type of airport terminal system in place. Common lounges used for several gates provide service while reducing the space requirements of individual gate lounges.

3.3.3.2 Arrivals Level

Arrival Lounges/Corridors

The arriving passengers usually enter the airport terminal at the departure lounge. Depending on the type of flight arriving, (International, Transborder, or Domestic) separation of the arriving and departing passengers may be required. If so the departure/arriving lounge provides an isolated passage for the arriving passengers to proceed to the Canadian Customs and Immigration location. This eliminates contact with departing passenger and ensures all arriving passengers pass through the proper processing.

Baggage Claim Area

The size of this facility is dependent on the type of aircraft serviced and the amount of flights arriving within a short time interval. Once again, segregated baggage claim facilities must be used for international and transborder flights. Domestic baggage claim may allow access for well-wishers into the baggage carrousel area. Issues such as exclusive belts add more space requirements to the area and can cause inefficient use of belts due to lack flights arriving by individual airlines. Sharing of belts for multiple

flights can lead to some confusion amongst passengers attempting to retrieve their bags and can cause added congestion in the area due to the increased time factor to retrieve baggage.

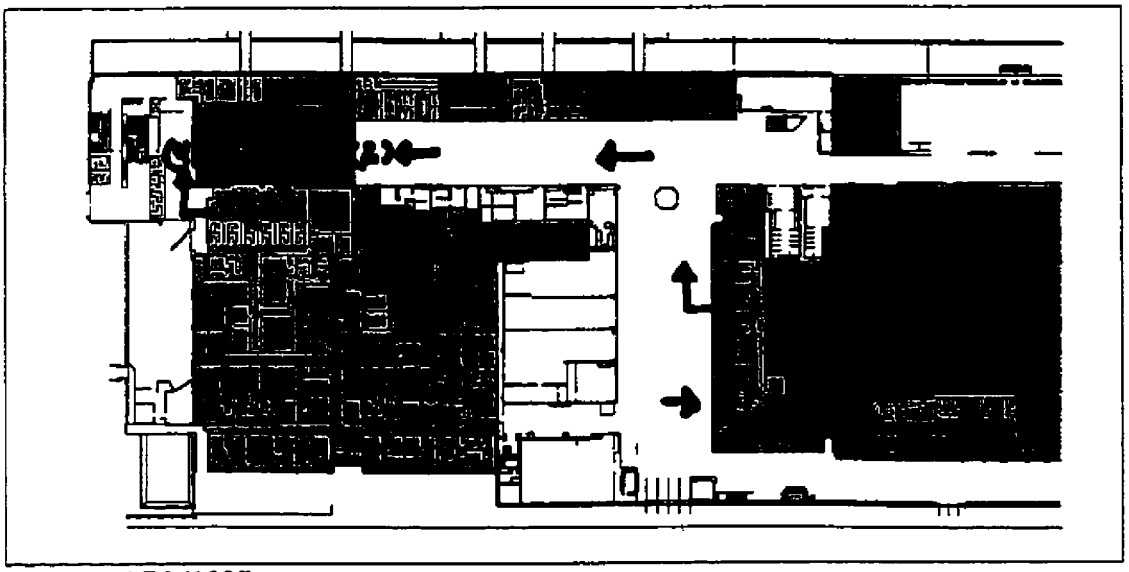
3.3.4 Analysis of Operational Functions and Flows

A main duty of the airport planner is to understand and plan for actual operational circumstances. As previously mentioned, the flows of airline passengers can be categorized as originating, terminating, and transfer passengers. The flow of anyone of the systems can be enhanced or hampered by the physical layout of the terminal building. The expression "a chain is only as strong as its weakest link" is quite appropriate in this scenario. A passenger who is stalled at any one of the stations/components will be annoyed at the whole process. Physical layouts that impede flows usually occur due to a misunderstanding or lack of knowledge about the flows and processes of a system prior to construction. "A proper airport system must provide good service to most of the people and acceptable service to all" (Elek and Beinhaker 1972, p.332).

An example of a physical constraint on a passenger flow is the U.S. Immigration and Customs processing system at Dorval Airport in Montreal (see figure 1). Prior to the recent renovations passengers would check their baggage through U.S. Customs located behind the individual airline check-in counters (1). Once this initial check was complete, passengers would proceed back into the general terminal area and walk a distance to the security check- point (2). Once through security, passengers would pass through U.S. Immigration (3) and then through a second U.S. Customs station located after a duty free

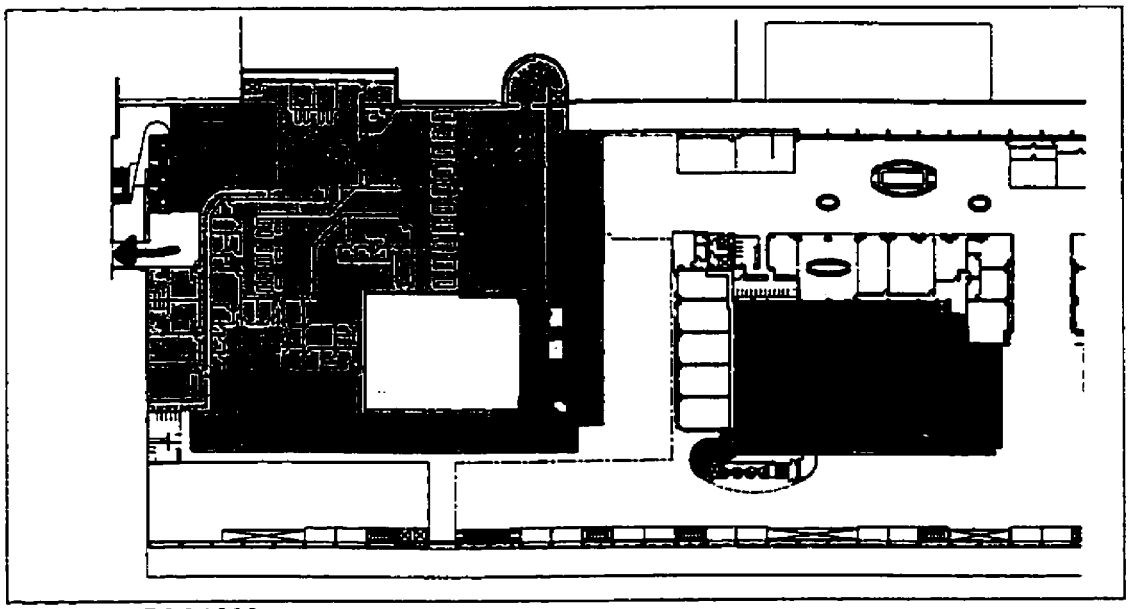
shop (4). This layout caused passengers to queue at four separate locations as well as having extended walking distances.

Figure 2: U.S. Pre-Clearance Procedures



Source: ADM1997

Figure 3: Post Re-development U.S. Pre-clearance Procedures



Source: ADM 1999

When airport renovations were complete the process was simplified to allow a better flow and less individual stations. All the elements of the U.S. Customs and Immigration were maintained but combined into a single stop (see figure 2).

Once a passenger is checked in at the airline counter they immediately proceed into a corridor leading to the U.S. Customs and Immigration processing Centre. The processing station is centralized (all passengers regardless of airline) unlike the original step of the old system. The passenger maintains their baggage until fully processed by U.S. Immigration and Customs. Once passed through the two steps, passengers place their baggage onto the outgoing baggage belt. The passenger only waits in line prior to the initial step and then filters through the entire process.

While improving the passenger flow, the new layout also improved the baggage flow. In the old system if a passenger was refused entry into the U.S. at the Immigration station (3^{rd} stop in the original process), their baggage was already loaded onto the aircraft that they were supposed to fly on. An airline ramp agent would then be required to physically search each bag tag to locate and expedite the baggage in question off the aircraft. This is a time consuming process and usually results in a departure delay.

In the new system the passenger maintains possession of their baggage until fully processed at which time they deposit their baggage onto the onload belt. As a result of this modification the baggage flow is also improved.

Improvements in the physical facilities can usually relieve problems, however, at some airports this is not a viable option and other methods must be utilized. Flows in all aspects of the airport environment can be improved by relatively simple means. Some example are listed below:

- Increasing the amount of check- in counters in operation, or increasing the number of Customs processing agents is a basic alteration but can carry high operating costs.
- Having a check-in counter that solely deals with longer more complicated tickets allowing a smoother flow for the remainder of the passengers in the queuing lines.
- Ensuring maximum frontage and easy access on arrival baggage carrousels.
- Enforcing off/onloading time limits on airport access roads, providing more space for added cars.
- Appropriately located signage with gate information, airline locales, and departure and arrival times.

Improved and updated information can inform passengers of changes in gates and delays as well as inform well-wishers of updated arrival times. If this information is available from outside sources such as computer terminals or telephones it can limit the amount of time spent in the terminal waiting needlessly. Long delays especially on international flights (larger aircraft, more passengers, and more well-wishers) can inundate the services in the passenger terminal building. If the delay is forecasted and passengers have the means to retrieve the information, they will postpone their arrival at the terminal building to a more appropriate time. Similarly, conveniently located and appropriately designed waiting halls can ensure passengers don't walk around endlessly and congest the remainder of the terminal. Locating display screens in these areas is essential.

3.3.5 Passenger Service Levels

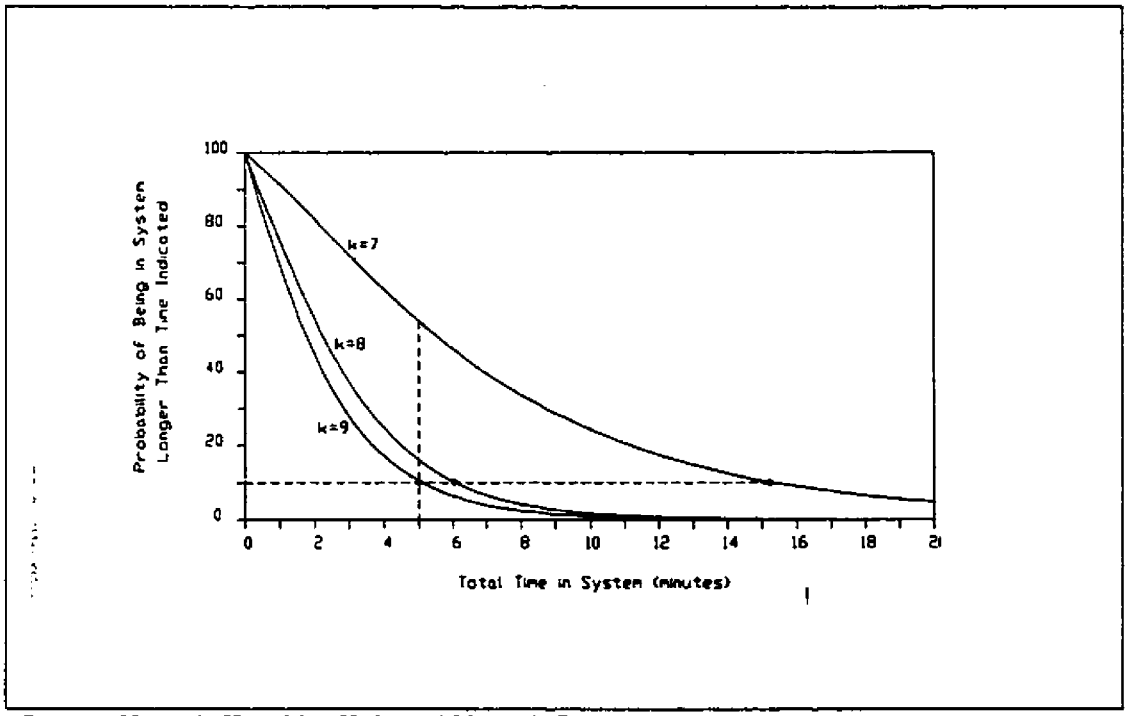
The forecasting relays the passenger information quantitatively. The terminal planner must then translate this information qualitatively. This is regarded as the level of service provision. Since there are no set standards for the level of service, the local airport planners must decide what type of system they intend to provide to the travelling public. Areas of concern include walking distances, space per passenger/density of crowds, processing time, queuing times and types of queues etc. The end result becomes a cost/benefit analysis. The costs can be evaluated not only in an economic cost, but also as a convenience level for the passengers. An example of an imposed convenience level would be specifying that 90% of the people won't experience an inconvenience worse than the represented by that standard (Elek and Beinhaker 1972, p.366).

The convenience level issue is contentious in that the three main players are against each other. The perspectives of the 1.airlines, 2.the passengers and 3.the airport authorities vary widely with regards to this issue. Priorities for the airlines are in on-time departures, allocation of personnel, minimizing airport costs and profitability. The passenger seeks completion of trip at lowest cost, minimum delay and maximum convenience, minimal congestion, shortest distance to plane, aircraft delay times. The airport authorities seek to "...provide a modern airport facility which meets airline and passenger objectives in harmony with expectations of the community" (Horonjeff and McKelvey 1994, p.446) while minimizing the costs of the terminal, capital and operating. Different levels of convenience will be present at various components of the terminal system . Components deemed more crucial to the operational system may have an inflated level of

convenience. The overall balance of the objectives becomes a guiding factor in the terminal design.

The costs of the terminal building are easily quantified, however the convenience factors aren't as readily given a dollar figure to compare (see figure 4). Economic costs include capital, operating costs of the airport as well as the individual airlines. The players must trade-off individual objectives in order to create the "best" complex with the limit resources. (financial, terminal space, land, etc.) A cost/benefit analysis is usually undertaken with any controversial planning issues.

Figure 4: Impact of the Number of Check-in Counters on Passenger time.



Source: Horonjeff and McKelvey 1994,p.447

The players that participate in airport construction are identical to that of any major civic project: the architects, the engineers, the public, the politicians and the planners. Without

being too stereotypical, the main focal points of each group are quite different. The architect seeks an elaborate mix of appealing and monumental fixtures along with the focus of aesthetics rather than practicality. The engineers seek simplicity of design and "straight lines" for servicing purposes. " The diversity and complexity of their pragmatic desires inherently clash with aesthetic preferences for simplicity of concept and form" (Hart 1985, p.103). The planner must attempt to create a balance between the needs of the population using the facility and the economics that play a major role in airport development.

> "... we didn't want an architect's dream and a passenger's nightmare. The real beauty of this terminal is how well the systems are designed to work and better serve the passengers who will be using it." (Deiter Bergt in Scolof 1997, p.66)

Authorities such as ICAO, IATA, Transport Canada, and the FAA institute a certain level of standards in which airport must adhere to. Other than sizing, the discretion usually lies in the hands of the active players in a particular project. This results in many varying results in the quality of the facility with respect to the users. Local customs can play a major role in the development of "acceptable" quality and quantity of facilities in the planning of the airport. While it is idealistic to attempt to assure maximum convenience to all passengers throughout the many fluctuations in the airport passenger levels, an objective of planners should be to assure that only a small proportion of the users will experience inconveniences above a specified level (Elek and Beinhaker 1972, p.331).

Efficiency becomes a major factor in the balance of convenience and economics. Adding gates may solve the convenience problem during peak hours, but if the gates remain idle

the rest of the day, the space is underutilized and economically costly in terms of capital as well as operating costs. If this economic cost is perceived as too great compared to the added convenience the expansion is usually not carried out. The amount of usage time and the amount of users per cost are usually a deciding factor in determining the number of gates and size of passenger facilities. A time horizon is usually implemented in order to better evaluate and distribute costs.

Passenger convenience and costs usually play an instrumental role in determining the type of terminal design implement at the airport site. Some of the terminal types are more apt to servicing economic issues. Other layouts provide better passenger convenience at the expense of economic cost. When evaluating alternative designs the planner must keep in mind a certain level of convenience in the comparison.

3.3.6 Space Planning

Once the planner has understood what level of service will be provided he/she translates this concept into the actual space requirements for the terminal building. This information is then passed on to the architect to develop the actual design within the set limits of the planner.

Within the terminal building there are a variety of competing interests with regards to space allocation within the terminal building. Table 4 distributes the percentages of space as suggested by the FAA. (Horonjeff and McKelvey 1994, p.445).

Table 4: Facility Space Distribution

55% rentable 45% non-rentable
35-40% Airline operations
15-20% Concessions and airport administration
25-35% Public space
10-15% Utilities, shops, tunnels, and stairways

Source: Horonjeff and McKelvey 1994, p.445

The overall space assignment is related to the horizon year (fully developed plan) estimates for total number of passengers. If a fully operational terminal is the goal, the terminal must still be within the set standards the planner has laid out the latter stages of the time horizon.

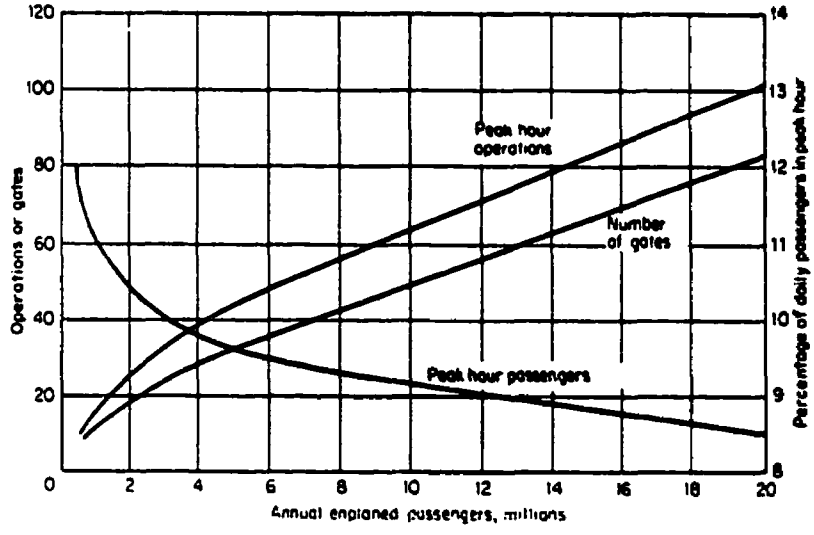
An initial step for the planner is to plan the terminal in two separate manners. The enplaning and deplaning passengers are vastly different in their needs and therefore require separate attention. In actuality the deplaning passengers attract very little attention from the planner since their stay in the airport is minimal and they pose very little stress on the system. Aside from the baggage retrieval area, (and the Customs and Immigration stage for international passengers) the arriving passengers make their way quickly through from the gate area to the pick-up ramp. Therefore minimal maneuvering space is deemed necessary in comparison with the departing passenger.

The established forecast of annual volume and the "peak hour" values are instituted at this stage in order to establish the amount of space required to accommodate the highest passenger volume in the day. The level of convenience is a major factor in determining

what percentage of users will face unfavourable conditions. Planning for 100% convenience is economically unfeasible and results in extremely high inefficiency the remainder of the day.

Forecasting is then used to estimate the number of seats per aircraft. This approximation aids in two manners. One, it gives the planner a scale onto which he/she can approximate the size of the lounge needed. Secondly, this value along with the number of passengers per hour gives the amount of aircraft per hour, which determines the speed at which passengers can be dispatched from the terminal building (Elek and Beinhaker 1972, p.379).

Figure 5 : Peak Hour Gate Distribution



Source: Horonjeff 94,p.445

In order to dock all these anticipated aircraft the planner must make an approximation on the number of gates that will be required. The peak-hour estimates are the guide to determining the amount of gates needed " Gate capacity is the maximum number of aircraft that a fixed number of gates can accommodate during a specified interval when there is a continuous demand for service" (Horonjeff and McKelvey 1994, p.354)(see figure 5). As a general rule it can be assumed that the number of gates required should equal the maximum number of aircraft that is scheduled to arrive or to depart in an two hour period (Elek and Beinhaker 1972, p.381)

The mix of aircraft and the particular policies of the nation or the airline can effect the number of gates available for certain aircraft (see figure 6). An international flight cannot dock at a domestic gate therefore capacity must be arranged with regards to the exclusive use of the gates by one particular flight sector. The airline policies with regards to exclusive gate use (airlines own there own gates) can decrease the utilization factor 0.5-0.6 instead of 0.6-0.8 for mutually used gates (Horonjeff and McKelvey 1994, p.498).

Table 5: Gate Occupancy Times per Aircraft Type

	Gate occupancy time, min	
Aircraft	Turnaround station	En route station
A-300-600	30	20
B-737	28	22
B-747-200	60	30
B-757-100	30	20
B-767-200	30	20
B-777	45	25
DC-9-51	30	20
DC-10-10	30	20
MD-11	52	24
MD-87	25	14

Source: Horonjeff and McKelvey 1994, p.354.

Another important factor in the space approximation stage is the understanding of and planning for the well-wishers. Since these persons do occupy space within many components of the terminal it is essential to include them in capacity numbers and density figures. Areas such as arrival halls, restaurants and main lobby are built to include these persons.

A major airport can house tens of thousands of employees. This produces a major element to plan for with regards to facilities catered to their needs. Included in this are offices, operational areas, breakrooms, garages, cafeterias etc. As noted in table 4 this can equate to a large percentage of the terminal space.

The choice of terminal concepts is usually influenced by the existing airport facility or the surrounding built environment. In most scenarios, the existing passenger terminal building constrains the planner. The expansion has to mesh well with the old facility thus limiting the suitable terminal concepts.

The following is a listing of the design considerations for the overall design of the facility as well as determining the terminal concept (Horonjeff and McKelvey 1994, p.437).

1. Development and sizing to accomplish the stated mission of the airport within the parameters defined in the master plan.
2. Capability to meet the demands for the medium and long run time frames
3. Functional, practical and financial feasibility
4. Maximization of use of existing facilities
5. Achievement of a balanced flow between access, terminal and airfield facilities during peak hours
6. Consideration of environmental sensitivity
7. Flexibility to meet future requirements beyond planning time frame

8. Capability to anticipate and implement significant improvements in aviation technology

3.4 TERMINAL DESIGNS

Different terminal types have a major influence on the flows within the airport. A centralized airport system might provide the better flow for an inter-airline transfer passenger, where as a decentralized exclusive terminal can be better for a regular originating passenger. The advantages and disadvantages of each terminal type are described below.

3.4.1 Centralized vs. Decentralized Facilities

The general philosophical question in creating an airport terminal is either to have a centralized facility or create of small units of service in a decentralized layout. As in all competing ideals, each has advantages and disadvantages. However, in the airport landscape the playing field is not level and is highly influenced by the passenger type. Therefore the actual circumstances usually weigh in favour of one option.

With all the terminal types described there can be a certain amount of centrality, however with some of the options this centrality is limited, and exceeding the limit would undo the positive attributes of that design.

A centralized system is usually comprised of an area that provides the processing for all passenger and baggage regardless of airline. (Each airline provides its own ticket counter, however current trends include the sharing of counter space.) Services and commercial establishments are mainly located in this main hall. Passengers proceed to gates via

corridors or passenger transport systems. The main advantage of the system is the economies of scale achieved by the intensive use of services (security, baggage carrousels etc.). The cost effectiveness of a terminal is increased by the maximum use of space that is only possible with each airline contributing into the overall system. This achieves one of the planning objectives, which is to minimize the amount of idleness (Elek and Beinhaker 1972, p.336).

The main disadvantage in this system is that once the airport reaches a certain threshold size, the passenger inconveniences outweigh the economic gains. The inconveniences include long walking distances to gates, high densities and confusion in central terminal area. If the terminal exceeds a certain size, the facilities should be duplicated to properly serve both extremities of the terminal (Elek and Beinhaker 1972, p.346). The need to physically separate flights (international, domestic, and transborder) takes away from the overall economy of scale.

The decentralized system provides very short distances from the car park to the aircraft door. The epitome of this system is the Gate-Arrival system (DFW) described below (see figure 7). This system benefits commuters, which can get in and out of the airport in a short time. Passenger services (check-in, baggage claim) are usually provided at or in close vicinity to each gate.

The disadvantages of this system include separate service facilities (baggage carrousels, security check-points) for one or a small number of gates. This increases the cost of

equipment and personnel (De Neufville 1976, p.102). The layout is linearly distributed resulting in long distances between gates. This can be frustrating for transfer passengers at larger airports.

A major factor in the deciding the exact type of facility is the issue of corporate identification. Many airlines in attempting to advertise and promote themselves choose to use exclusive facilities which range from ticket counters, gates, baggage claim facilities, and exclusive terminals. It is essential for the planners to know what the airlines have planned. Planning prior to knowing can lead in drastic plan changes. The amount of facility sharing depends entirely on the participation of the majority of the airlines. Many airlines that only provide a limited amount of flights at the airport in question will usually share the majority of services reducing their operational costs. At airports in which airlines insist on exclusive facilities the overall size of the airport is substantially larger and the efficiency of the individual elements is usually extremely low.

A current trend that is positively affecting the sharing of facilities are airline alliances and code sharing agreements between airlines. In this scenario, the airlines both publicize the flight under their corporate logo, however only one aircraft is used and the check-in for both airlines is done at one counter. (usually done at the more dominant airline's counter.) If this is the only flight for the "minor" airline, individual counter space isn't required at that airport.

Another positive trend is that airlines are combining efforts in order to build terminals suited to their needs however still reducing costs. Terminal One at John F. Kennedy International Airport in New York is an example of this type of partnership. Four Foreign carriers namely, Luftansa, Air France, Japan Airlines and Korean Air are developing a terminal which they will jointly manage and operate out of. " At Terminal One, we [the carriers] manage our own house" Deiter Bergt, CEO of Terminal One Management Inc. and executive at Luftansa Airlines (Socolof 1997, p. 66).

Each airport has it own individual design characteristics. However, all these designs can be narrowed down into 4 distinctive terminal concepts: The Finger or Pier design, The Modular or Linear Terminal, The Satellite Terminal, and The Transporter Layout (De Neufville 76, pp.98-123; Elek 72, pp.351-390; Horonjeff 94, pp.466-476).

3.4.2 Finger or Pier Design

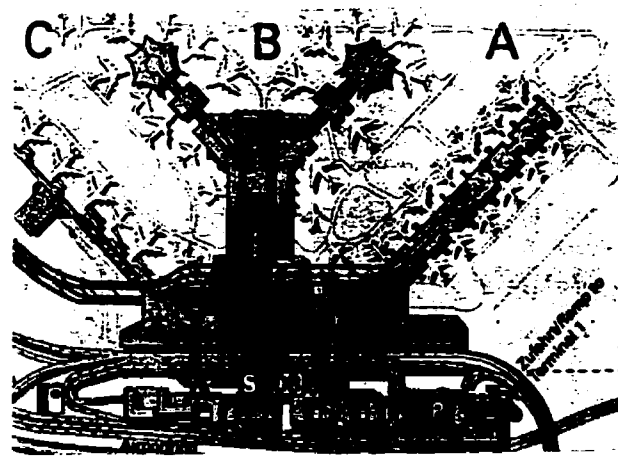
The Finger or Pier layout consists mainly of a centralized terminal building with corridors leading out to the gate areas (see figure 6). Aircraft can be parked on both or on one side of these extended corridors. All of the passenger facilities are located within the main hall. With centralization the key to this layout, the main advantage is that it promotes intensive use of the facilities. This usually relates into larger single check-points rather than many smaller points in other layouts. Another advantage is easier maneuvering for transfer passengers. An advantage of this design is the flexibility component. This permits expansion of the gate area independently of the terminal building and landside facilities (Elek and Beinhaker 1972, p.355). This expansion

process can take place in incremental steps being economical in terms of capital and operating costs (Horonjeff and McKevley 1994, p.446).

A disadvantage of the design is that in larger airports the walking distances can become excruciatingly long. This includes both distances from main terminal to gate areas as well as overall (check-in from curb drop off to aircraft). Central halls may become extremely congested and confusing for passengers unfamiliar with the airport. Having dual parallel piers can result in requiring a second taxi way for aircraft which in turn consumes a lot of land.

Dorval Airport as well as he majority of Canadian Airports fall within this layout or a hybrid of this layout.

Figure 6: Example of Pier Layout: Frankfurt Main (FRA)



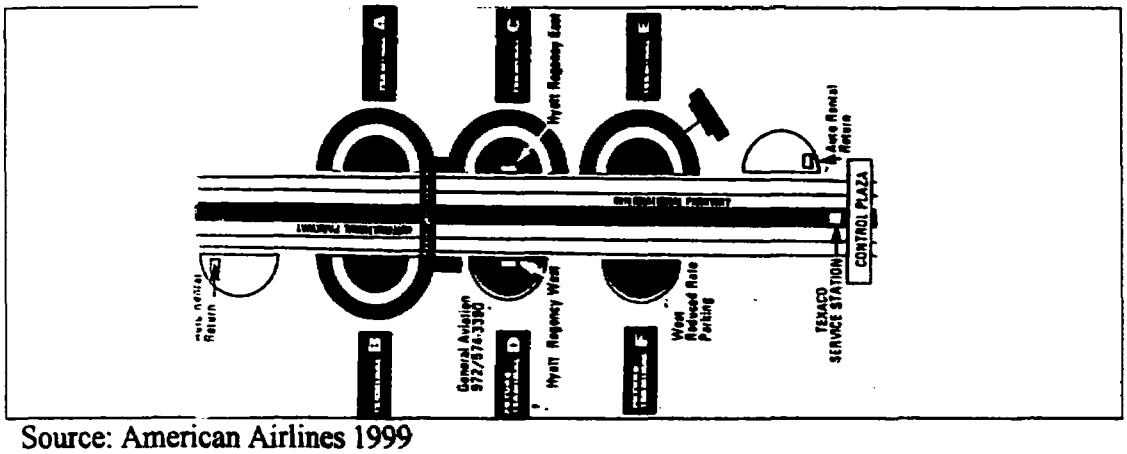
Source: Frankfurt Main Airport Authority

3.4.3 The Modular or Linear/Gate Arrival Design

This layout is a system that provides short walking distances from curb drop-off to the aircraft. The basic design is for a single line of aircraft parking directly parallel to all of the passenger service facilities (see figure 7). These service facilities are self-contained small modular units that are used for a single gate or for a small number of gates. The terminal building therefore consists of a long relatively narrow building with many small modular service facilities sandwiched between the aircraft gates and the general parking lot. The easy access, simple flow to the aircraft is a main advantage of this layout. Expansion is relatively easy by which extra modular units can be attached to present building.

The disadvantage of this layout is that there is no sharing of facilities, which can create an inefficient use of the facilities. There is very little economy of scale and operating costs can be high. Due to the physical nature of the layout walking distances between gates can be long, therefore in larger airports of this type passenger transportation systems are a must.

Figure 7: Ex. of Linear/Gate Arrival Layout: Dallas-Fort Worth (DFW)



Source: American Airlines 1999

3.4.4 The Satellite Terminal Design

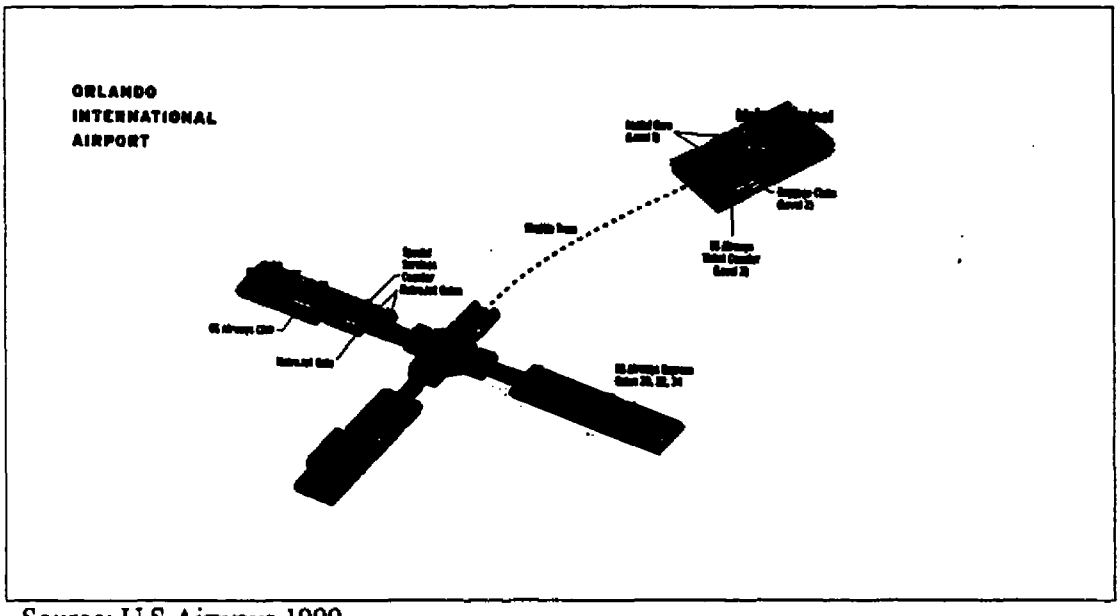
This design consists of an "island" terminal surrounded by the aircraft apron. The satellite terminal is physically separated from the main landside access curb (see figure 9). Access to the satellite terminal is usually attained via a passenger transportation system. This can be underground or above ground depending on the individual design. An advantage of this design is that it maintains the economies of scale that are present with a regular centralized terminal building. (Common departure lounges and common check-in etc.). Short walking distances are also an asset of this layout. This design can be seen as a development of the Ring Terminal (Elek and Beinhaker 1972, p.355) (see figure 8). However, the ring terminal provided access from landside to airside with parking usually in the center of the terminal building. Easy maneuverability of aircraft is also a benefit.

A main disadvantage of the design is the high cost of construction due to the need to provide an access system. Tunnel designs increase the costs even more. Arrangements for transporting baggage and mechanical systems also are needed. Another disadvantage is that it is a poor design for expansion in that the new terminal space directly consumes needed airside land.

Figure 8: Ex. of Ring Terminal: Toronto's Terminal 1(YYZ)

Source: Stroud 1980

Figure 9: Ex. of Satellite Layout: Orlando Intl. Airport (MCO)



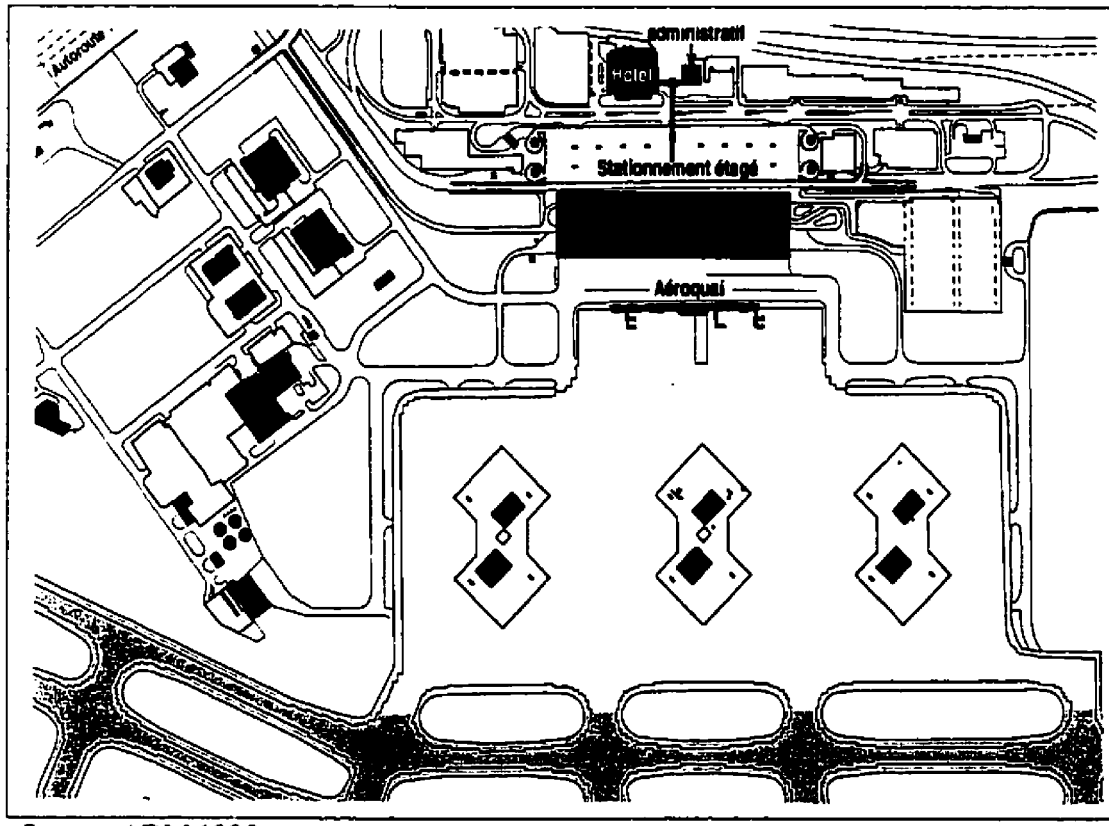
Source: U.S Airways 1999

3.4.5 The Open Apron/ Transporter System

This system is comprised of a centralized terminal, which is linked to the aircraft via independent mobile units. The aircraft are parked on an open apron away from the terminal building (see figure 10). As a centralized terminal, facilities are shared and efficiency is high. This design eliminates the dimensional conflicts of the airside in comparison with the terminal building. Aircraft size doesn't affect the terminal in any manner since it is physically removed from the terminal. Advantages include short walking distances, and common facilities and common departure lounges. This system can be expanded at a fraction of the cost of construction in other designs. If the amount of flights is increased, frequency of Passenger Transport Vehicles (PTV) can be increased or number of PTV's can be increased. Operations can increase without effecting the main physical structure. Therefore it remains highly flexible in terms of design.

A disadvantage of the design is that it increases the passenger loading time since the passengers must be first onloaded onto a vehicle, then offloaded and onloaded onto the aircraft, this can lead to delays. Operating costs are also a factor since the vehicles must be manned and maintained.

Figure 10: Ex. of Open Apron/Transport System: Mirabel Airport (YMX)



Source: ADM 1995

3.6 SUMMARY AND CONCLUSION

The purpose of the chapter is to introduce airport basics prior to the introduction of the case study of Dorval that is presented in the following chapter.

The passenger terminal building (as the interface of the landside and airside elements) main function is to process passengers from the access curb to the aircraft or from aircraft

to aircraft. The passenger flows in these instances vary and understanding the type of passenger is an essential element to physcially designing a passenger terminal building that best serves it user population. The arrangement of the interior components of the passenger terminal building also plays an important factor in passenger flows.

The four (4) classical models all have inherent qualities and disadvantages. Understanding the qualities as well as knowing the limitations of each model enables the planner to match the user population with the appropriate layout.

Chapter 4 Montreal Airport System; Past and Present

4.1 INTRODUCTION

Chapter 4 details the current status of Dorval Airport. It presents a short history of the Montreal airport scene leading upto the proposed development project. It illustrates the current physical conditions at Dorval and places the airport on a national and international scale in regards to size, aircraft mouvements and annual passengers. It also introduces the expansion possibilities for the airport.

4.2 HISTORY

4.2.1 Montreal International Airport- Dorval

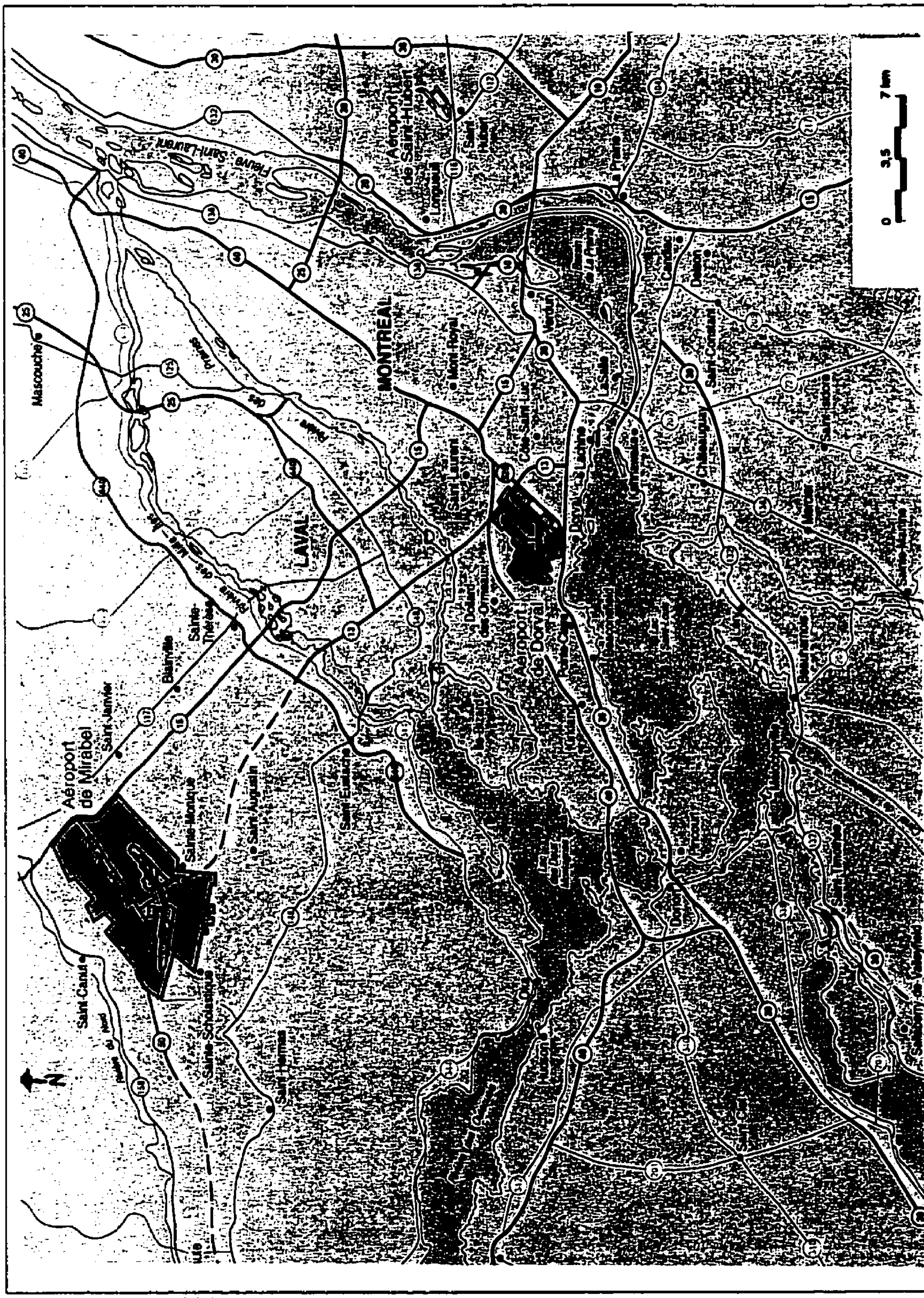
In 1939, the Department of Transportation and the Royal Canadian Air Force (RCAF) began scouting the Montreal region for sites to develop a new airport. The location of airport was to be closer to Montreal than the St. Hubert Airport that was currently used. In 1940, the racetrack and surrounding land in the town of Dorval was purchased in order to make way for the new airport (see figure 11). The order of council of December 24, 1940 stated,

> "...To develop an airport at Dorval for an Air Observer School and Wireless School under the British Commonwealth Air Training Plan (BCATP), The said airport to be develop also as a civil air terminal for the metropolitan area of Montreal in place of St. Hubert..."[Canada, D.O.T. file 5168-817 vol.4] (McGrath 92, p.147).

The airport opened on September 1, 1941 with two runways of 5000 feet on 1500 acres of land, which was the second largest in Canada (McGrath 1992, p.147). The terminal building was ready by December of that same year. It was built of masonry and plate

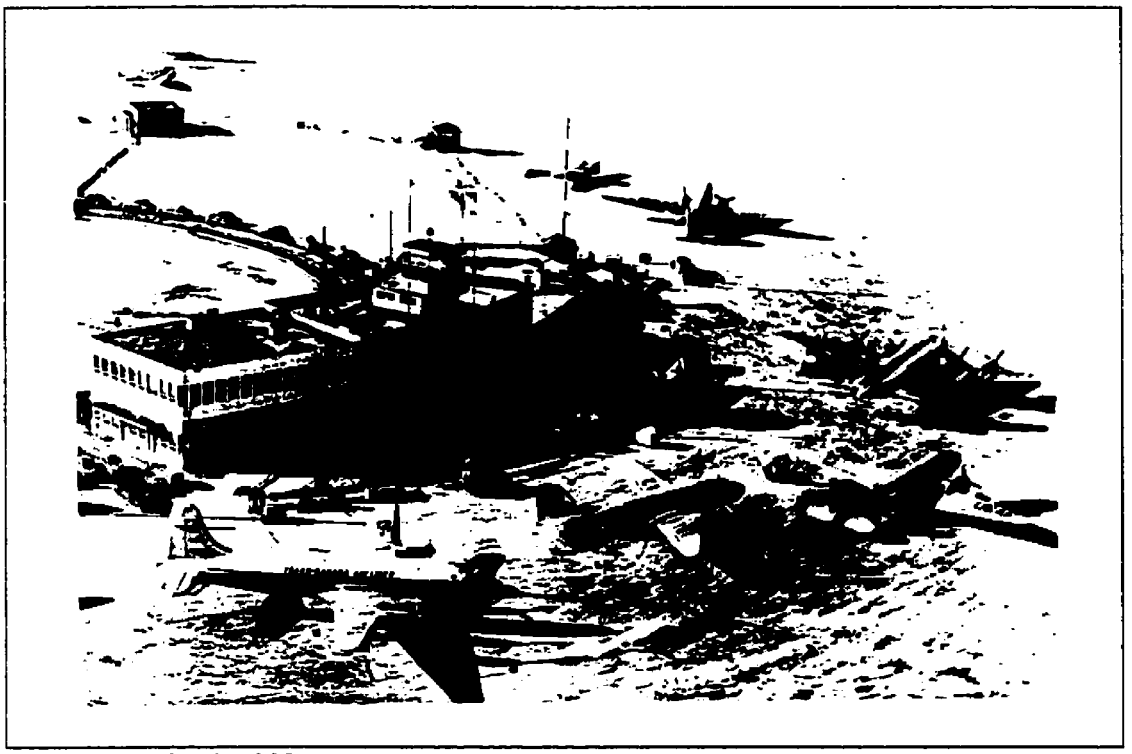
glass. Included within the terminal building was a large passenger lounge that maintained expansive views out onto the ramp due to the curved frontage of the building.

Figure 11: Montreal Regional Map



Source: ADM 1995

Figure 12: Illustration of Original Dorval Terminal Building



Source: McGrath 1992

Along with the commercial flights from Dorval the military played a major role in Dorval's early years. Dorval wasn't used for the BCATP as planned but instead served the needs of the expanded Royal Airforce Ferry Command, which built three hangars at Dorval. The Canadian Government Trans Atlantic Service (CGTAS) and the BOAC operated flights over the Atlantic mainly for servicemen and wartime supplies under the RAF (Pigott 1996, p.96).

Dorval also operated as a pivot point for military aircraft from California on their way to Europe and the war. Dorval was the site for the modification of the aircraft and familiarization flights for pilots prior to their entry into the war (Pigott 1996, p.96). The management of the airport site was divided among the two main components of the facility. " The Ferry Command operated the crash-fire and ambulance service and

controlled the security of its part of the airport. The Department of Transport maintained and managed the airport and controlled civil operations..." (McGrath 1992, p.148).

With the end of the war, the civil aviation component succeeded the military operations in importance at Dorval. Both airlines that ran ferry services from Dorval; BOAC (now British Airways) for the RAF and TCA (now Air Canada) for the CGTAS continued demilitarized service after the war ended. They operated out of the RAF Transport Command Administration Building, while the domestic service used the main passenger terminal (McGrath 1992, p.149).

In 1946, the RCAF handed over management of Dorval to the Department of Transport. In 1947, the 426 squadron of the RCAF made Dorval its base until it moved to Trenton in 1959 (Pigott 1996, p.96).

By 1952, 589,216 domestic/transborder and international passengers were using Dorval per year (McGrath 1992, p.149). This placed a severe strained on the facilities especially the make shift RAF building. The airlines using Dorval by the early fifties included:

	Airline	Date initiated service
1.	Trans Canada Airlines (TCA)	Sept. 1941
2.	Northeast	Sept. 1941
3.	Canadian Colonial	Sept. 1941
4.	Quebec Airways	Sept. 1941
5.	Canadian Pacific Airlines (CPAL)	May 1942
6.	BOAC	1946
7.	KLM	1949
8.	Air France	1950 (McGrath 1992, pp.149-155)

In 1952, Colonial and Northeast airline expressed an interest in adapting the U.S. Pre-Clearance system in Montreal. The airlines acted on their own, and in Nov. 1952 U.S. immigration staff began to work at the airline counters. In 1954, The Deputy Minister of Transport ordered the pre-clearance to be stopped, due to space requirements, but the airlines resisted and in April of 1955 the D.O.T. allowed the pre-clearance to continue (McGrath 1992, p.150).

With the ever-increasing amount of passengers at Dorval, construction of a new terminal began in 1956. In the late 50's more airlines began serving Dorval

1.	Eastern Airlines	1956	
2.	Luftansa	1956	
3.	SAS	1957	
4.	Sabena	1957	
5.	Nordair	1960	
6.	Alitalia	1960	(McGrath 1992, pp.149-155)

In 1960, the airport was officially renamed, Montreal International Airport –Dorval. The new 30 million dollar terminal opened on Dec. 15th 1960 with approximately two million passengers annually (Pigott 96, p.98). Dorval was competing with Malton (Toronto) for the busiest airport in Canada. The terminal was the largest and Canada and was to serve the aviation needs of the Montreal region for many years.

During construction there were many design alterations in order to meet the requests of the airlines and to accommodate the new aviation technology and the larger aircraft. The vast size of the new terminal allowed for the inclusion of many retail shops, bars and concessions which attempted to better serve the population. This new non-aviation focus

was in conjunction with Transport Canada's new policy for attaining more non-aviation revenue at its airports.

With the new terminal an array of new airlines began to serve the airport.

1. Swissair	1962	
2. Aeronaves de Mexico	1964	
3. Irish International	1966	
4. Aeroflot	1966	
5. Olympic	1969	
6. Georgian Bay Airways	1969	
7. Solair	1969	
8. North American Airlines	1969	
9. Iberia	1969	
10. Czechoslovakia	1970	
11. EL AL	1971	
12. TAP Air Portugal	1971	(McGrath 1992, pp.149-155)

The late 60's saw the extension of the runways, the installation of an underground hydrant fueling system and the creation of a general aviation area and the eastern edge of the airport property. Modern amenities such as passenger docking bridges were also introduced at the airport. In 1967, the transborder finger was extended to accommodate the rapidly growing Montreal-U.S. market. Four new aircraft gates were built. This physical improvement again led to the increase in new airlines serving the Montreal region.

1. Allegheny Airlines	1972	
2. Delta Airlines	1972	
3. Pilgrim Airlines	1974	
4. Atonabee Airlines	1975	
5. Air Caravane	1976	
6. Pem Air	1976	
7. American Airlines	1977	(McGrath 1992, pp.149-155)

In 1968, Dorval was handling 4.5 million passengers annually. A planning study showed:

(a) Airline passengers to double every 8 years
(b) Air cargo double every 3 to 4 years
(c) General Aviation to double every 10 years
(d) Approx. 40,000 people would be employed directly in the aviation industry in metropolitan Montreal by 1985. (10,000 persons in 1968)
(e) By 1985, 7,500 acres of land would be required for airport activities, plus 2,500 for expansion beyond that date.
(f) The airport would be required to operate 24 hours a day to allow efficient use of aircraft
(g) Noise disturbance to adjacent communities has already created social and economic problems, and complaints and petitions were being received I increasing numbers from widening area; a night curfew on jet operations was already in effect and would be difficult to lift. This imposed an increasing operating penalty on the airport and the airlines.

(McGrath 1992, p.152)

The study produced two solutions to the inevitable problems:

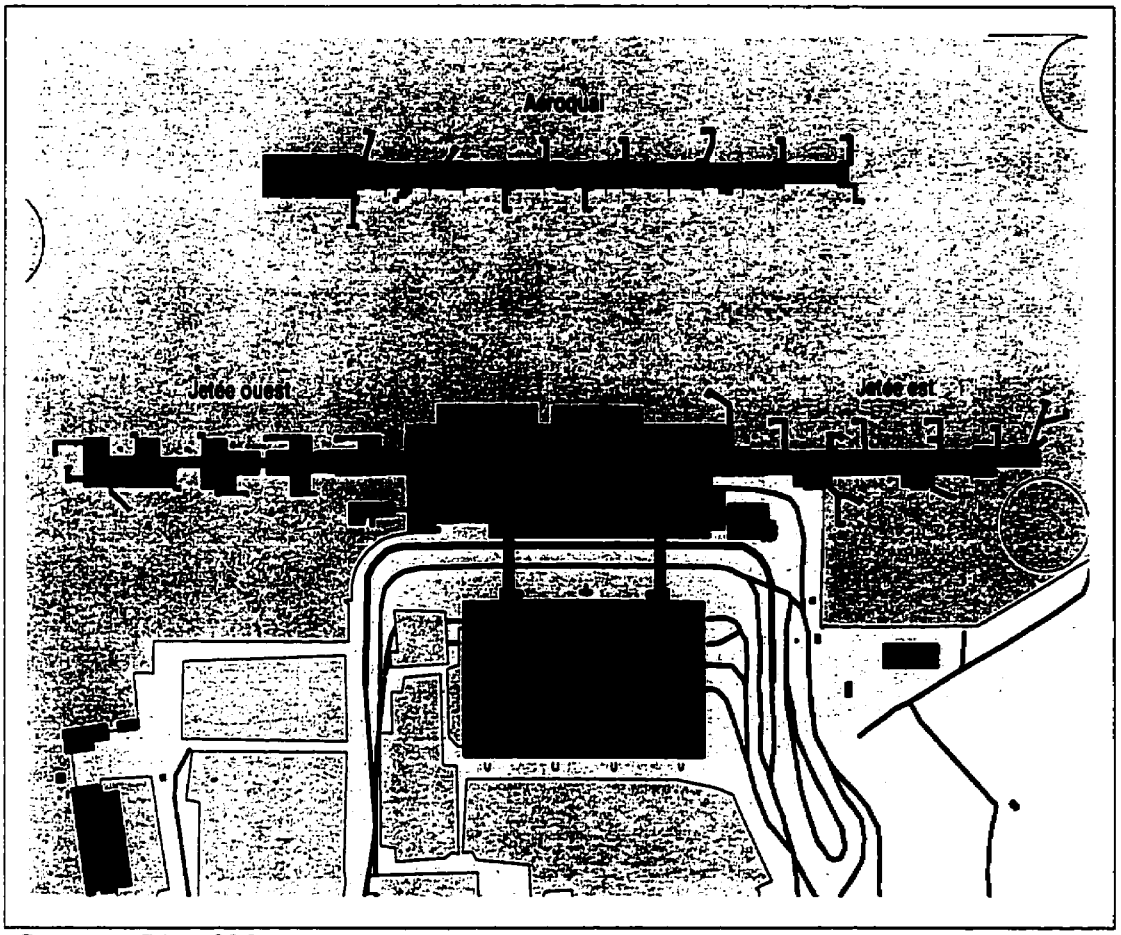
(a) Move people away form the airport, which would not be feasible form a social point of view and would be economically prohibitive.

(b) Move the airport away from the people; build a new airport.

(McGrath 92, p.152)

In 1970, the first 747 jumbo jet landed in Montreal. This along with other advancements in the aviation industry forced Dorval to expand it runways, gates and ramp. The number of gates increased drastically with the building of the aeroquay (satellite terminal).

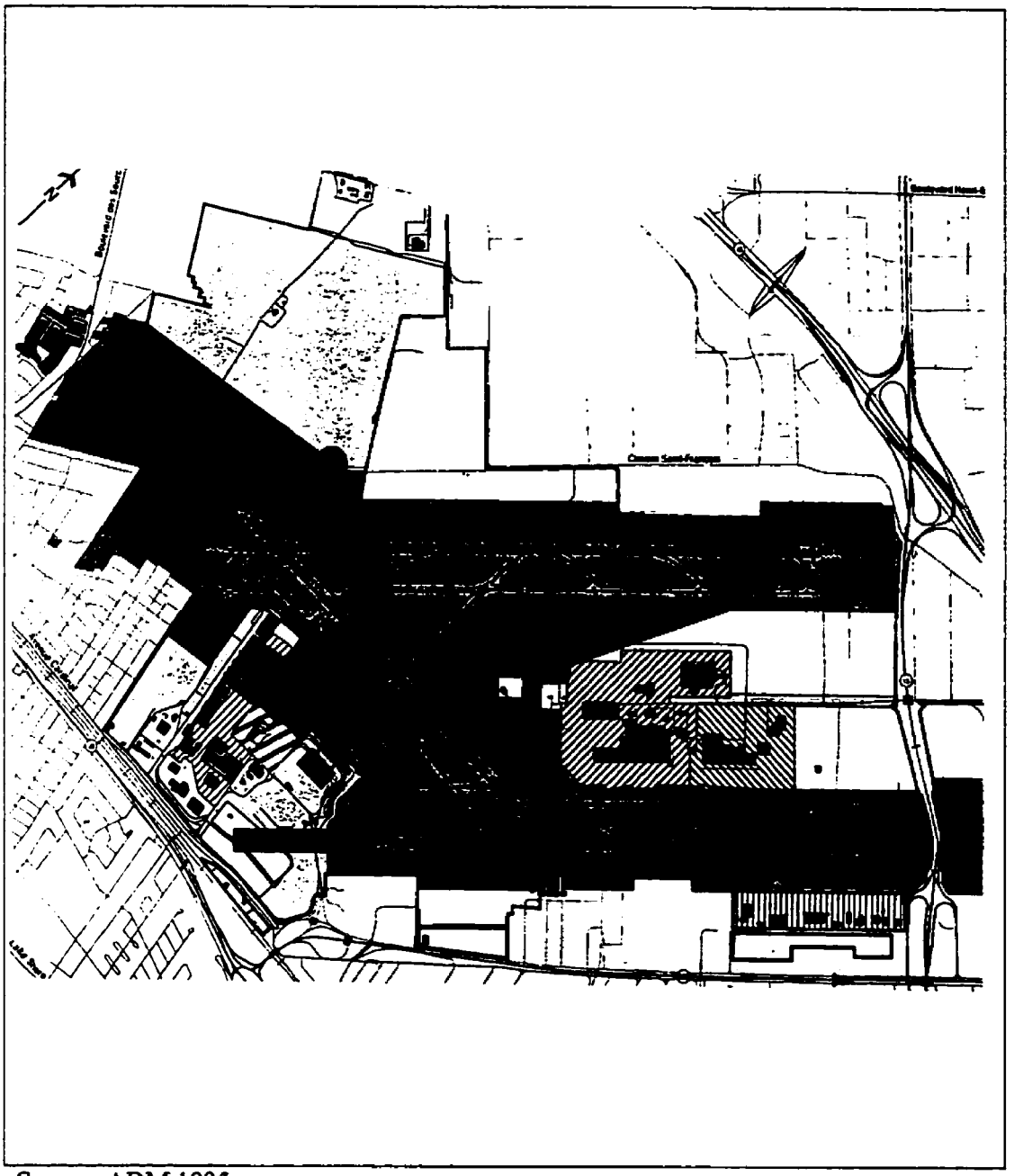
Figure 13: Dorval Terminal Building (YUL)



Source: ADM 1995

By 1975, Dorval had a centralized pier/finger terminal of 800,000 sq.ft. that accommodated all flights, operations and services that are associated with air travel (see figure 14). The terminal had 38 gates and 2,800 parking slots. It served 7 million passengers and 10 million visitors yearly by 1975. It was also home to 14,000 employees and transported 190,051 tons of cargo. The terminal had reached capacity. (McGrath 1992, p.152; Pigott 1996, p.98)

Figure 14: Layout of Dorval International Airport



Source: ADM 1995

Mirabel Airport opened on October 4, 1975, and relieved some of the congestion at Dorval. Dorval's new role was limited to domestic and transborder flights. These remaining flights were to be transferred to Mirabel by 1985. Dorval was to remain open

for some short haul flights, general aviation and aircraft maintenance. Dorval had no investment to its physical plant from the mid 70's to the early 80's.

Due to unrealized traffic estimates, and other surrounding circumstances, in 1982, Transport Canada announced that the remaining flights would not be transferred to Mirabel. This stance led to the revitalization of Dorval. 34 million dollars were invested in the terminal, offices and a new multi level carpark.

In 1985, the Quebec Regional Headquarters of Transport Canada moved into a new building at Dorval and abandoned the RAF Command building that it occupied since the end of the war (McGrath 1992 p.153).

1986 saw the government place both airports under one administrative structure, and announced that both would remain open to serve the Montreal area. Dorval airport served 3.7 million domestic passengers and 1.9 million transborder passengers for a total of 5.6 million passengers. Cargo was relegated only to amounts carried on passenger aircraft. By 1989, Dorval had 45 aircraft parking positions, and 5,700 parking spaces. Dorval remained important for aircraft building and overhaul. Air Canada retained it maintenance base while Canadair (Bombardier) built a new facility and assembly plant at Dorval.

In 1991, a new control tower was built along with a new fire station. Air Canada increased it presence at Dorval by building a new training centre and administration complex.

4.2.2 Montreal International Airport- Mirabel

The late 60's brought about tremendous growth to the Montreal economy. Along with the growth Montreal enjoyed its new status as a world-renowned city. The Department of Transportation's ongoing study of the Montreal aviation situation announced in 1968 that a new airport would be built for the Montreal region. The Airport was to fulfill two goals:

1. To relieve the overcrowding and congestion at Dorval
2. Be the Trans-Atlantic hub for Canada (The airport was to be the exclusive entry point into Canada for all Trans-Atlantic flights.)

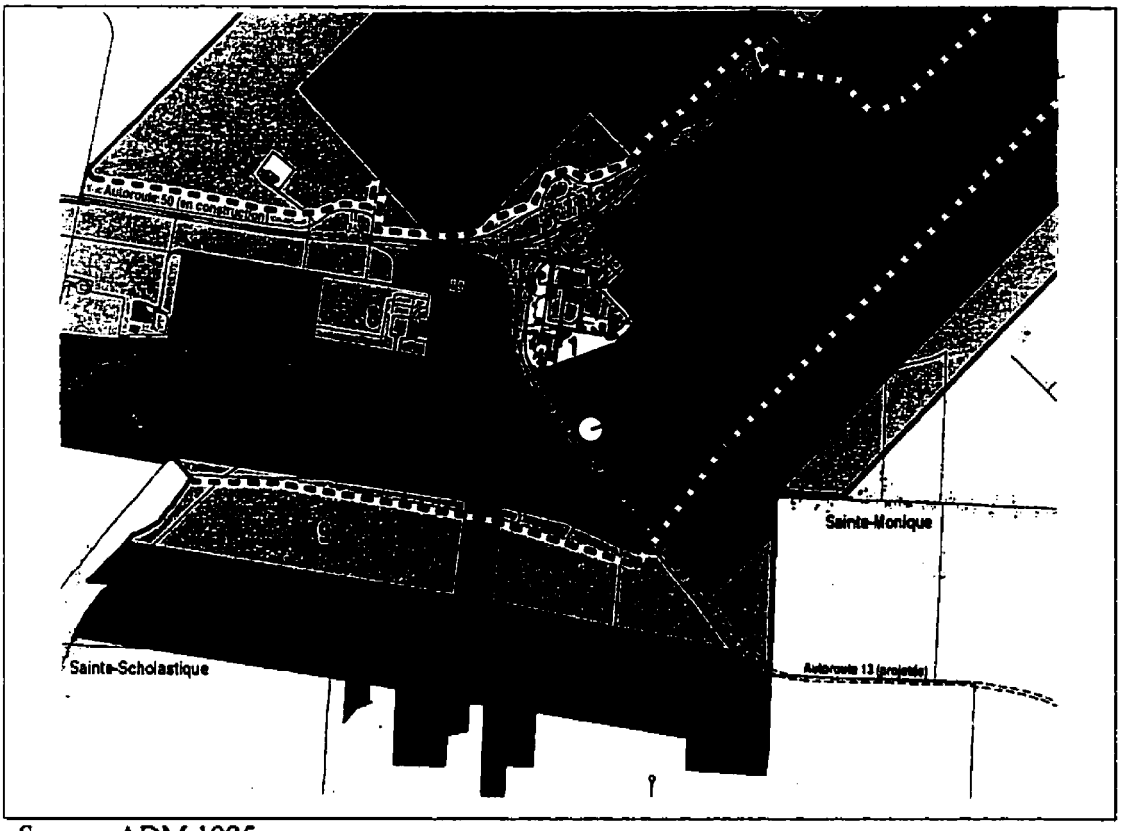
(Pigott 1996, p.99)

In 1969, a site at Ste. Scholastique was chosen for the new airport. The site was 58 kms from Montreal. The greenfield site was chosen partly as a result of the noise and congestion problems that occurred in Toronto in the mid 60's. The intent was to remove the airport from the city in order to avoid noise and environmental hazards that plague airports in close proximity to developed areas.(see figure 11)

Although only 5,000 acres were needed for phase one, the federal government proceeded to expropriate 90,000 acres. This excessive expropriation brought about many conflicts between the farmers and the federal government (Pigott 1996, p.100). Land that was not

required for the initial construction was given 10-year renewable land leases (McGrath 1992, p.155).

Figure 15: Mirabel International Airport (YMX)

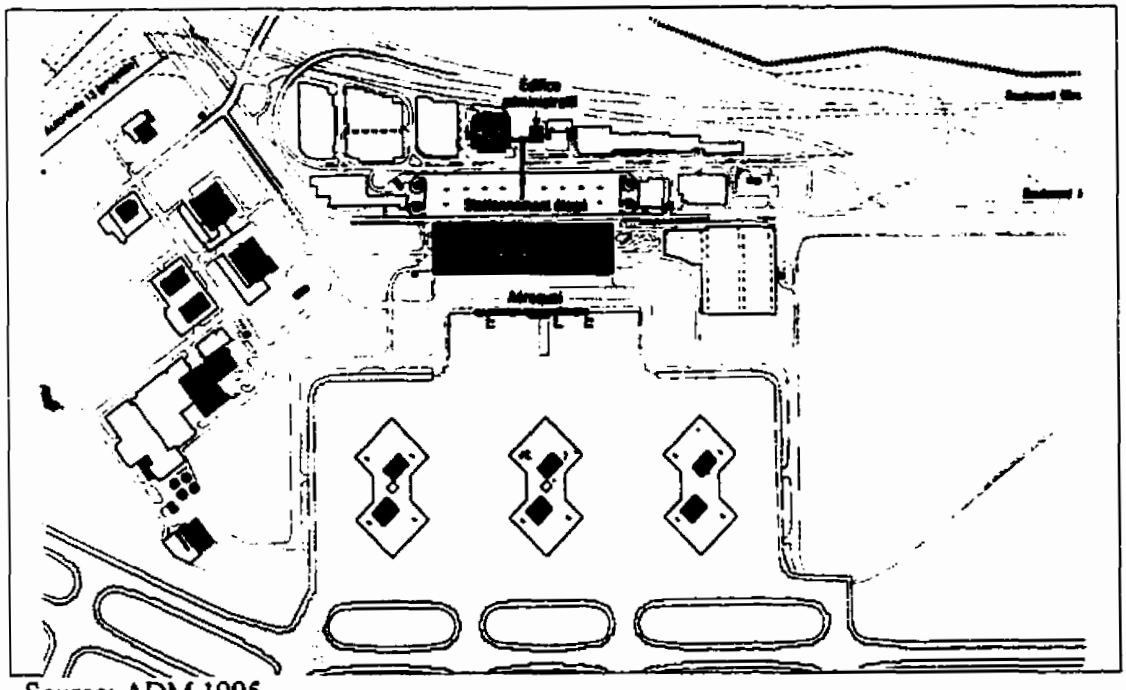


Source: ADM 1995

Phase I of the Mirabel project included two 12,000 ft. runways, a terminal building with a capacity of 6-10 million passengers, a control tower, a car park for 3,400 cars, service building and utilities, an underground refueling system and aircargo terminal. The latter two were built by the aviation industry. Canadian Pacific Hotels also built a 361-room hotel adjacent to the main terminal building (McGrath 1992, p.155).

The terminal complex was built under the Open Apron/ Transporter method. The main terminal had 18 arrival and 22 departure docks. Passengers would be moved between these docks and the 18 aircraft position divided into 3 service clusters by Passenger Transport Vehicles (PTV's). 22 PTV's with a capacity of 120 passengers would service the terminal (McGrath92, p.155). An aeroquay for connecting domestic flights was built at the request of the airline industry housing 6 gates directly linked to the terminal building.

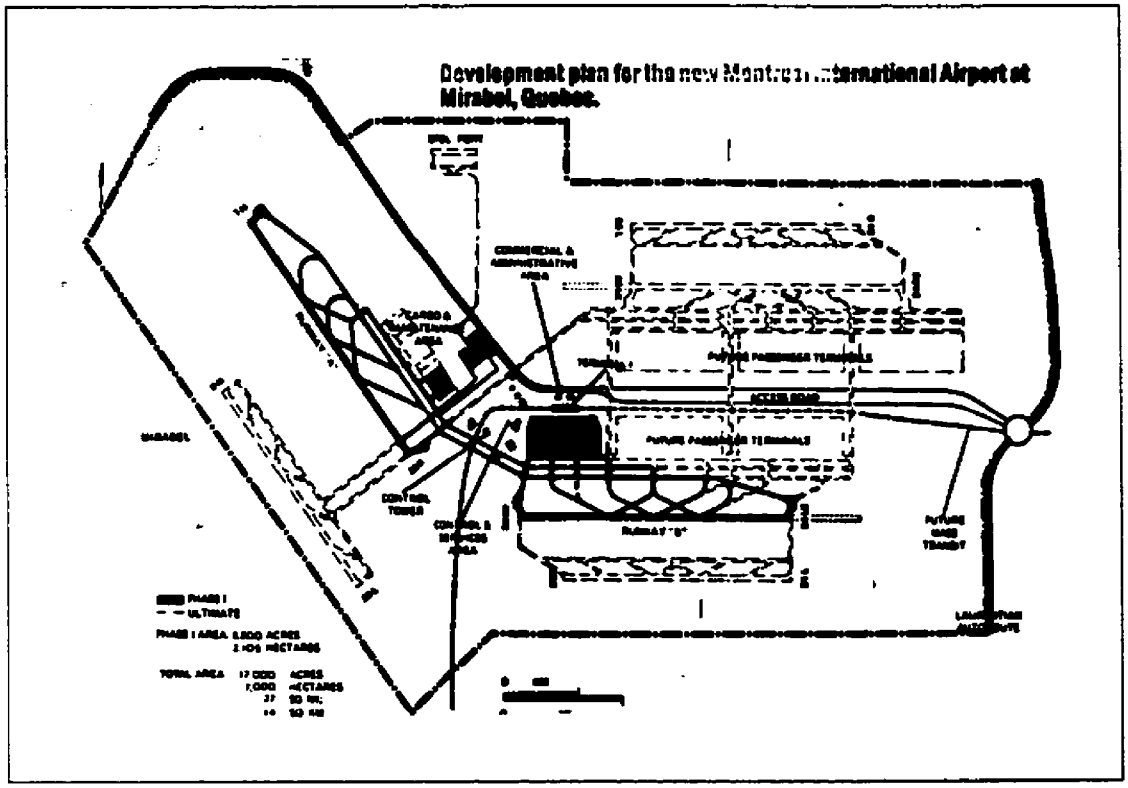
Figure 16: Mirabel Apron Layout



Source: ADM 1995

The master plan called for 6 runways of 12,000 ft. and 6 terminal buildings. Transport Canada predicted that Mirabel (YMX) would handle 30 million passengers by 1990 and have the capacity for 60 million by 2005. The airport was to be linked to Montreal by a high-speed train with a terminus at the airport. (Pigott 1996,100; McGrath 1992,155)

Figure 17 : Mirabel Master Plan



Source: Stroud 1980

Montreal International Airport- Mirabel officially opened on October 4, 1975, with operations beginning on November 29,1975. The airport was opened to all international flights and was served by 33 airlines.

The late 70's were not kind to Mirabel. The original master plan for Mirabel was never realized due to the fact that the traffic numbers that were predicted were never even remotely attained. Several reasons can be attributed to the shortcoming of the airport. One of the reasons was the effect of the OPEC oil crisis of the late 70's, which effected the whole airline industry. Locally the Montreal economy was in a tailspin and that was reflected in the travel levels. The most important factor was that new aviation technology allowed transatlantic flights bound for Canada to overshoot Montreal. This was coupled

by new bilateral air agreements between Canada and various European countries granting reciprocal traffic rights to national airlines. In return for European gateways for Canadian carriers, Canada has to give traffic rights to Toronto and other Canadian cities (McGrath 1992, p.156).

In 1979, Mirabel handled 2.75 million passengers in comparison to Dorval's 6.25 million. The numbers for 1988 read 2.5 million Mirabel and 6.5 million for Dorval.
The initial prediction was that with the additional domestic and transborder traffic scheduled for relocation to Mirabel in 1985, the airport would have approximately 17 million passengers annually.

The initial plan for relocation of the domestic and transborder flights never materialized and rather than add airlines, some airlines began to pull the unprofitable routes out of Mirabel. These include notables such as Canadian Airlines International, Alitalia, Sabena and Luftansa.

The 1986 government decision to maintain both airports, and place them under the same administrative structure began a cooperative effort to utilize all the assets within the Montreal airport system and attempt to improve the whole rather than one airport or the other.

1994 was a memorable year for Mirabel. It produced half of the 25 million-dollar profit of the Montreal airport system. This was in stark contrast to the billions in tax dollars

that were sunk into the airport for many years. (The initial 500 million dollars projected had blossomed to 4 billion by the opening of the airport.) In addition, it ranked 5th worldwide in an IATA passenger and facility survey based on criteria such as comfort, baggage handling, connections, restaurants and shopping (Pigott 1996, p.102).

4.3 DORVAL INTERNATIONAL AIRPORT FACTS AND FIGURES

4.3.1 Location

Montreal International Airport, Dorval, is located on the western portion of the island of Montreal. Located 20 km from downtown Montreal it is centered in the City of Dorval, Quebec. The total airport surface cover is 1325 hectares, the majority being in the City of Dorval (882 ha). This main area includes the terminal building, parking area and main hangar line. The airport stretches out into neighboring municipalities of Ville St. Laurent (437 ha) and the City of Pointe Claire (6 ha) (ADM master plan 95,p.17).

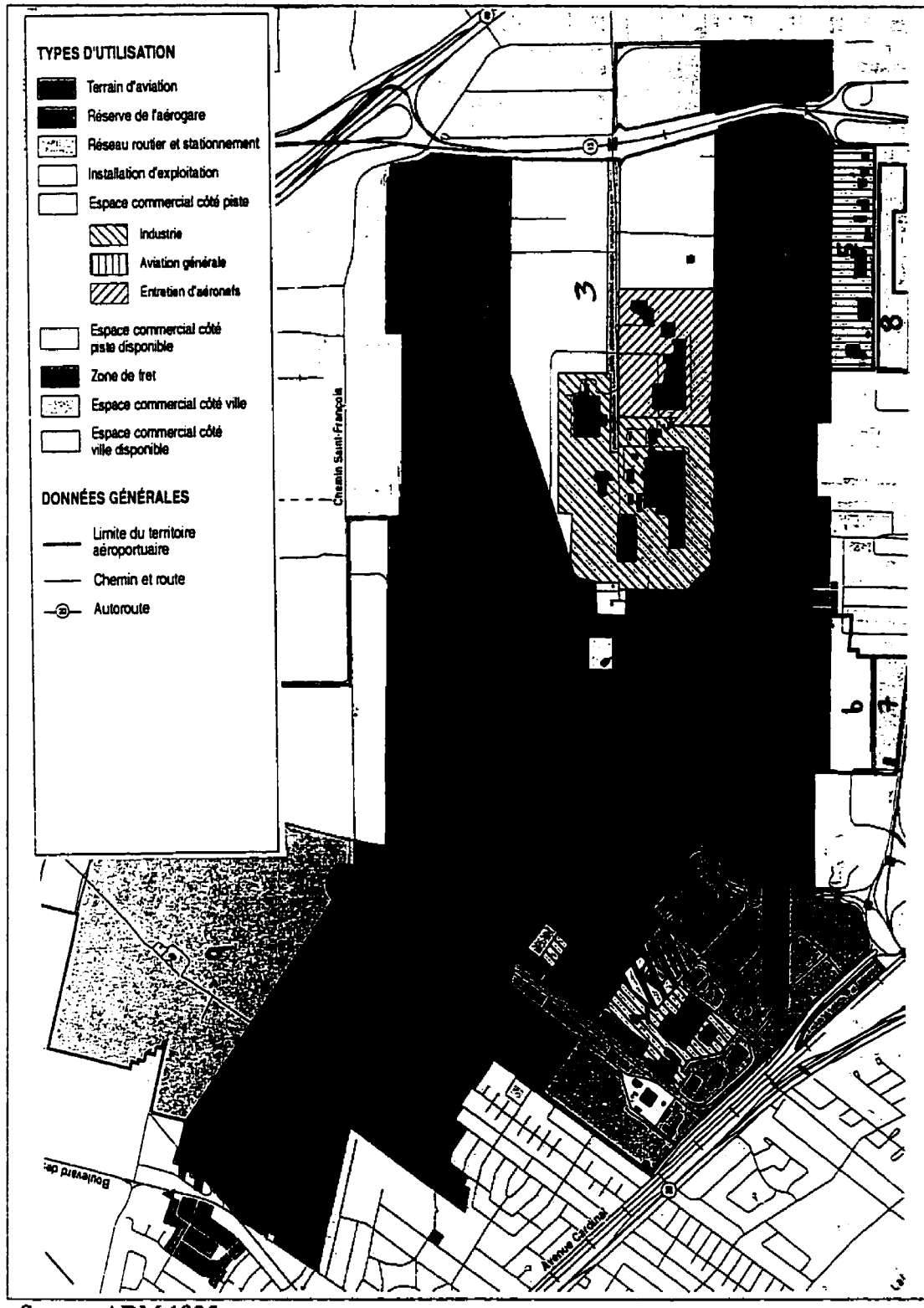
The airport is bordered mainly by commercial and industrial areas, however, there is some residential area on the south and southwest corner of the property.

The aviation area sprawls over 734 ha and contains 3 runways(see figure 18).

06L- 24R 3,353 m (11,900 ft. x 200 ft.)
06R-24L 2,926 m (9,000 ft. x 200 ft.)
10- 28 2134 m (7,000 ft. x 200 ft.) (ADM master plan 1995, p.17).

The two parallel runways were constructed in respect to the prevailing winds of the site. Generally these winds force the use of 24L, 24R, and 28, approximately 70% of the time. The aircraft maneuvering area also contains 17 taxiways.

Figure 18: Dorval Land uses



Source: ADM 1995

The designated terminal area comprised 250 ha. The central building is comprised of a 5-story complex. The main level being the arrivals level. The first floor is dedicated to departure activities. The remaining levels are dedicated to airline offices and administrative functions. (see figure 13)

Table 6 demonstrates the physical size of numerous international airports and the activity that can be accommodated within that space.

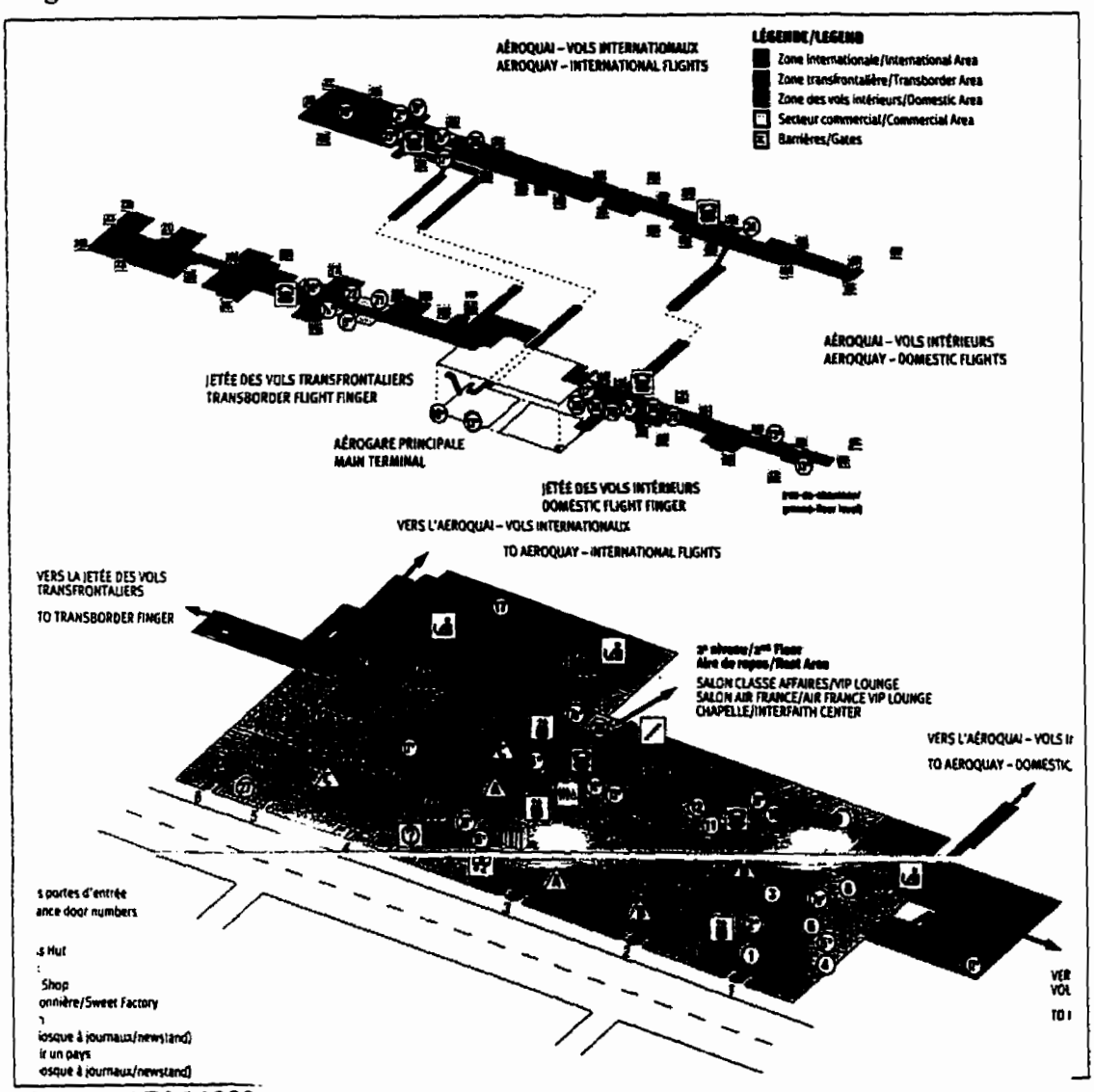
Table 6 : Airport Size Comparison Chart

Airport Size Comparison Chart			
	# of runways	Area (hectares)	# of Passengers (1999)
Dorval	3	1,405	8,293,278
Boston (Logan)	4	965	26,064,645
Atlanta	4	1,538	77,939,561
London (Heathrow)	3	1,197	62,263,710
Washington (Reagan)	2	348	15,020,011

Source: ADM 2000; ACI World Airport Traffic Report 1999

The actual terminal layout follows the traditional centralized concept (see figure 19). From this central main lobby extends two linear piers that make up the aircraft docking/boarding gate area. One sector is dedicated to domestic flights and the opposite pier is exclusively used by transborder (U.S.) traffic. A satellite gate area (Aeroquay) is linked to the main terminal via passenger tunnels beneath the main airport tarmac. In total there are 45 aircraft parking positions; 27 domestic and 14 transborder, and 4 mixed use. The terminal building measures 490 000sq. m.

Figure 19: Inside Main Terminal Dorval



Source: ADM 1999

The access roads and parking structure are located at the south sector of the terminal building. There are seven (7) lanes of access along the frontage of the terminal building. 3 elevated for departure level traffic and 4 ground level for arrival traffic. A single dedicated lane for tour buses taxis etc. is on the ground level. The parking zone consists of a main multi-level structure surrounded by ground level parking adding up to 4500

slots. The two preceding components constitute a single landuse zone (ADM master plan 95, pp.18-21).

The remainder of the aerodrome is divided into a variety of landuses (see figure 18):

- Commercial zone bordered by Albert de Niverville Blvd. and Stuart Graham Ave.
- Commercial zone west of Stuart Graham Ave.
- Commercial zone airside- 68 ha.
- General Aviation area (Ryan Ave.)-20 ha.
- Commercial zone Ryan Ave. – 10 ha. lot 15
- Commercial zone airside lot 10
- Commercial zone landside –8 ha- lot 11
- Commercial zone landside – 15 ha lot 1
- Future available zones – Lot 3,4,5,6 commercial areas airside
- Golf course 140 ha. currently leased out. (ADM master plan 1995, p.17).

4.3.2 Passenger Data

Table 7: Canadian Airport Passenger Figures

Canadian Airport Passenger Counts			
	1994	1996	Annual Inc.
Dorval YUL	5,851,682	6,376,806	2.10%
Mirabel YMX	2,426,638	2,565,077	2.50%
Toronto YYZ	20,086,922	24,259,268	8.50%
Vancouver YVR	11,057,214	14,201,313	11%
Calgary YYC	4,935,015	6,913,867	14.30%

(Groenewege 98, pp.1011-1042; Groenewege 96, pp.863-892)

Note: 1996 figures are used due to the fact that this was the final year that the Montreal Airports separated the flights between YUL and YMX.

These counts rank Dorval 115th and 119th respectively on a worldwide ranking scale. The '96 figures have Montreal in the ranks of Lisbon, Portugal; Raleigh/Durham, North Carolina; Rio De Janeiro, Brazil; and Columbus, Ohio (Groenewege 1998, pp.1011-1042; Groenewege 1996, pp.863-892). The highest passenger counts for Dorval were totaled in 1974, just prior to the opening of Mirabel airport. At that time Dorval served over 7 million passengers per year.

Mirabel International Airport (YMX) ranking was 198th on the international ranking in 1996. Its 2,565,077 passengers place it with cities such as Monterrey, Calif.; Calcutta, India; Lihue, Hawaii (Groenewege 98, p.1011-1042). None of these airports is a world powerhouse in the airport scenario

Other major Canadian centres, Toronto (YYZ), Vancouver (YVR), and Calgary (YYC), ranked 31st, 57th and 111th receptively (Groenewege 1998, pp.1011-1042) (see table 7). Vancouver's and Calgary's large increases in this time period are a direct result of the Open Skies Agreement. This lifted the restrictions at Canadian airports and allowed new routes and all U.S. airlines into the market. Vancouver saw an increase of 37% in transborder traffic, while Calgary's increase was 33% since the inception of the agreement (Carr, 1996 p.11). The agreement was not active for Toronto until 1997.

Combining the figures for YUL and YMX would give Montreal a total passenger count of 8,941,883 (see table 7). This comprehensive total would place Montreal 92nd internationally, and would be in the company of Vienna, Austria; Dublin, Ireland; New Orleans, Louisiana; and Houston (Hobby), Texas.

Montreal is linked to 140 direct service destinations. This includes 44 domestic, 34 transborder, 24 international and 38 leisure destinations. Leisure destinations represent non-scheduled service operated by charter airlines (ADM annual report 1997, p.20).

The world busiest airport in 1996 was Chicago's O'Hare International Airport with 69,153,528 passengers per year (Groenewege 1998, pp.1011-1042). In 1999, O'Hare was surpassed by Atlanta's Hartsfield International as the world's busiest airport with a total of 78.1 million passengers (Delta News mar.2000).

ADM has forecasted a growth of 2.5 percent annually for a total of 14 million passengers at the end of the master plan horizon year of 2020 (ADM may 2000). This is a reasonable/realistic forecasted growth which was below the North American average of 4% (Delta News apr. 2000).

4.3.3 Aircraft Movement Data

Another important statistic for analytical purposes is the number of aircraft movements. This represents total aircraft movements i.e. landings and take-offs of commercial aircraft and helicopter operation domestic or international scheduled non-scheduled flights involving the carriage of passengers, freight, and/or mail.(Groenewege 1998, p.1027).

A high number of passenger movements and a relatively low aircraft movement numbers indicate that a substantial percentage of the traffic was carried on large wide-bodied aircraft. Inversely, high aircraft movement relative to a lower passenger count would indicate smaller aircraft moved a substantial sector of the traffic.

These figures are essential to understanding the type of population at the airport and its distribution. On the airside as well as on the landside, the characteristics and needs of wide bodies, narrow bodies and regional jets all vary. The more obvious differences

include ramp space requirements, number of passengers off/ onloaded, number of personnel required per aircraft, size of needed boarding lounge area.

Dorval's movement figure of 202,340 rank it 79th worldwide while YMX's total of 55,800 doesn't rank in the top 200 internationally, it does rank 22nd in Canada (Transport Can.1996). Dorval's higher ranking for movements than for number of passengers would indicate the use of smaller aircraft types. Mirabel very low number of movements indicates the use of larger aircraft with less frequency.

Toronto ranks 28th internationally with 372,000 movements, Vancouver 38th with 330,000 and Calgary 66th with 235,000 movements (Groenewege 1998, p.1011-1042).

Two excellent examples of varying use amongst airports are London's Heathrow International Airport (LHR), and Cincinnati/ Northern Kentucky International Airport (CVG). LHR ranks 5th internationally in passenger movements, but only 20th in aircraft movements (Groenewege 1998, p.1011-1042). This is largely due to the enormous amount of long range international flights using the largest aircraft available. The amount of available landing slots are limited at Heathrow thus the airlines maximize the available slot by using large aircraft. CVG ranks 41st in passenger movements, but 25th in aircraft movements (Groenewege 1998, p.1011-1042). This is due to the fact that it is the hub for Comair Airlines, one of the largest regional airlines. Comair only flies regional jets and turbo props thus the need for more frequency and thus more aircraft movements.

The present airfield layout at Dorval has a capacity of 77 movements per hour. The forecast for the horizon year would be 74 movements. Currently there are only 53 movements during peak hours (ADM press release may 2000). This demonstrates that Dorval's current airfield can handle a substantial growth in aircraft movements. In actuality the airfield has been held under-capacity by the passenger terminal.

4.4 SUMMARY AND CONCLUSION

The chapter described how the Montreal airport scene has evolved over the past 80 years and compared Dorval with other land confined airports worldwide. Annual passenger numbers for these airports are well above the volume at Dorval demonstrating the room for growth at Dorval within it current site. The chapter also illustrated the lagging Montreal passenger numbers on a national scale and reinforced that action had to be taken to stimulate passenger growth.

The chapter also presented data illustrating that the airfield at Dorval is well below capacity and that any growth in passenger and aircraft at Dorval can be easily accommodated in the current airfield.

Chapter 5 Aéroports de Montréal Theory and Practice

5.1 INTRODUCTION

Chapter 5 examines the administrative structure of ADM and its decision making process. The first section of the chapter describes the structure, the mission and the goals of the airport authority. The second section details the change in policy for the allocation of flights and the effects of that decision on airport system in Montreal, with particular emphasis on the effects at Dorval airport. The final section describes how ADM makes its decisions and what theories the processes follow.

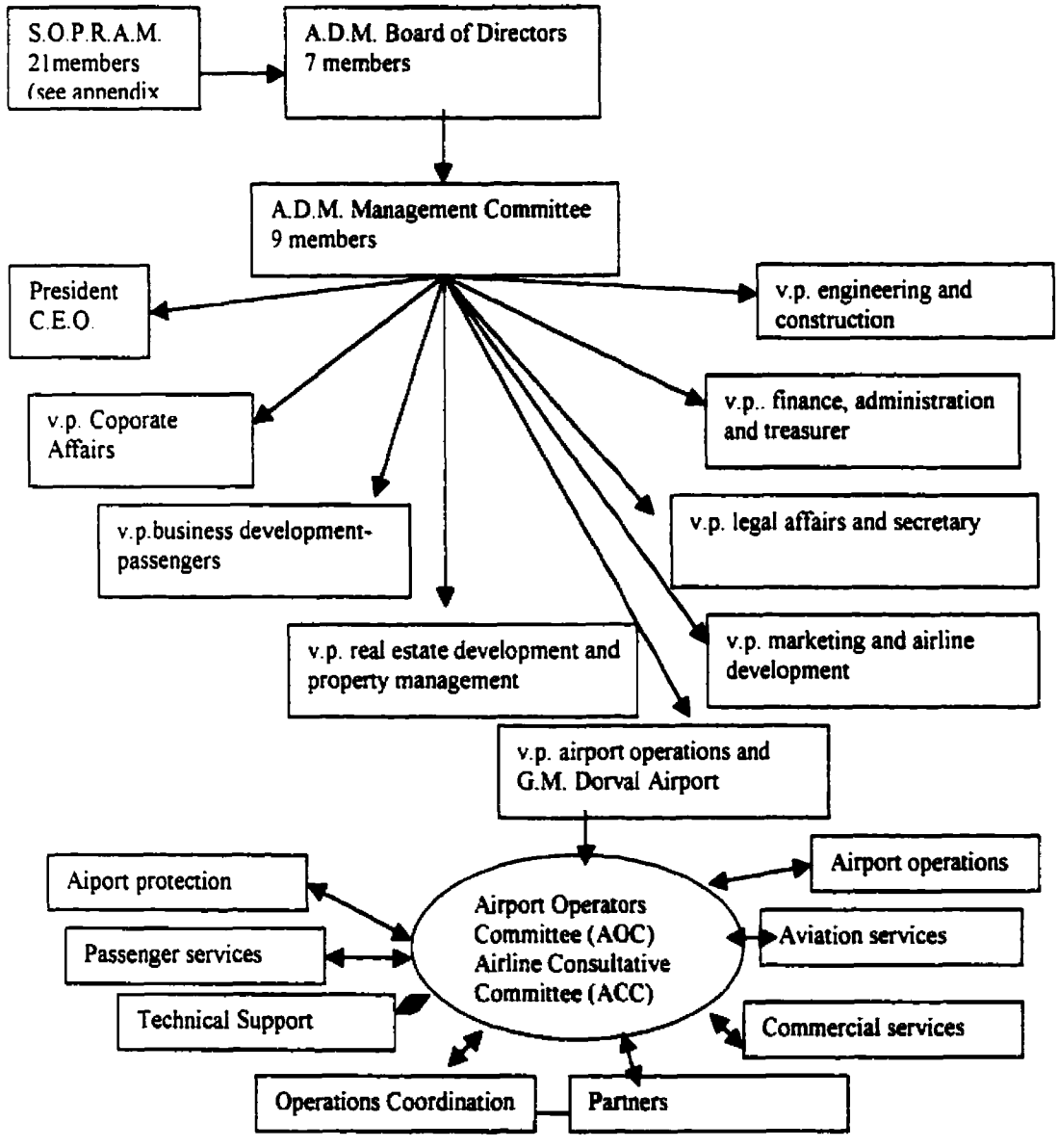
5.2 THE ADMINISTRATIVE STRUCTURE OF THE MONTREAL AIRPORT SYSTEM

In 1985 the Government of Canada announced its intention to transfer the administrative authority of Canadian airports to local authorities. Aéroports de Montréal (ADM) was formed in 1992 as a para-public non-profit enterprise created to take over administrative functions of both Montreal airports. Responsibilities of this new administration included management, financing, promotion, as well as planning and development of the Montreal airports (ADM master plan 1995, p.1). The Government of Canada retained responsibility over the real estate, aviation services, weather, public security and inspection. On July 31, 1992 ADM signed a 60-year lease renewable at 20-year intervals (ADM master plan1995, p.1).

A complementary organization was already existent at the time that ADM was created. The Société de Promotion des Aéroports de Montréal (SOPRAM), was created in 1987, as a non-profit organization to promote the airports as tools for the ultimate benefit of the

entire Montreal region, and as representatives of the citizens of the region (ADM annual report 1997). It was founded with the mission to promote the coordination of political and economic factors in the development of the airports. It is comprised of 21 members that represent municipalities, chambers of commerce, and other economic functions. This organization appoints the board of directors of ADM (see appendix 1 for complete list of SOPRAM members) (see figure 20).

Figure 20: ADM Administrative Structure Flow Chart



At its inception ADM tabled a mission statement as well as a set of values that it would fashion it future plans with.

> ADM Mission
>
> To exceed guest and business expectations by providing airport services designed to render our airports among the most accessible and welcoming in the world; to foster sustained growth for our airports while safeguarding the sound position of the Corporation; and, to contribute to economic development in the Greater Montreal area.
>
> ADM Values
>
> Guest and Business Partner Satisfaction
> At Aérports de Montréal, we are exceedingly responsive to the needs of our guests and business partners for it is they who are our reason for being.
>
> Efficiency and Profitability
> Efficiency and profitability form the core of Aéroports de Montréal's management practice.
>
> Excellence
> At Aéroports de Montréal, excellence is achieved through the pursuit of quality backed by our capacity to innovate and deliver outstanding performance.
>
> Integrity and Openness
> ADM expresses these values through our management practices and our standards of individual professional conduct.
>
> (ADM annual report 1997, p.i)

Simple general objectives are extrapolated from these values including: providing all customers with world class service; ensuring airport facilities meet world class standards; remaining flexible by allowing room for expansion; and offering services characterized by efficiency profitability, comfort, and security (ADM master plan 1995, p.v).

The Board of Governors of ADM has adopted a corporate governance model inspired by existing models at the Toronto Stock Exchange as well as the Montreal Exchange. "It was felt that managers of public property, the directors not only have an obligation to

report to both SOPRAM and the general public, but were also responsible for transforming the two airports into tools designed to spur economic development" (Goyette in ADM annual report 1997, p.5).

Together these two organizations recognize the importance of a healthy airport system. They attempt to improve, guide, and foster airport development as a vehicle for economic growth in the Montreal region as a whole.

5.3 STRATEGIC POLICY CHANGE

Since the inception of ADM the Montreal airport scenario has taken on a more holistic approach to improving the quantity and quality of air travel in the Montreal region. In 1993, ADM began an intense infusion of capital into both Dorval and Mirabel. This investment came after years of debate concerning the closure of one the airports. The uncertainty led to an unwillingness to upgrade a facility in case the facility would subsequently decommissioned. After numerous reports ADM cited a multitude of reasons why the two-airport system would be superior to a single site. These included a control on certain environmental problems notably noise pollution as well as the provisions of a higher quality of service mainly due to the lack congestion at both stations.

The roles for the airports would be mutually exclusive thus eliminating the possibility of competition among the two regional airports. The role for Dorval was as a hub for domestic activity as well as the principal location for transborder traffic. Cargo was limited to aircraft under 34, 000 kgs or cargo that is transported on passenger aircraft

(ADM master plan 1995, p.8). Mirabel was slated as the base for international flights (except U.S.A.) and the centre for cargo aircraft.

The first ever Master Plan for the Montreal Airport System was created in 1995. The master plan was a result of a cumulative information gathering session which spanned years and encompassed project studies, customer surveys, economic inquiries etc. The horizon year for the plan was 2010. However, the focus of the plan was the initial ten years. The plan encompassed both Dorval and Mirabel airports in a single document guiding the development of the Montreal system in a co-operative and cohesive manner. Objectives outlined for Dorval Airport included a passenger increase of 3.2% per year, increasing the volume for Dorval from 5.8 million to 9.7 million passengers by the final year of the plan (ADM master plan 1995, p.v). These forecasts are much more conservative and realistic than those of the late 60's that propelled Montreal into this two-airport dilemma.

The main initiative was an upgrade of the terminal facilities to meet current day standards. The equipment and commercial facilities lagged decades behind other North American airports. Dorval had not seen capital investment since the early eighties (34 million dollars investment) and prior to that only in the 1970's. A major area of concern was that the configuration and layout of current facilities, particularly check-in counters, waiting rooms and gates, made for inadequate movement (ADM master plan 1995, p.vi). The overall goal was to make Dorval once again competitive in the airport market. " The proposed new arrangement meets the needs associated with the hub and spoke structure

and consolidation of domestic routes proposed by national carriers" (ADM master plan 1995, p.vi).

On February 20th, 1996 ADM made a dramatic announcement that all scheduled airlines including international carriers would have the option to use either Montreal airport, Dorval or Mirabel. The transfer, "liberalization" was to be available by April of that same year, but the actual transfer was delayed until September of 1997 due to legal battles. The main reasons for this strategic decision was to " meet the demands of a rapidly changing market and to ensure that the Montreal area doesn't lose out as a result of the major changes that reshaped the commercial aviation industry in 1995" (Jacques Auger former ADM President in ADM Newsletter 1997). The exodus of international airlines serving Mirabel, and the ever declining percentage of the Canadian market for international and domestic transfers forced ADM to take drastic measures that would turn the situation around. Amalgamation was seen to be the catalyst to expansion of the Montreal aviation market.

The decision to ameliorate both facilities still remained, however the vocation of the airports changed. Dorval was envisioned as a business airport, while Mirabel would be a "vacation" airport along with its cargo base." ... The objective being to allow Dorval to become a hub that will consolidate and increase domestic, transborder and international air services, while facilitating connections" (Richard Cacchione, former President ADM in ADM Annual report 1997, p.7).

> " The major shift initiated by ADM in 1997 is based upon two underlying factors: Customer service which, although increasingly complex, is not

> critical in that it determines the choice of airport by both airlines and travelers and business development which requires an in-depth knowledge of the market one serves, operating flexibility and structures approach" (Richard Cacchione, former President ADM in ADM Annual report 1997, p.6).

Approximately 50 million dollars were spent in 1997 to prepare a temporary international finger in the aeroquay section of the airport. These temporary facilities along with other physical changes at the arrival hall were necessary to allow Dorval to handle the new passengers. The situation is not exceptional with regards to access and customer service, however it does allow for an increase in flights while a new permanent facility can be planned and built (see Ch. 6.2 for additional detailed information).

Stemming from the policy change, Montreal has seen an increase in international service being provided. Shortly after the announcement of the liberalization policy, Air Canada announced that new non-stop service to Frankfort and Tel Aviv would be provided out of Dorval. The launch of these new flights were postponed parallel to the legal battles that caused an injunction against the liberalization policy. Legal arguments took place contesting ADM right to change the vocation of Mirabel. Once the legal battles were settled the airline once again announced their intentions to provide service to these cities from Dorval. Air Canada also created more than 300 jobs related to the anticipation of more connecting passengers out of Dorval (ADM annual report 1997, p.13). Air Canada's London and Paris routes have seen increases in connecting passengers of 623% and 158% respectively (Mcgovern S. Mar. 23,1999). Other major aviation news included Swissair's announcement that stated Montreal was chosen as its Canadian base (Lamey, oct. 1997p.d1). Canadian Airlines, which had been drastically reducing service from

Montreal, in past years including the elimination of its non-stop service to Rome, Italy and the closure of its entire Mirabel operation began to re-invest in Montreal. Canadian re-instituted its non-stop service to Rome from Dorval and also created a new executive lounge at Dorval. Sabena Belgian World Airline also re-established service to Montreal after a five year absence. A major deciding factor was the consolidation issue at Dorval. After approximately 1 year of service to Dorval, the airline has increased its flight frequency from 4 to 6 flights weekly. Other recent international aviation news includes an increase in Air France's frequency to Paris to twice daily, Mexicana's increase in frequency to Mexico City, and new service from Tarom the Romanian National airline.

To the chagrin of many travelers, Aéroports de Montréal has instituted an airport improvement fee that any passenger beginning their journey from Dorval must pay. It is not included in the ticket price as with many airport fees, but is a separate on-site fee that goes towards the redevelopment costs at the airport. As a not for profit organization, ADM chose this fund raising method rather than asking the government to raise bonds to pay for the project costs. ADM has remarked that this is a user pay system, which it deemed more appropriate than a blanket type tax. The fee is not a deterrent for potential connecting passengers, for they aren't required to pay it.

The changeover of power between the Federal government and the Aeroports de Montreal organization changed the dynamics of the relationship between the airport authority and the airlines. ADM overhauled the internal structure of the Montreal airport administration. The working relationship between Transport Canada and the airline

partners was one based on cost recovery. From the onset of ADM taking over the reigns, this ideology was replaced by one of profit building and uncertainty about ADM's goals concerned the airlines. Transport Canada had a slow and rigid bureaucratic process, but the airlines were clear on were they stood and the terms of reference were clearly defined. The relationship with the airlines has improved significantly in recent years and ADM has become more attentive and receptive to the airlines and the airlines in turn have become more trusting and active participants on all levels.

5.4 ADM PLANNING PROCESS

The ADM decision making process works systematically within the general structure of its administrative framework. The initial decision in 1995-97 to transfer the international flights to Dorval is highlighted below as described by M. Benoit, ADM management committee member and N. Hamel public affairs director for ADM (in Zacarhias, mar. 1996 p.b2) (see figure 20).

- Oct. 9, 1995. ADM management committee (9 members) examined an external study on the Montreal aviation scene and general worldwide aviation trends.
- Nov. 2, 1995. ADM management team along with the external consultants presented the finding to the 7-member ADM board of directors.
- Jan. 11, 1996. ADM presented the study to SOPRAM's 21 members (see appendix 1 for list of SOPRAM members).

In this process SOPRAM was used as a "sounding board" (SOPRAM member and Dorval mayor Peter Yoemans). Due to the fact that SOPRAM was partly made up of elected officials ADM used this as its link and liaison with the general public. Via this ADM felt that its decision had the backing of the general population.

ADM then reviewed plans with its "partners": airlines companies, the board of trade, tourist and economic interests and individual members of SOPRAM (M. Benoit ADM management committee member). This stage was hurried through as a result of a leak to the media of such a plan. Throughout the process government officials at both the provincial and federal levels were kept abreast of the proceedings.

- Feb. 20, 1996. ADM board voted unanimously, choosing one of the four options that were presented by the management committee. The option that was chosen was to allow the transfer of all regular scheduled flights to Dorval airport, and reassign Mirabel to a leisure and all cargo airport. This decision was based upon the ADM management committee recommendation.

ADM then went on to inform the SOPRAM members at a conference prior to a public news conference. 20 of the 21 members of SOPRAM voted in favour of the plan. The only vote against the plan was from the mayor of Mirabel. ADM has basically followed the above outlined decision making format in its process for the actual development of Dorval Airport.

The general framework for the proposed expansion plans at Dorval falls mainly into the rational planning domain. ADM set up its (1) goals and objectives, (2) took stock of its inventory, (3) based its expansion upon aviation demand forecasts, (4) produced simulated models, (5) evaluated models and (6) selected an outline plan for the development.

1- ADM goals and objectives:

- Position Dorval as a backbone of airport activity.
- Improve Montreal's competitiveness by facilitating the integration of carrier operating and reducing transfer times.
- Offer new, world class user friendly facilities which reflect the specific character of Montreal and optimize the airport experience of the users.
- Maximize the airport facilities in compliance with the most stringent service standards.
- Ensure that phase 2 is perfect in keeping with the new 2020 master plan for the airport and consistent with service levels required to meet forecasted growth in air traffic. (Goyette feb. 2000, p.10)

This one administrative entity working with the rational planning domain was able to alleviate some of the weakness in the rational theory that Deneufville cites. (see ch.2.1) The political variable was controlled within ADM's administrative structure. The role of lead planning source was taken on by ADM therefore all information was filtered through a single actor. A unified set of values and goals was developed by the authority and was expanded later to include other value sets from the partner groups.

2/3- Inventory and Aviation Demand Forecasts

ADM had commissioned studies (internally and externally by Syper-Miller) investigating the aviation trends regionally and internationally (Zarcharias Mar.1996, p.b2). As well as general demographic studies of the regional

population and current trends that affect aviation. All these studies noted the essential element of transfer traffic that was limited by the two airport system.

Due to the fact that this is a redevelopment plan for an already built airport rather than a greenfield site, ADM carefully assessed the current conditions at Dorval and its surrounding environment. The areas bordering Dorval are fully developed in various land uses, commercial, industrial and residential (see figure 18). This issue remained an important element throughout the plan evaluation process as to minimize the disruption of the surround built up environment.

4/5- Simulated Models and Evaluation

At the onset of plans to develop Dorval airport, ADM's planning department had produced 21 development concept layouts (Taillefer 1999). From these preliminary 21 layouts, the ADM team narrowed down the possible selections by introducing various criteria and preferences. The criteria and preferences were introduced by the ADM planning team, "partners" such as the airlines, and outside consultants in airport planning, engineering, architecture and management specialists. From the increasingly stringent criteria the final conceptual plan and layout was chosen.

6- Outline Plan for Development

ADM then began work on a master plan for the airport that is to be in effect until the year 2020. The plan is divided amongst five main planning blocks, which begins with phase 2, the creation of a new transborder finger at the southwest

quadrant of the airport (The recent interior renovations to the passenger terminal building are know labeled as phase 1).

ADM stressed the significant role that the "partners" had in the planning process and plan development. The airport authorities and the airlines have various committees that provide a forum where they communicate (see figure 20). The main committee in the airport development process is the Airport Consultative Committee (ACC). This committee allows the expression of concerns in the general airport development and more so the expansion plans at this time. Another main committee is the Airport Operators Committee (AOC) which deals with the daily operational needs and requirements of the airlines and airport authorities.

ADM faltered when it went into consultations meetings with the airlines with an almost complete design. According to ADM, consultation at this stage was justified in that it laid out some essential framework. The airlines saw it as Fait Accompli. The airlines resented this fact, and it was only due to the airline's opposition to the institution of the plan as such that ADM really opened up a consultation process with responses and solutions. This is an area where rational planning theory fails, and ADM seems to have fallen into the same trap. ADM has made strides in establishing a better relationship with its "partners", and the initial obstacles in their relations with the airlines seem to be disappearing. The airlines in turn are now more active and willing participants.

Although mainly structured as a rational development process ADM has also used several other theoretical concepts in its strategic decision making. As an organization, ADM is loosely formatted according to Allison Graham's Organizational Behavior and Bureaucratic Political framework. ADM incorporated as a non-governmental agency has allowed it to function as a private body. This has entitled ADM to by-pass many legal obstacles in its planning process and allowed it to proceed independently from provincial and federal authorities although the airport is a very public facility.

An example of such allowances is evident in legal proceedings about ADM's sole jurisdiction to allow the transfer of flights. The judge stated "ADM is not a public body and did not have to meet the same level of public consultations as a public organizations do in the decision making process" (Moore, Henrich Apr.1997 p.a1). Other instances such as environmental investigation and regulations on development of federal land were circumvented by ADM being a private body (Mennie Oct.,1997 p.a9).

As a result, organizational issues are decided upon within the established structure of ADM not in the political forum. On the other hand, due to ADM's strong ties and network association with SOPRAM, ADM is able to balance the political side within its overall structure. The SOPRAM board gives ADM decisions political clout and public backing as a result of some SOPRAM members being elected officials.

Many political issues arose with ADM's announcement to allow the transfer of flights. This mainly affect two political circles: (1) The population surrounding the Town of

Mirabel, north of Montreal which lost an important economic generator and (2) the communities and municipalities surrounding Dorval, which were concerned about the possible disruption to their environment (although no expansion plans were involved at this stage). The baggage of this controversial decision has hampered the development plans at Dorval leading to the local communities being opposed to any proposed development plans.

ADM began to provide representation at town meetings to provide adjacent municipalities with information and facts about the proposed development. As a result of general town meetings being overtaken with airport issues, ADM planned several information sessions in local municipalities and also opened a consultation room at the airport for the general public (Zacharias Apr.1997 p.a3). The airport also set up a noise committee, which includes members of the public (Semenak Oct.1997 p.a1).

On a substantive theoretical level, ADM has focussed its new development plans in direct association with its current user population as well as its proposed user types and volumes. ADM has strongly taken into account the type of passenger (originating or transfer) and developed its new layout to accommodate the proposed growth in the transfer category. The transiting passengers are the focus of the proposed development with an emphasis on improved passenger flows through the system.

The destination of the passenger is also extremely important and ADM has also taken this into account. The layout recognizes the split in traffic per sector

(domestic/transborder/international: 45%, 26% and 29% respectively, ADM annual report 1999) and has planned its layout and infrastructure accordingly as to accommodate growth in all sectors. The distribution of gates dedicated to each section is representative of the current numbers per sector.

ADM has instituted flexibility on two levels. The first is the flexibility in the planning process. ADM has implemented a multi-phase plan onto which deadlines could be moved up or postponed accordingly to progressive forecasts (Goyette Feb.2000, p.6).

In her press conference The Chairman of The Board of Directors for ADM Ms. Nycol-Pageau Goyette also stated that the planning team is constantly modifying the plans to take into account the new Canadian outlook as well as more global trends. She also noted a tentative timetable for construction based upon "physical and operational constraints, and the necessity of consulting partners with a view to incorporating their requirements in to the master plan" (Goyette Feb.2000 p.10).

The second flexibility issue comes in the form of physical infrastructure adaptibility. This allows various components of the airport to be used in multiple sectors depending on the need of certain flight sectors (details of the terminal structure are found in ch. 6.3). This allows the airport to adapt and grow internally and be efficient in the use of space and allocation of physical resources.

5.5 SUMMARY AND CONCLUSION

The structure of ADM works well in allowing it to make strategic decisions as well as deal with political issues. The decision to consolidate the flights at one airport was the proper strategic move although a tough political decision. The decision making process is one based on the rational model with influences from other theories such as Charles Lindblom's Disjointed Incrementalism. ADM also used considerable amount of Substantive elements as a basis for its development project.

ADM's institution of flexibility in the planning process is an important element in assuring the airport plan can accommodate the continually changing aviation scene. ADM improved it communication and consultancy methods with the neighbouring citizens and its airline "partners" correcting the early uneasy relations.

From the processes listed in the chapter ADM came up with the plan and layout that is detailed in chapter 6.

Chapter 6 Dorval Airport Terminal Plan and Layout

6.1 INTRODUCTION

Chapter 6 lists and illustrates the changes to the physical structure at Dorval. The first section illustrates the recent renovations to the terminal building and how these alterations have been a positive lead-in to the development project. The second section describes the plans on a regional level down to the master planning level. It illustrates the involvement of a variety of players outside the normal airport landscape participating in an overall beneficial project. The final section describes the actual components of the final plans for the new development at Dorval. The selection of layout, number of gates and detailed information on the components are illustrated and documented.

6.2 TERMINAL RENOVATIONS

In keeping with the goals and objectives articulated in the 1995 Master Plan (ADM 1995), and the liberalization policy (allowing airlines to choose which airport to serve), the terminal building at Dorval has and is being completely overhauled for its new role in the Canadian and North American airport structure.

This section outlines the physical changes at the terminal complex, why they were done, and how it has affected the travelling public.

This initial strategy according to the 1995 plan was to pay particular attention to:

- Passenger traffic flows
- More space and accessibility
- More commercial areas
- Elimination of all functional elements that negatively affect public and public perception
- Improve aesthetically and create harmonious public spaces
- Introduction of a flexible system of infrastructure and remain flexible for expansion
- Harmonious redevelopment of the terminal building with bridges and waiting rooms (ADM master plan 95, p.29)

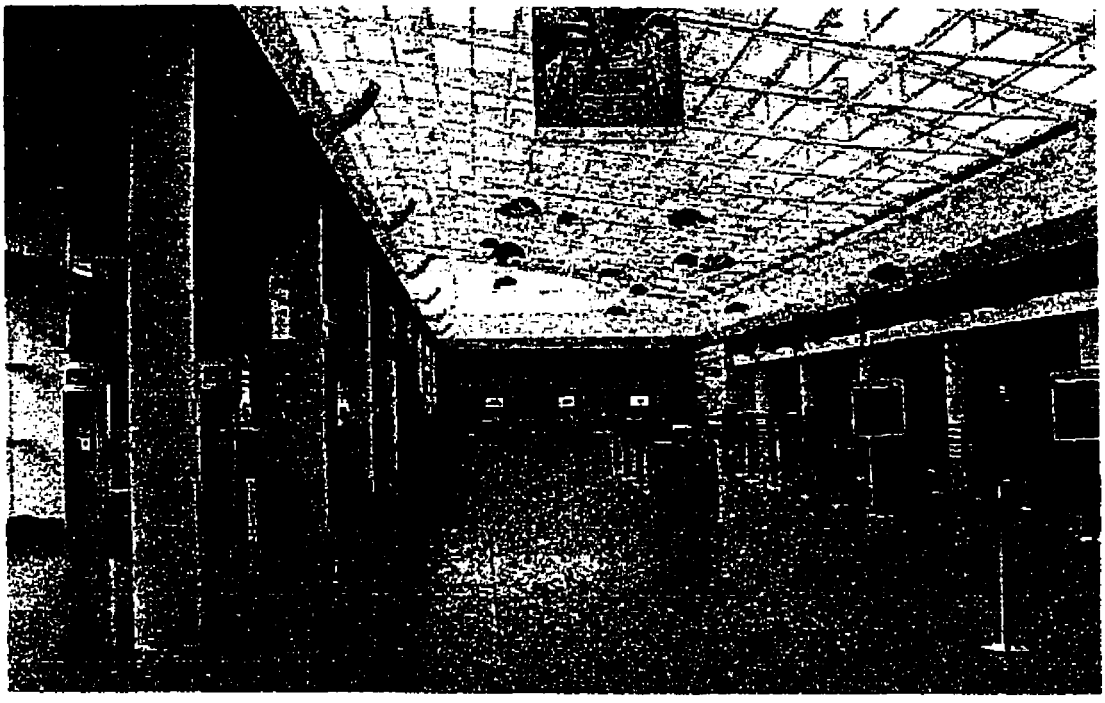
The slogan used by ADM during the initial projects was "Conquering Space". This term precisely described the efforts of the redevelopment project, which was the attempt to find more useable space with the already built confines.

The domestic wing of the terminal building was the first section to receive a face- lift. Work on the sector began in 1994. The main lobby saw a increase in vertical accesses to/from the arrivals level via the installation of new elevators, revamped escalators and new staircases. An enlargement of the area was accomplished via a glass enclosure that added natural light and more openness to the main lobby area. The southern façade of the terminal building was pushed backed 12m.along a 60m frontage to increase the floor area of the lobby (ADM Space Oct. 1996). The repositioning of the southern glass façade was done almost throughout of the length of terminal building (see figure 21). This enlarging was done on both the arrivals and departure level, in an attempt to seize every square foot of useable space.

Figure 21: Repositioning of Southern Façade

The commercial zone in the domestic terminal zone was completely revamped and additional shops and amenities added. A commercial strip along the northern area of the main terminal linking the domestic and transborder finger was created. The area entitled "Rue Montreal" combines eating establishments, bars, shops, bookstores and a children's play area. This was developed to upgrade amenities available to all airport users. The strip also provides an expansive view of the airfield, attracting persons in waiting. Montreal's distinct nature as a culture and a people is recognized by ADM. Aesthetically, ADM has stated that main areas of the airport will transmit this Montreal culture and civic pride to the inbound and travelling public.

Figure 22: Illustration of Interior Renovations



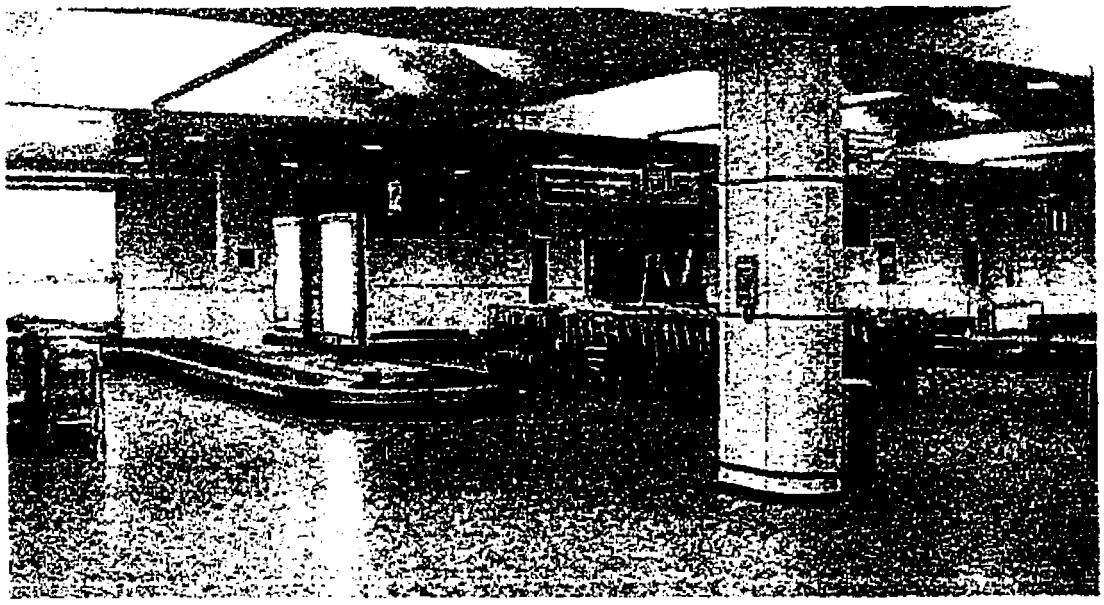
The security checkpoint was enlarged, as well as the addition of more and modern equipment to facilitate and speed up the security procedures for domestic passengers.

The departure/arrival gate area saw a refurbishment off all nine gates in the main domestic pier. The airlines aided in this redevelopment upgrading their dedicated gates. Along with the gate lounges renewal both Air Canada and Canadian Airlines built new executive lounges at the domestic finger.

The arrival concourse was redesigned with an expansion via the repositioning of the north façade 18m and south façade 12m. Increasing the overall floor area. The 5 older oval baggage carrousels were replaced by 2 larger flat bed carrousels (ADM Space Oct. 1996) (see figure 23). These increased the capacity of the belt for larger flights, and

increase the passenger frontage area to allow for an easier and more expedient delivery of baggage.

Figure 23: Domestic Arrivals Hall



Overall aesthetic improvements include full replacement of the restroom facilities, replacement of all floor, ceiling and wall coverings, more lighting etc. Functionally, the mechanical, electrical and HVAC systems were updated and/or redone. With regards to actual airport functionality, improvements included a new comprehendible public address system, state of the art flight monitors installed at more strategic locales, increased and better signage and directional aides, as well as information booths and freelance airport guides. Aesthetic, mechanical and electrical revamping took place at the transborder finger as with the domestic section.

The gate turnover is extremely high with only nine available gates. With the addition of some international flights using the domestic gates (due to lack of space at temporary

international finger) this finger is at capacity, for the majority of the day and over capacity during the evening peak time. The available boarding rooms and 900 seats in the finger aren't sufficient to handle the existing flights, and act as a deterrent to an increase of flights out of the airport.

The transborder finger saw drastic changes to its look as well as its functionality during the redevelopment. The airline counter layout was totally reconfigured to reflect a change in positioning and procedures regarding the U.S Pre-clearance facility.

In 1995, the U.S. Pre clearance facility housing U.S. Immigration and U.S. Customs facility were redesigned and relocated to a centralized zone, replacing an inefficient, decentralized, confusing and space consuming layout. (see map 2)

The old ticket counter areas were dismantled and replaced by over 60 modern consoles that house the computer terminals that can access any airline's computer system (see figure 24). This makes all counters available to any airline. This created a massive increase in usable public floor area, has reduced lineups, and allowed for more queuing areas during peak hours without interfering with the through flow of other airport users.

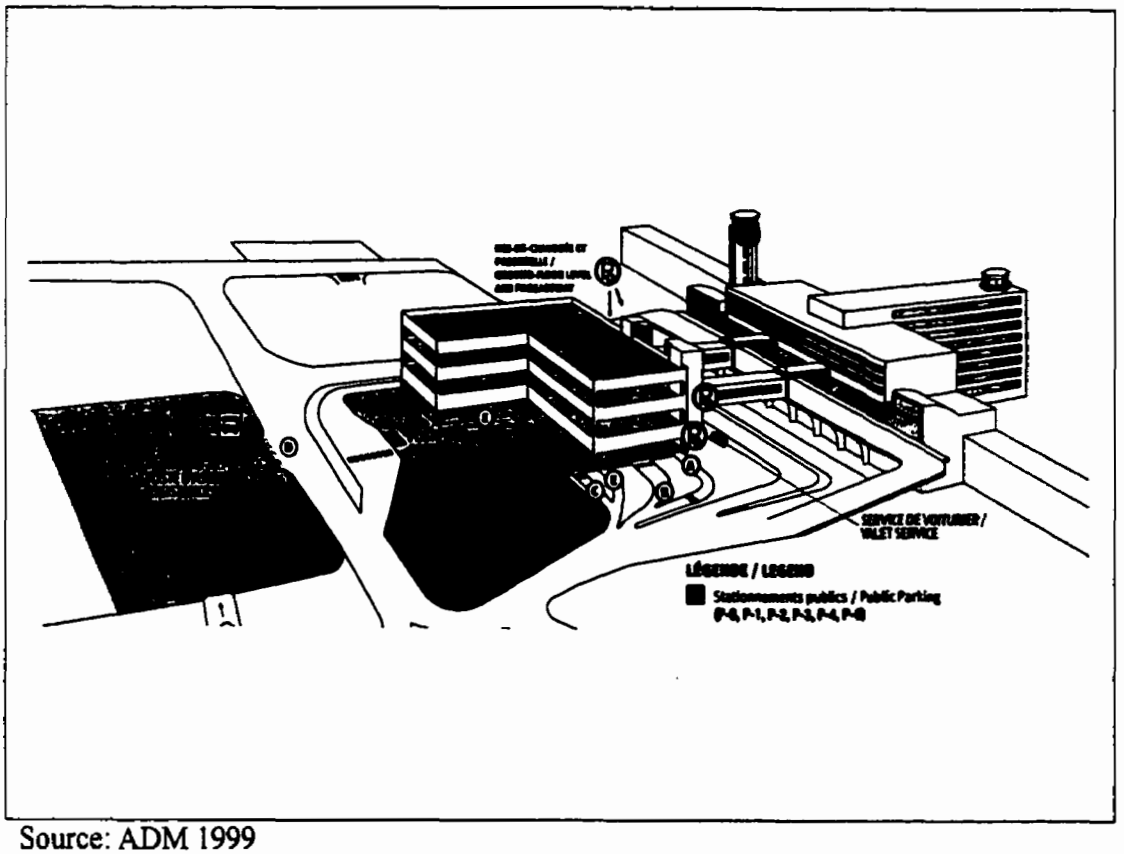
Figure 24: New Transborder Ticket Counters

A new outbound baggage hall for all airlines was built along with a state of the art baggage sorting system. This allows for one outbound belt to be used by all airlines with all baggage being sorted to the respective airline via the barcode on each checked bag. Once again this type of system allows flexibility and inter-use between airlines. If an airline requires another outbound baggage pier, a simple computer entry will allow that particular airline to use an open pier that was perhaps used earlier by another airline. The individual dedicated outbound baggage rooms and belts were inflexible and only allowed the airline unto which the ticket counter was connected to have access even if that airline had no activity at that time.

The arrival hall was renovated to include 2 new platform belts, which again improved the quality of service as on the domestic side. Relocation on redevelopment of the airline baggage service offices also took place.

The access road network was redeveloped in 1995. At that time the departure level elevated access road was expanded from two to three lanes. The arrival (ground) level was expanded to four lanes including a dedicated lane for public transport vehicles, tour buses and service vehicles. These changes on both levels led drastic improvement in access and circulation along the terminal frontage zone. Another major access principle was improved by the creation of 2 bridges linking the second floor of the tiered parking complex with the departure level (1st floor). This improved direct access to the departure level and reduced passenger congestion on the arrival levels. An extension of the tiered parking garage took place in 1996. An additional 1,150 spaces were created bringing the total available spaces to 4100 (ADM master plan 1995, p.48).

Figure 25: Dorval Landside Access



Source: ADM 1999

The decision to allow international flights to be serviced at Dorval, the "Liberalization" decision as announced by ADM thrust Dorval airport into another phase of redevelopment projects. Some projects that were still being completed were re-evaluated and altered to incorporate this new aspect of international flights and its new requirements. Under the '95 plan more commercial space was to be developed, however once the international flights were back at Dorval, the space allocated for the commercial use was used for the international airline check-in counter and facilities. (see figure 23) Due to the limited space the expansion of commercial sector was restricted and can't proceed until the new facilities are built, therefore leaving the initial start up costs mainly

on the shoulders of the airlines and the passengers via the mandatory airport improvement fee. Table 8 demonstrates the sources of revenues and costs:

Table 8: ADM Annual Revenues

ADM Annual Airport Revenues 1999		
(In millions of dollars)		
Commercial Airport Activities	65.2	40%
Aeronautic Activities	50.9	31%
Airport Improvement Fees	31.6	19%
Capital Assets	8.3	5%
Other Revenues	7.9	5%
TOTAL	163.9	100%
Source: ADM annual report 1999		

" More efficient airports get 60 to 70 per cent of their revenues from commercial sources"(Pierre Coutu aviation consultant in Ceausu Oct. 2000 p.t4).

Figure 26: Re-allocation of Commercial Space

On the departures level additional ticket counters were added in order to handle to international passengers. Amongst other alterations, a new security check-point was created for the international passengers, Passenger Transport Vehicles (PTV) docking bays and passenger lounge, and a new duty free shop for outbound international passengers.

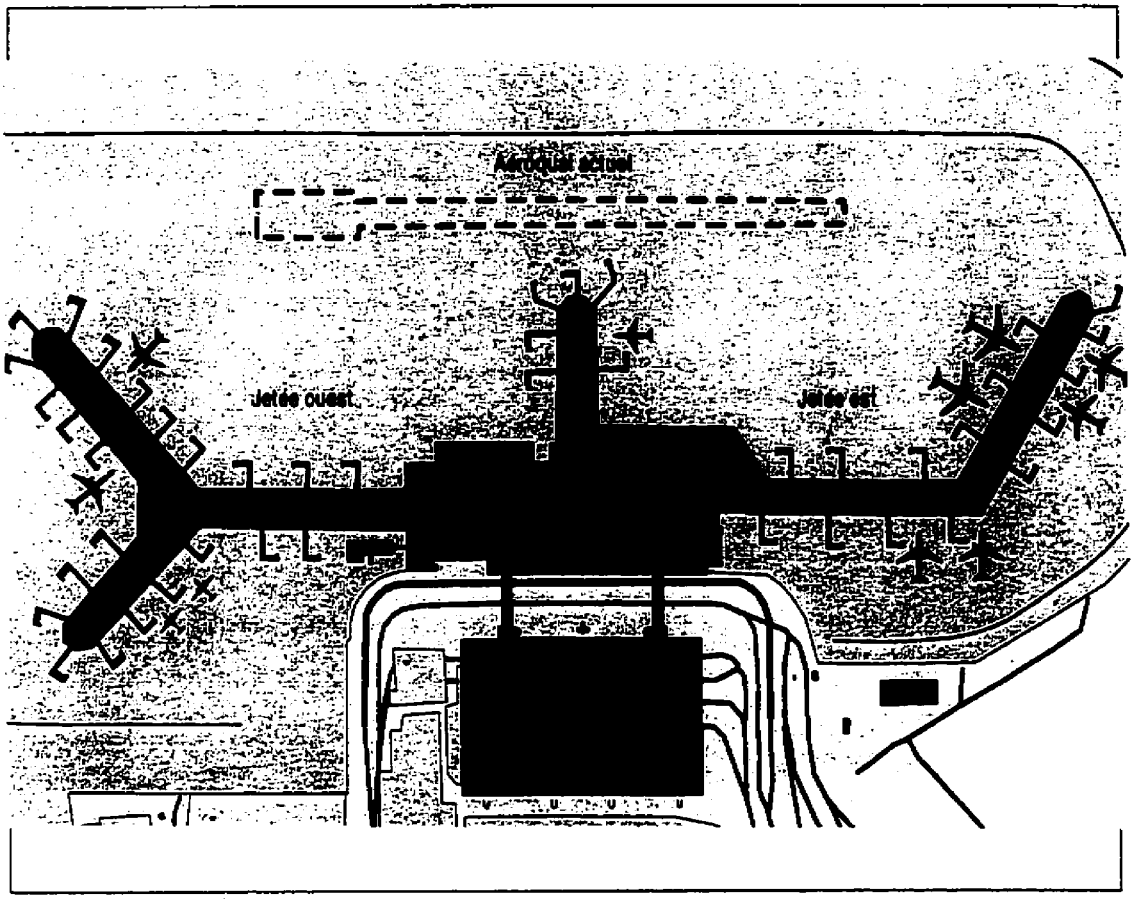
On the arrivals level, Canadian Customs and Immigration facilities were enlarged, and more stations added. Small baggage carrousels were replaced by 2 larger carrousels able to handle greater baggage amounts from international flights. The arrival waiting area for well-wishers was enlarged.

The largest project to come about due to the liberalization strategy was the redevelopment of the northeastern section of the satellite terminal (Aeroquay). The area was completely gutted and transformed into the base for international aircraft and passengers. 50 million dollars were spent on this phase 1 on the international project (ADM annual report 1997, p.14). This phase 1 included the construction of 8 new loading bridges (capable of servicing all aircraft sizes). The complete renovations included everything from new wall, ceiling and floor coverings, all new restrooms, new seating for passengers, new gate consoles, new shops and commercial facilities catering to an international clientele.

Figure 27: Renovated Aeroquay for International Flights

This development at the Aeroquay was in complete contradiction of the '95 master plan which proposed the demolition of the Aeroquay to make room for a new terminal configuration with better links the existing domestic and transborder fingers (see figure 28). The current layout with the Aeroquay was seen as a hindrance to the Hub ideals of the Canadian airlines. The new layout was intended to promote and allow the hub theory to flourish at Dorval. It would also provide a more centralized population fostering an increase in commercial services.

Figure 28: 1995 Master Plan for Dorval



Source: ADM 1995

The implementation of the international sector to Dorval has really maximized the use of the majority of the amenities and facilities at Dorval. Although temporary, the international activities and its required floor space has diminished some of the level of service that Dorval provides to all its users.

Until a permanent facility is built, gate sharing, counter swapping, and overall co-operation and sharing of space amongst the airlines is essential to maintaining all the operations at Dorval. These improvements weren't gratuitous changes made for aesthetic purposes but were necessary to upgrade an outdated and non-competitive facility.

As proudly mentioned in ADM's annual report " The Dorval team achieved a major feat as it successfully expanded the terminal within existing walls and transformed it into a modern, pleasant, highly efficient facility" (ADM Annual report 97, p.14).

However, the challenge to allow the continuance of the growth process, can only be met by expanding the physical structure beyond the current facility. Although ADM's efforts at providing shared gates and counter space, overall space is limited at Dorval. Due to this, an increase in flights, either via an increase in frequency to existing destinations; new destinations; or new carriers entering the Montreal market is constrained. The elevated use of all amenities and facilities has also taken away the planned customer convenience levels and reduced comfort levels.

Although the situation is temporary, until the new wings are built with the inclusion of a new permanent international concourse, growth at Dorval will be restrained due to a lacking of physical infrastructure and facilities.

The seeds for growth were planted by the consolidation of flights at Dorval; planning and accommodating this growth which is already evident is the next feat for ADM. This task of dealing with growth problems is one that ADM will take on gladly, rather than past tasks of dealing with decline.

6.3 GENERAL AIRPORT AND TERMINAL PLANNING

6.3.1 Airport Planning on the Regional Level

On the regional level (see system level 3.1.2), Aeroports de Montreal has clearly defined its intentions for the overall Montreal regional air transport system. ADM has taken a strong stance in assuring regional acceptance of its plans. The following quote and others are often re-iterated to ensure that everyone is a part of the overall plan. " This undertaking, which must be viewed with pride by citizens throughout the region, will endure greater Montreal, and Quebec as a whole are equipped with a world class airport that properly reflects the dynamic nature of our populations and our partners" (Goyette, ADM Feb.2000).

The first major position that ADM adopted was the continuation of its 1997 designated roles for the two Montreal airports; Dorval and Mirabel. This affirmed that Dorval is to continue to be developed and upgraded into a significant international airport and a major connection hub for the northeast North America and Europe. Mirabel will continue to be a leisure airport (vacation charters), as well as an all cargo facility.

As previously mentioned, the structure of the Montreal airport development team not only consists of ADM the directors and managers of the airport, but also SOPRAM the regional committee that promotes airport development as a catalyst for the overall regional economy. Through the involvement of SOPRAM a wide variety of interests are represented. The board consists of political officials, economic specialist and general regional business persons (see appendix 1 for list of members).

ADM has also included the involvement of local and national railway services, with a means to create an intermodal station at Dorval (Johnston sept.1999,p.a2). Transport Quebec, has also become a major partner in the development of the surrounding road network (Sutherland sept.1999, p.g3). Other parties include local, provincial, and national governments to thoroughly cover this development comprehensively and regionally.

ADM would like the federal government to be a major player in this development, but indirectly through a lease re-negotiation. Transport Canada is no longer the manager of the airport but is still the proprietor of the land. ADM claims that the current lease agreement limits the revenues available to ADM thus not allowing the generation of extra revenues that could be used to help pay for the enormous costs of this new expansion. "I am hopeful that the federal government will yield to the arguments of Montreal as it has done elsewhere in the country and accept to revisit the rent clause to ensure that our community will not solely be responsible for the transformation of Dorval and Mirabel"(Goyette Feb.2000 p.12).

ADM has not been quiet about this major economic development. It has stated several times that this airport development can be a catalyst spurring economic development for the whole region. It cites a world class airport is a major drawing card for investors (Goyette May 2000). In an ADM press release they indicate that the airport development will invest 500 million dollars in the economy of greater Montreal over the next 4 years.

It will create 6500 direct and indirect jobs for an aggregate total of $218 million in salaries. This results in $118.5 million in tax dollars for the two level of government (ADM press release may 2000 p.2). (see appendix 2)

6.3.2 Master Plan Level and Project Planning Level

The next stage of the planning process is the master plan level (ch. 3.2.3 and 3.2.4). This all-inclusive document is the blueprint for the complete development of the airport. This should include all land use designations, planning details as well as details on boarding properties adjacent to the airport, including access roads.

ADM produced the first master plan in 1995, which detailed the development of Dorval and Mirabel until the year 2010. However, due to the liberalization of flights, the redistribution of activities amongst the two airports and overall change in direction for the Montreal airport scene, the plan's mandate was cut short.

A new master plan for both airports has now in the works to better reflect the respective development of the two airports in regards to their new vocations. This new master plan entitled "Perspective 2020" is a 20 year development guide for the two airports.

The development options that were introduced in May of 1999 were analyzed and from all the criteria and objectives set out by ADM, the master plan and the general programming moved from the concept development to a layout of the new facility. At

this stage, phase 2 of the expansion plans was integrated into a 20 year master plan with a 1.3 billion-dollar investment at the 2 facilities (ADM press release Feb.2000).

The programming of the master plan, as for any airport, is based upon ADM research and forecasting coupled with numerous independent studies. These studies have indicated annual air traffic growth for Montreal to be in the range of 2.5%. The forecast includes all demographic influences such as population growth (locally and provincially), economic activity in the area and at a regional level, as well as local population profiles (age, income etc.)(Goyette, Feb.2000 p.6).

The change in the national aviation structure, having only one national carrier, Air Canada has also played a role in the general forecasting and programming for the airport. Air Canada's already strong presence in Montreal was a main player promoting the consolidation of flights at Dorval. They have stated that they will re-build Dorval status as a hub (Air Canada annual report 1999, p.9). Therefore, the airport authorities and Air Canada facility planners are both working to establish a better transfer point for passengers. The timing of the development is crucial in that Toronto is currently building a massive terminal with Air Canada as its main tenant. Therefore, Montreal must have in place the infrastructure to compete with Toronto for the possible new routes that Air Canada will establish. The high cost of the Toronto development may indeed help Montreal in that the profitability of routes may be limited by the high cost of rent and facilities that Toronto may impose on the airlines to pay for the development.

> "...discussions continue with GTAA, in regard to developmental issues, including the imposition of an airport improvement fee to fund capital

> expenditures, which have been a source of disagreement between the parties." (Air Canada Annual Report 1999 p.43)

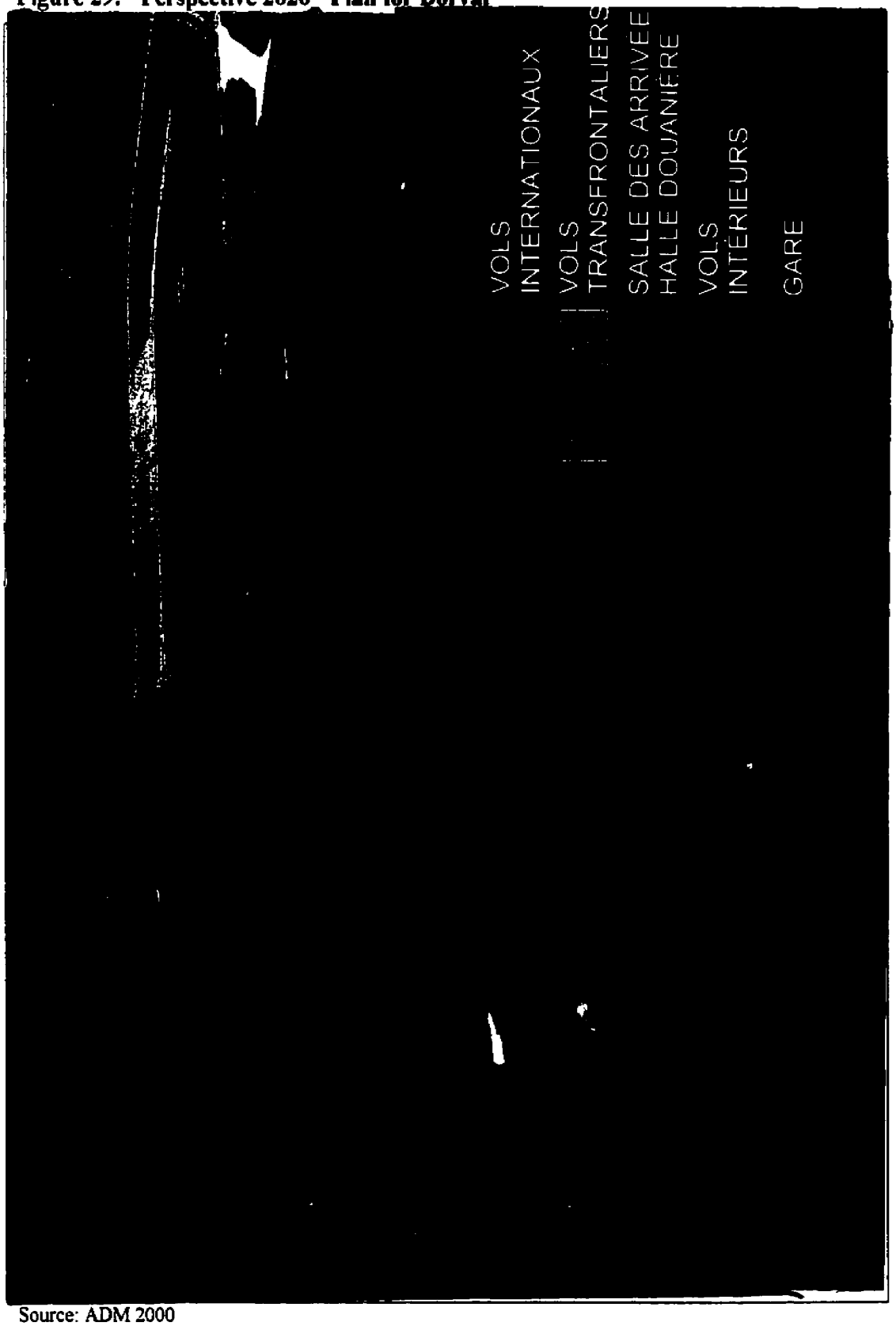
ADM has also factored in the composition of the air traffic at Dorval in the development of the master plan. The domestic sector comprises 45% of the total passenger traffic, while the international and transborder sector provide 29% and 26% respectively (ADM May 2000, p.2). As a result, the programming and development concept of the master plan is based upon this type of information to properly guide its future development. "All development strategies have been established on this basis in an effort to capitalize on existing assets, growth in market segments...enhance connection facilities... increase destinations etc" (Goyette May 2000, p2). Other influential factors include new airlines alliances, new reliance on regional jets (frequency of flights rather than size), and new aircraft technologies.

The focus of the new master plan is the massive expansion process that will be taking place at Dorval International Airport. The expanded master outlook is broken down into several phases. (see figure 29)

Phase 1 of the plan was the redevelopment of the interior of the existing passenger terminal building. This phase had two facets: 1) the much needed upgrade of the current facilities and (2) the remodeling of the facilities to temporarily host the return of the international flight sector at Dorval. (see ch.6.2)

Phase 2 is the current undertaking that will expand the transborder finger of the airport, expand the access roads and set the framework for the next 3 phases of the master plan (see figure 29).

Figure 29: "Perspective 2020" Plan for Dorval



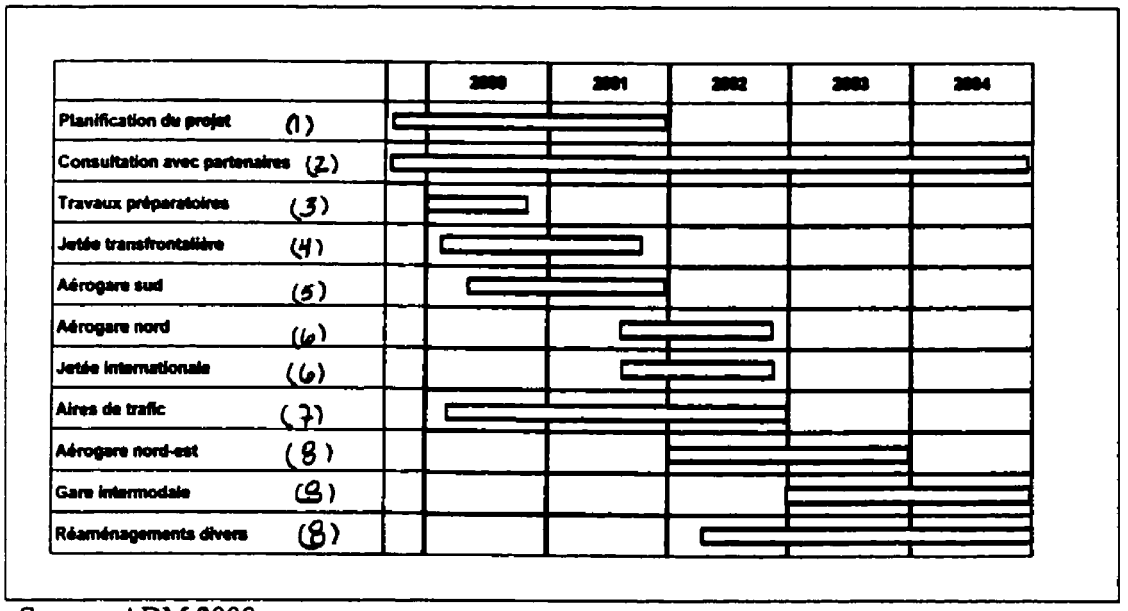
Source: ADM 2000

The master plan for Dorval is based upon a multi-phase development plan onto which deadlines can be moved up or postponed according to the current forecasts (Goyette Feb. 2000 p.6).

The initial programme timetable for the development at Dorval is as follows: (Goyette Feb.2000 pp.10-11).

1. Continuation of the planning stages until end of 2000.
2. Ongoing consultations throughout the project to make allowances for the constraints of daily operations.
3. Preparatory work continuing until September 2000.
4. Construction of transborder finger to be delivered in fall of 2001.
5. South wing of main terminal building expansion will follow completion of transborder finger.
6. Construction will then move to the north where the international finger and north-west expansion of the terminal will take place. To be delivered by fall 2002.
7. Traffic areas in vicinity of new facilities well be built concurrently
8. Followed by construction of north-west terminal, the intermodal train station, the indoor retrofit and enhancements to the façade of the existing terminal building.

Table 9: ADM Development Timeline



Source: ADM 2000

The construction of the expanded terminal building will be worked in conjunction with the development of the traffic arteries serving the airport parking. A new rail facility at the airport will be built to enhance Dorval's intermodal links.

6.4 FACILITY CLASSIFICATION AND TERMINAL SELECTION

The new 2020 master plan for Dorval Airport is based upon a design concept that extends from the existing main passenger terminal building. Although the master plan calls for major expansion projects the overall design will also retain the current centralized concept. The new layout maintains the airport's existing pier-finger design layout (see figure 29)

An expansion via the satellite concept (ex. MCO, see figure 9) would not have worked well because of the existing layout of the airfield. The new terminal would have to have been located quite a ways from the original terminal. This would have made passenger access an expensive proposition since a type of people mover would have had to have to be provided.

The Gate Arrival Design (ex. DFW, see figure 7), is the antithesis of the centralized system that Dorval is currently. The merger of these two ideologies is impossible. The only way to introduce this system at Dorval would be a total demolition of the existing complex and replace it with this decentralized concept. Even if this were considered the space currently available at Dorval wouldn't allow for such a design.

The Transporter System (ex.YMX, see figure 10), was already attempted at Montreal's other airport Mirabel. The disastrous final results of that development (although not all contributed by the transporter system), did not really promote this type of expansion at Dorval. Two transporter docks were built at Dorval, in order to move passengers with limited mobility to and from the international gates at the aeroquay.

Phase 2 and 3 of the master plan are comprised of the development of two fingers, one for the transborder sector (phase 2), and the second for the international sector (phase 3). This initial stage will develop a new transborder finger at the southwest quadrant of the current passenger terminal zone. Following the completion of this finger and international finger will be constructed at the northwest quadrant of the terminal zone (Goyette Feb.2000 p.7)(see figure 29). The transborder section will consist of 18 departure gates and the international finger will contain 10 gates.

The new arrangement will increase the number departure gates for each sector as well as provide numerous "swing" gates. These multi-use gates will be available for either sector depending on the necessity to increase capacity for one of the sectors. These gates are usually only needed to provide service for the additional peak rush hour flights. This concept is beneficial in that no large number of gates will be dedicated solely to one sector. Therefore, at slower times of the day, a limited number of gates will be idle. This is especially true in the international sector. Building 15 gates solely for the use of international flights, which mainly operate from late afternoon to early evening would

leave the sector's gates almost idle for more than half the day. If 10 dedicated and 7 swing gates are built, then at peak hours, 17 gates are available, but during the rest of the day perhaps only 2 or 3 gates will be idle, the rest being used by other sectors. This will also provide flexibility in the case that one sector grows disproportionately to the rest of the sectors, gates to accommodate the growth would be already available.

The limited space currently available at Dorval, has accustomed the airlines operating at the airport to share all the facilities. This will be beneficial in the expansion plans to maintain a certain level of co-operation and sharing amongst the airlines as a cost reduction and efficiency measure.

These two new fingers will replace the current transborder finger that jettisons west of the main terminal and the temporary international concourse that is located at the western tip of the satellite building (aeroquay). The new layout will attempt to optimize transfer times between international and transborder flights (Goyette Feb.2000, p.7).

In maintaining the centralized concept, Dorval airport hopes to provide top quality service for its passengers and airlines while maintaining the economies of scale that go along with a centralized unit. The airport expansion calls for an increase in space for general use, areas such as Canada Customs facilities, security check points, arrival halls, ticket counter space, baggage carrousels and general commercial areas. The commercial areas will be strategically located in order to be used by travelers and non-travelling well-

wishers. The expanded facilities will be housed in a 40,000 sq. ft expansion of the main passenger terminal building (Goyette Feb.2000).

With the total development of the 20 year plan, the passenger terminal expansion will remain in the current land use designated for the terminal. A small sector of the commercial cargo area will be reallocated to accommodate some of the new transborder concourse (see figure 29). The current airfield zoning will not be affected by the terminal transformation. A larger apron and more taxilanes will allow better flows of aircraft from the gate areas and the airfield. This is a major factor in that the increased capacity of the passenger terminal building doesn't decrease the capacity of the airfield components.

The expansion of the main terminal will take place on the north and west side of the existing central building. The first level will be used for the primary inspection area for Canada Customs for international and transborder arrivals. This strategic location will also house shops, restaurants and other services that will cater to passengers who will continue throughout to the transborder and or international fingers. The expansion on this level will also include numerous additional ticket check-in counters (Goyette Feb.2000 p.8).

The ground level will be dedicated to a new international arrivals hall with new carousels, expanded facilities and an aesthetic quality and design that will "reflect Montreal's specific character"(Goyette Feb.2000 p.8). This new area will also provide much needed space to house support facilities for airlines, customs, and security etc..

Expansion along the north side of the building will be used to better bind the 2 new piers to the domestic side of the terminal building. New gates along the immediate north side and new commercial passenger services will provide closer gates to enhance the link between the sectors.

The expansion will be concurrent to major modifications in the current terminal building. On the first level, additional new space will be provided for ticket counters as well as a reconfiguration of the overall ticket counter layout to provide more space and better service. The existing international security check point will be modified to increase capacity and functionality. A redesign of the overall commercial facilities on this level will take place. On the ground level the retrofit will create an expanded areas for the baggage claim areas as well as newly expanded arrivals halls for well-wishers.

The phase 2 new concourses will be developed using a 3-tier plan. The top level will be dedicated to arriving passengers with direct access to the Canada Customs area. The main level will be dedicated to departing passengers. This level will house the boarding lounges, commercial area, passenger services and executive lounges. The ground level will be the area for all the support and maintenance facilities (Goyette Feb. 2000 p.7). Building specifications of the later phases of the development will be released by ADM as the project progresses.

6.5 SUMMARY AND CONCLUSION

Chapter 6 detailed the renovations that took place at Dorval since the inception of the 1995 master plan. A second series of renovations took place to temporarily accommodate the international flights at Dorval. In keeping with the new vocation of Dorval as the main passenger airport, ADM produced a new master plan that factored in the international flight sector at Dorval. The new plan also reflected the type of passengers that use Dorval with a primary focus on the "connection passenger", the largest growth sector.

The proposed plan is based upon a multi-stage development process with a flexible timetable. The selected design maintains the centralized concept and the pier/finger layout. The development consists of the building of two piers (one for transborder/ one for international flights) extending from an expanded main passenger terminal building. A main component of the new development is the use of swing gates that expand the flexibility component at the airport.

Chapter 7 Conclusion and Recommendations

ADM made a Herculean decision on an extremely volatile political move (transfer of international flights). They backed the positive results of the action rather than shy away due to the political backlash. The consolidation of flights was the right decision by ADM, Dorval, albeit smaller than Mirabel, has room to increase its operations within the existing boundaries (see table 10).

As an airport authority group, ADM has set up a good framework to develop and grow the airports in Montreal. ADM's main goal for Dorval airport is to transform it from a mainly originating/terminating station to a transfer hub. On the national stage it would become a major hub attempting to regain some ground from airports such as Toronto and Vancouver in terms of overall traffic. On the North American and International stage it hopes to become a "mini-hub". This would be created via its own network of travelers as well as benefiting from a niche market that would capture travelers wanting to avoid major transfer airports such as Boston, New York, Chicago. ADM's goals match exactly with the airline's goals for Dorval. Airlines such as Air Canada hope to provide their passengers with an alternate to Toronto their main transfer hub (Air Canada annual report 1999 p.9). Carriers such as Delta, Air France, and American, hope to promote U.S./International transfers out of Dorval (D.Mitchell, P.Cote 2000). This would be accomplished mainly using routing from two code share partners and airline alliances. ADM is right on the mark with its attempts to restructure the Montreal airport scene. The

majority of positive events that have occurred in the Montreal aviation spectrum are a direct result of ADM's directional planning.

ADM, as an authority following the rational process, has gone through an exhaustive amount of inventory to create a good basis unto which they based the development of the airport. However, the airport authority in their ultimate choice of development options have basically only expanded what exists, which can definitely fall partially under the banner of Charles Lindblom's Disjointed Incrementalism.

In order to create a context and a site-specific project, ADM went beyond the rational to include a large amount of substantive theory as a partial basis for its development. They used tools such as consultative meetings with airlines (although not initially productive), the establishment of a development committee, passenger surveys, IATA airport rankings and airlines space requirements (present day as well as requirements for the airlines with respect to their individual growth expectations at YUL see appendix 3).

These efforts of investigating the whom we are planning for are perhaps long and time consuming but are essential in the production of a product that will be perceived as a combined effort from all the players that are involved in the everyday workings of the airport. If the majority of the players that are active participants in the airport landscape can lay claim to a positive attribute that was included as a result of their efforts, the terminal will be filled with employees, managers, travelers, and airlines which will enjoy that airport experience.

The information gathering sessions on the actual Dorval airport users were essential in allowing the airport planners to adjust and modify the terminal plan for the population that it serves. These efforts into understanding the user population serve more than just to improve public perception but also allow the planners to recognize and deal with the issues of that population and thus accordingly provide a proper physical structure for those needs.

Flexibility in the planning process can be found in the staged phase construction plans. This can be seen as hedging in case of a downturn in aviation trends. As mentioned in chapter 5, ADM feels that it would have the ability to increase or limit expansion if necessary. ADM has also noted in its time line (see table 8) that it will continue consulting with its partners right through until the end of the construction. This relates directly to when the original plans for the terminal were not up to the satisfaction of the airlines, ADM then revised its plans but the cost was a 2- year delay in start up. This can be seen as a means of remaining flexible but at a high cost. Through this proposed consultancy throughout the project, ADM has demonstrated that it has corrected its initial underestimation of the airline's will to contribute to the project and ensure their needs are met. Also mentioned in Chapter 5, the profit ideology of ADM was not easily accepted by the airlines. The airlines are all backing the development plans for the airport, but are cautiously monitoring the airport authority on the overall financial cost of the redevelopment. The airlines realize that any costs incurred by the airport will in turn be passed onto the airlines in terms of rental increases. The airlines see the growth factor as

positive, but maintain that if the costs for the airlines become excessive they will have to scale back regardless of the glamour of the new facilities.

In 1996, ADM's decision to liberalize the international flights not only upset the population in and around Mirabel airport but concerned the population around Dorval airport as to what this announcement would actually bring to their neighborhood. In this instance ADM was very slow to address the population. The decision was quite unexpected and ADM was unprepared to address the concerns and issues with the people. It was not until well into the process when ADM properly created forums to inform the concerned citizens. At this point they did make positive strides in this area via the introduction of town meetings hosted by ADM, a consultation room at the airport, information pamphlets, a noise committee, a 24hr complaint line, and the ability to sit in as a noise committee member etc. However, the positive efforts by ADM in developing these information tools may be under-appreciated by the public due to the lingering aura of mistrust due to the fact that ADM was unprepared and less than co-operative at the onset of such a major development project. Unfortunately, ADM did not get off to a better start with its airline partners either. The airport authority commonly mentioned the word "partners" when referring to airlines and commercial businesses in all media events and publications. However, as mentioned earlier the airlines were skeptical of their new partner.

Recommendation 1, that Aéroports de Montréal revisit and follow its corporate governance model and some of its stated values.

In adopting a corporate governance model ADM stated " It was felt that managers of public property, the directors not only have an obligation to both SOPRAM and the general public..." (Goyette in ADM annual report 1997 p.5). ADM also has a value statement of Integrity and Openness in which it is to express these values through our management practices and our standard of individual professional conduct (ADM annual report1997).

Economically, ADM has truly fulfilled its mission and has jump-started the long process of re-instituting Dorval as a gateway airport, one of its main goals. Its mission to grow the airport system in Montreal and use it as an economic catalyst for the region is also being fulfilled. However, for all the great economic and business achievements that this organization has accomplished, its brash attitude and public perception may overshadow these achievements. As an organization they must become more socially responsible, while striving for their economic goals. They can do this by continuing to address the neighbouring communities' needs and concerns throughout the development process and by being more attentive and responsive to the airline's and partner's needs. A major step in establishing public trust would be to become proactive in the promotion and distribution of information on the plans rather than being reactive once an opposition is created. This preparedness and inclusion of all parties interested early in the process will eliminate the aura of a hidden agenda and mistrust that goes along when outside parties are excluded or dealt with in a reactive way long into the process. The organization would then be able to continue to strive for economic goals while instituting a socially

responsible factor. The end product would be more likely to be accepted by the general population.

In regards to its business partners, as mentioned earlier ADM has corrected some of its earlier mistakes and intends to consult with the airlines throughout the project. This consultancy framework must remain intact even beyond the scope of the development project. The ever-changing industry requires constant monitoring and who better to communicate these trends to the airport authorities than the airlines and their passengers.

The 20-year master plan time line is quite standard for airports. What ADM has done was really focus on the first sector 2000-2004, where the new transborder, and international finger will be built as well as the redevelopment of the main passenger terminal. As mentioned above, the forecasting numbers of 2.5% annually for the long-term development plans are modest and therefore are not propelling the schematic plans with visions of grandeur. In actuality, the increase for 1999 was approximately 5%. This strengths the fact that the authorities made a wise decision in consolidating the flights.

Maintaining the centralized system of Dorval airport was the right path to follow. Dorval is currently a relatively heavily used central system in which all airlines participate in sharing of facilities and benefit from the economies of scale that are promoted in the central system (see appendix 4 for ticket counter assignments). The expansion of the terminal is necessary for expansion as well as alleviating some of the over-saturation at several components at the airport such as Canada customs, the arrival halls, check-in counters etc. This would allow for an increase in the efficiency of the overall terminal.

The airport at its fully developed stage would be properly sized to maintain the benefits of the centralized system. This includes relatively short walking distances from the terminal to the most exterior gates, proximity to other flight sectors for transiting passengers, centralized and easily accessible commercial areas, etc. This system also eliminates a duplication of services and utilities at the gate areas. Therefore, more space can be dedicated to the airside components.

The building of the two new wings, one for international travelers and one for transborder travelers will maintain the pier/finger design. Dorval is currently a hybrid of this layout combined with the satellite terminal. The proximity to the main terminal from all the gate areas is the main benefit of this layout. This will promote an increase in the transfer/transit passenger numbers, a main goal of the airport authorities. The main goal of the two new wings is obviously to increase the number of gates for these sectors. However, what ADM has done is to lay out the wings as to allow the connection point of the two new wings to provide numerous swing gates as mentioned in ch 6.3.

The master plan layout is in accordance to the type of facility that Dorval envisions itself as. In the hopes of continuing its trend towards a transfer station (hub) rather than primarily an originating/terminating station, ADM selection of a centralized option works well. The selection of layout responds to two primary current factors that reflect the present user population at Dorval. One, as mentioned earlier, the current largest growth sector amongst passengers at Dorval is the transfer population that is using Dorval as a gateway airport. The anticipated growth in this sector was the main reason why ADM

chose to eliminate the two-airport system. The centralized arrangement is an asset in such a sector development, as the main unit of the airport is accessible from all the concourses and the overall distances and ease of transfer remain manageable.

In 1998, Dorval ranked 6th world wide in a "ease of connectivity" category amongst all airports in its classification (under 15million passengers) as per IATA's Global Airport Monitor (see appendix 7). ADM's master plan hopes to increase transfer traffic while maintaining the "ease of connection".

The master plan also reflects the composition of traffic amongst the domestic/ transborder/international sectors. The distribution at Dorval is approximately 45% domestic, 26% transborder, 29% international. The categorical distribution of space in the master plan reflects the destination of travelers at Dorval. The new master plan arrangement for the whole airport fosters more connectivity and flow amongst all three traffic sectors. One of the goals of ADM was to increase the transit sector of the user population. In phase two of the master plan the only sectors that will be increasing connectivity will be the international to transborder (US) sector. It will only be in a later phase of the master plan that the domestic sector will be better linked to the other two sectors for passenger transfers. Since this sector presently has the majority of passengers, I believe that a link of this sector to one or both of the other sectors would have been a better starting block. Overall, the long-term plan does allow growth in all sectors (independently or concurrently). The programming of the physical structure is in line with current statistics for each flight sector.

Recommendation 2, that ADM continue on with its original 1995 plan to eliminate the aeroquay and create a fully pier-finger layout.

The 1995 master plan included the elimination of the aeroquay with the addition of a pier stemming north of the main passenger terminal for domestic gates (see figure 28). At the time this plan was conceived Montreal was still running a two airport system, however the domestic transformation into a true pier system was noted as being essential in the expansion of the Canadian transfer market mainly commuter to mainline. " The proposed new arrangement meets the needs associated with the hub and spoke structure and consolidation of domestic routes proposed by national carriers"(ADM master plan 1995 p vi).

The new plan perspective 2020 makes no mention of reconfiguration of the domestic sector. The plan does mention an expansion for gates along the north side of the terminal building (see figure 29) however, it only shows the replacement of the western sector of the aeroquay which is currently being used by international carriers until the new international wing is developed. Failing to better the physical layout on the domestic side (which accounts for 50% of the traffic) will severely hinder the development of the airport as a whole. The current layout isolates the commuter traffic, and secondary airlines to the aeroquay, which has not been updated since the 1960's. Access is only by means of an underground walkway approximately 200metres in length. There are no commercial establishments of any kind, and all the boarding bridges require passengers to climb stairs prior to entering the aircraft. All new airlines must dock at on of these gates due to the fact that Air Canada owns and utilizes all the gates on the main terminal side. The types of aircraft using the south side of the aeroquai is also limited due to the

center taxilane. Any wide body aircraft blocks the main access to the gates domestic and transborder.

Figure 30: Underground Walkway to Aeroquay

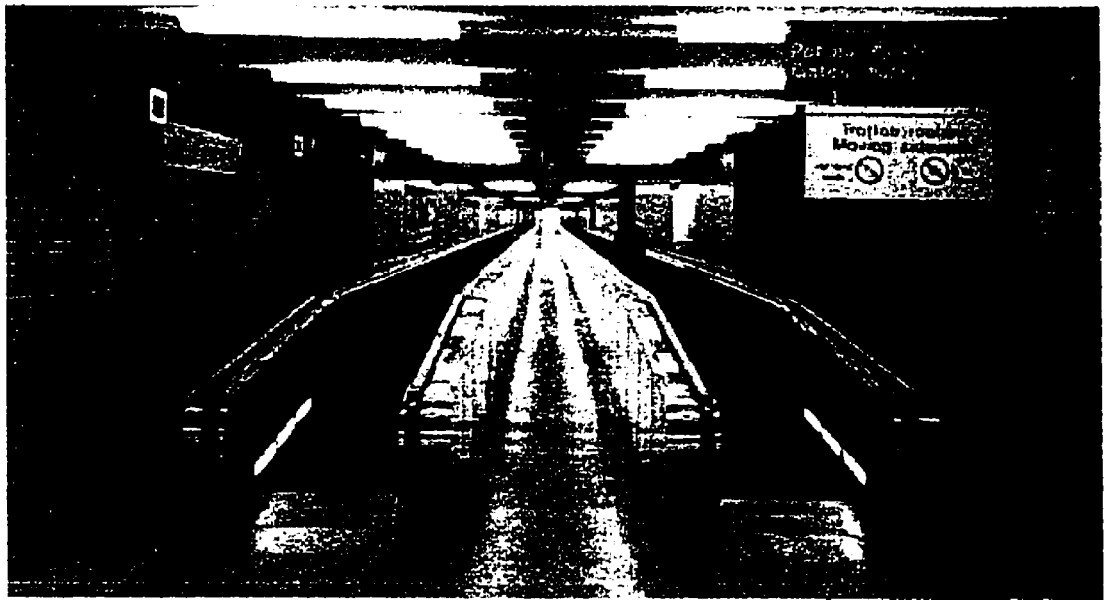


Figure 31: Typical Boarding Lounge at Aeroquay

The development of a pier north of the passenger terminal would have 6 major positive impacts:

1. It would improve "ease of connection" (time, distance) between domestic gates for domestic transfers.
2. Eliminate the isolated and limited gates currently on the aeroquay.
3. Create a cluster of gates that are closer to the international and transborder wings for inter-sector transfer passengers.
4. Allow for the creation of multiple taxilanes for aircraft, eliminating congestion and creating quicker access to the runways.
5. The consolidation of gates would provide a higher threshold for commercial activity.
6. Complete demolition of the aeroquay would ultimately provide room for an expansion pier north of the passenger terminal on the west side of the airport.

Overall, this transformation would provide a better more efficient use of space both on the airside and landside, as well as create a physically layout which allows expansion on the existing physical structure rather than a total redevelopment of the airport.

A **third recommendation** would be for ADM to create a system of interconnective passageways for the transfer passenger that it hopes to attract.

A transfer passenger that is coming from the U.S. and is continuing on to another destination in Canada currently has to follow the steps:

1. Descend to the arrivals halls
2. Pass through Canadian Customs
3. Claim their baggage in Montreal regardless of final destination
4. Go up to the departure level with their luggage
5. Pass through the entire terminal building
6. Find the domestic airline that they are using for the next portion of travel, re-check their baggage
7. Proceed again through security check point
8. Find their assigned gate

Overall, they are two-sector passengers. Firstly, they must follow the procedures for an arriving passenger, and secondly follow all the procedures of a departing passenger.

If the airport truly wants to attract a transfer population they must find a way to minimize the steps that a transfer passenger would have to pass through. What the airport should do is create a passageway on the same level in which the passenger can claim their baggage, pass through a small Canada Customs area, and so on to checking the baggage with the appropriate airline and proceed to the assigned gate. This would allow the passenger to bypass going up and down levels, bypass the main passenger terminal and its crowds, skip security (since the area will be sterile), and proceed straight to the gate area. It would become a simple, unmistakable, quick transfer path, with all the attributes that would attract a transit passenger. For this system to work, a simple physical structure of a direct sterile passageway would have to be created connecting two sectors (see figure 32)

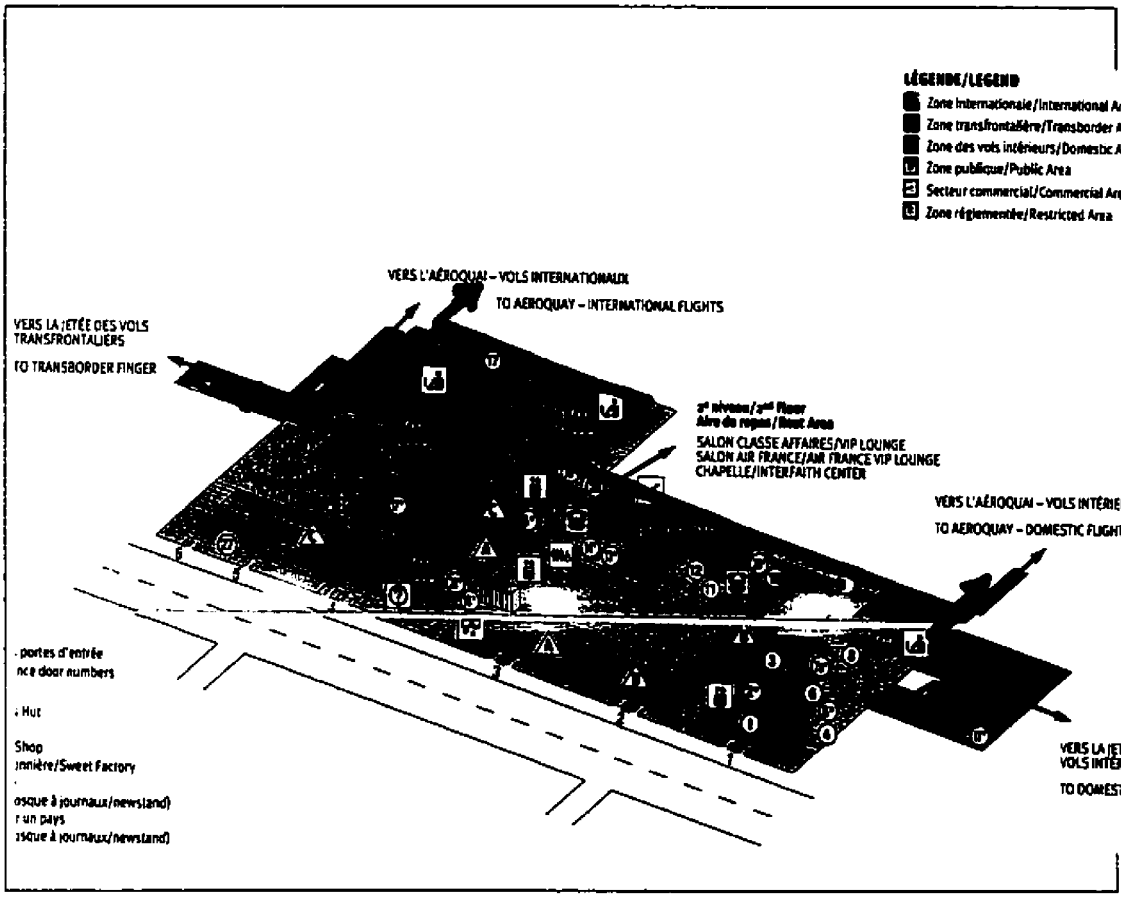
1. A small satellite Canada Customs area with minimal desks (depending on expected passenger number,2/3 agents
2. A conveyor belt that would send the incoming baggage to the satellite customs area for the transfer passengers only
3. Minimal Check-in counters for the airlines that would expect transfer passengers with a conveyor belt for the outbound transfer baggage.

Another transfer possibility would be to use the already available people transporters (PTV) to move larger groups of transit passengers directly from aircraft to aircraft without the passenger stepping foot inside the terminal building.

These are just some examples of non-standard ways of handling different passenger types in order to make the airport unique and attract a population that will appreciate an infrastructure that is created solely for them. ADM must institute some of these

techniques if it is to stand out from all the other airports competing for the same transfer passengers.

Figure 32: Inter-Sector Connection Corridor



On a macro level, ADM has done its part in promoting the airport development on a regional level. It always seems to mention the fact that it has the backing of SOPRAM. Growth in the industrial sectors of municipalities neighboring the airport is up considerably since the airport expansion plans came to light (Montreal Gazette Sept. 1999 p.g7). There are new hotels slated for construction in the airport vicinity as well as a redevelopment of all the access highways and roads leading to the airport (Sutherland Sept.1999 p.g3). The long-term development plans for the terminal building also

includes a rail station inside the terminal. This signifies a regional and multi-level partnership in this airport development.

A **fourth recommendation** would be that ADM develop the airport as a total package.

This would be to continue the development on the domestic sector as mentioned above, build the train station at the airport, assure that parking is readily available, and redevelop the Dorval traffic circle and the access roads as planned. All these components would contribute to the overall success of the airport. An omission of one part may hinder the growth of the airport as a whole. Going beyond the airport, the authorities must contribute to the development of hotels, services, bus links etc. that would be factors in a passenger deciding to use Dorval as a transfer point or perhaps a one day stop over on their way to Europe. If a passenger cannot find a hotel room, and has to lay over a night to catch a morning flight, no matter how good the airport facilities are that passenger would have no choice but to use another airport. An airport is a system where the passenger terminal is a main component but just one component of a large system that must work in unison to achieve the overall goal of passenger satisfaction.

No other building in a city by virtue of its vocation can represent a city and make a lasting impression on millions of people without having them even step outside. The memory is not one solely of visual awe, nor one of presence. What you will retain would be a combination of the two. You may appreciate the paintings that lined the tunnel to the satellite terminal, or remember the grandiose atrium in the passenger terminal, but

you certainly will remember the coffee shop that you sat in for 4 hours waiting for the next flight because you missed your original flight. You will remember the massive line up and 1 hour delay at customs, that forced you to run through the overcrowded terminal, misread a small ambiguous sign and end up at satellite terminal gate 145 instead of gate 45. An airport should be a combination of form and function, it should represent the city's character and cultural identity but it must first and foremost be an effective transportation station.

Appendices

APPENDIX 1: LIST OF S.O.P.R.A.M. MEMBERS

(Source: ADM 1997)

SOCIÉTÉ DE PROMOTION DES AÉROPORTS DE MONTRÉAL (SOPRAM)

SOPRAM is a non-profit corporation, the specific objective of which is to promote the development of airport facilities to the ultimate benefit of the Greater Montréal area, and to make known the needs and the interests of the citizens served by the said facilities. The Corporation groups together seven organizations responsible for designating a total of 21 members from three different categories. The seven members chosen from the business community make up the corporation's Board of Directors. Seven more members are selected from political circles, and a further seven from among the administrative personnel of the member organizations.

MEMBERS OF SOPRAM

City of Laval

Gilles Vaillancourt
Mayor

Lucien Desrochers
Assistant General Manager

Claude P. Lefebvre*
Chairman of the Board, SOPRAM
Vice-Chairman of the Board,
Aéroports de Montréal

City of Montréal

Pierre-Yves Mélançon
Member of the Executive Committee

Jean-Marc Lajoie
Director, Economic Development Department

Michel Langlois*
Associate Professor, UQAM
Chairman of the Board, Polyvision Group

Conference of Montréal Suburban Mayors

Peter Yeomans
Mayor, City of Dorval

Marc Vaillancourt
General Manager,
Conference of Montréal Suburban Mayors

Gordon J. Fehr*
Corporate Director

Chambre de commerce du Montréal Métropolitain

Paule Doré
Chairman of the Board
Vice-President, Corporate Affairs, CGI Group

Luc Lacharité
Executive Vice-President

Nycol Pageau-Goyette*
Chairman of the Board, Aéroports de Montréal
President, SOPRAM
President, Pageau Goyette et Associés

Société montérégienne de développement (SMD) and the City of Longueuil, jointly

Michel Lauzdrenne
Mayor, City of Saint-Hubert

Claude Ouimet
Director, Collège Edouard-Montpetit

Normand W. Guévremont*
Corporate Director

Corporation de promotion à Mirabel inc. (COPAM)

Hubert Meilleur
Mayor, City of Mirabel

André Gamache
President, COPAM

Paul-Yvon LeSage*
Corporate Director

Board of Trade of Métropolitan Montréal

André Godbout
President
Vice-President, Lévesque Beaubien Geoffrion

François Roberge
Director of Public Affairs, Research and Communications
President, Allcom Stratégies Communications

David McAusland*
Associate, Byers Casgrain

* Directors of SOPRAM and members of the Board of Directors of Aéroports de Montréal

APPENDIX 2: ADM FINANICAL IMPACT

(Source: ADM 2000)

IMPACT OF EXPENSES AND INVESTMENTS RELATING TO PLAN IMPLEMENTATION ($ 500 M)

DESCRIPTION	DIRECT IMPACT	INDIRECT IMPACT	OVERALL IMPACT
Labour	4200	2300	6500
Payroll	$ 144 300 000	$ 73 800 000	$ 218 100 000
Impact on GDP	$ 202 800 000	$ 136 200 000	$ 339 000 000
Québec government revenue (including incidental taxation)	$ 36 200 000	$ 39 300 000	$ 75 500 000
Federal government revenue (including incidental taxation)	$ 27 500 000	$ 15 500 000	$ 43 000 000

APPENDIX 3: DORVAL AIRLINE QUESTIONNAIRE

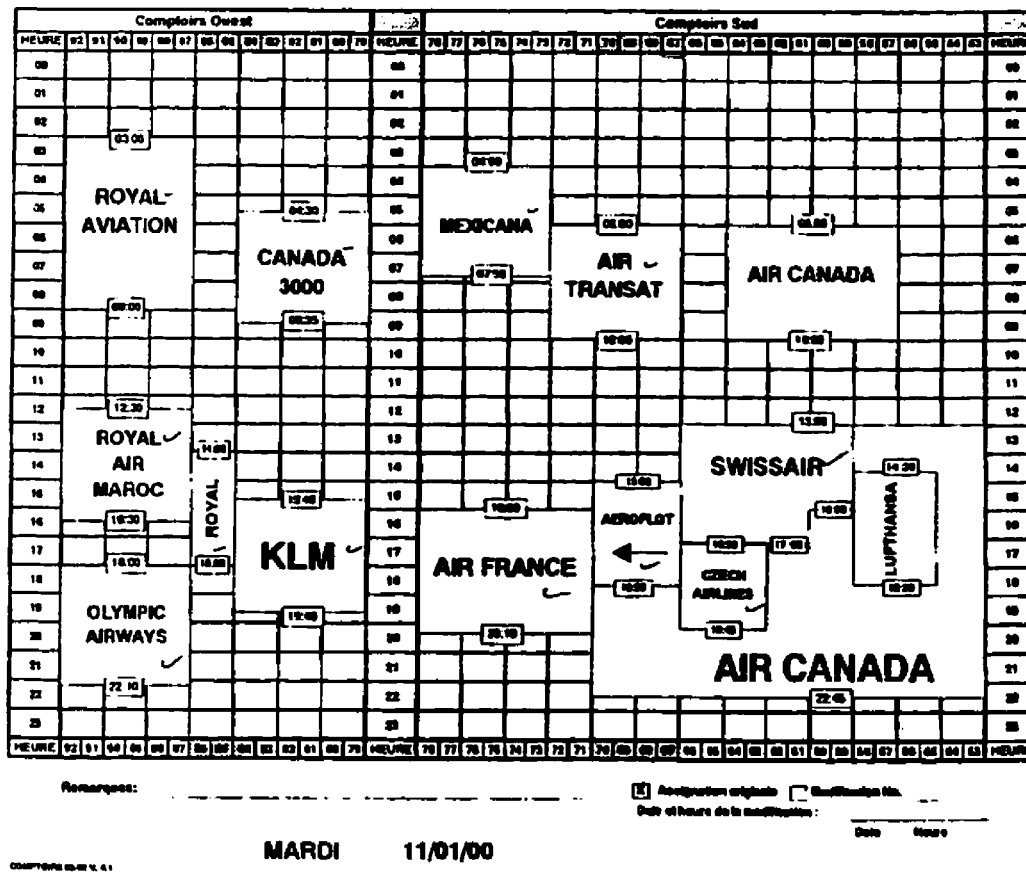
(Source: ADM 1999)

Dorval International Airport - Montréal
AIRLINE QUESTIONNAIRE

DORVAL - TERMINAL DEVELOPMENT PLAN QUESTIONNAIRE				
Airline/Handling Agent* :				
Contact :	**Tel. :**		**Fax :**	
Category	**Current**		**Projection 2009**	
1. Aircraft Mix at Dorval **Aircraft type/seating capacity**	**Number of Aircraft**			
2. Check-in/Ticketing	**Number of counters (check-in/ticketing)**			**Shared / Dedicated / None**
Economy/Hospitality				
First/Business				
Service/Ticket Sales				
Total :				
3. Support Facilities	**M² Current**	**M² 2009**	**General location**	**S / D / N**
• **CIPP/VIP Lounge** None				
Yes - common				
Yes - Dedicated				
• **Office Space / Operational Areas** Administration office				
Ramp support office				
Passenger servicing office				
Lost/Late baggage claim office				
Cash out office				
Stockroom				
Supervisor office				
OPS room				
Other				
• **Staff Facilities** Lockers				
Lunch/Rest room				
Other				
• **Ground/Ramp Support** Ready Rooms				
Closed Area for equipment				
Storage Area				
Commissary				
Under canopy				
Open Area				
Other				

APPENDIX 4: TICKET COUNTER ASSIGNMENTS

(Source: ADM 2000)

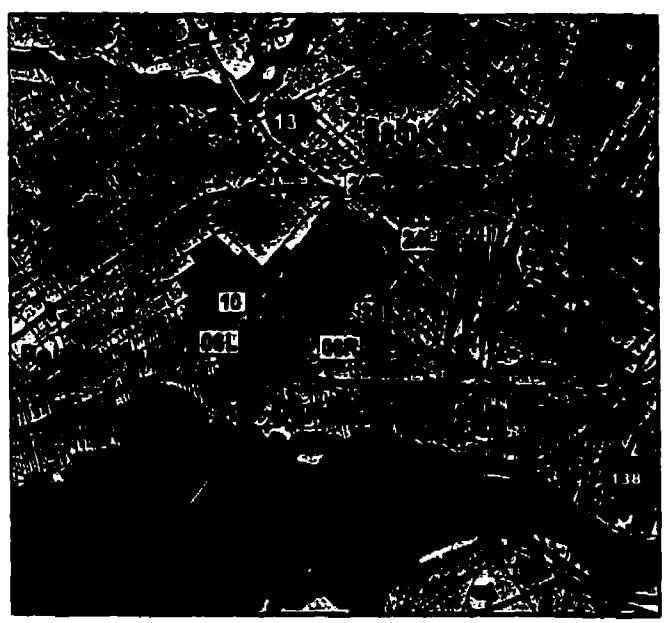


APPENDIX 5: ADM NOISE ABATEMENT PROGRAM

(Source: ADM 1999)

AÉROPORTS DE MONTRÉAL INTRODUCES NOISE ABATEMENT INITIATIVES

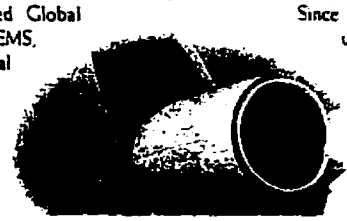
...in cooperation with NavCanada, Transport Canada, air carriers and municipalities nearby Montréal-Dorval International Airport



New flight paths direct general aviation aircraft over major roads and waterways during nighttime, thereby avoiding residential developments.

Based on data supplied by GEMS and citizen feedback, Aéroports de Montréal (ADM) instituted measures in 1999 designed to reduce aircraft-induced noise at Montréal-Dorval:

Aéroports de Montréal shares citizen concern over quality of life in residential areas close to Montréal-Dorval International Airport. This is why ADM continues to take action to improve the soundscape in the area around the airport. One of the key initiatives to date is the computerized Global Environment Management System, or GEMS, which enables ADM to monitor individual flight paths and to accurately measure noise levels in specific sectors to reduce them.



nighttime movements circumvent residential areas

Takeoffs late at night represent a considerable source of disturbance for citizens living in neighbouring municipalities. This explains why ADM monitors all such movements so closely.

Since April 1999, major general aviation operators using mainly propeller and small jet aircraft departing Dorval between 11:00 PM and 7:00 AM follow new takeoff procedures, which require them to overfly commercial and industrial areas rather

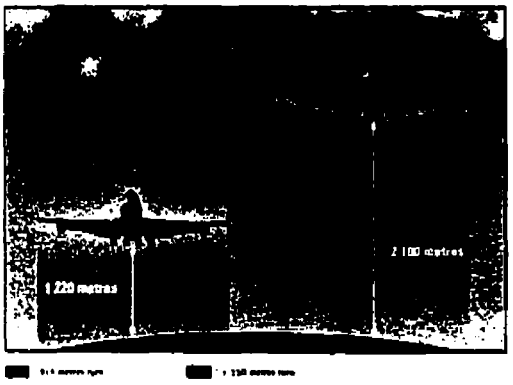
→

ADM REDUCING AIRCRAFT-INDUCED NOISE

than built-up residential areas. Owing to the conclusive nature of results to date, these new takeoff routes may ultimately be applied to all general aviation night flights from Montréal-Dorval.

night movements monitored
Aéroports de Montréal closely monitors all night flights and has adopted clearly worded directives designed to restrict permission to land or take off late at night. Irregularities are reported by ADM to Transport Canada officials who assess the situation and impose penalties, if need be. It is Transport Canada that is responsible for issuing notices of infraction and levying fines for failure to comply with applicable procedures.

revised takeoff procedure for runway 24R
In the winter of 1999, ADM introduced a new procedure designed to reduce the noise generated by aircraft departing on runway 24R. The revised outbound route takes aircraft up over Lake St Louis and requires them to turn to the right, only after having reached an altitude of 1 220 metres (4 000 feet). This represents an increase of an average of 305 metres (1 000 feet) over previous takeoff regulations. Accordingly, aircraft now overfly shoreline areas at altitudes ranging from between 1 220 metres and 2 100 metres (4 000 and 7 000 feet), resulting in a considerable reduction of perceivable noise in communities west of the airport.



As aircraft now approach the shoreline at a higher average altitude, levels of perceived noise have been reduced for citizens living in areas west of the airport

higher altitude approach to runway 06L
In the summer of 1999, the angle of approach to runway 06L was increased which, in turn, raised the altitude of incoming aircraft. Both perceived noise levels and visual impact have decreased as a result. At Pointe Charlebois in Pointe Claire, located 4 kilometres from the runway, aircraft now approach at an altitude of 195 metres (635 feet), well above the former level of 160 metres (530 feet).

Owing to a 20% increase in the altitude of approaching aircraft, planes now appear 40% smaller and generate lower levels of perceived noise

For more information on ADM's Environment Management Program:
- Contact us at (514) 633-3351
- Visit our website at www.admtl.com
- Write us at environment@admtl.com

AÉROPORTS DE MONTRÉAL

novembre 1999

APPENDIX 6: INTERVIEW QUESTIONS

ADM Planning Department

Planning Process Questions

1. Does ADM have a Master Plan; if yes, when was it introduced and what is the time span for the document?
2. Does ADM's development goals conform with the city of Dorval's planning document.
3. Who has jurisdiction over the airport development?
4. What type of airport does ADM consider Dorval; on a Canadian scale, on a North American/World Scale?
5. What are the short-term goals and objectives of the ADM planning board? Long term?
6. What market is ADM going after as a primary target to increase # of connectors?
7. How many possible plans (layouts) are being considered? Documentation of these if possible?
8. Who is developing these plans (titles and roles on the process)
9. Who will make the final decisions?
10. What type of evaluation process will be used?
11. What are the priorities with regards to layout? ex. Pax convenience, efficient design, airline directives, economic costs etc.
12. At what stage in the development process will the public be included?
13. Which airports or current redevelopment projects are being looked at as possible models to follow?
14. How binding and or practical are the ICAO/FAA/Transport Can. manuals on Terminal design? How readily are these used?
15. What is Transport Can. role in the development process?
16. Are the airlines being consulted for input?

Technical Data Accumulation

1. Sq.ft. of Terminal Building including aeroquay: current totals and prior to '95 renovations?
2. number of ticket counters?
3. U.S. customs and immigration #'s and capacity (today and pre-renovations)?
4. Number of take-offs and landings?
5. Number of pax originating; connecting; arriving?
6. Terminal capacity of Dorval. Have renovations increased capacity?
7. Has the consolidation of flights increased number of connecting pax and flights in the first year? If so by how much?
8. Plan of aerodrome
9. Plan of Terminal today, pre '95

Airline General Managers

1. Were you consulted o expansion plans?
2. How was your input responded to?
3. At what stage in the planning process were you included?
4. What type of information was offered to you?
5. What type of information was requested of you?
6. What level of participation did you feel was actually in effect?
7. What level of overall input from airlines?
8. How far would you go to help the airport authorities?
9. What are your priorities passenger service, facilities etc.
10. Was there are level of consultations prior to the introduction of the development plans?
11. What is your outlook on share gates?
12. What degree of independence does your airline want apart from ADM?
13. Does lack of gates hinder the introduction of new flights for you airline?
14. Does ADM do enough to promote the airport?
15. Were do you see Dorval what does the future hold, what type of facility?
16. What is the public perception of ADM?
17. What are the main things that you would want ADM to fix?
18. Where does your airline see potential growth at YUL?
19. Your opinion on the consolidation of flights?
20. What are the difference between ADM and Transport Canada?

APPENDIX 7: DORVAL FACILITY RANKING

(Source: ADM 2000; IATA Global Monitor 1999)

AÉROPORTS DE MONTRÉAL

DORVAL SE CLASSE EN TÊTE

Selon l'*IATA Global Airport Monitor*, qui mesure les perceptions des utilisateurs des principaux aéroports internationaux dans le monde, l'Aéroport international de Montréal–Dorval s'est classé, en 1998, parmi les 10 premiers dans plus de 15 catégories sur 21.

La collecte des données pour ce sondage s'est échelonnée sur une période d'une année et a été effectuée auprès de 77 000 passagers internationaux voyageant entre l'Europe et l'Amérique du Nord, l'Europe et l'Asie Pacifique, ainsi que l'Europe et le Moyen-Orient.

L'Aéroport international de Montréal–Dorval a été évalué avec des installations temporaires.

RÉSULTATS CATÉGORIE AÉROPORTS DE MOINS DE 15 MILLIONS DE PASSAGERS PAR ANNÉE

Critère	Classement
Disponibilité correspondances vols autres continents	1er
Stationnement	3e
Salles de toilette	4e
Sentiment de sécurité	4e
Courtoisie des employés	4e
Disponibilité des chariots à bagages	5e
Aires d'attente confortables	6e
Transport terrestre vers le centre-ville et du centre-ville	6e
Restaurants	6e
Facilité pour correspondances	6e
Tableau des vols	7e
Évaluation passagers d'agrément	8e
Inspection douanière	9e
Livraison des bagages	10e
Inspection passeport/visa	10e
Évaluation globale	11e
Affichage dans l'aéroport	11e
Disponibilité corresp. intra-continent	11e
Magasinage	12e
Évaluation passagers d'affaires	13e
Facilité de déplacement dans l'aéroport	14e

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