

Niagara District Airport Commission

**Niagara District Airport
Airport Master Plan
EXECUTIVE SUMMARY**

Victor Craig Aviation Services
May 1992

*NIAGARA DISTRICT AIRPORT
AIRPORT MASTER PLAN*

EXECUTIVE SUMMARY REPORT

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EXECUTIVE SUMMARY

1.0 BACKGROUND & OBJECTIVES

Preparation of the Master Plan for the Niagara District Airport has been carried out by the consulting firms of Victor Craig Aviation Services¹ of Toronto and Paragon Engineering Limited of Port Elgin, at the request of the Niagara District Airport Commission. Terms of reference for the master plan project were prepared by the Airport Commission. These defined a project that would identify the direction that the Commission should take to encourage development of the airport, and the future capital investment that this would entail. As no previous master plan had been prepared for the airport by Transport Canada, owner of the airport site, it was felt by the Commission that a document to guide future development and investment was long overdue.

The purpose of the Airport Master Plan is to create a long-term development plan for the airport site and its facilities, based on a realistic definition of a possible future role for the airport. Within this context, the two principal objectives of the planning process were:

1. To assess the present state of the Niagara District Airport and its facilities in relation to the role the airport should play in the social and industrial development of the Niagara Region, and
2. To identify improvements necessary, both in the short term and over a nominal planning period of 20 years, to upgrade facilities and services to enable the airport to function as a fully-fledged regional municipal airport, catering to the aviation-related activities and commercial requirements of the area.

The Airport Master Plan describes the historical background to the airport, the present state of its facilities and infrastructure, and the improvements necessary to encourage achievement of the desired airport role. A nominal planning horizon of 20 years has been used for programming implementation of the master plan proposals. It is recognized that beyond the immediate phase of improvement, investment decisions by the Airport Commission to implement specific projects will need to be made with the benefit of justification established either by traffic demand, or by a reasonable expectation of attracting business to the airport or to the industrial base of the Niagara Region. Consequently, the Airport Master Plan is put forward as a framework to guide development of the airport site over the long term.

It is important to stress that the Airport Master Plan does not represent a specific commitment to implement any or all of the facilities in accordance with the nominal 20-year program. Capital projects scheduled in the Master Plan for a particular phase may need to be deferred, or brought forward, according to the demand for the

¹ This company became part of AirPlan Aviation Technical Services Inc. in 1991.

project, the expected return on investment, or the availability of funds from public and private sector sources. Revision to the suggested implementation schedule, and to the master plan itself, will therefore need to be made from time to time to reflect current conditions.

For the purposes of the Airport Master Plan, the future role of the Niagara District Airport has been defined as follows:

"The role of the Niagara District Airport, on which the Airport Master Plan is based, is to function as a fully commercial entity under the direction of the Airport Commission, with the primary purpose of catering to the needs of commercial and corporate aviation within the commercial service area of the Niagara Region. In this role it should provide development land and facilities to attract aviation-related business to locate on the airport, support local industrial growth by facilitating access by corporate aviation, and encourage commercial passenger and freight air services to the extent that markets for these can be developed."

2.0

AIRPORT ASSESSMENT & REQUIREMENTS FOR THE MASTER PLAN

An assessment of the airport site and its facilities revealed that the Niagara District Airport is already equipped with some of the necessary infrastructure and facilities that can form the basis for a regional municipal airport. This includes a primary runway 1524 m. (5000 ft.) in length, additional runways for use under crosswind conditions, connecting taxiways and aircraft parking aprons. The primary runway and airside system is able to accommodate aircraft of a size up to Transport Canada Aircraft Code 'C' (wingspan up to 36 m.) within a limiting gross weight of 47,000 kg. In terms of size and weight this includes corporate jet aircraft as well as small jet transport category aircraft of 80 to 100 passengers. Runway length would however place a limitation on operations by some corporate jet aircraft and on jet transport aircraft in this size category, depending on the stage length to be flown. In general, therefore, the airport offers the basic airside infrastructure on which to build to accommodate the defined future role of the airport.

Nevertheless, there are areas of deficiency and constraint on the airport site that need to be noted. For instance, due to the capital works priorities of Transport Canada, only limited upgrading of the airport infrastructure has taken place over the past ten years. This has comprised principally asphalt overlays of the primary runways and the two secondary runways, replacement of the main drainage culvert under Runway 06/24, and installation of a water distribution system. Aside from these recent upgrading projects carried out by Transport Canada, little has been done to attend to the priority upgrading needs of the airport, or to address the future expansion of facilities on the airport. Consequently, the airport does not reflect the standard and quality of facility that would adequately represent the image and commercial potential of the Niagara Region.

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The present administrative situation at the airport reflects the divided responsibilities, interests and priorities of Transport Canada, as owner of the airport, and the Airport Commission, as airport operator. Exclusion of the Commission from both the process of planning and setting priorities for airport development, and from capital funding programs of the federal and provincial governments has been the result.

An assessment of the airport, its facilities, infrastructure and services has identified the following principal issues for the master plan:

- The primary runway can be extended to 1800 m. within the present airport property to accommodate the performance characteristics of all corporate aircraft, and permit operations by some commercial jet passenger aircraft. Installation of precision approach landing aids, considered important to the future role of the airport, especially for corporate and commercial users, and precision approach zoning protection will necessitate purchase of additional property.
- The airside system serving the primary runway does not operate well due to the single access/exit taxiway and the present small terminal apron. Use of the airport by greater numbers of aircraft, or aircraft having gross weights in excess of the strength capability of Taxiway "A" and Apron I, will result in congestion of the airside system.
- The taxiway system serving Runway 06/24, including the apron taxiway and a portion of Runway 01/19 south of the primary runway, are low stressed pavements. Thus, the pavement strength of the taxiway system does not match that of the runway it serves.
- The majority of the airport parking apron (Apron I) is an old wartime apron that is now in very poor condition. This pavement will need to be totally reconstructed to a strength consistent with the airport operational requirements.
- The primary runway (06/24) has recently had an asphalt overlay applied by Transport Canada. However, as the underlying pavement was in poor condition and badly cracked, it is expected that the runway will again show cracking, and that reconstruction will, in fact, be necessary within the master plan period.
- Aside from limited infilling of apron frontage west of the present terminal building, there is a lack of serviced land available for airside commercial development. This presently prevents the airport from attracting aviation commercial business to the site.

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- The airport's terminal building, erected in 1967, is a temporary structure that is now inadequate for the purpose it is intended to serve. Space within the building is insufficient for terminal and management functions and, as a temporary structure, the building is not in keeping with the image that the Airport Commission should portray to visiting corporate and commercial users.
- The airport's instrument approach, based on a Non Directional Beacon (NDB) located in the centre of St. Catharines, is penalized with high operating minima due to obstacles along the Welland Canal, including the Garden City Skyway. The present high operating minima are inadequate for the intended role of the airport. An upgrading of the instrument approach facilities is a requirement for the future.

The airport master plan has addressed all of the above deficiencies and constraints, and has recommended a development plan for a period that will likely exceed 20 years. One of the main features of the airport's future development program is the proposal that the Airport Commission and its constituent municipalities take charge of the destiny of the airport, by becoming responsible for setting the priorities for all future development decisions and capital investment. This entails having ownership of the airport transferred from the Federal Government and returned to the municipal level.

Responding to both the present deficiencies of the airport, and an assessment of airport needs as related to a future airport role, the master plan has identified specific improvement and expansion proposals. On airside, the plan proposes additional taxiways to resolve congestion on the terminal apron, an extension to the primary runway to provide a total length of 1800 m., reconstruction of most of the present apron area, and expansion of the apron serving the Terminal Building. As far as the runways are concerned, the master plan proposes retention of only two of the present three runways - Runways 06/24 and 01/19. Runway 11/29 has been assessed as superfluous to operational needs, and consequently is recommended for downgrading to taxiway status.

In the Terminal Area, the master plan proposes construction of a new permanent terminal building, sized to accommodate all of the required terminal functions, including the possibility of processing passengers for a small air carrier feeder service. Realignment of the terminal circulation roads is also proposed, along with construction of a car park to the south of a new Terminal Building. The airport's Control Tower, now occupied by a Flight Service Station, would remain, however other roads, structures and facilities presently in the terminal area would be removed or relocated to permit development of the terminal car park and circulation road system.

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To provide for the future development of aviation business activity on the airport, the master plan proposes an infilling of the existing hangar development areas, and that two new areas of airside development land be made available within the master planning period. These would be developed in stages to accommodate private and commercial lease lot needs as they occur. The first area for development is the South-West Commercial Area, which is totally contained on airport property to the south and west of an existing T-Hangar owned by the St. Catharines Flying Club. The second commercial development area is to the east of the Terminal Area, east of the existing hangar development. This is partly contained on airport property, however additional lands would be needed to realise the proposed development scheme. Site preparation and servicing of this South-East Aviation Commercial Development Area would be implemented in stages to reflect demand, and would therefore take some time to be completed. This area has been designed in a modular form to permit such staged implementation.

These two new development areas are expected to provide a sufficient reserve to accommodate aviation development needs to well beyond the master plan period. In addition to this provision, a reserve of lands in the north of the airport site would be established to act as a long-term development area, should there ever be a need for additional development land. This North Commercial Development Reserve would also be available should a major aviation-related industry require a large land parcel for a single airside use.

The master plan also proposes other important improvements to the airport. These are an upgrading of the airport instrument approach facilities to provide a precision approach capability, connection of the airport sewage system to municipal sanitary services, and construction of a new airport maintenance garage and electrical centre.

All of the improvements proposed in the master plan have been assigned a priority in terms of need, and phased for implementation in three phases. The suggested phasing of proposed airport improvements is addressed in Section 4.0.

3.0 AIRPORT MASTER PLAN RECOMMENDATIONS

The Airport Master Plan has determined the most appropriate future role for the airport and, from this, defined the direction development of the airport should take. An illustration of the master plan for the airport site at the fully-developed stage is provided in the body of the Technical Report. To implement the principal features of the Master Plan, the following policies and actions are recommended:

1. The Airport Commission is recommended to proceed to ensure the early transfer of ownership of the airport from the Government of Canada to local authority. This will permit the Airport Commission to direct the development of the airport in a planned fashion according to the needs and priorities of the Commission and its constituent municipalities. In addition, the airport will become eligible for capital and operating subsidies under the airport development programs of the federal and provincial governments.
2. The Airport Commission is recommended to adopt a development program for the airport that maximizes use of the developable lands for aviation commercial uses. This refers to land already part of the airport in the southwest of the airport property (south of Taxiway "A"), land that is available bordering the southeast of the property, and land that could be accessed in the longer term on the north side of the airport.
3. To ensure that a supply of aviation commercial land is available for release to aviation businesses, the Airport Commission is recommended to prepare sites for lease to private and commercial aviation interests in the southwest of the airport and extend a taxiway and road into this area to provide both airside and landside access. Also in the first phase of airport development, the Commission is recommended to acquire additional lands to the east of the existing hangars and south of Runway 06/24 for future use for a phased expansion of the aviation commercial function.
4. As a priority, the Airport Commission is recommended to address the need to upgrade the airport's instrument approach capability. In view of the obstacle formed by the Garden City Skyway and the Virgil Water Tower, investigation should be made of the feasibility of adding a precision approach aid for the primary runway and an automated weather observation station to provide altimeter setting information outside the operating hours of the Flight Service Station. Installation of a precision approach aid will entail acquisition of land immediately east of the airport property. The early implementation of the first stage of a precision instrument approach through the use of a localizer and DME (or MLS Azimuth & DME) equipment for the Runway 06 approach should be considered if a staging of this project is necessary.

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5. With regard to the airside pavements, it is recommended that steps be taken to construct an additional runway exit from Runway 06/24 to relieve runway/taxiway conflicts, rehabilitate and upgrade the existing light aircraft apron, extend the terminal apron, and decommission Runway 11/29 to taxiway status. In the second phase of airport development, it is recommended that extension of the primary runway be programmed for implementation.
6. To enable the airport to accommodate additional on-site aviation commercial uses and related industries, it is recommended that the airport property be connected to the regional sewer system, with subsequent elimination of the sewage lagoons. Additional services recommended are construction of an electrical centre to accommodate all airport electrical facilities and standby-power provision, and construction of a new appropriately-sized airport maintenance garage and compound in a more suitable location.
7. As a means of promoting the use of the airport and to attract aviation-related business to the airport, it is recommended that the Airport Commission implement a marketing program for the airport. This would include dissemination of information to industry, local economic development agencies and local political representatives to ensure that sufficient exposure is given to the benefits generated by the airport.

4.0 PHASING OF AIRPORT IMPROVEMENTS

Improvements and development requirements for the airport have been identified in the master plan. These have been assessed on the basis of priority and implementation has been assigned on a phased basis. Immediate requirements have been identified as being those improvements that would be necessary within five years, and these have therefore been assigned as Phase 1 proposals. Requirements that may take some time to reach their trigger points for implementation, or are desirable but not urgent, have been assigned to a ten-year period, Phase 2, which would follow Phase 1. Other proposed improvements that are of a long-term nature, or represent progressive expansion of development commenced in Phase 2, are assigned to Phase 3. Since it is difficult to predict the implementation schedule for such items, Phase 3 has been left open-ended, and may well extend beyond the 20-year planning period selected for the master plan.

The three master plan development phases defined for this project are as follows:

Phase 1	1992 - 1996
Phase 2	1997 - 2006
Phase 3	Beyond 2007

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Details of the major capital improvements recommended in the Airport Master Plan are listed below and relate to the three defined development phases.

Phase 1 Development Program Elements (1992 - 1996)

- Taxiways "A" & "D" Reconstruction
Reconstruct and realign Taxiway "A" west of Apron I.
Reconstruct Taxiway "D" based on pavement evaluation tests.
- Taxiway "G" Exit from Runway 06/24
Construct new exit from primary Runway 06/24.
- Apron I Reconstruction
Remove old apron pavement and reconstruct as secondary pavement.
- Apron II Expansion
Extend Apron II to the east by 120 m. Construct as primary pavement.
- Property Acquisition
Acquire property for precision approach instrumentation, Airport Maintenance Facility, and aviation commercial development areas.
(Approximately 33.9 ha. - 83.8 acres total, depending on requirements for instrumentation).
- Sanitary Sewer Connection
Construct sanitary sewer connection to municipal system.
- Terminal Area - West Aviation Commercial development
Construct access road and utility services.
- South-West Aviation Commercial Area
Prepare initial 50% of designated area for lease.
Construct first stage Taxiway "F".
- Airport Terminal Building Development
Prepare design for terminal building, circulation road system and car park.
- Airport Marketing Program
Carry out airport economic impact assessment. Prepare marketing program for airport and provide marketing input to Regional and Municipal industrial development programs.
- Airport Master Servicing Plan
Prepare servicing and staging plan for water, sewer and electrical services.

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Phase 2 Development Program Elements (1997 - 2006)

- **Airport Terminal Building**
Construct 1st. stage of new Airport Terminal Building.
- **Terminal Area Circulation Roads & Car Park**
Realign terminal area circulation roads and construct 1st stage car park.
- **Apron I Extension**
Extend Apron I west 130 m. as required for light aircraft parking
- **Taxiway "C" Repair, Realign & Overlay**
Repair and overlay former Runway 11/29 as extension of Taxiway "C"
Realign section of Taxiway "C" at intersection with Runway 06/24
- **Taxiway "H" Construction**
Construct new taxiway for access to Terminal Area - East Development
- **Taxiway "E" Construction**
Construct 1st. Stage Taxiway "E" to 1st. module in S-E Development Area.
- **South-East Aviation Development Area.**
Prepare 1st. module for development.
- **South-West Aviation Development Area**
Prepare remaining area for lease and extend Taxiway "F".
- **Terminal Area - West Aviation Commercial Development Area**
Prepare sites for lease
- **Terminal area - East Aviation commercial Development Area**
Relocate 1 hangar and prepare lease site
- **Runway 06/24 Extension**
Extend Runway 06/24 eastward by 276 m. to 1800 m. total length.
- **Runway 01/19 Pavement Upgrading**
Upgrade south section of runway to be compatible with pavement characteristics of runway 06/24 and Taxiway "A"
- **Instrument Approach Improvements**
Upgrade airport instrument approach with precision approach instrumentation
- **Airport Maintenance Facility and Electrical Centre**
Construct new Airport Maintenance Garage and Electrical Centre.

Phase 3 Development Program Elements (Beyond 2007)

- Runway 06/24 Reconstruction
Reconstruct primary runway subject to pavement condition evaluation.
- Runway 01/19 Extension
Extend runway 01/19 to 914 m. subject to demand by light aircraft operations
- Taxiway "E" Extension
Extend Taxiway "E" as required to serve additional airside development. Link Taxiway "E" to the threshold of Runway 24.
- South-East Aviation Development Area
Prepare additional modules for airside commercial development as required to meet demand.
- Landside Commercial Development Area
Prepare commercial lease sites in response to demand

5.0 AIRPORT DEVELOPMENT COSTS

The capital cost of implementing the phased program has been estimated (in 1992 dollars). Financial details of the program are provided in the Technical Report. In summary, these costs for the three development phases are as follows:

Phase 1	\$ 2.69 M
Phase 2	\$ 5.91 M
Phase 3	\$ 3.90 M

Costs quoted for Phases 2 and 3 include items such as preparation of areas for aviation commercial development. Construction of infrastructure for these would normally be triggered by demand conditions, with expansion of commercial development areas occurring in response to demand. The actual implementation of the expansion stages of the South-West and South-East Aviation Development Areas may therefore be advanced or deferred accordingly. In particular, this applies to the expansion of the South-East Development Area and its associated Taxiway (Taxiway "E"), which has been designated for Phase 3. In practice much of the development in this area could be expected to occur beyond the nominal 20-year planning horizon of the Airport Master Plan.

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It should be noted that the preparation and leasing of the North Commercial Development Area is regarded as a very long term prospect, beyond the Airport Master Plan. Development of this area would only be warranted at an earlier date if a major tenant were attracted to the airport. Costs for development of the area will depend on the nature of the potential user and the arrangements between the tenant and the Airport Commission. Consequently, costs for development of the North Commercial Area have not been included in the above cost estimates for the master plan phases.

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**Niagara District Airport
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TECHNICAL REPORT**

Victor Craig Aviation Services
May 1992

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TECHNICAL REPORT

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1.0 INTRODUCTION TO THE MASTER PLAN

1.1 Purpose of the Master Plan

The master plan for the Niagara District Airport was commissioned by the Niagara District Airport Commission and carried out by Victor Craig Aviation Services¹ of Toronto, in association with Paragon Engineering Limited of Port Elgin.

The purpose of the master plan project is to create a long-term development plan for the airport site and its facilities, based on a realistic definition of a possible future role for the airport. The plan has been prepared in accordance with terms of reference established by the Niagara District Airport Commission. At the start of the project, the consultants established a number of guiding principles which reflected the needs of the Airport Commission at the time. These are outlined below:

1. The master plan must identify improvements necessary over the long term to develop the airport as a regional facility serving the Niagara Peninsula, with suitable provision for private and corporate aviation, and the ability to accommodate short-haul regional commercial air services, should such services prove feasible in the future.
2. The plan must provide specific guidance for the siting and form of development of the airside facilities, aviation commercial development, terminal and landside facilities, public access and possible future aviation commercial activities and related industrial uses.
3. The plan must identify any requirements for site expansion and property acquisition that relate to achieving the desired airport role, or are necessary to accommodate aviation commercial activities and related industry on or adjacent to the airport site.
4. The plan must address the need to offer leasable development lots on the site to attract additional commercial and non-commercial aviation tenants and enable the airport to increase its revenue base.

This document describes the master plan for the airport and defines the scope of facility development necessary to achieve the desired airport role and satisfy the above requirements. While a nominal 20-year planning horizon has been adopted for the plan, it is recognized that beyond the initial phase, implementation of some of the elements of the plan will need to be justified either by a demand for aviation services resulting from local economic and industrial growth, or by a market development opportunity that might stimulate further industrial growth. The master plan must therefore be viewed as the framework to guide development of the airport site over the long term, rather than a commitment to implement specific facility improvements according to a pre-defined schedule.

¹ This company became part of AirPlan Aviation Technical Services Inc. in 1991.

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Since the purpose of the airport master plan is to describe the recommended future form for development of airport facilities and services, a description of the Niagara District Airport, as existing in 1991 during the preparation of the master plan, is provided in this report for reference only. An appraisal of the 1991 status and condition of airport facilities and services has been carried out during the course of the master plan project, however, the focus of this has been to identify deficiencies and requirements in the context of the future role of the airport.

The primary focus of the master plan report is therefore on the master planning parameters and future requirements that form the basis of the plan, and the definition of the recommended form and phasing of future airport development. The report also addresses matters that concern the ownership of the airport and the level of control exercised by the Airport Commission over development of the airport lands.

1.2 Previous Studies

The Niagara District Airport has never been subjected to a formal process of master planning since the airport property ceased to be used for military flight training at the end of the Second World War. A land use plan for the airport was, however, prepared by Transport Canada in 1987 ("Airport Land Use Plan - St. Catharines Airport", Transport Canada, Ontario Region, TP8661E). This planning study reviewed the facilities provided at the airport at that time and recommended a land use plan based on the perceived need over a 20-year planning horizon. The principal recommendations of the 1987 Airport Land Use Plan were as follows:

1. Acquire additional land for construction of a parallel taxiway to the primary runway, Runway 06/24.
2. Protect Runway 06/24 for precision instrument approach operations.
3. Decommission Runway 11/29 and maintain as a taxiway.
4. Reserve lands for installation of a precision instrument landing system and a direction finding unit (VHF/DF).
5. Upgrade the light aircraft apron and tie-down area.
6. Provide additional space at the terminal building for expansion of the airport management function.
7. Provide additional space for employee amenities and for accommodation of the airport fire equipment at the airport maintenance garage.
8. Study the needs of the airport sewage system and consider installation of an interruptible power unit for the airport electrical system.

The consultants have reviewed the Transport Canada Airport Land Use Plan and are in general agreement with its recommendations. However, it was felt that these recommendations did not go far enough as the Land Use Plan had not been based on a clear definition of the future airport role and potential. In addition, it was felt that the earlier plan only considered the airport lands in their present form and did not attempt to maximize the opportunity to attract revenue-generating aviation commercial uses through expansion of the present airport site for that purpose. Also of concern in reviewing the plan was the fact that Transport Canada's own capital program and priorities for capital works did not reflect a planned implementation of airport facility requirements for this airport. As a result, it was clear that a mere updating of the 1987 Land Use Plan to reflect current conditions would not be satisfactory, and a full master plan study was required. This would need to be based on an acceptable, but far-sighted, definition of the possible future role of the airport, and reflect both the commercial objectives of the Airport Commission regarding operation of the airport, and the industrial development objectives of the Region of Niagara.

1.3 Master Plan Recommendations

The Airport Master Plan project has determined an appropriate future role for the airport and, from this, defined the direction development of the airport should take. Details of the required facilities and services associated with this role are provided in the text of this report, and costs for a phased implementation program identified. In order to implement the recommended airport master plan, a number of actions are recommended and summarized below.

1. The Airport Commission is recommended to proceed to ensure the early transfer of ownership of the airport from the Government of Canada to local authority. This will permit the Airport Commission to direct the development of the airport in a planned fashion according to the needs and priorities of the Commission and its constituent municipalities. In addition, the airport will become eligible for capital and operating subsidies under the airport development programs of the federal and provincial governments.
2. The Airport Commission is recommended to adopt a development program for the airport that maximizes use of the developable lands for aviation commercial uses. This refers to land already part of the airport in the southwest of the airport property (south of Taxiway "A"), land that is available bordering the southeast of the property, and land that could be accessed in the longer term on the north side of the airport.

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3. To ensure that a supply of aviation commercial land is available for release to aviation businesses, the Airport Commission is recommended to prepare sites for lease to private and commercial aviation interests in the southwest of the airport and extend a taxiway and road into this area to provide both airside and landside access. Also in the first phase of airport development, the Commission is recommended to acquire additional lands to the east of the existing hangars and south of Runway 06/24 for future use for a phased expansion of the aviation commercial function.
4. As a priority, the Airport Commission is recommended to address the need to upgrade the airport's instrument approach capability. In view of the obstacle formed by the Garden City Skyway and the Virgil Water Tower, investigation should be made of the feasibility of adding a precision approach aid for the primary runway and an automated weather observation station to provide altimeter setting information outside the operating hours of the Flight Service Station. Installation of a precision approach aid will entail acquisition of land immediately east of the airport property. The early implementation of the first stage of a precision instrument approach through the use of a localizer and DME (or MLS Azimuth & DME) equipment for the Runway 06 approach should be considered if a staging of this project is necessary.
5. With regard to the airside pavements, it is recommended that steps be taken to construct an additional runway exit from Runway 06/24 to relieve runway/taxiway conflicts, rehabilitate and upgrade the existing light aircraft apron, extend the terminal apron, and decommission Runway 11/29 to taxiway status. In the second phase of airport development, it is recommended that extension of the primary runway be programmed for implementation.
6. To enable the airport to accommodate additional on-site aviation commercial uses and related industries, it is recommended that the airport property be connected to the regional sewer system, with subsequent elimination of the remaining sewage lagoon. Additional services recommended are construction of an electrical centre to accommodate all airport electrical facilities and a standby-by unit, and construction of a new airport maintenance garage and compound in a more suitable location.
7. As a means of promoting the use of the airport, and to attract aviation-related business to the airport, it is recommended that the Airport Commission implement a marketing program for the airport. This would include dissemination of information to industry, local economic development agencies and local political representatives to ensure that sufficient exposure is given to the benefits generated by the airport.

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2.0 NIAGARA DISTRICT AIRPORT - HISTORICAL OVERVIEW

2.1 History of the Airport

The Niagara District Airport traces its origins back to 1928 when the St. Catharines flying club was formed. The original airport, which at that time comprised a 100-acre field some four kilometres from the present airport, was officially opened in September 1929. Known as "Homer Field", the airport was the base for the St. Catharines Flying Club and a popular attraction for local residents. Aviation activity at that time included visits from aviation celebrities, sight-seeing flights over Niagara Falls, and parachute jumps.

In 1935 the "Homer Field" airport was forced to close, due to the construction of the Queen Elizabeth Way. A new site was found for the airport to the northeast, and a parcel of 66 acres was leased from a local farmer by the City of St. Catharines. This land was sub-leased by the City to the St. Catharines Flying Club, and an annual grant provided to the Flying Club for operation and maintenance of the airport site.

In 1939, to prepare for war in Europe, Canada participated with Britain, Australia and New Zealand in creating the British Commonwealth Air Training Plan. This provided safe flying training airfields and established schools to train pilots and aircrews prior to their assignment to operational squadrons in the European, Middle East and Far East conflict areas. The St. Catharines Airport became part of the BCATP when it was agreed that No. 9 Elementary Flying Training School would be established at the airport. A condition for this was that the City of St. Catharines, who held a ground lease on the site, would purchase the airport lands and hand them over to the Crown. Thus, for a fee of \$1.00, the Government of Canada obtained title to the airport site.

To fulfil the needs of the BCATP, the airport site was expanded through acquisition of additional property and, in the years 1940 and 1941, considerable facility construction took place, including three paved runways, taxiways, two hangars, water distribution and sewage treatment systems, and barrack buildings to house staff and 180 trainee pilots. The original runway system, as found at most of the EFTS airfields, comprised a triangular pattern with two 2,550 ft. runways and one 2000 ft. runway.

Until 1942, the No. 9 EFTS at St. Catharines was equipped with Fleet Finch Biplanes, manufactured locally at the Fleet factory at Fort Erie. By spring of 1942, the Fleet Finch was replaced by DH-82 Tiger Moth biplanes, which remained in service until closure of the EFTS in January 1944.

At the end of the war, the British Commonwealth Air Training Plan was officially terminated and, in 1946, the City of St. Catharines regained responsibility for the airport under a lease with the Government of Canada. Under the terms of the lease, the City became responsible for all operations and maintenance of the airport site and its facilities, while title was retained by the federal government. At that time the

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Flying Club returned to occupy the airport, later constructing a hangar complex to replace the original Flying Club facility that burned down in 1947.

At the request of the City, management of the airport was assumed in 1951 by Genaire Limited, a company that had leased one of the two wartime hangars for the purposes of manufacturing and repairing a variety of aviation-related components. In 1957, responsibility for management of the airport was returned to the St. Catharines Flying Club. This arrangement lasted until 1966.

As a result of a recommendation made by the St. Catharines Junior Chamber of Commerce, steps were taken to broaden municipal involvement in the airport and, in 1959, the Niagara District Airport Commission was formed to manage, operate and maintain the airport. At that time the airport was renamed the Niagara District Airport, although this name has never been acknowledged by the federal government, owner of the airport site. When it was originally formed, the Airport Commission comprised members from 11 municipal bodies in the immediate area. In time, with amalgamation of local municipalities and the formation of regional government in the Niagara Peninsula, the number of member municipalities forming the Airport Commission was reduced to four, namely St. Catharines, Niagara Falls, Thorold, and Niagara-on-the-Lake. At the time of the master plan, these four municipalities comprised the Airport Commission and appointed a total of 22 elected and lay members.

In keeping with its mandate to operate and maintain the airport, the Airport Commission ultimately assumed direct management of the airport, and appointed its own full-time airport manager in 1966. This coincided with the extension of the airport's main runway to 5000 ft. and a considerable improvement in the capability of the airport to accommodate business aircraft and aircraft used by air carriers.

Since 1966, the airport has witnessed other improvements, such as the construction of a temporary terminal building in 1967, extension of the terminal building in 1971 to accommodate a Weather Office, construction of an Air Traffic Control Tower, pavement overlay of the secondary runways, overlay of the primary runway and upgrading of the water distribution system. Private and corporate investment in the airport has also occurred in the form of hangars constructed to the east of the ATC Tower to accommodate private aircraft storage, and hangar facilities for corporate aircraft based on the airport. In this period the Airport Commission employment has increased to three full-time staff, including the Airport Manager, a Secretary/Accountant, and a Maintenance Supervisor.

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2.2 Commercial Air Services At The Niagara District Airport

Over the years a number of commercial air services have been introduced to the airport, commencing in 1959. From historical information available for the airport, the following services appear to have been offered in the period 1959 to 1986:

<u>Carrier</u>	<u>Service</u>	<u>Start/End</u>
Southern Provincial	Toronto Island Toronto Malton Brantford	1959
Nordair	Montreal	1967
Royalair	Peterborough Ottawa, Pembroke Montreal, Toronto	1968-1969
Air Niagara	Toronto Island	1969-1970
South-West Air	Hamilton, Windsor	1986
Trillium Air	Toronto	1986

All of the above services were short-lived, with very few lasting more than one year. A number of reasons have been put forward to explain the lack of success experienced by commercial air carriers in serving the Niagara District Airport. These include such factors as the accessibility by car to Toronto, Niagara Falls NY and Buffalo offered by the Queen Elizabeth Way, an uncertainty of air access to Toronto Island Airport, and the lack of a sufficient market base for business travel in the Region. At the time, reasons such as these may have had validity, however the present market for air service cannot be judged in the same terms. Changes have occurred in several of the original governing conditions, even in the past five years. For instance, accessibility to Toronto by car has deteriorated due to traffic congestion on the Q.E.W., while improvements have been made at the Toronto Island Airport for commuter air services.

3.0 NIAGARA DISTRICT AIRPORT - 1991 STATUS

3.1 Airport Status

At the time of the Airport Master Plan (1991), the Niagara District Airport held the status of a publicly-owned facility, owned by the Government of Canada through Transport Canada. The entire site, with the exception of a lease held directly with Transport Canada by Genair Limited, is leased to the Niagara District Airport Commission by Transport Canada. Operation and maintenance of the airport is the sole responsibility of the Niagara District Airport Commission under the agreement with Transport Canada.

The airport is certified by Transport Canada for public use and is equipped for day and night aircraft operations as well as operations under instrument meteorological conditions to published non-precision approach limits. Federal registered zoning is in place to protect the airport and its runway approaches from construction of obstacles that could curtail operation of the airport.

The airport provides facilities for public and private aviation use, and accommodates commercial air services involved in charter passenger and freight service, flight training, corporate aviation related to business activity in the Niagara Peninsula and private general aviation users visiting or based at the airport. Facilities available at the airport include a Terminal Building, aircraft hangarage and outside parking, and aircraft refuelling. Typical aircraft using the Niagara District Airport comprise light single and twin-engine piston aircraft, occasional larger twin turbo-prop aircraft, and corporate jet aircraft. Predominant use of the airport is made by the light single and twin-engine aircraft category, although corporate use of the airport by business jets serving the industries of the Niagara Peninsula is an important role of the airport.

Support facilities existing on the airport comprise an airport maintenance garage, aviation fuel farm, Environment Canada Weather Office, and Air Traffic Control Tower. The Air Traffic Control service at the Niagara District Airport ceased in 1991, and a Flight Service Station (FSS) was installed in the former ATC Tower during the summer of that year.

Capital funding for the airport is provided from two sources - Transport Canada and the constituent municipalities of the Airport Commission. Capital funds under Transport Canada's main capital program are provided for programmed projects according to priorities set by Transport Canada. In the past ten years this has provided funding for asphalt overlays for the airport's three runways, drainage works and partial funding for a water distribution system. The other source of capital funding are the four municipalities comprising the Airport Commission. These have invested some \$322,000 in capital works and equipment at the airport over the past ten years.

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Funds to support the airport's operations and maintenance are provided solely by the member municipalities of the Airport Commission. Because the airport is owned by the federal government, the Niagara District Airport receives no other form of financial assistance from either the provincial or federal levels of government.

The arrangement regarding the ownership and operation of the airport, and the differing responsibilities and priorities of Transport Canada as owner, and the Airport Commission as operator, has tended to suppress the development of the airport and delay improvements and repairs that are now long overdue. This is because federal ownership of the airport has, thus far, rendered the airport ineligible for capital and operating funding from other sources, and the consequent lack of funding has prevented the Commission from implementing as many improvements to the airport as it would wish. In addition, the present arrangement with Transport Canada has meant that the Airport Commission has subsidized the operation and maintenance of the airport for some thirty years, yet has no role in setting the priorities for major repairs and improvements to the infrastructure, and is not party to the planning and approval process for developments on the airport.

With a view to rectifying these issues, options to change the airport ownership situation were investigated during the airport master planning process. At the time that the Airport Master Plan was completed, the Airport Commission had formally applied to Transport Canada to transfer ownership of the airport to local authority. When this process is completed and the transfer made, the Airport Commission and its constituent municipalities would obtain control of all of the airport administrative functions and be in a position to develop the airport according to its own policies and priorities.

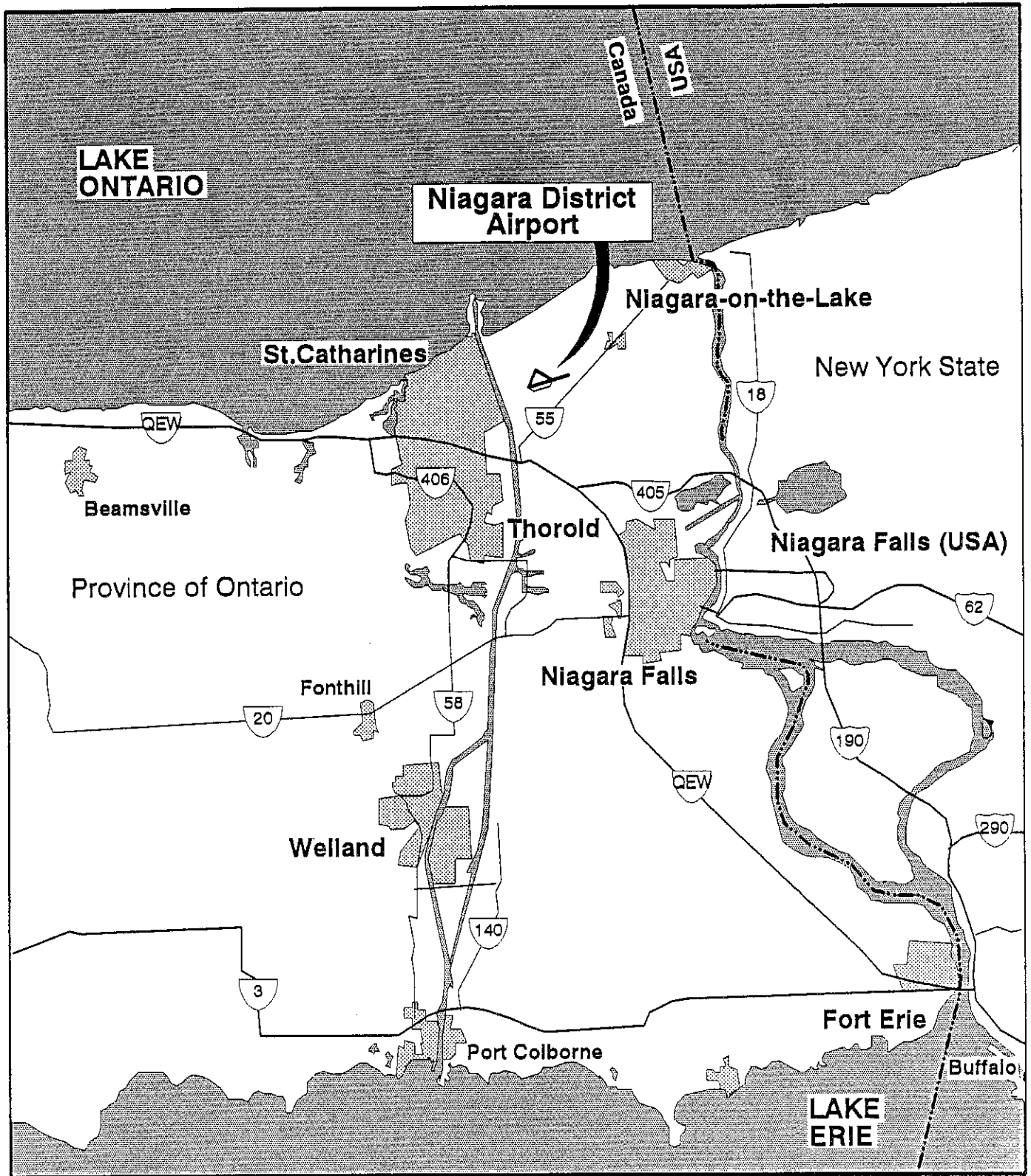
3.2 Airport Site

At the time of the Airport Master Plan the Niagara District Airport comprised an area of approximately 130.3 ha. (321.7 ac.), located 8 km. northeast of the centre of the City of St. Catharines and 10 km. southwest of the Town of Niagara-on-the-Lake, in which municipality the airport is located. The regional setting of the airport is illustrated in Exhibit 1.

The airport site is bounded generally by Highway 55 to the south, federal lands under the ownership of the St. Lawrence Seaway Authority to the west, and private agricultural lands to the north and east. Access to the airport is provided by means of a 300 m. access road from Highway 55, which links the City of St. Catharines to the Town of Niagara-on-the-Lake.

In terms of topography, the airport site is generally flat and shows no significant features. Elevations on the site range from 98 m. (321.5 ft.) in the western and central part of the site to 96 m. (315 ft.) in the northeast corner. No significant features exist on the site that would preclude further airport infrastructure development.

Exhibit 1
Airport Regional Setting



Drainage of the airport lands is accomplished by means of open ditches, except for the paved surfaces, which drain into a piped system that outfalls into the open ditch drains. All surface water run-off is led into Eight Mile Creek, and ultimately into Lake Ontario, some 4.5 km. to the north of the airport. Soil conditions on the airport are typical for the area, namely silt and clay till, with pockets of silty sand. The flat topography of the airport and the silty clay nature of the underlying soils do not represent good conditions for natural drainage. No problems have yet been encountered for the drainage of surface run-off from the airport site and none are anticipated as a result of future development.

The airport site does not include any surplus lands, and all areas of the site are required to support the existing runway system and on-site development. To the east, west and north, the airport site is not constrained and could be expanded into neighbouring agricultural land. In the south of the site, the terminal area can absorb only limited development within the confines of the existing property boundary. All of the principal airport facilities, namely the hangar buildings, terminal, maintenance garage and supporting infrastructure, are located in the southern part of the airport site, directly accessible from Highway 55 via the airport access road. This area, which is the focus of the airport, could be further developed, but additional adjacent land would need to be acquired for this purpose. Lands adjacent to the airport site on all sides have the same characteristics as the airport itself, and any such site expansion would not introduce difficulties for construction of buildings and supporting infrastructure.

A plan of the airport site, indicating the extent of development existing in 1991, and the location of the principal airport facilities, is provided in Exhibit 2.

3.3 Airside Pavements

3.3.1 Primary Runway - Runway 06/24

The existing primary runway at the Niagara District Airport is an asphalt-paved facility, 1524 m. long and 45 m. wide. Its designation is Runway 06/24, based on a magnetic orientation of 059/239 degrees. The runway is equipped with medium intensity runway edge lighting, runway identification strobe lights (RILs) and a low intensity single row approach light system for both approaches. A precision approach path indicator (PAPI) system is installed for approaches to Runway 06. The runway lighting system can be activated remotely by aircraft by radio control (ARCAL).

The present runway length of 1524 m. has proved to be adequate for the aircraft using the airport. The Airport Commission has not been made aware of potential commercial or corporate users for whom the existing runway is inadequate, however accommodation of business jet aircraft for long stage lengths, or the use of the airport for any larger jet transport operations would necessitate an increase in the length of the primary runway. Extension of the runway to 1800 m. to accommodate the full

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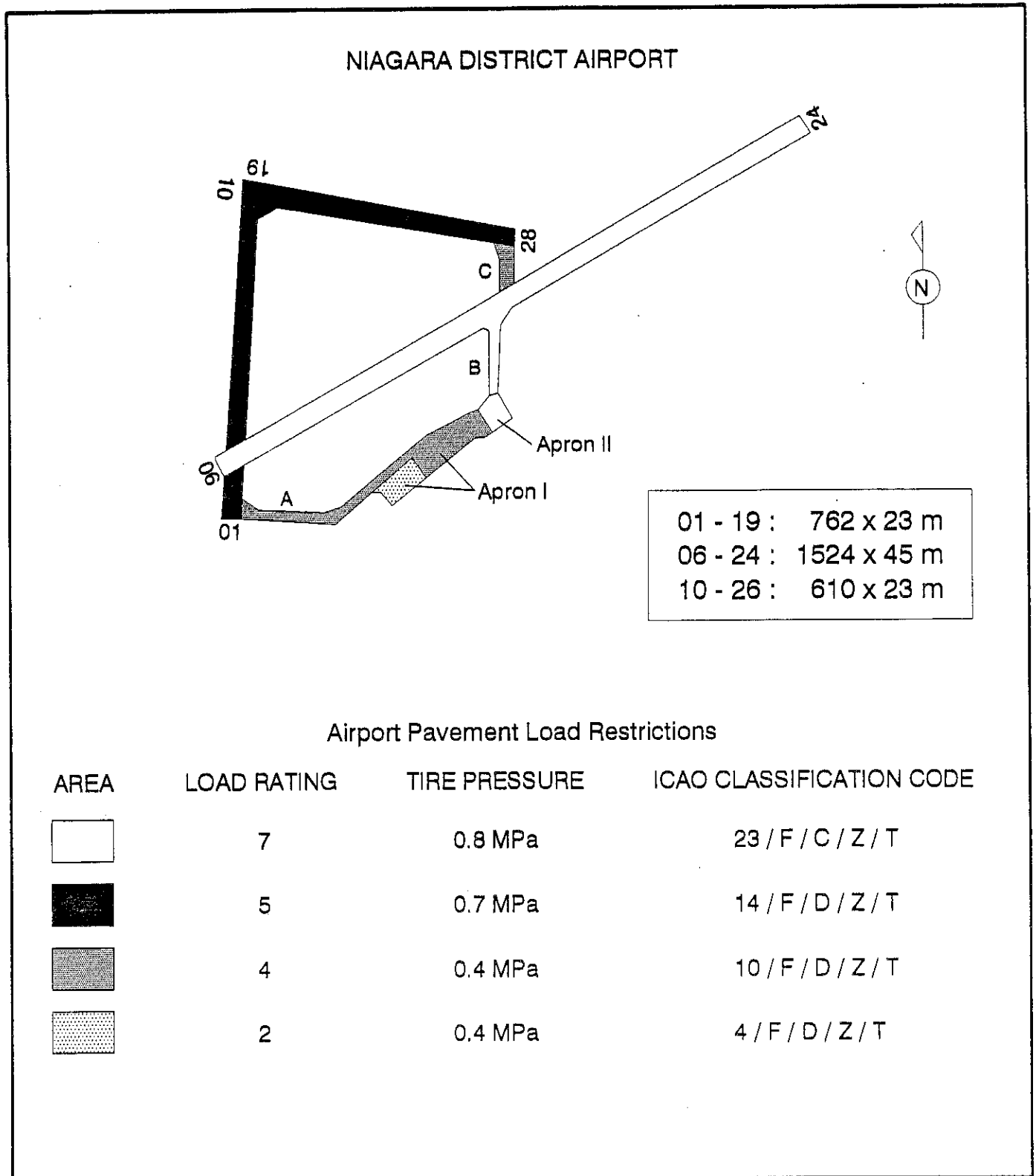
range of corporate aircraft under an enhanced airport role is possible within the present airport site, provided such extension can occur to the east. Additional lands would be required if a westward runway extension were proposed, however such extension is limited in the west by the obstacle clearance requirements for the Runway 06 approach. This is influenced by the Garden City Skyway over the Queen Elizabeth Way, Hydro lines west of the Seaway Canal, and development in the City of St. Catharines north of the QEW. To the east, runway extension by 276 m. to 1800 m. is possible within the airport property. Additional land would only be required to accommodate any precision approach landing aid and its protected area.

The present runway width is 45 m., which exceeds the width required for the classification of the runway. A reduction in runway width could be considered whenever the runway is overlaid or reconstructed, however the reduced cost of this in terms of asphalt would have to be weighed against the cost of relocating the runway lighting system.

The existing runway pavement was recently overlaid at its full width with 60 mm. of asphalt (mid-1991). With the underlying pavement structure, the runway has a pavement load rating of 7 (PLR 7) and an asphalt surface capable of supporting aircraft with tire pressures up to 0.80 MPa (116 psi). This means that the runway can support unlimited operations by aircraft having a gross take-off weight of up to approximately 38,100 kg. (84,000 lbs) under spring loading conditions, and up to approximately 47,100 kg. (103,600 lbs) in dry summer conditions. Restricted and infrequent operations by aircraft heavier than this could be permitted in dry conditions, subject to prior assessment of the desired operating weight and ground conditions at the time. On the basis of pavement strength, unlimited operations by aircraft of the size and weight of the BAe 146, Convair 580, Fokker F-28 can be accommodated on the present pavement at any time of year. In dry conditions, heavier aircraft such as BAC 1-11, Fokker 100, DC-9, C-130 and B737 can be accommodated, the latter two types at a reduced payload. All business jet aircraft are within the structural strength limitations of the pavement and the tire pressure limit of the asphalt surface is acceptable as well. An illustration of the pavement strength capability of the airside pavements is provided in Exhibit 3.

Visual inspection of the runway prior to the recent overlay showed that the runway was in poor structural condition, with considerable cracking evident. Normally, this condition would justify total rehabilitation. Application of the 60 mm. asphalt overlay in 1991 is not felt to be long-term solution, and cracking can be expected to reflect through the new asphalt. Ultimately, because of the poor conditions below the overlay, the runway pavement will need to be rebuilt. The Airport Commission will need to monitor this situation and program a total runway reconstruction when the condition of the pavement is observed to have deteriorated. As the overlay has only just been applied, it is not possible to predict when reconstruction of Runway 06/24 will be required.

Exhibit 3 Pavement Load Rating Chart



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With regard to its adequacy for aircraft operations, Runway 06/24 has reasonably clear approaches, although obstacles are evident in both cases. The Runway 06 approach is over the City of St. Catharines and, in the inner approach, over the Welland Canal. Obstacles in this area comprise hydro lines on the west side of the Welland Canal and the fairly large ships that use the Canal during the navigation season. For the Runway 24 approach, the principal approach direction for the airport, a water tower in the community of Virgil some 4 km. northeast of the airport represents an obstacle in the approach area, almost on runway centreline. In neither case do the approach area obstacles constitute a hazard to aviation at the airport, and the referenced obstacles do not penetrate the registered obstacle zoning surfaces. In spite of this, these obstacles may affect the airport's instrument approach limits, and this issue is addressed in Section 3.10.

The orientation of Runway 06/24 suits the prevailing wind direction in the area. Wind coverage for this runway, at a limiting crosswind of 15 knots, is 99.81% under all weather conditions, and 91.9% under visual meteorological conditions. At the limiting crosswind for very light aircraft (10 knots), wind coverage on this runway under all weather conditions is 88.4%. The usability of the runway from the consideration of wind is therefore very good for aircraft able to operate at a 15 kt. crosswind. However, for those aircraft limited at 10 kts. crosswind, the wind coverage provided by Runway 06/24 is not adequate, and a crosswind runway is therefore required for the lighter category of aircraft. A combination of two runways will therefore provide sufficient wind coverage to accommodate the needs of all aircraft operations at this airport.

Runway 06/24 fulfils certification obstacle zoning requirements for a Transport Canada Code 3-C runway based on instrument precision approach criteria. The runway is certified for instrument non-precision operations, however the federal registered zoning in place for Runway 06/24 is for the more stringent precision approach criteria. Aircraft operations under instrument flight rules are authorized by Transport Canada on this runway on the basis of an instrument approach from the "SN" NDB located in the City of St. Catharines, 4.1 nautical miles southwest of the airport.

3.3.2 Secondary Runways - Runway 01/19 & Runway 11/29

Two secondary runways presently exist at the airport. These are Runway 01/19, 762 m. (2500 ft.) in length and oriented 008°-188° M., and Runway 11/29, 610 m. (2000 ft.) in length and oriented 106°-286° M. Both runways are asphalt-paved runways with a paved width of 23 m. (75 ft.).

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The two secondary runways were overlaid in 1984 and narrowed from 30 m. to the present 23 m. The pavement strength of these two runways is classified by Transport Canada as being pavement load rating 5 (PLR 5). This means that the limiting aircraft gross take-off weight for Runways 01/19 and 11/29 is 18,000 kg. (40,000 lbs). Tire pressure limitation on these pavements is 0.7 MPa (102 psi). These gross weight and tire pressure limitations are well in excess of the needs of the type of aircraft that would operate on such short runways, or would be required to use a crosswind runway.

Runway 01/19 remains in good structural condition and is used as the principal crosswind runway when wind conditions necessitate. The volume of traffic using Runway 01/19 is low at approximately 1000 aircraft movements per year.

Runway 11/29 has experienced considerable deterioration since the overlay, particularly along the southern half of the runway surface. Considerable patching has been necessary to correct failed areas and inevitably this has resulted in a poor surface condition where patching has been carried out. This runway also experiences approximately 1000 movements per year.

As neither of the two secondary runways receives any significant volume of aircraft movements, continued maintenance of both runways is questioned. In the Airport Land Use Plan carried out in 1987, a recommendation was put forward to decommission Runway 11/29. In view of the pavement condition and implied maintenance costs for this runway, the minimal traffic volumes served, and the existence of an alternative runway that already serves crosswind operations, the recommendation to decommission Runway 11/29 should stand.

3.3.3 Taxiway System

The airport presently has four taxiways, Taxiways "A", "B", "C" & "D". Taxiways "A" and "B" connect the aprons to Runway 01 and Runway 06/24, Taxiway "C" provides a connection from the north side of Runway 06/24 to the threshold of Runway 29, and Taxiway "D" serves an aviation development area east of the terminal facilities. These taxiways are shown on Exhibits 2 and 3.

With the exception of Taxiway "A", the airport taxiways are in fair to good condition. Taxiway "A" is in poor condition and contains a large amount of transverse and alligator cracking. Surface elevation of the taxiway is observed to be almost at natural ground elevation, raising the question of the effectiveness of the taxiway drainage system in this area and the structural integrity of the pavement itself. Improvements to Taxiway "A" through reconstruction of the pavement will be necessary during the life of the master plan. Improvements to the other taxiways would only need to take the form of pavement overlays, although repairs to part of Taxiway "D" and some reconstruction will be required.

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In terms of pavement strength, Taxiways "A", the apron taxiway and Taxiway "C" have a pavement load rating of 4 (PLR 4), giving an aircraft gross weight limitation of 13,500 kg. (30,000 lbs). The tire pressure limitation for these taxiways is 0.4 MPa. (58 psi). Taxiway "B" has the same structural strength and tire pressure limitations (PLR 7 and 0.8 MPa.) as Runway 06/24. The structural strength and tire pressure limitation of Taxiway "D" is not known as this has not been evaluated.

Assessment of the taxiway pavement strength limitations indicates that part of the taxiway system that serves the primary runway does not have the same strength characteristics as the runway. In particular, the strength and tire pressure limitations of Taxiway "A", the apron edge taxiway through Aprons I and II, and the section of Runway 01/19 south of Runway 06/24, are well below the load bearing capability of the runway. This means that aircraft operating on Runway 06/24 at weights and tire pressures greater than the limiting bearing strength or tire pressures for the taxiway connections cannot, under present circumstances, use Taxiway "A" or the apron edge taxiway. Such aircraft would therefore be required to use only Taxiway "B" and back-track on Runway 06/24 for arriving and departing operations. Upgrading of the pavement strength and wearing surface thickness for the taxiway system serving Runway 06/24 is required in order to avoid an operational constraint imposed as a result of pavement strength and tire pressure limitations.

As far as their usefulness to aircraft is concerned, the existing taxiways perform as intended. Access by aircraft to Runways 01/19, 11/29 and 06 is available by means of the existing taxiway system, subject to the above-referenced pavement strength limitations. Access to Runway 24, the principal operational runway direction is not so easily obtained, since the nearest taxiway connection for Runway 24 is Taxiway "B", which links to this runway 800 m. from the threshold. Considerable back-tracking of aircraft is therefore necessary with the present taxiway configuration. Taxiway "B", however, is well located for aircraft to leave Runway 06/24, after landing on Runway 24. With aircraft also using Taxiway "B" to enter the runway to backtrack and depart from Runway 24, congestion occurs at the intersection between Taxiway "B" and Runway 06/24. Aircraft have been observed taxiing in both directions on this taxiway at the same time, each keeping well to the right of the taxiway pavement. Obstacle clearances for this type of taxiing operation do not exist on Taxiway "B", and consequently such practices cannot be permitted.

Clearly, the present taxiway configuration serving Runway 06/24 is not acceptable for safe operations and an additional taxiway link is necessary. A simple solution would be to provide a taxiway exit from Runway 06/24, west of the intersection with Taxiway "B". This would enable arriving aircraft to land and taxi past Taxiway "B", then exit from the runway to the central part of the apron. Departing aircraft could then wait until the arriving aircraft has cleared the Taxiway "B" intersection before

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entering the runway to back-track to the threshold of Runway 24. A longer term solution would be to provide a full parallel taxiway between the east end of the terminal apron and the threshold of Runway 24. Whatever approach is finally considered, the pavement strength of the entire taxiway system serving both thresholds of Runway 06/24 will need to be constructed, or upgraded, to the strength of the runway itself.

3.3.4 Aprons

Two aprons are provided at the airport, one serving the Terminal Building for itinerant parking (Apron II), and the other contiguous to it serving the St. Catharines Flying Club and providing long-term apron parking for light aircraft (Apron I). An apron taxiway exists along the north side of both aprons to provide a continuous taxiing route between Taxiway "A" in the west and Taxiway "B" in the east.

Apron I is the largest apron on in the Terminal Area, measuring approximately 170 m. x 60 to 70 m. This is intended to provide paved parking for light aircraft, both itinerant aircraft and aircraft based at the airport. The apron also provides access to the St. Catharines Flying Club, which tends to occupy much of the apron space available on Apron I. The northern portion of the apron, comprising a depth of 15 m. functions as an apron edge taxiway linking Taxiway "A" to Apron II and to Taxiway "B". An area of old pavement adjacent to Apron I on the west side provides additional aircraft parking for light aircraft. This pavement measures approximately 80 m. x 50 m., but is not all usable due to its poor condition.

Apron II, adjacent to the Terminal Building measures approximately 60 m. x 60 m. and is intended to accommodate itinerant aircraft parking in the immediate vicinity of the Terminal Building. This area is only partially available for aircraft parking as the northern part of the apron forms part of the apron edge taxiway system, which severely reduces the actual area available for aircraft parking. Another constraint on the area available for this apron results from the location of Taxiway "B" which enters the apron opposite the Terminal Building. As described in Section 3.3.3 above, the lack of an adequate taxiway system for Runway 06/24 creates aircraft manoeuvring congestion in the area of Taxiway "B", and this obstructs Apron II. The space problem is compounded by the fact that the eastern edge of Apron II is also used by piston engine aircraft for engine run-up. Apron II is presently too small to serve its intended function, yet provide an obstacle-free apron edge taxiway. Expansion of the terminal apron is now required, and this issue will need to be addressed in future capital works programming.

In terms of pavement condition and strength, Apron I is generally in fair to poor condition, with a pavement rating of PLR 4 (13,500 kg. gross weight) and a tire pressure limitation of 0.4 MPa. (58 psi.). This apron appears to have three sections in which the condition varies. The easternmost section is in the best condition, however this appears to be a low strength apron with a thin granular base. Low

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areas and a large amount of alligator cracking is evident. The central section appears to be an old concrete base with a thin asphalt surface layer applied on top. The asphalt has now cracked and spalled off in numerous places, leaving depressions in which the underlying concrete has been exposed. The western section is the extension to the apron north of the Genaire Hangar. This is in very poor condition and the entire apron is in need of reconstruction.

Apron II is in good condition, having recently been overlaid with asphalt as part of the contract to overlay the main runway. Pavement strength of Apron II is reported as PLR 7 (34,100 kg./47,100 kg) with a tire pressure limitation of 0.8 MPa. (116 psi.).

3.4 Terminal Facilities

A single-storey prefabricated metal-clad frame building, erected in 1967, serves as the airport's Terminal Building. Located at the east end of Apron 1, the Terminal Building measures 27m. x 10m. Contained within this area are the following spaces and functions:

- Public Waiting Area
- Airport Management Office
- Airport Commission Meeting Room
- Pilot's Lounge
- Environment Canada Weather Office
- Storage Room for Weather Office
- Canada Customs Office
- Electrical/Storage Room
- Washrooms (Male & Female)
- 1 Rented Office

The present terminal building is an inadequate structure for a regional municipal airport, due to its temporary nature and appearance. Spaces within the building are also generally inadequate, although only certain functions are actually cramped. The principal space deficiencies in the present terminal building are the accommodation for the Airport Management & Airport Commission, Visiting Pilot's Lounge, Washrooms and storage. The public waiting area gives the impression of being sufficient for present traffic levels, however much of this space is effectively circulation space. The actual accommodation for public waiting is not large and offers no amenities and little seating. Mention should also be made of the inadequate storage space available in the building. This has caused the electrical room to be used for a variety of janitorial and storage functions, none of which are appropriate for the airport electrical room.

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An expansion of the space provided to airport users at the Terminal Building is required, however it would not be appropriate to expand the existing building, due to its narrow depth, temporary structure and lack of building systems. The total space requirement for a municipal terminal building for an airport such as Niagara District Airport is approximately 400 m². Space is available to expand the present building, however as the structure is inappropriate the required terminal space should be provided through construction of a new airport terminal building.

Car parking for the Terminal Building is available to the west of the building, in a large asphalt area. This area is, in fact, an undeveloped space with apron frontage lying between the terminal building and the facilities of the St. Catharines Flying Club. At present the area is used by both the Flying Club and users of the Terminal as a car park. Normally 6 to 10 vehicles are parked in the area close to the Terminal Building and presumably belong to Terminal users and management. No capacity constraints for car parking are evident in this area.

Access to the Terminal Building is provided by means of the main airport access road, which links to Highway 55 some 300 m. south of the Terminal. The access road directs vehicles to the terminal circulation road which loops around a monument south of the building. A pick-up/set-down area is available in front of the terminal for airport users.

The location of the Terminal Building, car parking facilities and the access road and circulation system are illustrated in Exhibit 2.

3.5 Airside Commercial Development Area

Airside commercial development has occurred only in the airport terminal area, both west and east of the terminal building.

To the west of the Terminal Building, two tenants occupy airside lease lots fronting onto Apron I. These are Genaire Ltd. and the St. Catharines Flying Club. The activity of Genaire is not airside-related, and this lease is therefore not appropriate for an airside development lot, especially one having a prime apron frontage. Relocation of Genaire to a landside location would be desirable, however this may not be easily accomplished due to the nature of the lease itself, and the existence of sensitive equipment located adjacent to the Genaire hangar building. Infill space exists along the frontage of Apron I for two or three additional tenants. One or two additional tenants could be accommodated through arrangement with Genaire west of the Genaire building, while space also exists for a large tenant lease east of the St. Catharines Flying Club, in an area that is presently used as a parking lot. The total area of development west of the Terminal Building, including the existing leased areas, presently comprises approximately 3.1 ha. (7.7 ac.).

To the east of the terminal area, accessible to airside via Taxiway "D", an area comprising 2.2 ha. (5.4 ac.) has been developed for private and corporate hangars. A total of four tenants have constructed hangars in this area and space exists for one more hangar with a rearrangement of the lease limits. Subdivision and organization of development in this area has not been carried out with efficiency, and consequently use of the rather scarce lands for airside commercial development purposes has not been optimized.

The total airside development area presently available at the airport is approximately 5.3 ha. (13 ac.). At the time of the master plan three or four additional tenants could be accommodated, either fronting onto Apron I, or in the area east of the present airport maintenance garage, accessed from Taxiway "D".

The layout and identification of all buildings in the airside aviation commercial development areas is indicated in Exhibit 2.

3.6 Landside Development Area

Landside development presently consists of two leases in an area south of the terminal area and west of the airport access road. The present tenants are a yacht manufacturer (Aztec Yachts) and the Civilian Air Rescue Search Association. These two leases presently occupy approximately 0.3 ha. (0.7 ac.) in an area that can accommodate additional development. The total area presently available for landside development, including the two existing leases, is approximately 0.9 ha. (2.2 ac.).

3.7 Aircraft Parking Areas

Rental parking space for aircraft is provided at tie-down positions on Apron I (paved parking), and along the north side of the Apron I taxiway (unpaved parking). The areas available for aircraft parking can accommodate up to 25 aircraft. At the time of the master plan, demand for aircraft tie-down parking was at approximately one-third of the capacity available.

3.8 Airport Utility Services

3.8.1 Water Supply

The airport is served by a municipal water supply. A potable water supply was constructed in 1983 and a separate supply for fire water added in 1985. An assessment of the water supply and distribution system carried out by Transport Canada in 1987 determined that this system is adequate for the present and future needs of the airport. To serve future development on the airport an extension of the existing water distribution system would be required.

3.8.2 Sewage Disposal

The sanitary sewage system is based on a gravity collection system from the Terminal Building and buildings in the terminal area. This flows northeast to a pump house located north of the ATC Tower near the Steed & Evans Hangar. From this point sewage is pumped to a single cell lagoon located to the northeast of the pump house south of Runway 06/24. This system has been viewed as inadequate and a recommendation was made by Transport Canada that the existing sewage disposal system be assessed and the options to upgrade the airport sewage disposal evaluated.

A study of the airport sewage system was commissioned by Public Works Canada in 1989. This examined a number of options for improvement, including upgrading the existing sewage lagoon system, installation of a package treatment plant on the airport, and connection to the municipal sewage treatment plant. Of these options, the study indicated that the uncertainties of obtaining approvals from the regulatory agencies weighed against connection to the municipal sewage system. It therefore recommended that the existing sewage lagoon system be improved and that an effluent treatment system be added to ensure that effluent discharge to the drainage system meets environmental standards. At the same time the study suggested that Public Works Canada pursue the option of obtaining approval to connect the airport by forcemain to the municipal sewage system, and adopt that option if the necessary approvals can be obtained. If this proves to be impossible, then the option to upgrade the existing lagoon system would have to be adopted.

At the time of the master plan, it was accepted that the best option, although the most costly, would be to construct a forcemain from the airport to the municipal sewage trunk line (Glendale Industrial Park Trunk Sewer), intercepting this trunk line close to the QEW at the intersection of Highway 55 and Queenston Road. Positive indications were received by the Airport Commission in the latter stages of the master plan regarding the acceptability of this proposal.

3.8.3 Electrical Service

Electric power to the airport is provided by Niagara-on-the-Lake Hydro Electric Commission. Primary power is fed to the airport from the Hydro Commission overhead distribution lines on Highway 55. The electric power supply to the Airport Commission facilities is fed along the airport access road on an overhead distribution system at 4160 volts 3 phase. After metering, the primary service splits into two, one to serve the electrical loads at the Terminal Building, and one to serve other Airport Commission facilities. Primary transformation takes place at two separate pole-mounted transformer banks - one bank of three 37.5 KVA transformers which supply 120/240 volts at 3 phase for the Terminal Building loads, and one bank of two 5 KVA transformers, which supply 600 volt/3 phase power to the other facilities.

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The Terminal Building electrical loads include building air conditioning, heating, lighting and power requirements, as well as the airfield lighting equipment. Airfield lighting electrical loads include three 4KW constant current regulators for the runway and taxiway edge lighting, and a 7.5 KVA transformer to step up distribution to 600 volts to the low intensity approach lights and runway identification lights for Runways 06 and 24.

Other facilities operated by the Airport Commission are the aviation fuel pumps in the Fuel Compound, the sewage pumps in the Sewage Pump House and the Airport Maintenance Garage. These are served by a branch of the secondary distribution system and supplied with 3-phase power at 600 volts. Power to the Airport Maintenance Garage is stepped down to 120/240 volts with a transformer at the garage.

The Flight Service Station and all tenant-owned facilities on the airport property are served directly by the Hydro Commission using its own distribution system. Separate primary supply is fed from the Hydro Commission's 4160 volt line to the Flight Service Station in the former ATC Tower, and to the individual tenant-owned hangars and buildings. Primary transformation for these loads occurs at or near to the individual buildings or groups of buildings. The Hydro Commission estimate these loads to amount to approximately 500 KW.

The situation prevailing at the time of the Airport Master Plan was that the loads imposed by the Airport Commission facilities are close to the capacity of the supply and transformation system. In addition, the secondary distribution system appears to have been added to over the years and is now is poorly organized and inefficient. With the lack of any significant capacity on the supply side and the state of the secondary distribution for the Airport Commission facilities, an upgrading and total reorganization of the electrical distribution system would appear to be warranted.

In the near term, the Terminal Building primary transformation could be increased to 150 KVA to accommodate a small increase in electrical load. Any substantial increase in airport electrical loads would, however, require a larger pad-mounted transformer installation. This would also require that the incoming primary supply from Highway 55 be upgraded to 27.6 KV with taller poles installed along the airport access road. Primary distribution is available at 27.6 KV on Highway 55, however upgrading of the supply into the airport, including installation of a higher capacity transformer would be the responsibility of the Airport Commission.

3.8.4 Bell Telephone

The airport is served by Bell telephone lines to the terminal area for telephone service to the Airport Commission and tenants on the airport. There are no known constraints in this service and expansion of telephone service could be implemented as required.

3.9 Airport Management, Operations and Maintenance Services

The Niagara District Airport is owned by the Government of Canada, and hence all matters relating to property development and capital projects on the airport are administered by Transport Canada through its Ontario Regional Office. Management, operations and maintenance of the airport are the responsibility of the Niagara District Airport Commission, through a lease held by the Commission with Transport Canada. The lease to operate and maintain the airport was established at the end of the war when the airport ceased to be an RCAF Flying Training Base.

At the time of the master plan, the Airport Commission staff on the airport numbered three full-time employees - an Airport Manager, a Secretary/Accountant and a Maintenance Supervisor. These staff resources are adequate to manage, operate and supervise maintenance of the airport at the present level of activity. No addition to the airport staff will be necessary for some time to come.

Facilities provided for the functions of airport management, operations and maintenance comprise the following:

- Airport Manager's Office (in the Terminal Building)
- Airport Commission Reception/Accounting Office
- Airport Maintenance Garage

The Airport Management Office is located in the Terminal Building. This comprises two rooms at the west end of the building. One of these is the official Airport Commission Meeting Room, while the remaining space is intended for all other airport management and office functions. These comprise the Airport Reception function and all office and accounting functions performed by Airport Commission staff. Due to increasing space needs for the general office and accounting function, the Airport Manager has had to relocate from the general office to the adjoining Airport Commission Meeting Room. This room now functions to accommodate the Airport Manager, Airport Commission Meetings, and other meetings such as construction meetings that may need to be held on the airport site between Transport Canada, its consultants and contractors. Storage for the airport management office function is provided in an electrical room adjacent to the Airport Commission Meeting Room. The present accommodation for the airport management office and Airport Commission functions is now totally inadequate for the purpose and additional space will need to be provided in the future.

The Airport Maintenance Garage comprises a four-bay pole construction building located south of the airport terminal building. Constructed to a standard Transport Canada configuration some 17 years ago, this facility is intended to provide inside storage for airport vehicles and equipment. The building also enables minor maintenance to be performed on airport equipment.

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At the time of the master plan the airport maintenance building was found to be filled with airport equipment, while other vehicles and a runway sweeper are normally stored outside. In some cases, equipment has to be stored outside because it is too wide for the narrow bay structure of the building. In addition, it was noted that no proper workshop, parts storage, staff accommodation or wash-up facilities are available in the present maintenance building. The present maintenance facility is clearly inadequate, both in terms of structure and internal functional space, to properly perform the functions for which it was intended. A larger facility is needed at the airport for storage and maintenance purposes, and this should be addressed in the master plan period as a priority requirement.

3.10 Aviation Support Services

The following support services to aviation are provided at the airport:

- Environment Canada Weather Office, information and briefing service.
- Canada Customs
- Flight Service Station
- Aircraft Refuelling Service.

Environment Canada Weather Office

The Niagara District Airport is equipped with a Weather Office operated by Environment Canada. This office, which is staffed daily with limited hours on weekends, provides aviation weather information and weather briefings to pilots. The office is accommodated in the Terminal Building and, although cramped for space, is adequate for present purposes.

Canada Customs

Niagara District Airport is an authorized airport of entry for general aviation aircraft. Canada Customs service is provided to the airport for the purposes of clearing privately-operated aircraft and small charter flights of up to 15 passengers. Limited clearance of commercial freight consignments is also provided.

Customs service at the airport is provided on the basis of prior notification and within limited hours. A daily 15-hour service (0800 - 2300 hrs.) is available year round with officers on call from the border crossing at Queenston. A 24-hour service is available to the airport at times when Customs manpower resources permit. The extent of the present customs service, both in terms of hours of attendance and type of service, is adequate for the role served by the airport and the nature of its corporate users.

Flight Service Station

The airport is equipped with a Flight Service Station operated by Transport Canada. This is located in the former Air Traffic Control Tower. The FSS has been provided since July 1991 when the Air Traffic Control Unit was withdrawn from the airport. The FSS provides an airport traffic advisory service within the airport traffic zone, and generally to aircraft operating in the Niagara Region.

Aircraft Refuelling Services

Aircraft refuelling service for 100LL and Jet A fuel is available on the airport. Fuel facilities are owned by Shell Canada and leased to the Niagara District Airport Commission. Operation of the aircraft refuelling service is sub-leased by the Commission to the St. Catharines Flying Club, who act as a Shell dealer. Fuel is dispensed to aircraft from fuel tanker trucks owned by Shell Canada and operated by the Flying Club. The price charged for sale of aviation fuel at the airport is established by the Flying Club, however the Commission receive a surcharge of 1.9 cents per litre of fuel dispensed.

The airport fuel facility is a fenced compound located adjacent to the airport access road at the entrance to the Terminal Area. In this area are contained the two underground fuel storage tanks, each of which has a capacity for 10,000 gallons, and all filters, pumps and equipment. The location of the fuel facility is not appropriate as it is well removed from the apron areas and lies in the logical alignment of the airport access road into the Terminal Area. Relocation of the fuel facility will be necessary with any redevelopment of the Terminal area and the access road system.

The present arrangement for operating the airport fuel service has not proved to be acceptable. The availability of fuel through the Flying Club is dependant on the financial health of the Flying Club, and disruption to supply has occurred through lack of funds to purchase fuel. In addition, the Airport Commission has no control on the pricing of fuel by the Flying Club and its own revenue derived from fuel sales is therefore directly influenced by the policies of the Flying Club. As the sale of fuel is a significant revenue generator of airport revenues at municipal airports, the future of the fuel service operation should be re-evaluated by the Commission.

3.11 Instrument Approach Aids

The Niagara District Airport is certified for instrument operations on Runway 06/24 under instrument non-precision approach criteria. Published non-precision approaches are available straight-in to Runway 06 and circling for Runway 24. Due to wind and weather patterns, the favoured IFR approach direction is the Runway 06 approach, which is equipped with a non-directional beacon "SN", located 4.1 nautical miles southwest of the Runway 06 threshold on the extended runway centreline. The "SN" NDB facility is owned and maintained by Transport Canada. Operating minima

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published for the straight-in approach to Runway 06 are 900 ft. minimum descent altitude and 1 ¼ miles visibility. This provides a minimum descent height above runway threshold of 579 ft. for all aircraft categories. For the circling approach to Runway 24 from the "SN" NDB the minimum descent altitude is also 900 ft. (581 ft. above Runway 24 threshold) with 1 ½ miles visibility for aircraft categories A and B. Higher minima apply to aircraft categories C and D.

These instrument approach minima are higher than desirable for an airport keen to serve the corporate aviation community. It is quite probable that IFR operating minima as high as these, which reflect the influence of towers carrying a hydro line over the Welland Canal, would detract from the usefulness of the airport to corporate and commercial operators. Accessibility to the airport under instrument meteorological conditions to the limits available for the NDB approach has been estimated to be less than 96%. This is an inadequate level of accessibility to ensure reliability of access to the airport in poor weather conditions. In addition, it should be noted that the minimum descent altitudes published are increased by 150 ft. (i.e. to 1050 ft. for the final approach minimum descent altitude) when the local on-airport altimeter setting is not available outside the operating hours of the Flight service Station, and an altimeter setting must be obtained from Toronto. It is concluded that the present instrument approach to the Niagara District Airport is not adequate and an improvement in operating minima must be obtained.

Investigation of the present instrument approach has revealed that improvements to the present approaches could possibly be made. A review of the location of the critical obstacles relative to the assessment area should be made to confirm whether the Hydro Towers are in fact the critical obstacles, or whether the Garden City Skyway fulfils this role for the straight-in approach to Runway 06. In addition, an investigation should be carried out to determine whether an NDB/VOR approach might be possible for approaches to Runway 24, with position reference provided from the Buffalo VOR. Options such as these should be investigated as a possible way of reducing the operating minima for IFR access to the airport. In the longer term, since the Garden City Skyway is likely to remain an obstacle to any NDB-based approach to Runway 06, installation of a precision approach aid should be considered.

3.12 Commercial Activity

Commercial activity at the airport comprises the rental of space on the airport to commercial and private sector tenants. The following list catalogues the extent of commercial activities carried out on the airport at the time of the master plan study (1991). The location of the airport tenant leases is illustrated in Exhibit 2.

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Terminal Building Tenants

- Environment Canada - Weather Office
- Canada Customs Office
- Rental Office (1)

Airside Commercial Area Tenants

- Genaire Ltd (1 Wartime hangar and miscellaneous buildings)
- St. Catharines Flying Club (1 hangar and club facilities)
- Hayes-Dana Inc. (1 hangar)
- Conquest Air Ltd. (1 hangar)
- Steed & Evans (1 hangar)
- Angus Gordon (1 hangar)

Landside Commercial Area Tenants

- Aztec Yachts
- Civilian Air Rescue Emergency Service (CARES)

Other Commercial Activity

- Aircraft Refuelling -
Jet A and 100LL fuels
Pumps, tanks (2x10,000 gal.) and equipment owned by Shell Canada.

Refuelling services are operated under sub-lease from the Niagara District Airport Commission by the St. Catharines Flying Club.

3.13 Air Traffic Activity

Air traffic activity statistics for the Niagara District Airport reflect the number of aircraft movements recorded by the Flight Service Station and the former Air Traffic Control Unit during the hours of operation of these services. A small number of movements occur outside these hours and are therefore not recorded officially by the airport. The statistics distinguish between "local" and "itinerant" aircraft movements due to the different character of the traffic groups and their purpose for using the airport. Local movements are defined as those activities by aircraft departing and returning to the airport without leaving the airport traffic area. Essentially, the local movement activity reflects the extent of circuit operations associated with flying training carried out at the airport, normally by the flying school based at the airport. Itinerant movements are those by aircraft whose place of origin or destination is at an airport other than Niagara District, and represent activities by aircraft visiting the airport for reasons of tourism, pleasure or business.

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The historical pattern of aircraft movements recorded at the airport for the years 1985 to 1991 is listed below:

Year	Jet & Turbine Itinerant A/C Movements	Total Itinerant Movements	Local Aircraft Movements	Total Airport Movements
1985	1167	18,600	39,900	58,500
1986	1036	19,300	38,700	58,000
1987	1201	16,500	29,700	46,200
1988	1119	14,900	27,600	42,500
1989	1041	19,200	23,500	43,700
1990	928	16,400	31,600	48,000
1991	N/A	14,190	21,950	36,140

In the above table it should be noted that detailed movements for the jet and turboprop aircraft categories were not available for 1991 at the time of the Airport Master Plan. Movements by these aircraft, and by other itinerant aircraft, were depressed in 1991 as Runway 06/24 was closed for two summer months for resurfacing. In that period only light aircraft able to operate on the remaining two short runways had access to the airport.

The historical record of aircraft movements shows that the local aircraft movements, which represent about 65% of total movements, has been in a steady decline since the mid-1980's, with the current level of activity being about 45% lower than for 1985. This is an indicator of the level of flying training carried out at the airport. Itinerant traffic, which represents about 35% of total traffic activity, has fluctuated by about 15% between the high and low levels in the years to 1990. While there have been increases and decreases in itinerant traffic from year to year, there is no evidence of a sustained decline in this traffic group. The 13% decrease between 1990 and 1991 can, in part, be attributed to the runway closure in the summer of 1991, although the 1991/92 recession is also likely to have been a factor.

Itinerant aircraft visit the airport for a variety of purposes, including tourism, recreation and business. Analysis of the aircraft movement statistics cannot distinguish the first two of these, but a reasonable estimate of the use of the airport by the larger business users can be made from the number of jet and turboprop aircraft recorded. In this case, the jet and turboprop aircraft represent approximately 6.5% of itinerant traffic. In the period 1985 to 1990, this traffic group has fluctuated from year to year within a range of 23% between the high and low levels. Aside from a regular fluctuation, there is no clear pattern in the recorded movements, and the corporate traffic is considered to have been relatively stable over the period investigated.

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From the historical traffic information available for the past seven years it is possible to conclude that the total aircraft activity at the Niagara District Airport has declined considerably. It is clear that this decline is a result of declining local movements, rather than a trend in the itinerant traffic group. As flying training is the principal reason for local aircraft movements at an airport, it is reasonable to conclude that the airport traffic levels reflect a reduced level of local flying training at the airport over the past several years.

Also clear from the statistics is that the itinerant traffic levels have been fluctuating from year to year, with no pattern of decline evident. This means that, aside from the effects of the lower levels of traffic in 1991, the level of traffic generated by visiting tourists, recreational aviators and the corporate sector has been relatively stable. Air traffic generated by the larger business users, as represented by aircraft movements by jet and turboprop aircraft, also appears to be relatively stable, despite of fluctuations from year to the year. The size of the fluctuations in this sector is not large and are of the order of 80 to 165 movements between any two consecutive years. The general stability of itinerant traffic is important for the airport, since the role of the airport in the future will be primarily to serve the needs of the itinerant traffic group, rather than function as a base for flying training.

As far as the future is concerned, it is particularly difficult to forecast future airport traffic movements when the major part of the airport's traffic (flying training local movements) is in a decline. Whether this trend continues will depend on the local economic conditions and the service offered and marketing efforts of the local flying training schools. No attempt has been made in this project to forecast the future of the flying training market and the local movements that this will generate for the airport in the future. Since the airport is operating well under capacity, and the facilities planned for the airport in the future are not dependant on this traffic, there is no risk associated with the uncertainty over future local traffic volumes.

Itinerant movements at general aviation airports are often forecast in relation to the expected levels of growth in local population and economic indicators. On this basis, assuming a reasonable recovery of itinerant traffic in 1993 and a growth rate in the region of 3% per annum, it could be expected that itinerant traffic levels could increase to between 22,000 and 25,000 annual movements over the coming ten years. This does not take into account the effect of additional on-site development that might attract more itinerant traffic to the airport. With the benefit of added services, improved facilities and more aviation businesses located on the airport, the growth in itinerant traffic would be expected to be greater than this broad forecast.

4.0 BASIS FOR MASTER PLANNING - AIRPORT DEVELOPMENT REQUIREMENTS

4.1 Airport Role

In its airport system development plan (Ontario Airports System Plan - OASP), the Ontario Ministry of Transportation classified the Niagara District Airport as a "**General Transport Airport**". This defines an airport that has the capability to serve large transport category aircraft (up to 91,000 kg. gross weight), and is equipped with a runway in the length range of 1350 m. to 1800 m. With the exception of the pavement bearing capacity which is presently below the specified gross weight limit, the MTO classification reflects the current design capability of the airport, and is indicative of the size and type of aircraft that could use the present 1524 m. runway. Although use of the airport by aircraft having performance requirements at the upper limit of the runway capability is very limited, the present classification is accepted and no change is suggested for the master plan period.

The airport's classification should be regarded as indicative of the role that the airport might be expected to achieve at some time in the future, given an environment that will foster growth. At the present time, the population of the airport service area, taken as the limits of the regional municipality, is estimated at 387,000. Future growth in population will likely be below the provincial average, at an estimated 1.1% per annum, and the projected population of the airport service area in ten years time is expected to be in the region of 432,000. Despite the effects of the 1991/92 recession, a solid industrial base is evident in the Region, with 26% of the workforce engaged in manufacturing, especially in the aerospace and automotive industries. The size of the regional population and existence of a local industrial base implies that the airport could well serve to support industry, including corporate and freight transport. An expanding population, possibly enhanced by relocation of government offices to the area, could also create a limited market for short-haul commercial passenger air services of a commuter nature.

In view of this, it is entirely appropriate that the airport classification of **General Transport Airport** be applied to reflect the scale of future development of the Niagara District Airport within the master plan period to the year 2011. This classification establishes that at its maximum scale of development the airport would have a primary runway of 1800 m. in length, with a pavement strength on the runway, associated taxiway and terminal apron capable of supporting frequent operations by aircraft up to 47,000 kg. gross take-off weight.

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For the purposes of the Airport Master Plan, the future role of the Niagara District Airport has been defined as follows:

"The role of the Niagara District Airport, on which the Airport Master Plan is based, is to function as a fully commercial entity under the direction of the Airport Commission, with the primary purpose of catering to the needs of commercial and corporate aviation within the commercial service area of the Niagara Region. In this role it should provide development land and facilities to attract aviation-related business to locate on the airport, support local industrial growth by facilitating access by corporate aviation, and encourage commercial passenger and freight air services to the extent that markets for these can be developed."

4.2 Airport Development Requirements

The Niagara District Airport Master Plan, and the facilities and services identified in the plan for development or upgrading, is based on the planned future role of the airport. This reflects a projection of the type and nature of air traffic likely to use the airport in the planning period, and the scale of commercial, corporate and general aviation activity to be accommodated on the site. Two types of requirements are identified for the master plan:

- Requirements for upgraded facilities and services where inadequacies and deficiencies in the existing airport have been identified; and
- Requirements for new facilities and services that do not currently exist, but are needed to fulfil the proposed airport role.

Both of the above conditions have been used to define the principal requirements for airport development within the master plan program. These are addressed in the following paragraphs:

1. Primary Runway

In keeping with the anticipated role of the airport and its classification, the master plan must provide for the ability to extend the primary runway from its present 1524 m. to an ultimate length of 1800 m. This will ensure that the airport could appeal to as wide an air transport market as is reasonable for a regional municipal airport, and can support operations by all corporate jet aircraft and some medium jet transport aircraft used in charter and freight operations. To provide for an 1800 m. runway, an eastward extension of 276 m. to the existing primary runway is possible.

2. Secondary (Crosswind) Runway

To accommodate the continuing role of the Niagara District Airport to support flying training and light aircraft used privately for recreational purposes, a single crosswind runway should be maintained. This should be Runway 01/19, which is presently 762m. in length and generally adequate for the purpose of accommodating aircraft limited by crosswinds on the primary runway. The possibility of extending this runway to 914 m. should be maintained as a long-term requirement, to be justified by traffic needs. The present third runway at the airport (Runway 11/29) is not required for operations.

3. Airside Pavements

The primary airport pavements, such as main runway, taxiways serving the primary runway, as well as the terminal apron and access taxiways into major commercial areas should be planned and developed with the clearances appropriate for Transport Canada Code 'C' aircraft. A structural capability to accommodate aircraft up to 50,000 kg. gross take-off weight at tire pressures up to 1.03 MPa (150 psi) should be a development objective for all of these pavements. At the time of the master plan the primary runway satisfied current requirements, although in any future reconstruction of the runway, the higher strength and tire pressure criteria should be adopted. Reconstruction of Runway 06/24 is expected to be a rehabilitation requirement that will arise during the master plan period, since the asphalt overlay applied in 1991 was placed over a very badly cracked runway.

With the exception of Taxiway "B", the taxiway system serving Runway 06/24, including Taxiway "A", the apron taxiway and the southern portion of Runway 01/19, are well below the structural strength and tire pressure criteria for the primary runway. Upgrading of these pavements to match the strength criteria of Runway 06/24 is a requirement for the future.

The secondary pavements, such as Runway 01/19 north of the intersection with Runway 06/24, all existing and future light aircraft parking aprons and access taxiways to secondary commercial development areas, should be designed for Code 'B' aircraft at gross weights of 8000 kg. and tire pressures of 0.69 MPa. (100 psi). At the time of the master plan the portion of Runway 01/19 north of the intersection with Runway 01/19 fulfilled these criteria, however the remaining pavement areas considered as secondary pavements did not. Upgrading of the light aircraft parking apron to the defined strength and tire pressure criteria is a requirement for the master plan.

4. Airside Operations

Improvements to the airside operation for Runway 06/24 are necessary to avoid congestion and potentially hazardous operations in the area of the Taxiway "B" exit from Runway 06/24. A requirement has been identified for an additional runway exit taxiway, west of Taxiway "B", to alleviate present taxiing problems on Apron II and Taxiway "B".

5. Instrument Flight Operations

The airport's instrument approach, based on an NDB in the centre of St. Catharines, is penalized with high operating minima due to obstacles along the Welland Canal, including the Garden City Skyway. The present high operating minima are inadequate for the intended role of the airport. An upgrading of the instrument approach facilities is a requirement for the future. Reflecting both this existing problem and the future role of the airport, an upgrading of the existing non-precision approach instrumentation in favour of a precision approach system such as an Instrument Landing System (ILS) or Microwave Landing System (MLS) is required in the future. To protect for this, all future development on the airport must be carried out such that the physical requirements for operations under instrument flight rules are met within the criteria for precision instrument operations on the primary runway. Protection of the instrument precision approach critical areas is presently provided through federal registered zoning for the present 1524 m. primary runway. Protection for instrument precision approach criteria for an extended runway will require that additional property be acquired on the north and east side of the airport for protection of the extended runway strip and precision approach instrumentation.

Although the ultimate requirement to upgrade the instrument approach is to install precision approach instrumentation an interim improvement, should a precision approach appear unattainable in the near term, would be to install a localizer for the Runway 06 approach in conjunction with a DME unit. At a later stage a glide path unit could then be added to provide descent guidance to create the precision approach capability.

6. Terminal Area Development

The airport's terminal building, erected in 1967, is a temporary structure that is now inadequate for the purpose it is intended to serve. Space within the building is insufficient for terminal and management functions and, as a temporary structure, the building is not in keeping with the image that the Airport Commission should portray to visiting corporate and commercial users. A clear requirement of the master plan is that provision needs to be made for the early construction of a new terminal building, car park and terminal circulation road system. The new terminal building will need to provide a considerable increase in space over the present structure. Provision must be made for development of an unconstrained terminal building and apron area to serve visiting commercial, corporate and general aviation aircraft. The Terminal

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Building for the Niagara District Airport should be sized to accommodate commercial passenger flights of up to 20 passengers, including provision to add airline handling and security processing. Expansion of this facility must be possible in order to accommodate the potential to handle greater numbers of terminal users should a market for commercial air services develop in the longer term. In addition, the Terminal Building is required to provide space for general and corporate aviation, support services such as reception and catering, flight planning, meteorological briefing and customs, and accommodate the airport management functions.

7. Commercial Development

Aside from limited infilling of apron frontage west of the present terminal building, there is a lack of serviced land available for airside commercial development. This presently prevents the airport from attracting aviation commercial business to the site. To fulfil the airport role and attract commercial aviation activity to the airport, additional development areas must be designated on the airport site. These areas are required to provide for future aviation commercial development (airside frontage), as well as for limited aviation-related activities that require only landside frontage. Such development areas must be capable of incremental expansion and servicing to accommodate a changing demand for lease lots over time.

4.3 Design Conditions for Master Plan Airside Development

Design conditions affecting the development of the master plan relate principally to the airside pavements and the obstacle limitation surfaces associated with the runways. The following design conditions have been established for the development of the airport airside system in the master plan. These conditions relate to the certification standards established by Transport Canada for certified airports (Transport Canada Publication TP 312E).

1. Runway 06/24 (Primary Runway)

Ultimate runway length	1800 m.
Runway width	30 m.*
Design runway code	3
Design aircraft code	C
Operational approach category	Instrument (Precision)
Runway strip width	300 m.
Approach surface slope	2.0 %
Transitional surface slope	14.3 %

* Note that the existing runway width of 45 m. exceeds the minimum required width of 30 m.

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2. Runway 01/19 (Crosswind Runway)

Ultimate runway length	915 m.
Runway width	23 m.
Design runway code	2
Design aircraft code	B
Operational approach category	Non instrument (Day & Night VFR)
Runway strip width	60 m.
Approach surface slope	4.0 %
Transitional surface slope	20.0 %

3. Obstacle Clearances

Runway to Taxiway clearance	168.0 m.
Taxiway to obstacle clearance	28.5 m.
Apron taxi-lane clearance	24.5 m.
Aircraft/aircraft apron clearance	4.5 m.
Aircraft/apron obstacle clearance	15.0 m.
Airport property line clearance	9.0 m.
Approach roadway clearance	4.5 m.

4. Pavement Requirements

Primary Airside Pavements Structural Strength
(applies to primary runway, principal taxiways
and aprons):

Aircraft Gross Take-off Weight	50,000 kg.
Aircraft Tire Pressure	1.03 MPa. (150 psi)
Aircraft Load Rating	ALR 8

Secondary Airside Pavements Structural Strength
(applies to light aircraft paved areas):

Aircraft Gross Take-off Weight	8,000 kg.
Aircraft Tire Pressure	0.69 MPa. (100 psi)
Aircraft Load Rating	ALR 3

The above design conditions affect the planning of the airside facilities on the airport to comply with Transport Canada certification standards. In some cases the existing conditions may exceed the required minimum standards, or engineering considerations may require that a higher standard be applied.

4.4 Site Conditions and Constraints

The airport site lies in a generally flat agricultural area, devoid of any significant topographical features that would constrain future development of the airport facilities. A gentle slope from south-west to north-east is evident, with elevations ranging from 98 m. (321.5 ft.) to 96 m. (315 ft.).

Drainage of the airport lands is effective and no difficulties are expected in draining run-off from future paved areas on the airport site. Underlying soils are silty-clay in nature, which is not good for natural drainage, however no difficulties have been encountered that would suggest that the soil conditions would inhibit future development on the site.

With the exception of a two small areas of land in the south-west corner and north of the present Runway 11/29, the airport site does not include any surplus lands. Only limited facility development can take place on the existing vacant airport lands and on limited undeveloped parcels of land west of the terminal building and east of the Airport Maintenance Garage. Development needs in excess of the space available on site can be accommodated through expansion of the airport site. To the east, west and north, the airport site is not constrained and could be expanded into neighbouring agricultural land. Lands adjacent to the airport site on all sides have the same characteristics as the airport itself, and site expansion would not introduce difficulties for the construction of buildings and supporting infrastructure.

The airport site and its conditions are such that no serious constraints to development are evident. The only limiting factor to airport development would appear to be the lack of adequate space for accommodating aviation commercial development, and additional property would be necessary for this.

4.5 Options for Site Development

Following a review of the existing airport site, its condition and facilities, the master planning process identified a number of airport development requirements. Aside from those relating to the airside pavements and operations, two involve development of the airport site. The first is the need for space in the terminal area in which to develop a new terminal building, car park and access road system. In this case sufficient space could be made available in the vicinity of the present terminal building. No additional lands would be required to satisfy the terminal area requirement, however removal of some of the existing roads and the present airport maintenance facility would be necessary. The second requirement concerns the need to ensure that land is available for aviation commercial development. A deficiency of developable land has been identified and the airport can presently offer only very limited space for additional private and commercial hangar development. To remedy this, the master plan must assign lands for future aviation commercial development.

Areas on the airport site and adjacent to the airport that might be suitable candidates for aviation development were therefore subjected to assessment. In each case, aside from criteria relating to the physical development of the lands identified, suitability was judged on the basis of the ease of providing both airside (taxiway) access and landside (road) access, and the ease or difficulty of servicing development areas with utilities. Operational considerations and the potential for phasing development were also weighed in order to determine which of the potential development areas should be recommended for the airport master plan.

Three general areas on, and adjacent to, the airport were identified as having the potential to be developed for aviation commercial purposes. The merits of these areas are discussed below and the areas themselves are illustrated in Exhibit 4.

4.5.1 Area Development Options

Area 'A' - North Development Option

Area 'A' is an area north of Runway 11/29 lying between the existing runway and the airport's northern property boundary. A total area of 8.9 ha. (22.0 ac.) is available in this area. Access to development on the north side of the airport is possible, however this would require construction of an access road from Carlton Road north of the airport. A road allowance (Irvine Road) exists between private properties bordering the airport on the north side, and no additional property purchase would be necessary to open this area for development. No utility services are presently available to the area and any such development would require provision of full utilities.

Area 'A' would be suitable for construction of airside pavements, access roads, and buildings related to aviation commercial development. Due to its location, which is remote from the focus of airport facilities on the south side of the primary runway, Area 'A' would, perhaps, be best suited to accommodating a single large tenant whose activities do not require frequent direct contact with the airport's terminal area.

Area 'B' - South-West Development Option

Area 'B' comprises two parcels of land, designated 'B1' and 'B2' on Exhibit 4, in the south-west of the airport site.

Area 'B1' comprises an area of 7.8 ha. (19.4 ac.) in the extreme south-west of the airport site and lies entirely within the airport property. The area is suitable for aviation commercial development and an acceptable lease lot subdivision scheme can be created for both small and medium-sized hangars. Access to the area for aircraft could be provided from Taxiway 'A', while vehicular access could be provided from

an extension of a road that presently serves the Genaire building. Utility servicing for the area could be provided as a direct extension of the airport terminal area utilities. There appear to be no constraints to opening Area 'B1' for near-term development.

Area 'B2' comprises an area of 10.1 ha. (24.9 ac.) lying immediately east of 'B1' and south of the airport terminal area. At the present time this parcel of land, which is privately-owned, is in agricultural production, although zoned for airport industrial use in the draft official plan of the Town of Niagara -on-the-Lake. Area 'B2' is suitable for development for aviation commercial uses, and could be accessed by aircraft by means of a taxiway from Taxiway 'A' passing through Area 'B1'. Road access to development in Area 'B2' could be provided directly from the existing airport access road. Utility services to Area 'B2' could be provided in a similar manner to Area 'B1' as part of the airport utility servicing in the southern part of the site.

Of these two land parcels, development of 'B1' would create a very suitable aviation commercial development area for small and medium-sized hangars, including T-Hangars and multiple unit hangars for light aircraft within the Code 'B' category. Development of Area 'B2', although technically possible, is less appropriate, since subdivision of this area for lease lots and airside access would result in a long 'dead-end' taxiway due to the remoteness of this area from the present airside pavements. On operational grounds, a long taxiway of this nature would be undesirable, and could only be considered if no other possibility exists.

Area 'C' - South-East Development Option

Area 'C' is an area comprising 20.1 ha. (49.9 ac.) located south of the primary runway and east of an area of existing aviation commercial development. Part of this area (5.6 ha. - 13.7 ac.) lies within the present airport property, and the remaining lands, amounting to 14.5 ha. (36 ac.), lie outside the airport and would need to be acquired from private owners if this area were to be developed. The entire area is suitable for aviation commercial development and for subdividing into a lease lot system for medium and large size hangars. Airside access for aircraft could be provided from a future taxiway parallel to the primary runway. Access on landside could also be readily provided by extension of an existing airport road. The area lends itself to a progressive expansion and could be designed such that an eastward expansion of the airside subdivision could take place in stages, along with a progressive extension of the landside access road and corresponding extension of a parallel taxiway to Runway 06/24.

4.5.2 Assessment of Potential Development Areas

Assessment of the potential of the three areas to support future pavement and building development revealed that Areas 'B1' and 'C' would be the most suitable to develop for aviation commercial uses.

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AIRPORT MASTER PLAN*

Area 'B1' can readily be subdivided and prepared for development and made available for tenants to construct facilities for light aircraft storage, maintenance and repair. No additional land purchase would be necessary to initiate this development, and site grading and construction of the necessary infrastructure, such as a taxiway, access road and utilities, could be phased to respond to a developing demand for lease land.

Area 'C' is also favoured for development as an aviation commercial area since it can be provided with both airside and landside access without difficulty. The size of the area would enable the airport to offer large lease sites for use by tenants wishing to construct large hangar facilities. While a part of the suggested area lies within the airport, additional land would be required in order to realise this development. Site grading and construction of the necessary infrastructure to access and service this development area could be phased to respond to developing demand for lease land.

A combination of Areas 'B1' and 'C' could provide ample development land for lease to aviation commercial tenants for the master plan period and beyond. Should additional lands beyond these be required at some time in the future, the area to the north of the primary runway, Area 'A', could be developed. It is possible that a single large tenant could conceivably be attracted to the airport at some time in the future and it would therefore be prudent to reserve Area 'A' for future commercial use in order to keep this option open. Since the land in question is already within the airport property and no additional land purchase would be required, reserving Area 'A' for such a future use does not carry any disadvantages to the airport, or to the conceptual form of the airport master plan.

5.0 AIRPORT MASTER PLAN

This chapter describes the Niagara District Airport Master Plan, as developed to reflect the future airport role and corresponding long term development requirements. The layout of the airport master plan developed in this master plan project is illustrated in Exhibit 5 for the entire airport site, and in Exhibit 6 for the central terminal development area.

5.1 Site Development & Property Acquisition

The airport master plan proposes that the airport property be expanded by acquiring land bordering the south side of the airport, both west and east of the terminal area, and land immediately east of the airport in the Runway 24 approach area. This represents a site expansion of approximately 33.9 ha. (83.8 acres) to acquire the suggested lands. Land acquisition requirements to fulfil the master plan concept are as follows:

- Area south of existing Genaire lease to permit construction of access to proposed South-West Aviation Development Area (1.0 ha. - 2.5 ac.)
- Area northeast of the terminal area to permit development of the proposed South-East Aviation Development Area and a new Airport Maintenance Facility (14.5 ha. - 35.8 ac.).
- Area on the northeast of the airport, within the Runway 24 approach area, to protect for a site for precision instrument approach electronic equipment (18.4 ha. - 45.6 ac.). This is reduced to 1.3 ha. (3.3 ac.) if Runway 06/24 is not extended to 1800 m.

The purpose of this site expansion is, firstly, to accommodate future development of an extensive commercial lease area for aviation-related commercial activity, and, secondly, to ensure that land is available on which to site a future precision approach landing system and protect the operation of this facility.

It should be noted that the area identified for acquisition for a precision approach aid is based on the requirements for an instrument landing system (ILS) localizer installation, and assumes a runway extension to 1800 m. In practice, because the lands beyond the threshold of Runway 24 are under registered federal zoning control, it may prove to be necessary to acquire a smaller area than identified above to ensure an acceptable degree of protection for the localizer installation. This issue will be settled between the Airport Commission and Transport Canada at the time that the Commission elects to proceed with installation of a precision approach aid.

No other land acquisition is considered necessary to develop the Airport Master Plan.

5.2 Airside Development (Runways and Taxiways)

5.2.1 Primary Runway 06/24

It is proposed that Runway 06/24 be retained as the primary (instrument) runway for the airport. An extension of 276 m. would be added to its eastern end to provide an ultimate total runway length of 1800 m. This would be phased as a medium term project and enable the airport to fulfil its future long-term role and attract to the airport aircraft that might be operationally constrained by the existing runway length.

The existing runway pavement (1524 m. in length and 45 m. wide), which has recently been overlaid with a 60 mm. lift of asphalt, would be reconstructed within the life of this master plan. It is proposed that this be accomplished in the latter part of the period, and anticipated for the years 2003 to 2010.

5.2.2 Secondary Runway 01/19 (& Runway 11/29)

It is proposed that the paved Runway 01/19 would be maintained as a serviceable crosswind runway for non-instrument day and night use. The runway itself would be retained at its present length of 762 m. (2500 ft.) throughout the master plan period. However, should an increased use of the runway become necessary due to local climatic changes or a change in the nature of aircraft using the airport, consideration should be given to lengthening this runway to 914 m. (3000 ft.). Provision has been made in the master plan to permit such an extension, by means of construction of an additional 152 m. of runway to the south end of the existing Runway 01/19.

An upgrading of the pavement forming the southern portion of Runway 01/19 (i.e. the section south of Runway 06/24 is proposed in the master plan. This is because Runway 01/19 has a pavement strength below that of Runway 06/24, yet the southern section of the runway is used by aircraft taxiing for Runway 06/24, either departing from Runway 06, or exiting at the west end after landing on Runway 24. The strength of the southern portion of Runway 01/19 should be compatible with the proposed strength of Taxiway 'A' and Runway 06/24, since these pavements are all to be used by the same aircraft types and weights. The northern section of Runway 01/19 (i.e. the section north of the intersection with Runway 06/24) does not require any further upgrading on the basis of traffic demand and, other than normal maintenance and periodic overlay of the pavement, no other recommendations are put forward for this runway.

With regard to the present Runway 11/29, it has been concluded on the basis of the airport role and anticipated levels of aircraft activity, that this runway is not required to provide wind coverage for the remaining two runways, nor is it required to add runway capacity or support airport operations. Consequently, the master plan concludes that this runway should be decommissioned as a runway, and downgraded

to taxiway status. As a taxiway, the former Runway 11/29 would be maintained as a link taxiway between the Runway 06/24 intersection with Taxiway "B" and the threshold of Runway 19.

5.2.3 Taxiway System - Runway 06/24

The taxiway connections to Runway 06/24 from the Terminal Aprons existing at the time of the master plan would be retained as part of the master plan configuration for the airside. Taxiway "A", which presently links the Terminal Aprons to the threshold of Runway 01 (to serve Runways 01 and 06) would be reconstructed and upgraded in load bearing capability early in the master plan period. Taxiway "B", which was overlaid as part of Transport Canada's 1991 overlay program at the airport, would be maintained as a primary taxiway link to Runway 06/24 from the east end of the Terminal Aprons.

Additional taxiways are proposed for Runway 06/24. These are a staged development of a full parallel taxiway to Runway 06/24 (Taxiway "E"), and an exit taxiway (Taxiway "G") to Apron I at approximately 450 m. from the threshold of Runway 06.

Construction of Taxiway "E" (the parallel taxiway) would be carried out in stages in keeping with the pace of development in the South-East Aviation Commercial Area. Development in this area would occur in a progressive fashion towards the east, with the taxiway extended eastward as justified by development needs. Extension of the parallel taxiway eastward from the Terminal Apron would be achieved in stages to provide access to new commercial development areas south of the runway. Ultimately, if aircraft movement volumes increase to the point that traffic conflicts on the taxiway system are creating delays to taxiing aircraft, the parallel taxiway would be extended further east to link to the threshold of Runway 24.

Construction of an additional taxiway link (Taxiway "G"), connecting the west apron area to Runway 06/24, is also proposed. This link is intended to function as an exit taxiway from Runway 06/24 to relieve an existing capacity problem on the runway, as well as congestion and conflict in the area of Taxiway "B" between arriving and departing aircraft. Since completion of the full length parallel taxiway to Runway 06/24 would only be justified by commercial development and consequently would be a long-term project, construction of Taxiway "G", the exit taxiway, would be staged as an early improvement.

5.2.4 Taxiway System - Commercial Area Access Taxiways

Six additional taxiways are included in the master plan to provide airside access to the proposed aviation commercial development areas. These taxiways are all intended to provide direct airside access for aircraft into proposed commercial development lots designed for the South-West and South-East Aviation Commercial Development Areas, as well as into an existing airside hangar development near to the ATC Control Tower. Although known as taxiways, and intended to function as surfaces on which to taxi aircraft between the commercial development lots and the airport taxiway system, these commercial development access taxiways are not defined as aircraft manoeuvring areas within the definition employed by Transport Canada. This clarification needs to be made since these taxiways would not have the same legal status as the airport's designated taxiway system.

In the South-West, a single taxiway, Taxiway "F", is proposed as an access taxiway into aviation commercial development in the South-West of the site. This taxiway would link to Taxiway "A" to serve two rows of aviation commercial lease lots. Taxiway "F" would be constructed in two stages. The first stage would proceed very early in the master plan period in order to permit access to the initial development lots in this commercial area. As necessitated by demand for airside development sites, this taxiway would be extended to the south to serve additional development lots.

In the South-East, four taxiways, "E1", "E2", "E3", and "E4", are proposed to provide access to the South-East Aviation Commercial Development Area. These link to the proposed parallel taxiway to Runway 06/24 (Taxiway "E") and would be developed in stages in keeping with the development of the South-East Commercial Area. Initially, the first section of the parallel taxiway (Taxiway "E") would be constructed with its access taxiway (Taxiway "E1") into the first module of commercial development. Later, as warranted by development needs, Taxiway "E" would be further extended and the second access taxiway (Taxiway "E2") constructed into the second development module. This process would continue until the entire South-East Development Area is filled and the parallel taxiway completed to the threshold of Runway 24.

The sixth commercial access taxiway proposed for the master plan is Taxiway "H". This would lead from Taxiway "E", east of the proposed eastward apron expansion, to serve the existing developed commercial area near the former ATC Control Tower. This taxiway has been added so that direct access may be gained to the hangar development without necessitating access via the terminal apron. Much of the area to be served by Taxiway "H" is already leased to corporate and commercial tenants, and provision of Taxiway "H" would only open up one or two additional lease lots. However, this taxiway is a necessary improvement, due to the inefficient use of the terminal apron that would result if it were not provided.

5.3 Terminal Area Development

The master plan proposes substantial redevelopment of the terminal area. Although the terminal facilities would remain in the same location, the existing temporary terminal building would be replaced with a new permanent structure. A new car park would be constructed immediately south of the new terminal building, and a new circulation road system provided. On airside, the terminal apron would be extended to the east to allow for increased aircraft parking and manoeuvring space.

Apron Development

The proposed public apron expansion would be contiguous with the future parallel taxiway to Runway 06/24 and access to the apron for aircraft would be from the existing Taxiway "B", or from Taxiway "A" along the north edge of the apron. Expansion of the apron is proposed in two areas. To the east of the Terminal an expansion of 120 m. is proposed for Apron II to provide an expanded area for itinerant aircraft having a need to park in the vicinity of the terminal facilities. At the present time the area available for itinerant parking at the Terminal is limited and insufficient for the corporate aircraft that use the airport. This pavement would be a primary airside pavement and therefore designed for aircraft having a load rating of 7 to 8, subject to frost conditions.

Apron expansion is also recommended to the west of the existing Apron I. This will involve an actual westward expansion of the apron by 130 m., as well as an infilling of land between the present and proposed alignment of Taxiway "A". At the same time, additional infilling is suggested to the west of the proposed apron expansion as far as the future Taxiway "F", including the access area to the St. Catharines Flying Club T-Hangar. This westward expansion of Apron I and the infill areas are intended to provide a paved parking area for light aircraft (Code A and B) for lease as long-term parking positions. This apron expansion would be a secondary airside pavement and would be designed for aircraft having a load rating of 3, subject to frost conditions. With the apron space proposed for the very long term as a result of the westward expansion of Apron I, it is likely that the Airport Commission could provide paved tie-down parking for all light aircraft that require outside tie-downs, rather than making provision for a grassed tie-down area.

Terminal Building

The master plan proposes a new terminal/operations building. This building would replace the existing facility, but would be positioned to enable a phased replacement of the existing building. To accommodate the functional requirements of a public terminal to serve corporate, commercial and private users, including a possible commuter air service, as well as customs, weather office and airport administration, the initial construction of the terminal building would be to provide a gross main floor area of 420 m². Expansion of the terminal building to the east and west would also be possible to accommodate any future additional space needs, provided that the

initial planning of the terminal anticipates such possibilities. All existing terminal building functions would be accommodated in the new terminal, however, space allocations would be increased for the functions of the passenger waiting area, general and corporate aviation pilot's lounge, offices, washrooms and airport administration. Provision would be made in the initial space planning to enable food service to be established should the need for this become apparent.

Public Car Park

A new public car park to serve the terminal building would be developed to the immediate south of the building. The area assigned for the new car park in the master plan is capable of accommodating in excess of 150 cars at its maximum development. Initial development would be for a capacity of 62 cars, and the remainder of the car park would be added in later phases as required to satisfy demand. Construction of the new car park would entail complete redevelopment of the terminal approach roads to enable a proper access to the terminal building and a close proximity of the car park to the terminal.

5.4 Commercial Area Development

The master plan proposes that additional airside commercial development on the airport site occurs through the infilling of two existing development areas (Terminal Area - West and East), and the development of two new areas (South-West and South-East Aviation Commercial Development Areas).

Terminal Area - West

The area west of the terminal building as far as the St. Catharines Flying Club T-Hangar, could provide an additional 1.5 ha. of airside commercial lease space in 3 lease lots. One of these lots comprises the large vacant area immediately west of the Terminal building. The other two lots are created by extending the existing service road for the St. Catharines Flying Club and Genaire Building on a straight alignment. This road alignment has been necessary in order to avoid the Genaire lease holding, while providing an access to the proposed South-West Commercial Development Area to the west of the Genaire facilities. Additional developable land results, however, to provide for the access road, the Airport Commission will need to acquire an additional 1.0 ha. (2.5 ac.) of land that is presently in private ownership.

Terminal Area - East

The second area where infilling could occur is the area presently occupied by corporate and commercial hangars east of the former ATC Tower. Through reorganization of the leases and relocation of an existing small hangar, an additional lease lot of approximately 0.35 ha. (0.85 ac.) can be created. This does not require any additional property.

South-West Aviation Commercial Development Area

In the southwest of the airport site the master plan proposes that an airside development subdivision be created to the south of Taxiway "A", east of the approach to Runway 01. This area would be developed for light aircraft storage purposes and designed to accommodate small individual aircraft hangars, T-Hangars and multiple aircraft hangars. The western half of the development would be designated for small individual hangars and T-Hangars, while the eastern half would be more appropriately used for any larger hangars, especially for multiple aircraft hangars. Airside access to this area would be from a new taxiway, Taxiway "F", which would lead south from Taxiway "A". Landside access to the area would be provided from an extension of a road that leads west from the terminal area to serve the St. Catharines Flying Club and the Genaire Building. The new access road for the South-West Commercial Development Area would be aligned to pass around the rear of the airside development to provide a rear lot access to the development. Utility services for this area would be routed within the right-of-way of this road system. The South-West Commercial Development Area comprises a gross area of 7.7 ha. (19.0 ac.), of which a net leasable area of 3.9 ha. (9.5 ac.) could be created for rental to airport tenants. No additional property is required for this development.

South-East Aviation Commercial Development Area

The South-East Aviation Commercial Development Area is located to the north-east of the airport terminal complex, east of the existing Terminal Area - East Hangar Development, and south of the alignment of the future parallel taxiway (Taxiway "E") for Runway 06/24. The South-East Development Area is an airside development area, intended for major airside aviation uses, and designed for implementation in four modules. The modular nature of the proposed development would enable the Airport Commission to open up lease lots to prospective tenants on a module-by-module basis, in response to demand. While all of the property for the proposed commercial development area needs to be acquired, the site preparation and construction of roads, access taxiways and utility infrastructure can be staged over time. Airside access into the South-East Commercial Area is planned to be from Taxiway "E", the parallel taxiway to Runway 06/24, with direct access to the individual lots provided from four access taxiways, "E1", "E2", "E3", and "E4". Landside access would be from a road leading east from the airport access road, which would provide rear lot access to the development modules. All utility services would be provided in the right-of-way of the access road system. The South-East Commercial Development Area comprises a gross area of 19.4 ha. (47.9 ac.), within which a net leasable area of 11.8 ha. (29.2 ac.) would be created for lease to commercial tenants. To develop the entire South-East Commercial Development Area, the Airport Commission would need to acquire an additional 13.7 ha. (33.8 ac.) that is presently in private ownership.

Landside Commercial Development

For landside development, only a minimal space provision is believed to be necessary. Since there are municipal industrial parks in relatively close proximity to the airport, there is little need for landside uses to locate directly on the airport property. Exceptions to this exist, and uses such as a courier operation, freight forwarder or aircraft parts distributor, have a direct relationship to aviation and such activities should therefore be encouraged to locate on the airport. In the master plan, recognition has been given to allowing for some landside uses to be accommodated in an area that has no airside access. The area designated in the master plan for landside commercial development is already used for this purpose, and is located to the south and west of the Terminal Building, south of the service road for the St. Catharines Flying Club and Genaire Building. Present tenants located in this area are Aztec Yachts and the Civilian Air Rescue Emergency Service. A gross area of 0.9 ha. (2.3 ac.) is available in the master plan for landside commercial development in this area. No additional property acquisition is proposed for this development category.

5.5 Landside Access

The present access to the airport is from Highway 55, via an airport access road of approximately 300 m. The master plan proposes to retain the present airport access intact, however from approximately the location of the existing fuel farm, the access road would be realigned to create a one-way flow system to serve the new Terminal Building. Relocation of the aviation fuel storage compound would be required to implement this proposal. The proposed access road would pass close to the former ATC Tower, then turn west to pass in front of the landside entrance to the new Terminal Building. From this point, the road would swing to the south and form the exit branch of the road system.

This access road and terminal circulation system would provide access to all south side facilities on the airport. Besides the Terminal Building, this includes all planned Aviation Commercial Development Areas, Landside Commercial Development, and the Airport Maintenance Compound. To facilitate access to these areas, service roads would connect into the circulation road system so as to avoid conflict with the public access to the Terminal Building. Access to the public car park, which has been planned to be located immediately south of the new Terminal Building, would also be provided from the circulation road system. A portion of the proposed circulation road system is planned as a one-way road system in order to provide an orderly flow of traffic passing in front of the Terminal Building. The one-way section would comprise only the road section that provides direct access to the public set down and pick-up area at the main doors to the Terminal Building.

The master plan provides for vehicle access from landside to airside for authorized vehicles permitted on airside. Such access to airside would be provided from the one-way circulation road system that serves the new Terminal Building. To avoid having

airport service vehicles passing in front of the main doors to the Terminal, two service roads are planned for airside access. One access road is planned on the east side of the Terminal to enable entry to airside, and the other on the west side of the Terminal to provide an exit from airside. In both cases, access and egress would be controlled by means of lockable security gates.

5.6 Utility Services

It is proposed that the airport facilities will be served by all necessary utilities. In the absence of natural gas service, all heating on the airport would be provided by propane, oil or electric heating systems. While the water supply and distribution is adequate for the airport service, a major upgrading of the sewage disposal system and electrical system is proposed in the master plan.

5.6.1 Water Supply

Water would continue to be supplied from the existing source, with extensions made to the distribution system as required to serve future development.

5.6.2 Sewage Collection & Disposal

The master plan endorses the proposal accepted by the Airport Commission that the airport be connected to the municipal sewage disposal system. If the necessary approvals can be obtained for this, a new forcemain sewer line would be constructed from the airport, south along Highway 55 to the intersection of Highway 55 and Queenston Road. At this point the airport sewer line would be connected to the Glendale Industrial Park Trunk Sewer and hence into the municipal treatment system.

To enable this system to be implemented on the airport, it will be necessary to replace and upgrade the existing sewage pumping facility on the airport. All of the sewage from the south side development would be connected via gravity mains into a new pumping facility, from which point it would be pumped to the municipal system. This consideration will play an important role in establishing the location of the future sewage pumping station, since both the South-West and South-East Commercial Development Areas will ultimately require service. For the very long term, and in order to avoid a very deep sewer and high lift pumping to collect sewage from the extreme eastern portion of the South-East Commercial Development Area, consideration may need to be given to providing a second pumping facility for the South-East Commercial Development. It should be noted that the issues of sewage collection and distribution have only been studied in relation to serving the existing development on the airport. To account for proposed future development an airport servicing plan will be needed to ensure that whatever sewage system is constructed in the near term will accommodate the Airport Master Plan development proposals.

5.6.3 Electrical Service

The master plan proposes that, over time, additional commercial development would be encouraged to take place on the airport, and that the Airport Commission facilities be upgraded and expanded. Both of these situations will result in an increased electrical load being placed on the electric power supply and distribution system serving the airport. As was noted in Section 3.8.3, any such anticipated increase in the anticipated airport power requirements would require that the airport electrical system be upgraded, both in terms of the primary supply and transformation, and the secondary distribution system. The upgrading of the airport electrical system should be studied as part of a master servicing plan for the airport and implemented in the most cost-effective manner to suit the future needs of the Airport Commission and its tenants.

For the future power requirements of the Airport Commission, there will be a need to upgrade the primary supply line from Highway 55 and the primary transformation, and to reorganize the secondary distribution system for greater efficiency. The primary supply from Highway 55 will need to be upgraded to 27.6 KV, while a new primary transformer, rated for the future electrical loads, will need to be installed. The number of transformers and the capacities required for this will depend on whether the Airport Commission electrical loads and secondary distribution remain separate from those of the airport tenants, or whether the Hydro Commission will require that the Airport Commission assume responsibility for distribution to all loads on the airport site.

In view of the need to upgrade the primary supply and transformer facilities, as well as the other proposals of the Master Plan, it is recommended that the airport electrical facilities and equipment, including airfield lighting regulators, be accommodated in an Airport Electrical Centre. The Master Plan proposes that the Airport Electrical Centre be co-located with the proposed new Airport Maintenance Facility and constructed at the same time. The Airport Electrical Centre would be sized for the electrical equipment requirements, and include the provision to add a standby-generator in the future.

An alternative location for the Airport Electrical Centre has been suggested. This is adjacent to the ATC Tower, or forming part of an expansion at the base of the Tower proposed by Transport Canada for FSS telecommunications and power equipment. The merits of this suggestion will need to be assessed in the light of the overall needs of the airport.

Regardless of the location selected for the Airport Electrical Centre, re-routing of the primary supply to the airport, as well as changes to both the overhead and buried secondary distribution, would be required when the Electrical Centre is constructed. This will need to be coordinated with the realignment of the airport access and terminal circulation roads.

5.7 Airport Support Facilities

The Airport Support Facilities comprise those facilities necessary for the management, operation and maintenance of the airport. In the master plan it is proposed that airport management and administration be accommodated in the new Terminal Building, while the airport operations and maintenance functions would be located in a new Airport Maintenance Facility.

5.7.1 Airport Management Facilities

The airport management function is proposed to be accommodated in the new Terminal Building. Facilities to be provided would comprise an office for the Airport Manager, and administration space for two additional staff, as well as space for office equipment, filing and plan storage, and general storage. The total area required in the terminal building for this function will amount to 50 m².

5.7.2 Airport Operations Facilities - Emergency Services

The Airport Commission no longer maintains an emergency response capability on the airport and none of the airport staff are trained for aircraft fire-fighting. Emergency services are available from the Town of Niagara-on-the-Lake, in which municipality the airport is located, and from the City of St. Catharines. This arrangement is adequate at the level of operations existing at the time of the master plan, however when air traffic activity develops, and as aviation businesses locate on the airport, consideration will need to be given to providing an element of first response to aircraft-related accidents, using airport staff and tenants as a volunteer response unit. Structural fire-fighting would under this scenario remain a responsibility of the municipal emergency services.

5.7.3 Airport Maintenance Facilities

Reference has been made in this report to the inadequacy of the present airport maintenance facilities. A new facility, designed to provide proper accommodation for the airport service equipment, a workshop, storage room, employee washroom, is required at an early date in the master plan program. The location of the existing airport maintenance facility has also been found to be inappropriate when the future development of the airport is considered. Of particular concern has been the need to design a proper circulation road system for the terminal area and this will necessitate removal of the existing maintenance building.

The master plan proposes that a new Airport Maintenance Facility be developed in an Airport Maintenance Compound, to the east of the present building. The site proposed for the new facility provides good access to both airside and landside areas, and is large enough to permit development of a multiple bay garage facility and workshop, as well as all necessary outside and inside storage space. For master planning purposes, the new Airport Maintenance Facility has been sized as an eight-bay drive-through facility with ancillary spaces. The ultimate planned area of the 8-bay facility is 714 m², for which construction would be staged with 6 bays constructed initially.

The maintenance facility is planned to be contained in an airport maintenance compound which would also provide an open parking area for mobile equipment and sheltered storage for materials. It is proposed that the Airport Electrical Centre be co-located with the Airport Maintenance Facility, subject to an assessment of the implications of this for the electrical distribution system. Development of the new Airport Maintenance Facility would require acquisition of 0.8 ha. (1.9 ac.) of additional property east of the Terminal Area - East Hangar Development.

5.8 Aviation Support Facilities

Weather Office and Briefing Service

The Environment Canada Weather Office function is expected to remain unchanged throughout the master plan period. The service itself would be relocated from the present terminal building to the proposed new terminal building. Some relocation of outside equipment associated with the Weather Office would also be necessary.

Canada Customs Services

Canada Customs service would continue to be provided at the airport and accommodation for Customs officers and clearance facilities would be incorporated into the floor plan layout of the new terminal.

Flight Service Station

The Flight Service Station is assumed to remain at the Niagara District Airport throughout the life of the airport master plan. Transport Canada have proposed that the FSS remain located in the former ATC Tower and that an addition be made to the base of the Tower Building to accommodate equipment and FSS offices. The master plan has assumed that this expansion to the Tower would be carried out by Transport Canada according to its own priorities, and the extent of the proposed expansion has been accommodated in the development of the terminal area and circulation road system.

Aircraft Refuelling Service

Aviation gasoline 100LL and Jet A turbine fuel will continue to be available at the airport. However, a suggestion is made in the master plan that the Commission re-evaluate the arrangement for wholesaling and retailing aviation fuels on the airport with a view to ensuring a satisfactory fuel service.

With regard to the installed facilities for fuel storage, pumping and filtration, these will need to be relocated to enable development of the proposed airport access and circulation road system. At the time of the master plan the fuel facilities were located on the south side of the terminal area, adjacent to the main access road, where they would be in conflict with the alignment of the proposed entry roads for the terminal area. Relocation of the two fuel tanks and associated pumping equipment and filters is necessary to accommodate the proposed realignment of the road system. A new location for the fuel facility has been designated in the master plan at the west end of the landside commercial development area. Relocation of the fuel storage and pump equipment could involve reuse of some of the existing equipment, however replacement of the tanks with double-walled fibreglass tanks, and provision of a fuel spill containment system could be considered at the time that relocation of this function occurs.

Access by fuel delivery tankers to the proposed new fuel compound would be from the service road for the Genaire Building. Access by airside refuelling bowsers would be available from an airside access to be constructed on the east side of the St. Catharines Flying Club T-Hangar. This latter access is the designated access route for the airside refuelling bowsers, since this route would ensure that fuel trucks could be kept well away from the terminal circulation road system and public car park. Until this access to airside is made as part of the construction for the South-West Commercial Development, airside access for fuel bowsers will continue to be from the terminal airside access roads.

5.9 Airport Instrument Approach Facility

The straight-in NDB approach existing at the time of the airport master plan was judged to provide an unacceptable level of accessibility to attract corporate and commercial air traffic for a regional airport. An improvement in the approach capability to provide operating minima better than 579 ft. above threshold elevation has been recommended.

There is a possibility that an improvement in the operating minima might be possible and this needs to be pursued by the Airport Commission. In addition, an investigation should be carried out to determine whether an NDB/VOR approach might be possible for approaches to Runway 24, with position reference provided from the Buffalo VOR.

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Options such as these should be investigated as a possible way of improving IFR access to the airport. In the longer term, since the Garden City Skyway is likely to remain an obstacle to any NDB-based approach to Runway 06, a precision approach aid is recommended as the ultimate requirement.

In consideration of the role that the airport might play in the Niagara Region to serve and attract aviation relating to business and industry, the IFR access to the airport is of primary concern. Instrumentation required to satisfy the long-term objectives of the airport is an instrument approach facility that will enable precision approaches to be made to the primary runway under Category I criteria. The master plan development has been based on the standards and operational criteria for instrument precision approach operations, and installation of a precision approach aid at the Niagara District Airport is recommended.

At this point, implementation of a conventional instrument landing system is recommended (ILS), although it is recognized that the conventional ILS may be replaced by a microwave-based landing system (MLS) by the time that implementation of a precision approach becomes a reality.

Another factor that will likely weigh in the decision of what type of equipment to install and when, is the forthcoming introduction of a satellite-based navigation system. Known generically as the global navigation satellite system, and operated by the U.S. Department of Defense as the "Global Positioning System" or GPS, the satellite-based navigation system is expected to be applied to non-precision instrument approaches within the decade of the 1990's. If development of GPS shows that adequate accessibility may be gained from an Area Navigation (GPS) approach, then installation of a precision approach may be deferred or even superceded. Since the timing of the GPS program is not known, and the extension of the system to RNAV approaches is unknown, the Airport Commission can only proceed on the basis of an objective to acquire a precision instrument landing capability as soon as funding permits.

In view of the cost of installation of a precision approach facility, it is recognized that implementation of the necessary equipment may need to be phased. Consequently, an initial installation of part of the ILS can be considered, with a localizer and distance measuring equipment (LOC/DME) for a primary approach to Runway 06 forming the first stage. This would be followed by installation of a glide path in the second stage.

At the time that the Commission is ready to proceed with installation of precision approach instrumentation at the Niagara District Airport, the requirements for land acquisition will need to be addressed to permit installation of the localizer equipment.

5.10 Airport Development & Marketing

The success of the airport in attracting both commercial tenants to lease development space on the airport, and commercial and corporate air traffic to use the terminal facilities, is closely related to the industrial development of the Niagara Peninsula. At the same time, the image and service offered at the airport plays an important role in attracting businesses to use the airport and to locate in the area. For many corporations using air transport, the airport, its management staff, terminal building and amenities represent the elements that establish a first impression of a community. First impressions may have very significant implications for businesses when it comes to making decisions concerning corporate operations. Certainly, features such as good accessibility in poor weather, high quality modern terminal facilities and aircraft handling services help to create the conditions conducive to businesses using aircraft for personnel and freight transport.

Marketing the airport to the aviation and industrial communities involves making a commitment to implement improved facilities and services, using the airport master plan as a guide. In addition, marketing the airport's services directly to existing and prospective industrial enterprises also plays a valuable role in promoting use of the airport. This requires that the facilities and air access offered by the airport be clearly addressed in the industrial marketing carried out by regional and municipal industrial development authorities. On another level, an additional, but vital, element in airport marketing is to create an awareness among civic leaders of the value of the airport to the community, in terms of job creation and dependency, as well as in monetary values reflecting the direct and indirect benefits of airport activities.

For all of the above reasons the Commission is recommended to prepare a marketing program for the airport that addresses the following three principal elements of airport marketing:

- Promotion of airport facilities and services directly to industry and to industrial and business groups,
- Integration of airport marketing with regional and municipal industrial development strategies, and
- Dissemination of information concerning economic impact and role of the airport to political and civic leaders.

6.0 MASTER PLAN DEVELOPMENT PHASING

For the purposes of staging the implementation of the master plan, three periods or phases have been identified. These reflect the priorities for improving the airport and expanding its capability within the defined airport role. The first phase reflects the immediate priorities for facility development on the airport within the first five years. The second phase includes improvements or additions that may not reach their trigger points for implementation for a number of years, or are considered desirable, but not urgent. These have been assigned to the second phase, which represents a ten-year period following Phase 1. Proposals for these phases are therefore an expression of the need to both correct present deficiencies, and to achieve the defined role of the airport within a nominal 20-year period.

In view of the limited capital expenditure on airport improvement over the past ten years and the poor state of some of the infrastructure (particularly the aprons), it is clear that upgrading the airport to the expected standard of a regional municipal airport will require significant capital expenditure. Funding requirements to achieve the necessary improvements in the first two phases may well exceed the ability of the Airport Commission to raise the necessary capital. The implementation program may therefore have to be extended beyond the nominal master plan period, and priorities examined fairly frequently. It should be emphasized that in defining the capital construction elements of these two phases, no attempt has been made to relate the program to a funding capability. The ability of the Airport Commission to obtain funding in the future is largely dependent on a transfer of ownership of the airport to the Commission, and on the response of senior government to subsequent subsidy requests. At the time of preparing the master plan it was not known how long it would take to confirm transfer of ownership from the Federal Government.

The third phase of the program contains the lower priority elements of the master plan, and principally concerns progressive expansion of the basic airport infrastructure and site preparation and servicing of aviation commercial development in response to demand. While a nominal 20-year period has been adopted as the context for master planning, it is recognized that implementation of some of the features of the master plan, especially the preparation of commercial development areas, will need to be justified by demand, and this may take a long time to develop. For that reason, the third phase of the master plan program has been left open, with the expectation that progressive development and expansion would occur over a further ten to fifteen years beyond the year 2007. These three phases of the master plan implementation program are defined below with their related time periods:

- Phase 1 - 1992 to 1996
- Phase 2 - 1997 to 2006
- Phase 3 - Beyond 2007

EXHIBIT 7

NIAGARA DISTRICT AIRPORT MASTER PLAN CAPITAL DEVELOPMENT COSTS (1992)

ITEM	DESCRIPTION	AREA (sq.m.)	COST (\$)	PHASE
1.0	AIRSIDE - RUNWAYS			
1.1	Runway 06/24 Extension	12,375	519,750	2
1.2	Runway 01/19 Extension	4,470	187,740	3
1.3	Runway 06/24 Reconstruction	68,625	2,333,250	3
1.4	Runway 01/19 Section Upgrading	4,470	26,820	2
2.0	AIRSIDE - TAXIWAYS			
2.1	Taxiway 'A' - Reconstruction	5,900	200,600	1
2.2	Taxiway 'C' - Overlay	9,610	57,660	2
2.3	Taxiway 'C' - Realignment	2,020	68,680	2
2.4	Taxiway 'D' - Reconstruction	1,240	42,160	1
2.5	Taxiway 'E' - Stage 1	4,610	156,740	2
2.6	Taxiway 'E' - Stage 2	3,600	122,400	3
2.7	Taxiway 'E' - Stage 3	3,600	122,460	3
2.8	Taxiway 'E' - Stage 4	3,300	122,200	3
2.9	Taxiway 'E' - Stage 5	4,200	142,800	3
2.10	Taxiway 'G' - Runway Exit	3,170	107,780	1
3.0	AIRSIDE - APRONS			
3.1	Apron I Reconstruct	16,670	333,400	1
3.2	Apron I Extension	18,100	362,000	2
3.3	Apron II Extension	7,220	216,600	1
4.0	LANDSIDE			
4.1	Terminal Building Development	420	903,000	2
4.2	Terminal Car Park (62 sp.)	1,950	33,150	2
4.3	Terminal Area Road System	4,510	76,670	2
5.0	AVIATION SUPPORT			
5.1	Instrument Approach Aid		2,000,000	2
5.1.1	- Property (ha.-ac.)	18.4 - 45.6	456,000	1*
5.1.2	- Electrical Service		30,000	2
5.4	Automatic Weather Station		40,000	2
5.5	Fuel Storage Compound Relocation		225,000	2

* Note that this property requirement reflects the area to be protected.
The area to be acquired could possibly be less because of existing federal zoning.

EXHIBIT 7 cont.../

ITEM	DESCRIPTION	AREA (sq.m.)	COST (\$)	PHASE
6.0	AIRPORT SUPPORT			
6.1	Airport Maintenance Garage	714	538,000	2/3
6.1.1	- Property Required (ha.-ac.)	0.8 - 1.9	19,000	1
6.1.2	- Site Preparation	6,030	15,080	2
6.1.3	- Asphalt Areas	2,040	34,680	2
6.1.4	- Utility Services	-	16,500	2
6.2	Airport Electrical Centre	-	175,000	2
6.3	Sanitary Sewage Reconfiguration	-	650,500	1*
7.0	AIRPORT COMMERCIAL DEVELOPMENT - TERMINAL AREA WEST			
7.1	Gross Area (ha.-ac.)	2.8 - 7.0	-	1
7.2	Area Leased (ha.-ac.)	1.4 - 3.5	-	
7.3	Net Leasable Area (ha.-ac.)	1.5 - 3.6	-	
7.4	Property Required (ha.-ac.)	1.0 - 2.5	25,000	1
7.5	Site Preparation	15,000	37,500	2
7.6	Access Road	2,340	35,360	1
7.7	Utility Services (W, S & E)	-	36,300	1
8.0	AIRPORT COMMERCIAL DEVELOPMENT - TERMINAL AREA EAST			
8.1	Gross Area (ha.-ac.)	1.4 - 3.5	-	1
8.2	Area Leased (ha.-ac.)	1.0 - 2.5	-	
8.3	Net Leasable Area (ha.-ac.)	0.4 - 1.0	-	
8.4	Property Required (ha.-ac.)	Nil	-	
8.5	Site Preparation	4,000	10,000	2
8.6	Taxiway 'H' - Construction	2,100	71,400	2
9.0	AIRPORT COMMERCIAL DEVELOPMENT - SOUTHWEST AREA			
9.1	Gross Area (ha.-ac.)	7.7 - 19.0	-	1
9.2	Net Leasable Area (ha.-ac.)	3.9 - 9.5	-	
9.3	Property Required (ha.-ac.)	Nil	-	
9.4	Site Preparation	39,000	97,500	1/2
9.5	Taxiway 'F' construction	5,500	187,000	1/2
9.6	Access Road	5,070	76,610	1/2
9.7	Utility Services (W, S & E)	-	91,300	1/2

* Cost for Sanitary Sewage Reconfiguration developed from Public Works Canada Study "Upgrade Sewage System at Niagara District Airport", Acres International, February, 1990.

EXHIBIT 7 cont.../

ITEM	DESCRIPTION	AREA (sq.m.)	COST (\$)	PHASE
10.0	AIRPORT COMMERCIAL DEVELOPMENT - SOUTHEAST AREA			
10.1	Gross Area (ha.-ac.)	19.4 - 47.9	-	2/3
10.2	Net Leasable Area (ha.-ac.)	11.8 - 29.2	-	
10.3	Property Required (ha.-ac.)	13.7 - 33.8	338,000	1
10.4	Module 1 Development			
	Site Preparation	34,000	85,000	2
	Taxiway 'E-1'	3,375	114,750	2
	Access Roads	5,800	87,650	2
	Utility Services	-	85,800	2
10.5	Module 2 Development			
	Site Preparation	34,000	85,000	3
	Taxiway 'E-2'	3,375	114,750	3
	Access Roads	3,230	48,800	3
	Utility Services	-	48,400	3
10.6	Module 3 Development			
	Site Preparation	34,000	85,000	3
	Taxiway 'E-3'	3,375	114,750	3
	Access Roads	3,230	48,800	3
	Utility Services	-	48,400	3
10.7	Module 4 Development			
	Site Preparation	17,130	42,830	3
	Taxiway 'E-4'	1,670	56,780	3
	Access Roads	2,530	38,230	3
	Utility Services	-	30,800	3
11.0	LANDSIDE COMMERCIAL DEVELOPMENT - TERMINAL AREA			
11.1	Gross Area (ha.-ac.)	0.9 - 2.3		3
11.2	Net Leasable Area	(Depends on Use)		
11.3	Property Required	Nil		
11.4	Site Preparation	9,000	22,500	3
12.0	AIRPORT COMMERCIAL DEVELOPMENT RESERVE NORTH DEVELOPMENT AREA			
12.1	Gross Area (ha.-ac.)	8.7 - 21.5		3
12.2	Net Leasable Area	(Depends on Use)		
12.3	Property Required	Nil		
12.4	Site Preparation	(Depends on Use)		3
12.5	Taxiway System	(Depends on Use)		3
12.6	Main Access Road	4,270	75,590	3
12.7	Utility Services	(Depends on Use)		3

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6.1 Phase 1: 1992 - 1996

Phase 1 represents the immediate five year period of the master plan implementation and comprises the highest priority items for improvement. In Phase 1 the development program concentrates rehabilitation and expansion of the aprons, property acquisition for commercial development, initiation of the South-West Aviation Commercial Area, initial upgrading of the airport instrument approach and upgrading of the airport sewage system.

Aside from the above construction items, two other items are also included in the Phase 1 development program. The first is a Marketing Program, which refers to the preparation of an overall program of promotion and preparation of an economic impact assessment for the airport. In Phase 1 it is recommended that the Commission create a formal marketing program to promote the airport, its facilities and its planned improvements in order to attract additional commercial users to the airport and to the Niagara Region. The second is a Master Servicing Plan, which concerns the need to define the future airport utility servicing needs and the staging of services in response to the Airport Master Plan.

The full extent of the proposed Phase 1 program is listed below. Capital costs for items of capital expenditure are provided for Phase 1 in Exhibit 7.

Phase 1 Development Program Elements

- Taxiways "A" & "D" Reconstruction
Reconstruct and realign Taxiway "A" west of Apron I.
Reconstruct Taxiway "D" based on pavement evaluation tests.
- Taxiway "G" Exit from Runway 06/24
Construct new exit from primary Runway 06/24
- Apron I Reconstruction
Remove old apron pavement and reconstruct as secondary pavement.
- Apron II Expansion
Extend Apron II to the east by 120 m. Construct as primary pavement.

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- **Property Acquisition**
Acquire property for precision approach instrumentation, Airport Maintenance Facility, and aviation commercial development areas. (Approximately 33.9 ha. - 83.8 acres total, depending on requirements for instrumentation).
- **Sanitary Sewer Connection**
Construct sanitary sewer connection to municipal system.
- **Terminal Area - West Aviation Commercial development**
Construct access road and utility services.
- **South-West Aviation Commercial Area**
Prepare initial 50% of designated area for lease.
Construct first stage Taxiway "F".
- **Airport Terminal Building Development**
Carry out planning and design for terminal building, circulation road system and car park.
- **Airport Marketing Program**
Carry out airport economic impact assessment. Prepare marketing program for airport and provide marketing input to Regional and Municipal industrial development programs.
- **Airport Master Servicing Plan**
Prepare servicing plan and staging program for future water, sewer and electrical services.

6.2 Phase 2: 1997 - 2006

Phase 2 represents a major expansion phase for the airport and comprises a ten-year period following Phase 1. In the early part of this phase the development of the new terminal area complex is proposed. This would comprise a new terminal building, car park, and realignment of the airport access and terminal circulation road system. Also scheduled for construction at this time would be construction of the first stage of the parallel taxiway for Runway 06/24 and the preparation of the first module of aviation commercial development lots in the South-East Aviation Commercial Area. The timing of the preparation of aviation commercial lease lots within Phase 2 will depend on the success in leasing the lots in the South-West Commercial Area and the level of economic activity in the Niagara Region at that time. In the second five year portion of Phase 2 it is proposed that Runway 06/24 would be extended to the east by 276m. and a precision instrument approach facility installed.

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The full extent of the proposed Phase 2 program is listed below. Capital costs for items of capital expenditure are provided for Phase 2 in Exhibit 7.

Phase 2 Development Program Elements

- **Airport Terminal Building**
Construct 1st. stage of new Airport Terminal Building at 420 m², and remove existing structure.
- **Terminal Area Circulation Roads & Car Park**
Realign terminal area circulation roads and construct 1st stage car park for 62 cars.
- **Apron I Extension**
Extend Apron I west 130 m. as required for light aircraft parking
- **Taxiway "C" Repair, Realign & Overlay**
Repair and overlay former Runway 11/29 as extension of Taxiway "C"
Realign section of Taxiway "C" at intersection with Runway 06/24
- **Taxiway "H" Construction**
Construct new taxiway for access to Terminal Area - East Development
- **Taxiway "E" Construction**
Construct 1st. Stage Taxiway "E" to 1st. module in S-E Development Area.
- **South-East Aviation Development Area.**
Prepare 1st. module for development.
- **South-West Aviation Development Area**
Prepare remaining area for lease and extend Taxiway "F".
- **Terminal Area - West Aviation Commercial Development Area**
Prepare sites for lease
- **Terminal area - East Aviation commercial Development Area**
Relocate 1 hangar and prepare lease site
- **Runway 06/24 Extension**
Extend Runway 06/24 eastward by 276 m. to 1800 m. total length.
- **Runway 01/19 Pavement Upgrading**
Upgrade south section of runway to be compatible with pavement characteristics of runway 06/24 and Taxiway "A"

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- Instrument Approach Improvements
Upgrade airport instrument approach with precision approach instrumentation
- Airport Maintenance Facility and Electrical Centre
Construct new Airport Maintenance Garage and Electrical Centre.

6.3 Phase 3: Beyond 2007

Phase 3 represents a phase of progressive expansion and improvement once the basic infrastructure for the master plan has been constructed. During the period beyond the year 2007, it is expected that the Runway 06/24 will require complete reconstruction, as the overlay applied over the badly-cracked pavement in 1991 will likely have shown excessive reflection cracking by that time and warrant a major rehabilitation. The timing of any of the above development, and the priority for construction would depend on the demand for aviation commercial development lots. Consequently, it is possible that much of the Phase 3 program would not be implemented for a considerable time, and well beyond the assumed master plan period. Recommendations relating to this phase would therefore be superseded by an update of the master plan.

The principal elements of the Phase 3 program are listed below. Capital costs for these items are detailed in Exhibit 7.

Phase 3 Development Program Elements

- Runway 06/24 Reconstruction
Reconstruct primary runway subject to pavement condition evaluation.
- Runway 01/19 Extension
Extend runway 01/19 to 914 m. subject to demand by light aircraft operations
- Taxiway "E" Extension
Extend Taxiway "E" as required to serve additional airside development. Link Taxiway "E" to the threshold of Runway 24.
- South-East Aviation Development Area
Prepare additional modules for airside commercial development as required to meet demand.
- Landside Commercial Development Area
Prepare commercial lease sites in response to demand

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6.4 Capital Costs for Master Plan Implementation

The cost of implementing the phased master plan development program for improvements and expansion are listed in Exhibit 7 and summarized in Exhibit 8. In summary, the capital costs for the planned items in each of the three development phases are as follows:

Phase 1	\$ 2.69 M
Phase 2	\$ 5.91 M
Phase 3	\$ 3.90 M

As noted above, the costs quoted for Phases 2 and 3 particularly, assume a level of aviation commercial development and on-site investment by the private sector. Preparation of development sites for lease to the private sector, and construction of infrastructure for these would normally be triggered by demand conditions, with expansion of commercial development areas occurring in response to demand. In practice, the actual implementation of the expansion stages of the South-West and South-East Aviation Development Areas may therefore be advanced or deferred accordingly. In particular, this applies to the expansion of the South-East Development Area and its associated Taxiway (Taxiway "E"), which has been designated for Phase 3. Much of the development in this area could be expected to occur beyond the nominal 20-year planning horizon of the Airport Master Plan.

It should be noted that the preparation and leasing of the North Commercial Development Area is regarded as a very long term prospect, beyond the Airport Master Plan. Its development would only be triggered by an interest from a major potential aviation use, such as an aircraft or parts manufacturer. If that should occur, development of the North Commercial Area can be advanced as required. Costs for site preparation, utilities, access and taxiways will depend very much on the nature of the potential user, the manner in which the site is to be developed, and the financial arrangements agreed between the Airport Commission and the prospective tenant. Consequently, costs for development of the North Commercial Area have not been included in the above cost estimates for the master plan phases.

EXHIBIT 8

NIAGARA DISTRICT AIRPORT SUMMARY OF MASTER PLAN CAPITAL DEVELOPMENT COSTS (1992)

ITEM	DESCRIPTION	COST (\$)
PHASE 1 1992 - 1996		
2.1	Taxiway 'A' - Reconstruction	200,600
2.4	Taxiway 'D' - Reconstruction	42,160
2.10	Taxiway 'G' - Runway Exit	107,780
3.1	Apron I Reconstruct	333,400
3.3	Apron II Extension	216,600
5.1	Precision Instrument Approach (Property Acquisition)	456,000
6.1	Airport Maintenance Garage (Property Acquisition)	19,000
6.3	Sanitary Sewage Reconfiguration	650,500
7.0	Terminal Area Commercial Development West (Property)	25,000
7.0	Terminal Area Commercial Development West	71,660
9.0	S-W Development Area Stage 1 - 50%	226,200
10.0	S-E Development Area (Property Acquisition)	338,500
	Total Estimated Property Acquisition Costs	838,500
	Total Cost of Capital Improvement Items	1,848,900
	Grand Total for Phase 1	2,687,400
PHASE 2 1997 - 2006		
1.1	Runway 06/24 Extension	519,750
1.4	Runway 01/19 Section Upgrading	26,820
2.2/3	Taxiway 'C' - Overlay & Realignment	126,340
2.5	Taxiway 'E' - Stage 1	156,740
3.2	Apron I Extension	362,000
4.0	Terminal Building, Access & Car Park	1,012,820
5.1	Precision Instrument Approach Aid	2,030,000
5.4	Automatic Weather Station	40,000
5.5	Fuel Storage Compound Relocation	225,000
6.1	Airport Maintenance Garage (6-Bays)	518,260
6.2	Airport Electrical Centre	175,000
7.0	Terminal Area - West Commercial Development	37,500
8.0	Terminal Area - East Commercial Development	81,400
9.0	S-W Development Area Stage 2 - Remaining 50%	226,200
10.0	S-E Development Area Module 1	373,200
	Total for Phase 2	5,911,030
PHASE 3 BEYOND 2007		
1.2	Runway 01/19 Extension	187,740
1.3	Runway 06/24 Reconstruction	2,333,250
2.6/9	Taxiway "E" Remaining Sections	509,860
6.1	Airport Maintenance Garage (2-Bay Expansion)	86,000
10.0	S-E Development Area Modules 2,3 & 4	762,540
11.0	Landside Commercial Development	22,500
	Total for Phase 3	3,901,890

7.0 AIRPORT IMPACT AND PROTECTION

7.1 Environmental Aspects of Airport Development

7.1.1 Aircraft Noise

The Niagara District Airport is located outside the built-up area of the City of St. Catharines and its primary approach lies over open farmland to the east of the airport. Aircraft using the airport when winds favour Runway 24 do not disturb residents of St. Catharines. The community of Virgil, immediately east of the airport, lies beneath the flight path for long straight-in approaches to the airport and would only be affected by aircraft noise if the airport were to develop significant corporate jet operations. At the time of the Airport Master Plan, the corporate jet traffic using the Niagara District Airport amounted to approximately 500 to 600 movements per year, or about 3% of total itinerant traffic. While the future role of the airport is expected to include an increase in the use of the airport by corporate aircraft, this use is not expected to be a high frequency operation.

When operations require use of Runway 06, which is when winds tend to be easterly, aircraft approaching the airport overfly populated areas of the City of St. Catharines between two and four miles from the airport. Noise from corporate jet aircraft operations could affect the eastern part of St. Catharines, however the airport is not aware of any serious concern from past operations. Consequently, aircraft noise is not anticipated to be an issue to affect airport development in the future.

7.1.2 Effect on the Natural Environment

With regard to the potential impact on the natural environment, an environment assessment has not yet been carried out for the Niagara District Airport and comments can only be made in this document on an unofficial basis. Two areas of environmental impact for the airport should be noted.

The first concerns the added water run-off from hard surfaces that would result once significant lease lot development occurs. This would be discharged into the water courses passing through the airport and add to the flows from the site. If run-off calculations indicate a need for mitigation through engineering solutions this would need to be addressed at the time that a trigger condition is reached.

The second issue relates to the discharge of sewage effluent into the airport drainage system. The master plan proposes that the sewage generated by the airport be pumped into the municipal sewage treatment system, and that the existing sewage lagoon be closed. If the municipal sewage system proposal cannot be implemented, then the lagoon system will be retained. In this case it has been proposed that the lagoon system be upgraded and the effluent polished prior to discharge, so that the water entering the water courses is of an acceptable quality.

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At the time of preparation of the master plan, there were no other known areas of environmental concern. The airport does not contain any wetlands, is not a habitat for any significant wildlife and has minimal bird activity.

7.2 Airport Protection and Obstacle Height Zoning

The Niagara District Airport is fortunate to have the protection of federal registered zoning to control the erection of structures or other obstacles to aviation within a 4 km. radius of the airport. The principal benefit of the federal zoning, which is registered on title for the surrounding land holdings, is that it provides a mechanism to control obstacles in the approaches to the airport's runways. At present the federal registered zoning is based on the three existing runways, with runway 06/24 protected for future precision instrument operations. The Airport Master Plan proposes decommissioning Runway 11/29 and construction of an extension to Runway 06/24. Consequently, the federal registered zoning will need to be amended to reflect these planned changes to the runway system. An illustration of the required obstacle zoning protection for airport certification is provided in Exhibit 9.

While registered zoning is effective in protecting the certification of the airport, it does not guarantee protection of the airport's instrument operations. This is because an obstacle that may comply with certification zoning restrictions can be erected in a location that may result in a penalty for existing, or future, instrument approaches. An example of this would be the Virgil Water Tower, which satisfies the obstacle limitations imposed through registered zoning, but which would become the governing obstacle if a straight-in approach were planned for Runway 24. In view of this anomaly in the protection of airports and their operations, it would be advisable for the Airport Commission to establish with the affected municipalities a limitation on obstacles in the areas that affect instrument operations. At the very least the Airport Commission should organize a "red-flagging" system to identify potential obstacles that might inadvertently be approved by the Town of Niagara-on-the-Lake and the City of St. Catharines, but which could affect the airport's instrument operations.

7.3 Municipal Land Use Controls in the Vicinity of the Airport

The Niagara District Airport is located in the Town of Niagara-on-the-Lake in rural farmland, much of which is devoted to soft fruits and vine cultivation. Land use in the vicinity of the airport is agricultural, with very low density rural residential uses.

In the Official Plan for the Town, the airport is designated as an airport land use. This permits a variety of uses, such as "commercial uses, offices, restaurants, car rental agencies, travel agencies, gift shops, and commercial flying agencies". Industrial uses are also permitted on the airport lands and these include a wide range of activities including manufacturing, fabricating, assembly and processing of raw materials, partially processed materials, goods and products, warehousing, open

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storage of bulk goods, servicing and maintenance operations, public utilities, communications and transportation facilities, and research and development laboratories. Industrial uses requiring close proximity to the airport are specifically identified in the Town's Official Plan as being permitted on the airport lands, and these include such activities as specialty warehousing, aircraft repair and servicing.

While it is useful for the Airport Commission to have the ability to accommodate a wide range of permitted uses on the airport site through the mechanism of the Official Plan, the municipal zoning in this case is too wide and could give rise to pressure to locate incompatible industrial and commercial uses on the property. There is also the issue of whether the Official Plan could be enforced on the airport lands at the present time, because of their federally-regulated status. For that reason, the Airport Commission would be advised to establish its own Airport Zoning and Commercial Development Controls to limit and control future land uses on the airport. Once the Commission has defined its own permitted use policy, it would then be appropriate to register this with the host municipality, with a view to having the permitted use zoning incorporated in the Official Plan whenever amendments are being made through the normal process. Should the Airport Commission wish, the Airport Zoning and Commercial Development Controls can be used to implement the municipal building controls to assist in the control of tenant development on the airport lands.

Outside the airport property, the surrounding lands are designated agricultural. However, immediately south of the airport, the privately-owned lands between the airport terminal development and Highway 55 are designated as "airport industrial" in the Official Plan. Some of this land will be required by the Airport Commission to provide access to the South-West Commercial Development Area and to permit development of the future Airport Maintenance Facility east of the airport access road. The remaining lands are not identified as being required for the airport master plan. Acquisition of these lands by the Airport Commission could provide a long-term future development reserve.

The Airport Commission has expressed concern that the Town's Official Plan could permit incompatible uses on lands designated as "Airport Industrial" that lie outside the airport boundaries. As a result, the Town of Niagara-on-the-Lake has recommended that the Official Plan incorporate a special policy clause. This would require that before development can proceed within the "Airport Industrial" designation, a Planning Impact Analysis would need to be undertaken and approved by the Town to ensure compatibility with the Airport Master Plan.