Denendeh
Development Corporation

LPS AVIA
CONSULTING

Airport Runway Optimal Lengths and Issues in the Northwest Territories

GNWT Airport Runways
Issues & Optimal Lengths

Prepared for:
Department of Transportation
Government of the Northwest Territories
2nd Floor, Lahm Ridge Tower
4501 Franklin Ave
Yellowknife NT X1A 2N9

November 2007

Submitted by:

LPS Aviation Inc.
One Antares Drive, Suite 250
Ottawa, Ontario
CANADA K2E 8C4

Tel: (613) 226-6050 Fax: (613) 226-5236
e-mail: info@lpsaviation.ca
Web site: www.lpsaviation.ca

Disclaimer

The Airport Runway Issues and Optimal Lengths Study is not a commitment on the part of the Government of the Northwest Territories to expand /improve infrastructure at individual airports. It provides an analytical framework within which project proposals may be scrutinized. Provision has been included allowing site-specific adjustments to be made to the framework. Justification for projects will be detailed in program documentation. Implementation of projects will be subject to Government of the Northwest Territories priorities and the availability of funds.

Executive Summary

The Government of the Northwest Territories (GNWT) Department of Transportation (DOT) contracted LPS AVIA Consulting, working in conjunction with Denendeh Development Corporation, to assess issues related to the length of runways at the 27 airports and aerodromes operated by the GNWT. Key objectives included recommending a process and analytical tool(s) for determining the optimum runway length for each community, considering existing as well as emerging operational, technical and regulatory factors.

GNWT DOT airports are organized into three categories:

- Gateway Hub (Yellowknife),
- Regional Hubs (Inuvik, Norman Wells); and
- Community Airports (remaining 24 airports).

Three classifications of air services serve these airports pursuant to the Canadian Aviation Regulations (CAR). These include:

- CAR Part 703 Air Taxi Operations (non-jet aircraft with 9 or fewer passenger seats);
- CAR Part 704 Commuter Operations (multi-engine aircraft with 10 to 19 passenger seats); and
- CAR Part 705 Airline Operations (aircraft with 20 or more passenger seats).

While the operating regulations are generally similar there are significant differences in the regulations affecting runway length.

Consultations were conducted by Denendeh Development Corporation with the 27 GNWT DOT airport communities. Responses indicated that communities are generally happy with their airports, and only in Colville Lake and Gamèti/Rae Lakes were safety concerns specifically expressed. Most communities were found to be more concerned with their air service, and not directly with the runway length, but most took the opportunity to suggest that a runway extension would be "good for the community" with expected improvements in costs and tourism.

Aviation industry and regulatory consultations were undertaken directly by LPS AVIA. While responses typically avoided statements of future commercial intent, stakeholder comments were found to follow several themes.

- Air services are expensive and the limitations of short runways can force the use of inefficient aircraft types, which contribute to higher costs.
- Runway declared distances at a number of airports are insufficient in light of new Transport Canada regulations. Currently runways 3000 feet in length are not adequate for the types of aircraft that could serve the communities most effectively. There was a common theme that all runways should be 5000 feet in length.
- Another theme focussed on new regulations for gravel runway operations. Under new regulations, gravel runway performance data is necessary to determine aircraft performance at an airport. Such data does not exist for many aircraft types.
- Many carriers believe that airports are essential for tourism, and the benefits of longer runways were often mentioned. There were very few comments about the condition of runways, suggesting that this is not an issue of general concern.

The study analyzed statistical data for the period 1996-2006. Nine air carriers provided some 340 weekly round trip scheduled flights in the NWT in 2006, and a number of trends were determined:

- Air Taxi operations at smaller airports are decreasing, replaced by increasing Commuter and Airline scale operations.
- Medium size airports are experiencing growing Commuter operations, particularly at Fort Resolution, Holman, Paulatuk and Tuktoyaktuk, as well as growing Airline operations.
- The largest GNWT DOT airports have seen declines in Air Taxi operations, with the exception of Yellowknife and Norman Wells where resource development is the most intense. Inuvik and Norman Wells airports are experiencing increased Commuter operations and Yellowknife is seeing pronounced increases in competitive Airline operations.

A review of accident statistics for the last 16 years indicated that existing runway lengths have not been a significant issue in accident or incident reports.

The study assessed the changing air operating environment in the GNWT. The use of larger, higher performance aircraft in the NWT was documented. It was identified that the overall impact of changing aircraft types is that runway extensions may become necessary to avoid excessive payload constraints, which might theoretically lead to higher prices.

New demands for air services within the NWT are described and baseline, high and low growth air traffic projections presented. The forecasts indicate a relatively small growth in demand, even in the nominal high growth scenario for the most affected airport, Norman Wells. **Forecast traffic is not large enough in most cases to force a change in service aircraft type, rather than just an increase in service frequency.** As well, **a strong link between increasing demand and a need to extend runway lengths could not be demonstrated.** While fleet changes may occur for other reasons, projected traffic growth was not found to be a primary driver for runway expansion in the NWT.

The study noted that a number of Notices of Proposed Amendment to the Canadian Aviation Regulations may impact runway lengths in the NWT. The Amendments pertain to Aircraft Performance Certification, Take-Off Weight Limitations, Operations on Gravel Runways, Wet/Contaminated Runway Operations, and Runway End Safety Areas (RESA). The study establishes that the Amendments will have an impact on NWT airports, and that **some aircraft will no longer be able to operate profitably in the North and must be replaced.** As well, **new aircraft types may require increased runway lengths and may become the "critical aircraft" at some airports necessitating changes in airport design.** However, new regulations for operations on wet and contaminated runways, when extended to turboprop aircraft, will not have a significant impact on runway length requirements as the affected airports are already sized for large turbo-jet operations. If RESA's become mandatory, which is uncertain at this time, then "declared runway lengths" may be reduced at constrained airports, and expensive runway extensions may be required to accommodate the "critical aircraft".

Changing weather patterns were found to have three major impacts .

- Runway and taxiway infrastructure elements will be affected through reduced strength and durability.
- Buildings such as hangars and air terminals will be subject to structural impacts including footing deterioration.
- Airport operations may be affected by changes in weather conditions. Environment Canada has predicted 11 changes in daily weather that will affect air transportation operations. The overall impact of these changes includes a requirement for improved navigation aids, and possibly for increased runway lengths if contaminated runway events become more frequent.

To establish a runway extension prioritization process, the study identifies four justifications for extending a runway:

- to improve safety;
- to achieve economic benefits;
- for socio-economic purposes; and
- to improve the level of service.

As runway extension decisions are complex, a procedure and an objective evaluation tool were developed. Program analysis is recommended on a year-round basis or as changes occur following a series of guidelines proposed in the study. Following initial project tests, a Priority List is established from which current and future year projects are identified, with the list being updated with new information annually. Runway expansion priority factors include: Safety Issues, Aircraft Capabilities (including current aircraft, regulatory changes and fleet replacement factors), Economic Demand, Level of Service, Benefit/Cost Analysis, and Political Issues. These are evaluated by responding to a series of assessment questions for which weighted factors are suggested. The weighting factors can be adjusted, but the data entry values are objective.

To support the use of an objective evaluation and a prioritization process the study recommends the following series of steps:

- collect standard data for each site;

- build a comprehensive database;
- develop an Economic Assessment for each airport and community to support decisions;
- plan and carry out runway extension projects only in accordance with an approved Development Plan for the airport;
- create an initial upgrade Priority List based on the optimization model;
- use the priority list for government budgeting purposes;
- update the list on an annual basis;
- use the model as an overall decision support tool to respond to stakeholders.

Runway extension decisions are complex. The recommendations for specific runway extensions listed in Chapter 7 are formulated through use of an objective evaluation tool and situational information and are essentially technical recommendations Final decisions must be based on detailed analysis of benefits and costs of individual projects.

The Airport Runway Issues and Optimal Lengths Study is not a commitment on the part of the Government of the Northwest Territories to expand or improve infrastructure at individual airports. It provides an analytical framework within which project proposals may be scrutinized. Provision has been included allowing site-specific adjustments to be made to the framework. Justification for projects will be detailed in program documentation. Implementation of projects will be subject to Government of the Northwest Territories priorities and the availability of funds.

The recommendations in Chapter 7 are broken down into 3 categories, with key points as follows:

- High priority runway extensions are recommended at Fort Good Hope, Tulita, and Fort McPherson.
- All other runway length requirements should be monitored regularly.
- Yellowknife Airport's runway capabilities and requirements are considerably more complex and require detailed assessment as part of a full-scale master planning study (currently underway).

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

The Government of the Northwest Territories, Department of Transportation contracted LPS AVIA Consulting, in 2007, to carry out a study of the issues related to the length of runways at the 27 airports and aerodromes that are operated by the GNWT. Figure 1-1 illustrates the location and size of the airports included in the study.

The objective is to recommend a process for determining the optimum runway length at each community for the short and long term, taking into account various factors, such as regulatory changes, fleet changes, climate change and public safety.

This is the final report of the findings of the study and is accompanied by a spreadsheet that implements the processes and procedures recommended herein.

1.2 Technical Background

The facilities in the NWT are either registered aerodromes or certified airports. The correct generic term for both types of facilities is 'aerodrome'. Common usage, however, often uses the term 'airport' as a generic reference. Within this report, both terms are used generically but a reference to a specific facility will use the correct term for that facility.

The aerodromes operated by the GNWT are classified into three categories:

1. Gateway Hub: Yellowknife
2. Regional Hubs: Inuvik and Norman Wells
3. Community Aerodromes: the remaining 24

The aerodromes have very different capabilities and facilities that are identified in detail in Section 2 but range from a 2,362 foot gravel strip at Colville Lake to a 7,500 asphalt runway at Yellowknife.

Throughout the report, a number of technical terms are used and to facilitate an understanding of the content, several of those terms are defined below.

1.2.1 Canadian Aviation Regulations (CARs)

The CARS are enacted by Transport Canada under the authority of the Aeronautics Act and cover all aspects of aviation in Canada. Of particular importance to this study are the definitions of the various types of air operations that are closely linked to the size of the aircraft and to the fact that it is used for scheduled air services.

The differing types are referred to by the section numbers of the relevant CARS:

Part 703 refers to "Air Taxi Operations" and includes single-engined aircraft or multi-engined aircraft, other than a turbo-jet-powered, that has a Maximum Take-Off Weight (MTOW) of 8,618 kg (19,000 pounds) or less and a seating configuration, excluding pilot seats, of nine or less.

Part 704 refers to "Commuter Operations" and includes multi-engined aircraft that have a MCTOW of 8,618 kg (19,000 pounds) or less and a seating configuration, excluding pilot seats, of 10 to 19 inclusive and turbo-jet-powered aircraft that has a maximum zero fuel weight of 22 680 kg (50,000 pounds) or less and which has been authorized to carry not more than 19 passengers.

Part 705 refers to "Airline Operations" and includes aircraft weighing more that 8,618 kg and carry 20 or more passengers.

The operating regulations are similar in many ways but there are significant differences, particularly in the regulations affecting runway length.

In Sections 3 and 4 of this report, many references are made to Part 703, 704 and 705 in the assessment of runway capabilities and regulation impacts. In addition, there is a strong differentiation in the application of the regulations to aircraft used for scheduled services and those used for charter operations.

1.2.2 Aerodrome Standards

A second set of technical terms are related to the length and width of the runway at the aerodrome. The runway is designed to support operations by the "critical aircraft" for the aerodrome. The critical aircraft is the largest or most demanding aircraft that is expected to use the aerodrome on a regular basis. Its characteristics are described in terms of take-off and landing runway length requirements, the aircraft wingspan and distance between the outside edges of the landing gear.

Each aerodrome runway is described using one number and one letter. The number defines the length as follows:

Code 1 less than 800m (2625')

Code 2 from 800 to 1200 m (2625 to 3932')

Code 3 from 1200 to 1800m (3932 to 5900')

Code 4 more than 1800m (5900')

The letter from A to E reflects the wingspan of the critical aircraft as follows:

A less than 15m

B 15 to 24m

C 24 to 36m

D 36 to 52m

E 53 to 65m

In addition, a designation is appended to indicate the types of operation approved for the aerodrome as follows:

NI non-instrument (i.e. visual flights only)

NP non-precision landing aids available that permit operations to lower ceiling and visibility limits

P Precision landing aids available such as Instrument Landing System that permits even lower minimum operations.

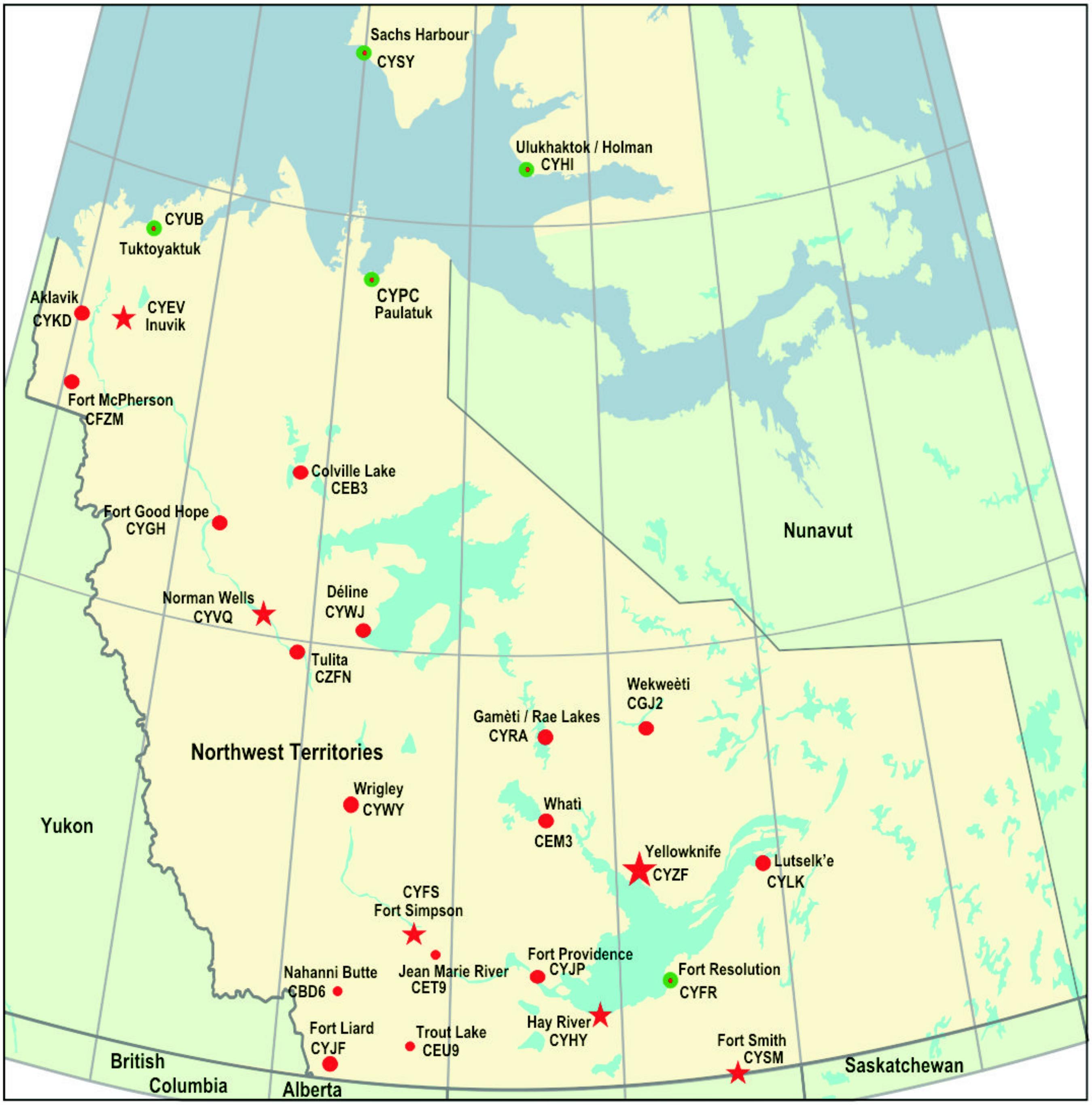
A designation such as 3C-NP carries a number of constraints such as the width of the runway, the distance of obstructions from the runway, the lighting at the aerodrome and many others.

1.2.3 Aircraft Performance

A third set of technical terms used in the study relate to the performance of the aircraft. A given runway design and obstruction environment determines the Take-Off Distance Available (TODA), the Accelerate-Stop Distance Available (ASDA), the Landing Distance Available (LDA) and the Take-Off Run Available (TORA).

These published distances are compared to the aircraft flight manual performance specifications for the aircraft such as the Accelerate Stop Distance required and the Take-off Distance required to determine if it is possible to use an aircraft at an aerodrome, legally and safely.

Aircraft performance is affected by such elements as the air temperature and pressure, the runway surface condition (smoothness and contamination with water or snow), the aerodrome altitude, the take-off weight of the aircraft and many others. The flight manual charts and formulae must be applied to the conditions of the day to determine the safety factors available.



GNWT Airports
Runway Lengths and Issues Study

Aerodrome Code and Location

Figure 1.1

LPS AVIA CONSULTING

2 Data Collection

2.1 Statistical Data

The factual and statistical data collection and assembly task was undertaken in the following manner and the sources of relevant data are identified below.

2.1.1 Current Facilities

The current airport facilities are shown in Table 2-1 on the following page. There is a large range of capabilities among the 27 airports and aerodromes in the Northwest Territories. The most critical parameters for the purposes of this study are the runway length and width and the surface material.

The following terms and acronyms are used within the table:

Runway Lighting:

ALS – Approach Light System

APAPI – Abbreviated PAPI

HIALS – High Intensity Approach Light System

LIRL – Low Intensity Runway Lights

MIRL – Medium Intensity Runway Lights

ODALS – Omni-Directional Approach Lighting System

PAPI - Precision Approach Path Indicator

PCL – Pilot Controlled Lights

REIL – Runway End Indicator Lights

VASIS – Visual Approach Slope Indicator System

Navaids:

DME – Distance Measuring Equipment

NDB – Non-Directional Beacon

VOR – VHF Omni Range

Airport minima shown are for the most capable published approach and are in terms of:

minimum ceiling in feet / minimum visibility in miles

e.g. 500 / 1-1/2

reads as 500' ceiling, 1-1/2 mile visibility

There are recent examples of steeper than normal approach angles supported by vertical guidance (PAPI, APAPI) shrinking the landing zone with the net result of lengthening the effective landing distance available. It is recommended that:

a) the advantages of steep approach supported by vertical guidance be investigated at each site; and

b) each site should be surveyed to ensure that declared distances are at the maximum.

2.1.2 Airport Availability

Airport availability depends on the airport navigation aids and lighting, the weather conditions (visibility and winds) and the capabilities of the aircraft using the airport. Table 2-1 identifies the navigation aids available and, by extension, the ceiling and visibility limits that apply to each airport.

Availability statistics for each airport can be assessed through statistical analyses and comparison of official Environment Canada weather observation statistics to the published ceiling and visibility limits for the airports. However, the availability is not directly related to the runway length.

Availability is related, rather, to the type and location of the navigation aids at or near the airport as well as the obstruction environment in the airport vicinity. Extension of the runway, in itself, would not significantly alter the availability of the airport and as such, the factor has not been included in the assessment and prioritization model. Review of the navaids is a part of a detailed availability study for an airport.

Table 2-1 Airport Data

Airport	ICAO Ident.	Cert/Reg	Long.	Lat.	Runway Designations	Runway Dimensions	Longest Runway Length (ft)	Type of Runway Construction	Airport Code	Critical Aircraft	Critical A/C MCTOW ASD (ft)	Runway Lighting	ILS	Navaids	Minima
Aklavik	**CYKD**	**Cert**	**135 0.35W**	**68 13.38N**	13/31	914 x 23 meters 3000 x 75 feet	3000	Gravel	2B NP	B-99	3675	PCL, MIRL, REIL, APAPI	No	NDB	500 / 1-1/2
Colville Lake	**CEB3**	**Reg**	**126 05W**	**67 1.2N**	10/28	836 X 30 meters 2743 x 100 feet	2800	Gravel	2B NI	DHC6	2700	PCL, LIRL	No	NDB	VFR
Déline	**CYWJ**	**Cert**	**123 26.15W**	**65 12.6N**	07/25	1198 x 30 meters 3933 x 100 feet	3933	Gravel	2B NP	DHC6	2700	PCL, MIRL, REIL, APAPI	No	NDB	497 / 1-1/2
Fort Good Hope	**CYGH**	**Cert**	**128 39.05W**	**66 14.4N**	06/24	914 x 30 meters 3000 x 98 feet	3000	Gravel	2B NP	B-99	3675	PCL, MIRL, REIL, APAPI	No	VOR-DME, NDB	461 / 1-1/2
Fort Liard	**CYJF**	**Cert**	**123 28W**	**60 8.4N**	02/20	898 x 30 meters 2946 x 98 feet	2946	Gravel	2B NI	208 Caravan	2210	PCL, LIRL, REIL, APAPI	No	NDB	VFR
Fort McPherson	**CZFM**	**Cert**	**131 51.5W**	**67 24.42N**	11/29	1067 x 30 meters 3500 x 100 feet	3500	Gravel	2B NP	B-99	3675	PCL, LIRL, REIL, VASIS	No	NDB	524 / 1-3/4
Fort Providence	**CYJP**	**Cert**	**117 36.35W**	**61 19.2N**	13/31	914 x 30 meters 3000 x 98 feet	3000	Gravel	2B NI	Saratoga	1770	PCL, LIRL	No	nil	VFR
Fort Resolution	**CYFR**	**Cert**	**113 41.4W**	**61 10.8N**	12/30	1219 x 30 meters 4000 x 100 feet	4000	Gravel	3B NP	DHC6	2700	PCL, MIRL, REIL, PAPI	No	NDB	474 / 1-1/2
Fort Simpson	**CYFS**	**Cert**	**121 14.2W**	**61 45.6N**	13/31	1829 x 46 meters 6000 x 150 feet	6000	Asphalt	4C-NP	B-737-200	9100	MIRL, PAPI	No	VOR-DME, NDB	305 / 1
Fort Smith	**CYSM**	**Cert**	**111 57.7W**	**60 1.32N**	11/29 02/20	1829 x 61 meters 6000 x 200 feet 549 x 30 meters 1800 x 100 feet	6000	Asphalt Asphalt /gravel	4C-NP	B-737-200	9100	MIRL, REIL, ALS, VASIS	No	VOR-DME, NDB	329 / 1
Gamètì/ Rae Lakes	**CYRA**	**Cert**	**117 18.6W**	**64 6.0N**	14T/32T	914 x 30 meters 3000 x 98 feet	3000	Gravel	2B NI	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR
Hay River	**CYHY**	**Cert**	**115 46.9W**	**60 50.34N**	04/22	6000 x 150 feet 1219 x 46 meters	6000	Asphalt /gravel	4C-P	B-737-200	9100	HIRL, PAPI, HIALS	Yes	VOR-DME	200 / 1/2
Inuvik Mike Zubko	**CYEV**	**Cert**	**133 28.9W**	**68 18.24N**	06/24	1829 x 46 meters 6000 x 150 feet	6000	Asphalt	4C-P	B-737-200	9100	HIRL, ODALS, HIALS, VASIS	Yes	VOR-DME, NDB, DME	250 / 1/2
Jean Marie River	**CET9**	**Reg**	**120 34W**	**61 30.96N**	10/28	762 x 18 meters 2500 x 60 feet	2500	Gravel	1B NI	DHC6	2700	nil	No	nil	VFR
Lutselk'e	**CYLK**	**Cert**	**110 40.93W**	**62 25.2N**	08T/26T	913 x 30 meters 2996 x 100 feet	2996	Gravel	2B NI	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR
Nahanni Butte	**CBD6**	**Reg**	**123 23.35W**	**61 0.6N**	15/33	754 x 18 meters 2475 x 60 feet	2475	Gravel	1B NI	C206	1860	nil	No	nil	VFR
Norman Wells	**CYVQ**	**Cert**	**126 47.9W**	**65 16.92N**	09/27	1828 x 46 meters 5997 x 150 feet	5997	Asphalt	3C NP	B-737-200	9100	MIRL, REIL, ALS, PAPI	No	VOR-DME, NDB	522 / 1-3/4
Paulatuk	**CYPC**	**Cert**	**124 4.5W**	**69 21.66N**	02T/20T	1219 x 30 meters 4000 x 100 feet	4000	Gravel	3B NP	B-99	3675	PCL, MIRL, REIL, APAPI	No	NDB	263 / 1
Sachs Harbour	**CYSY**	**Cert**	**125 14.55W**	**71 59.58N**	08T/26T	1219 x 30 meters 4000 x 100 feet	4000	Gravel	3B NP	B-99	3675	PCL, MIRL, REIL, PAPI	No	NDB	299 / 1

Table 2-1 Airport Data

Airport	ICAO Ident.	Cert/Reg	Long.	Lat.	Runway Designations	Runway Dimensions	Longest Runway Length (ft)	Type of Runway Construction	Airport Code	Critical Aircraft	Critical A/C MCTOW ASD (ft)	Runway Lighting	ILS	Navaids	Minima
Trout Lake	**CEU9**	**Reg**	**121 14.2W**	**60 25.8N**	13/31	762 x 18 meters 2500 x 60 feet	2500	Gravel	1B NI	DHC6	2700	PCL, LIRL	No	nil	VFR
Tuktoyaktuk	**CYUB**	**Cert**	**133 1.55W**	**69 25.98N**	09/27	1524 x 46 meters 5000 x 150 feet	5000	Gravel	3C NP	B-99	3675	PCL, MIRL, REIL, VASIS	No	NDB	505 / 1-1/2
Tulita	**CZFN**	**Cert**	**125 34.1W**	**64 54.0N**	05/23	914 x 30 meters 3000 x 100 feet	3000	Gravel	2B NI	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	NDB	VFR
Ulukhaktok/ Holman	**CYHI**	**Cert**	**117 48.35W**	**70 45.78N**	06T/24T	1311 x 30 meters 4300 x 100 feet	4300	Gravel	3B NP	HS748	5400	PCL, MIRL, REIL, PAPI	No	NDB	515 / 1-1/2
Wekweètì	**CFJ2**	**Cert**	**114 4.55W**	**64 10.8N**	13T/31T	914 x 23 meters 3000 x 75 feet	3000	Gravel	2B NI	C206	1860	PCL, MIRL, REIL, APAPI	No	nil	VFR
Whatì	**CEM3**	**Cert**	**117 14.85W**	**63 7.2N**	09/27	911 x 30 meters 2990 x 100 feet	2990	Gravel	2B NI	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR
Wrigley	**CYWY**	**Cert**	**123 26.2W**	**63 12.54N**	10/28	1067 x 30 meters 3500 x 100 feet	3500	Gravel	2B NP	DHC6	2700	PCL, LIRL, REIL, VASIS	No	VOR-DME, NDB	526 / 1-3/4
Yellowknife	**CYZF**	**Cert**	**114 26.4W**	**62 27.72N**	15/33 09/27	2286 x 46 meters 7500 x 150 feet 1524 x 46 meters 5000 x 150 feet	7500	Asphalt	4C-P	B-737-200	9100	MIRL, HIRL, REIL, ALS, HIALS, PAPI	Yes	VORTAC, NDB	200 / 1/2

Acronyms

Runway Lighting:

ALS – Approach Light System
APAPI – Abbreviated PAPI
HIALS – High Intensity Approach Light System
LIRL – Low Intensity Runway Lights
MIRL – Medium Intensity Runway Lights
ODALS – Omni-Directional Approach Lighting System
PAPI - Precision Approach Path Indicator
PCL – Pilot Controlled Lights
REIL – Runway End Indicator Lights
VASIS – Visual Approach Slope Indicator System

Navaids:

DME – Distance Measuring Equipment
NDB – Non-Ddirectional Beacon
VOR – VHF Omni Range

Minima

Airport minima shown are for the most capable published approach and are in terms of:
minimum ceiling in feet / minimum visibility in miles
e.g. 500 / 1-1/2 reads as 500' ceiling, 1-1/2 mile visibility

2.1.3 Air Traffic Statistics

Movements

Airport movement statistics are compiled by the individual airports and tabulated in the annual Transport Canada publication TP-577. A movement is either a take-off or landing activity. A summary of the most recent aircraft movements for all reporting airports is provided in Table 2.2.

To ensure relevance to runway length analysis, the total movements do not include helicopter movements, in some cases a significant part of the total movements.

The categories in the table are those used by Transport Canada and defined as follows:

ITINERANT refers to flights conducted between two distinct points, or in other word, is not local traffic around the airport.

AIR CARRIER are aircraft operators, licensed by the Canadian Transportation Agency to transport persons, mail and/or goods by air.

OTHER COMMERCIAL are flights performed by commercial aircraft operators not included in the air carrier category. Flying schools, agricultural sprayers, water-bombers, aerial photographers and surveyors, etc. are classified as Other Commercial.

The territorial hub, Yellowknife continues to enjoy robust traffic growth, with movements up 17% in 2006 over 2005. The largest contributing segment have been air carrier activities, with many new scheduled and charter activities in support of the territory's rapidly expanding resource sector. The majority of these movements were destined to private resource aerodromes north of the Capital.

Resource development up the Mackenzie River enabled Norman Wells to surpass Inuvik as the territory's second busiest airport by movements in 2003. In 2006 Norman Wells had 18,000 aircraft movements compared to 17,000 at Inuvik. Norman Wells traffic has grown 21.2% over the last decade, while that of Inuvik has grown 19.7%.

With few exceptions most GNWT communities rely on air and river transport for the movement of people and goods. There is a direct relationship between population and air traffic growth in the territory. In recent years this growth has been disproportionate in the territory. As large numbers of people and goods have been flowing into Yellowknife, Inuvik, and Norman Wells in support of new resource projects, many other GNWT-run community aerodromes have actually experienced slight declines in both population and aircraft movement activity over the last 10 years. The largest decreases were at Tuktoyaktuk, which saw movement activity decline nearly 15.8% since 1996, and Hay River, down 12.4% since 2001.

Table 2-2 Air Traffic Movements at GNWT Airports, 2006

Community	Air Carrier Itinerant	Other Commercial Itinerant	Private Itinerant	Government -Civil Itinerant	Military Itinerant	Total Local	- Rotary Wing (heli)	**Total Movements (fixed wing)**
Aklavik	1,299	12	5	18	4		38	1,300
Déline	2,282		8	46			312	2,024
Fort Good Hope (2005 data)	2,360	1	32	77	7		471	2,006
Fort Liard	2,475	16	23	26	12		1,533	1,019
Fort McPherson	488		4	35	4		16	515
Fort Resolution	296		9		4		3	306
Fort Simpson	Total only available							3,320
Fort Smith	Total only available							6,553
Gamèti/Rae Lakes	943		2	9			14	940
Hay River	4,993	30	228	228	153	117	167	5,582
Holman / Ulukhaktok	773	10	1	15	3		67	735
Inuvik	15,185	123	564	280	190	729	4,036	13,035
Lutselk'e	1,392	2	16	28	8	4	24	1,426
Norman Wells	13,857	213	531	237	68	3,189	3,876	14,219
Paulatuk	Total only available							850
Sachs Harbour (2005 data)	318			6	2		18	308
Tuktoyaktuk	3,535	26	60	39	27		937	2,750
Tulita	2,758	60	31	28	2		401	2,478
Wrigley	409	6	8				143	280
Yellowknife	50,554	239	1,656	934	787	11,799	4,618	61,351

The following analysis in Tables 2-3, 2-4 and 2-5 refers to Itinerant Part 703, 704 and 705 operations as well as runway codes 2, 3 and 4 as are defined in Section 1.2. Code 1 aerodromes do not report movement statistics to Transport Canada. Statistics available do not permit the extraction of helicopter movement statistics from the following analysis.

As newer aircraft are slowly introduced into the NWT, airports have witnessed gradually shifting usage patterns. Analysis of 10 and 5 year movement data by aircraft weight group illustrates a number of trends.

The following tables illustrate the recent trends in aircraft movements among GNWT airports reporting movement statistics to Transport Canada.

Table 2-3 Itinerant Aircraft Movements by Weight Group, Code 2 Airports, in 2006

Community	CAR 703		CAR 703		CAR 704		CAR 704		CAR 705		CAR 705		CAR 705	
	2000 kgs and under	avg % chg 5 yrs	2001-4000	avg % chg 5 yrs	4001-5670	avg % chg 5 yrs	5671-9000	avg % chg 5 yrs	9001-18000	avg % chg 5 yrs	18001-35000	avg % chg 5 yrs	35001 and over	avg % chg 5 yrs
Aklavik	507	-7.8	149	68.4	606	13.5	69	799.7	7	93.8				
Déline	496	-6.4	649	-7.4	953	15.9	6	-23.6	30	141.3	202	-1.6		
Ft. Good Hope	661	-7.1	290	-10.8	268	9.1	6	16.7	5	128.7	83	-8.5		
Fort Liard	2,001	3.4	75	-19.6	453	4.4	10	-22.2						
Fort McPherson	75	-4.9	28	26.7	204	15.7	9	58.2			215	6.0		
Lutselk'e	130	-4.4	608	-8.7	685	13.5	8	73.2	7	87.8	8	120.2		
Tulita	1,054	-3.9	849	-2.2	751	20.9	2	44.0	25	151.3	198	11.6		
Wrigley	382	4.5	24	12.7	15	-0.8								

Table 2-4 Itinerant Aircraft Movements by Weight Group, Code 3 Airports, in 2006

Community	CAR 703		CAR 703		CAR 704		CAR 704		CAR 705		CAR 705		CAR 705	
	2000 kgs and under	avg % chg 5 yrs	2001-4000	avg % chg 5 yrs	4001-5670	avg % chg 5 yrs	5671-9000	avg % chg 5 yrs	9001-18000	avg % chg 5 yrs	18001-35000	avg % chg 5 yrs	35001 and over	avg % chg 5 yrs
Fort Resolution	28	45.3	45	13.0	177	8.6	55	153.5	4	5.0				
Ulukhaktok/Holman	65	78.8	8	21.1	459	24.3	28	179.7	4	75.9	298	25.7		
Paulatuk (2005 data)	222	-3.3	255	252.1	643	0.7	56	140.7	19	2.0				
Sachs Harbour (2005 data)	21	22.0	3	-32.2	255	-1.8	27	7.1	20	675.5				
Tuktoyaktuk	492	-11.7	121	7.9	2,545	0.7	432	267.3	75	65.4	14	115.7		

Table 2-5 Itinerant Aircraft Movements by Weight Group, Code 4 Airports, in 2006

Community	CAR 703		CAR 703		CAR 704		CAR 704		CAR 705		CAR 705		CAR 705	
	2000 kgs and under	avg % chg 5 yrs	2001-4000	avg % chg 5 yrs	4001-5670	avg % chg 5 yrs	5671-9000	avg % chg 5 yrs	9001-18000	avg % chg 5 yrs	18001-35000	avg % chg 5 yrs	35001 and over	avg % chg 5 yrs
Fort Simpson (2005 data)	548	-2.2	557	22.7	426	11.3	52	7.8	18	53.0	771	-2.6	0	
Fort Smith (2005 data)	2,061	-0.3	800	21.9	854	-2.2	1,741	4.2	12	135.1	169	-24.0	6	4.5
Hay River	688	-3.6	376	-10.6	1,197	0.6	102	-9.0	1,231	6.4	1,994	1.5	44	33.1
Inuvik	4,705	-8.8	941	-3.7	7,595	4.3	914	86.4	264	2.9	642	6.1	1,281	4.2
Norman Wells	6,497	0.8	2,453	-1.9	3,660	12.4	165	62.0	132	20.9	565	24.7	1,434	0.9
Yellowknife	6,512	9.0	5,937	-1.6	10,929	3.4	3,424	12.6	2,222	6.7	11,307	10.0	13,839	14.3

Note that for some aerodromes, weight group data was not available for 2005. In those cases the 5 year average growth rates were based on 2001 – 2005 rather than 2002 – 2006 data.

Note also that the above statistics include both rotary wing and fixed wing aircraft as available statistics do not separate weight groups by aircraft type.

Among the airports with runways measuring between 2,625 feet and 3,932 feet (Code 2) there has been a marked reduction in the frequency of certain CAR 703 or “Air Taxi” aircraft (seating for up to 9 passengers), particularly those with up to 4,000 kgs Maximum Takeoff Weight (MTOW). At the same time CAR 704 operations, those in the “commuter” category seating up to 19 seats, and over 4,001 kgs MTOW, have continued to increase. These airports are also seeing increasing numbers of CAR 705, “airline” category movements (aircraft seating over 20 seats).

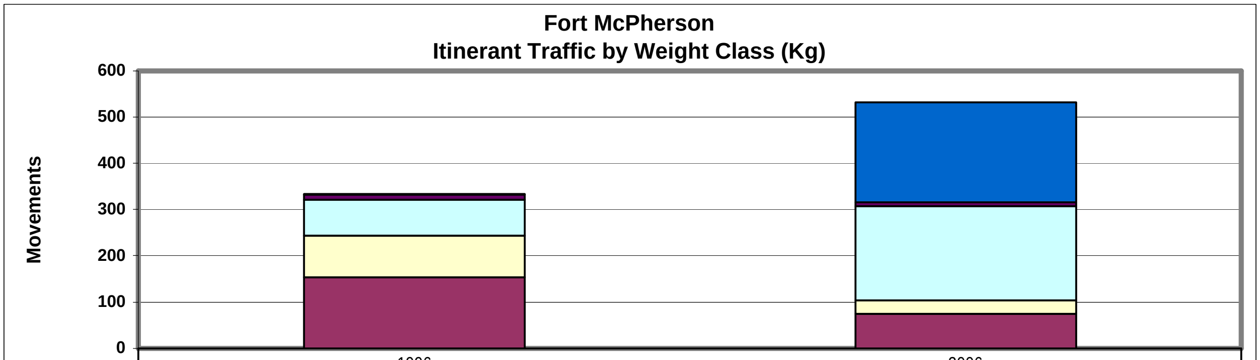
Airports with runways between 3,933 feet and 5,900 feet (Code 3) however, have generally witnessed increases in CAR 703 movements, likely because of population shifts from the smaller communities. There have been significant increases in CAR 704 operations at Fort Resolution, Holman, Paulatuk, and Tuktoyaktuk. There have also been increases in CAR 705 movements at the Code 3 airports.

Finally, airports with runways in excess of 5,900 feet (Code 4) have witnessed declines in CAR 703 movements with the exception of Yellowknife and Norman Wells reporting slight increases. This seems to support the observed movement of populations from the smaller communities to the hub communities with the resulting change in travel patterns. CAR 704 activities have also increased over the last 5-10 years at Code 4 airports, particularly at Inuvik and Norman Wells. Yellowknife has witnessed some of the most pronounced growth in CAR 705 activities in the GNWT.

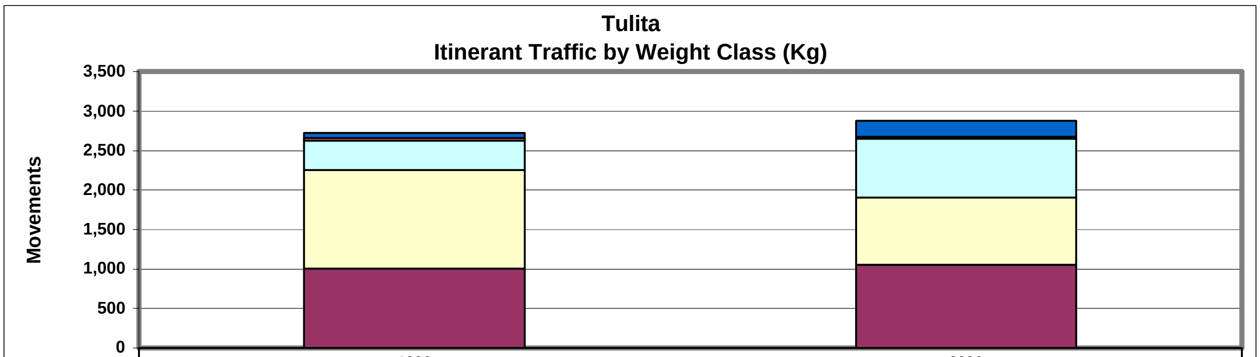
Overall there has been a continued decrease in CAR 703 operations at GNWT airports, and continued increases in both CAR 704 and CAR 705 operations. These shifting traffic patterns are in evidence across all airport categories. These changes are however more pronounced in the smaller communities with Code 2 and Code 3 runways, where with few exceptions there is a trend toward larger aircraft.

The following figures depict by example some of the changes occurring throughout the NWT, where CAR 704 and 705 activities are handling a greater share of airport movements at the expense of CAR 703 activities.

Figure 2-1 Selected Code 2 Airport Comparisons, 1996 vs 2006

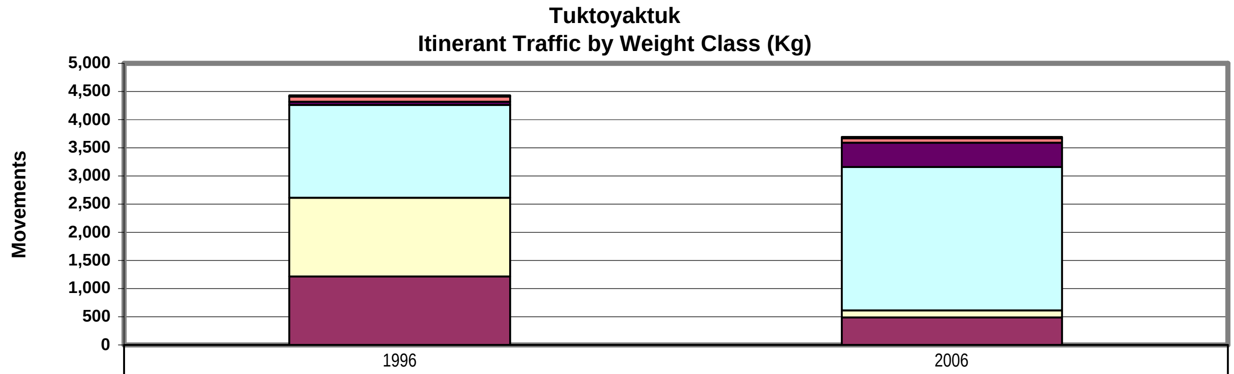


	1996	2006
>35,000	0	0
<35,000	2	215
<18,000	0	0
<9,000	10	9
<5,670	78	204
<4,000	90	28
<2,000	154	75



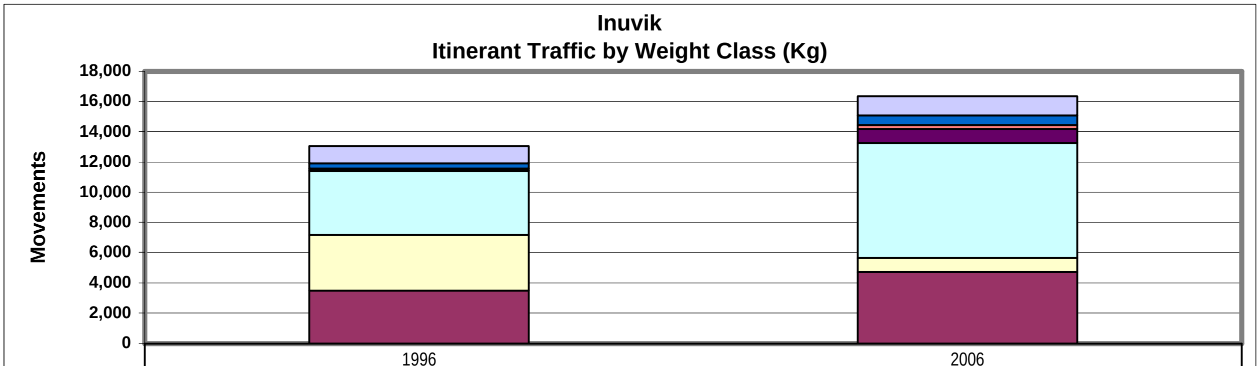
	1996	2006
>35,000	0	0
<35,000	66	198
<18,000	32	25
<9,000	3	2
<5,670	374	751
<4,000	1,244	849
<2,000	1,007	1,054

Figure 2-2 Code 3 Airport Comparison, 1996 vs 2006



	1996	2006
>35,000	6	8
<35,000	11	14
<18,000	94	75
<9,000	50	432
<5,670	1,657	2,545
<4,000	1,389	121
<2,000	1,219	492

Figure 2-3 Code 4 Airport Comparison, 1996 vs 2006



	1996	2006
>35,000	1,174	1,281
<35,000	316	642
<18,000	115	264
<9,000	48	914
<5,670	4,208	7,595
<4,000	3,696	941
<2,000	3,487	4,705

Passengers

Nine air carriers currently provide scheduled services in the NWT including:

- Air Canada Jazz;
- Canadian North;
- First Air;
- Aklak Air;
- Air Tindi;
- Arctic Sunwest;
- North-Wright Airways;
- Northwestern Air; and
- Buffalo Airways.

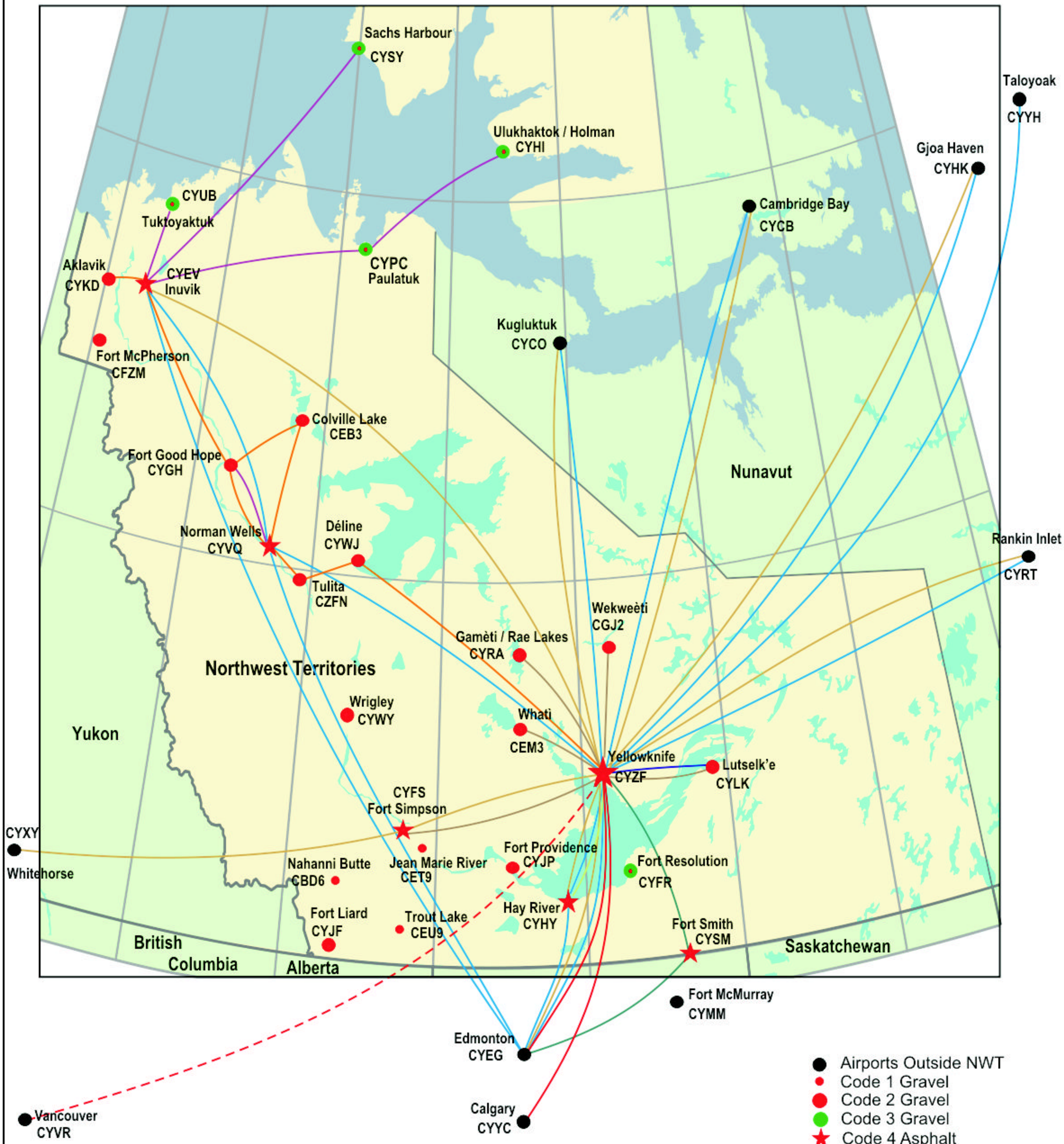
Based on Spring 2007 flight schedules, over 20,000 seats are currently offered on approximately 340 weekly round trip flights in and to the territory. This includes new Air Canada Jazz services linking the capital with Calgary and Edmonton. New seasonal services to Vancouver begin in December 2007. Using a traffic stimulation approach, Air Canada Jazz has brought lower fares and new competition to the territory in addition to capturing a share of existing traffic.

Economic and social trends help influence passenger activity at Canadian airports. In a mature economy there are usually direct correlations between population growth, Gross Domestic Product (GDP), and Personal Disposable Income (PDI). Geography plays an additional role in much of the NWT, with dispersed and isolated communities requiring air transportation for the movement of people and goods.

Recent passenger growth in the NWT is owed to increased real GDP growth, fuelled by the growth in the non-renewable resource sector, related employment opportunities, and greater disposable income. While data on passenger enplanements and deplanements is not readily available for most GNWT airports, Yellowknife experienced 8.4% passenger growth between 2004 and 2005 (the most recent year statistics are available from Statistics Canada). Figures for 2006 are anticipated to be much greater owing to new competition from Air Canada Jazz. The carrier's arrival in Yellowknife has enabled more people to travel by air out of the territory and with greater frequency.

While it is anticipated that GDP will continue to increase over the next decade in the NWT, the corresponding impacts by community may be uneven. Recent evidence of out-migration to Yellowknife, Inuvik and Norman Wells, where new resource development is taking place nearby, may result in net decreases in enplanements and deplanements in many communities in the very near term. Should mega projects such as the Mackenzie Valley Pipeline project commence within the next few years, many communities may see a reverse flow of migrants, along with renewed growth along the Mackenzie Valley. Overall, as the NWT population continues to increase it may also be expected that both movement and passenger activity at GNWT airports will increase longer-term.

Table 2.6 illustrates the current scheduled airline routes by community, with corresponding air carrier services and equipment types operated. Figure 2.4 illustrates the current route network.



GNWT Airports
Runway Lengths and Issues Study

Scheduled Air Services - 2007

Figure 2.4

LPS AVIA CONSULTING

- Air Canada Jazz
- Air Tindi
- Aklak Air
- Arctic Sunwest
- Buffalo Airways
- Canadian North
- First Air
- Northwestern Air
- North Wright Airways

Table 2-6 NWT Scheduled Air Services, 2007

Carrier	Routes		R/T freq. per week	Avg seats per flight	R/T seats per week	Acft type
	from	To				
Air Canada Jazz	Yellowknife	Calgary	14	50	1,400	CRJ
	Yellowknife	Edmonton	14	50	1,400	CRJ
	Yellowknife	Vancouver (Dec 2007)	7	50	700	CRJ
Canadian North	Hay River	Edmonton	6	21	252	DHC8
	Hay River	Yellowknife	6	21	252	DHC8
	Inuvik	Edmonton	3	66/ 100	498	B737/ F100
	Norman Wells	Edmonton	3	66/ 100	498	B737/ F100
	Norman Wells	Inuvik	10	66/ 100	1,660	B737/ F100
	Norman Wells	Yellowknife	7	66/ 100	1,162	B737/ F100
	Yellowknife	Edmonton	17	66/ 100	2,822	B737/ F100
	Yellowknife	Cambridge Bay	4	21/ 66	352	DHC8/ B737
	Yellowknife	Gjoa Haven	3	21	126	DHC8
	Yellowknife	Kugluktuk	6	21	252	DHC8
	Yellowknife	Rankin Inlet	3	66	396	B737
	Taloyoak	Yellowknife	3	21	126	DHC8
First Air	Yellowknife	Cambridge Bay	7	66/ 20	588	B737/ ATR
	Yellowknife	Edmonton	19	66	2,508	B737
	Yellowknife	Fort Simpson	6	20	240	ATR42
	Yellowknife	Gjoa Haven	5	20	200	ATR42
	Yellowknife	Hay River	11	20	440	ATR42
	Yellowknife	Inuvik	4	66	528	B737
	Yellowknife	Kugluktuk	7	20	280	ATR42
	Yellowknife	Rankin Inlet	5	66	660	B737
	Fort Simpson	Whitehorse	3	20	120	ATR42
Aklak Air	Inuvik	Aklavik	10	15	300	B99/ DHC6
	Inuvik	Tuktoyaktuk	18	15	540	B99/ DHC6
	Inuvik	Paulatuk	3	4	24	B99/ DHC6
	Paulatuk	Holman	2	4	16	B99/ DHC6
	Inuvik	Sachs Harbour	3	4	24	B99/ DHC6
Air Tindi	Yellowknife	Fort Simpson	8	4	64	C208
	Yellowknife	Lutsel K'e	8	4	64	C208
	Yellowknife	* Wekweètì	5	4	40	C208
	Yellowknife	* Wha Ti	9	4	72	C208
	Yellowknife	* Rae Lakes	6	4	48	C208

Table 2-6 (cont) NWT Scheduled Air Services, 2007

Carrier	Routes		R/T freq. per week	Avg seats per flight	R/T seats per week	Acft type
	from	To				
Arctic Sunwest	Yellowknife	* Lutsel K'e	9	4	72	B99
North-Wright Airways	Norman Wells	* Tulita	14	9	252	C208/ B99
	Tulita	* Déline	11	9	198	C208/ B99
	Déline	Yellowknife	5	9	90	C208/ B99
	Inuvik	Fort Good Hope	6	9	108	C208/ B99
	Fort Good Hope	Norman Wells	8	9	144	C208/ B99
	Norman Wells	Colville Lake	2	9	36	C208/ B99
	Fort Good Hope	Colville Lake	1	9	18	C208/ B99
	Inuvik	* Aklavik	17	9	306	C208/ B99
Northwestern Air	Yellowknife	Fort Smith	11	15	330	J31
	Fort Smith	Edmonton	5	15	150	J31
Buffalo Airways	Yellowknife	Hay River	6	26	312	DC3

* community regularly sees extra section flights, the table reflects scheduled flights only.

2.1.4 Air Transportation Costs

Air transportation costs were compiled from air carrier published tariffs and published cargo rate schedules. Table 2-7, following Figure 2-4, tabulates example fares, cargo rates and the seat cost per kilometre for routes from community airports to the nearest regional hub and for those routes that leave the territory.

Air transportation costs may show the effects of aircraft type used on a route, air carrier corporate efficiency, or lack of competition. The data is presented here but as it does not directly impact on runway length priority setting, is not analysed in detail.

Table 2-7 Air Fares and Cargo Rates

Air Carrier	Route and distance (km)	Lowest Average One Way Fare ($)	Fare per seat-kilometre ($)	Average Cargo / Kg < 500 lb/ 227 kgs
Air Canada Jazz	Yellowknife-Calgary 1261	276.00	.22	n/a
	Yellowknife-Edmonton 1020	249.00	.24	n/a
	Yellowknife-Vancouver 1570	406.00	.26	n/a
Canadian North	Yellowknife-Hay River 190	174.00	.92	1.51
	Inuvik-Edmonton 1970	514.00	.26	4.03
	Norman Wells-Edmonton 1522	465.00	.31	4.03
	Norman Wells-Inuvik 445	310.00	.68	2.37
	Norman Wells-Yellowknife 681	310.00	.45	2.37
	Yellowknife-Edmonton 1020	295.00	.29	2.35
	Yellowknife-Cambridge Bay 852	486.00	.57	2.62
	Yellowknife-Gjoa Haven 1092	621.00	.57	n/a
	Yellowknife-Kugluktuk 646	352.00	.55	n/a
	Yellowknife-Rankin Inlet 1138	567.00	.50	2.74
First Air	Yellowknife-Cambridge Bay 852	503.00	.59	2.34
	Yellowknife-Edmonton 1020	249.00	.24	2.09
	Yellowknife-Fort Simpson 363	314.00	.87	2.49
	Yellowknife-Gjoa Haven 1092	638.00	.58	4.92
	Yellowknife-Hay River 190	192.00	1.01	2.17
	Yellowknife-Inuvik 1091	406.00	.45	2.33
	Yellowknife-Kugluktuk 646	369.00	.51	3.36
	Yellowknife-Rankin Inlet 1138	567.00	.50	2.74
Aklak Air	Inuvik-Aklavik 63	71.00	1.13	1.73
	Inuvik-Tuktoyaktuk 127	126.00	.99	2.85
	Inuvik-Paulatuk 396	385.00	.97	4.07
	Inuvik-Sachs Harbour 515	482.00	.96	5.09
Arctic Sunwest	Yellowknife-Lutsel K'e 190	140.00	.74	1.25

Table 2-7 (cont) Air Fares and Cargo Rates

Air Carrier	Route and distance (km)	Lowest Average One Way Fare ($)	Fare per seat-kilometre ($)	Average Cargo / Kg < 500 lb/ 227 kgs
Air Tindi	Yellowknife-Fort Simpson 363	306.00	.84	2.90
	Yellowknife-Lutsel K'e 190	165.00	.87	1.61
	Yellowknife-Wekweeti 193	163.00	.85	1.67
	Yellowknife-Wha Ti 162	160.00	.99	1.41
	Yellowknife-Rae Lakes 234	202.00	.86	1.89
North-Wright	Norman Wells-Tulita 71	120.00	1.69	0.82
	Norman Wells-Fort Good Hope 136	136.00	1.00	0.98
	Norman Wells-Colville Lake 232	136.00	.59	1.37
	Yellowknife-Déline 538	485.00	.90	1.53
	Inuvik-Fort Good Hope 310	201.00	.65	2.09
	Inuvik-Aklavik 63	62.00	.98	0.64
Northwestern Air	Yellowknife-Fort Smith 303	230.00	.76	2.00
	Fort Smith-Edmonton 754	380.00	.50	2.15
Buffalo Airways	Yellowknife-Hay River 190	202.00	1.06	1.20

2.1.5 Accident/incident History

Transportation Safety Board data covering incidents recorded north of 60ºN in Canada in the years 1991 through 2002 was reviewed. This data includes incidents that resulted in formal TSB reports as well as those incidents that did not require detailed investigation and reporting.

Of all the events recorded, 57 occurred in those parts of the NWT that are now not part of Nunavut.

Of those 57, only three were recorded as being on or near a GNWT airport. The remainder occurred on remote sites such as lakes or resource development airstrips. Of the three airport incidents, one was a take-off/landing event and involved a Cessna 185.

Published TSB annual statistics show 148 accidents in the NWT from 1990 through 1999 but do not differentiate those locations that are not now in the NWT but are in Nunavut. The later statistics show 44 accidents between 2000 and 2005 in the NWT alone.

Published accident investigation reports from 1994 to 2005 include 11 reports related to accidents in the NWT and excluding Nunavut locations. Of these accidents, three were on or near GNWT airports and none involved runway overrun but rather fuel exhaustion, navigation errors or pilot error.

From the available statistics, it is apparent that there has not been a history of accidents or reportable incidents related to runway length at GNWT airports over the past 16 years and as such, the statistics do not indicate a pressing need for runway extensions.

2.1.6 Runway Extension Costs

In November 2006, Class D Estimates were prepared by the GNWT for extensions to runways at 16 communities. The results are presented in Table 2-8 below. The estimates do not include the 6 airports that currently have paved runways nor the airports that do not currently have scheduled service.

The estimates included three scenarios for each airport that allowed for extension of the current runway length to 4,000 feet, 5,000 feet or 6,000 feet.

In many cases, an extension to even 4,000 feet is not possible at the current airport location so an entirely new airport would be required, a contingency that has a significant effect on budget estimates.

The estimates (rounded to the nearest $50,000) do not include costs for the acquisition of lands where required, the costs of gravel royalties payable for any required gravel fill, the costs for NavCanada activities if the airport is moved or the cost for amending zoning regulations where required.

For airports that can be extended at the same location, construction costs ranged from about $190,000 for 100 feet of extension to about $290,000 per 100 feet, depending on local construction costs and the challenges of each site.

The construction costs have been compared to recent experience in construction of airports and roads in Nunavut and Alberta oil sands regions and they are reasonable for northern construction. However, the costs must be reviewed as significant increases have been evident even in the past six months due to competition for scarce construction resources ion Western Canada that are in high demand in the Alberta oil patch.

A comprehensive land use plan should be developed and maintained for each airport to identify expansion/relocation options and issues.

Each project will require additional costs that may include such items as: an access road, a new or relocated ATB, a maintenance garage, power, lighting, Nav Aids etc.

The relevant civil construction costs are included in the spreadsheet as a decision factor.

Table 2-8 Runway Construction Costs

Site	Existing Runway Length x Width (ft)	4000 ft Runway Code 3C NP Cost excluding Land	5000 ft Runway Code 3C NP Cost Excluding Land	6000 ft Runway Code 4D NP Cost Excluding Land
*** Aklavik**	3000 x 75	$10,250,000	$12,850,000	$14,950,000
*** Colville Lake**	2743 x 100	$10,250,000	$12,350,000	$14,450,000
Déline	3933 x 100	$200,000	$2,400,000	$5,850,000
*** Fort Good Hope**	3000 x 100	$1,700,000	$4,400,000	$7,850,000
*** Fort Liard**	2956 x 100	$1,750,000	$3,950,000	$14,950,000
Fort McPherson	3500 x 100	$1,150,000	$3,300,000	$6,750,000
***Lutselk'e**	3000 x 100	$1,700,000	$4,400,000	$8,050,000
Paulatuk	4000 x 100	N/A	$2,200,000	$5,650,000
*** Gamèti / Rae Lakes**	3000 x 100	$10,250,000	$12,350,000	$14,950,000
Sachs Harbour	4000 x 100	N/A	$2,200,000	$5,650,000
Tuktoyaktuk	5000 x 150	N/A	N/A	$2,400,000
*** Tulita**	3000 x 100	$1,900,000	$4,100,000	$8,450,000
Ulukhaktok (Holman)	4300 x 100	N/A	$1,950,000	$4,650,000
*** Wekweètì**	3000 x 100	$1,700,000	$12,350,000	$14,450,000
Wha Ti	3000 x 100	$1,700,000	$4,350,000	$6,600,000
Wrigley	3500 x 100	$1,150,000	$3,600,000	$7,200,000

Source: GNWT, Department of Transportation, November 2006

* Re-location of NavCanada facilities not included where a new airport is required

* Land acquisition / exchange could be an issue for extension or new airport sites

2.2 Consultations

Input was solicited from key stakeholders including community representatives, air carriers, government users and resource industry users to address such factors as:

- adequacy of current runway lengths based on current operations;
- adequacy of runway lengths based on future operations;
- effectiveness of NWT airport hours of operation;
- current air transportation costs;
- issues resulting from aircraft performance limitations imposed by runway lengths; and
- other issues.

Input from stakeholders was obtained via interviews wherever possible, and questionnaires adapted as appropriate to stakeholder interests.

Consultations were undertaken:

- in NWT communities by Denendeh Development Corporation staff (community issues and costs);
- in Yellowknife by LPS AVIA staff (air carriers, tourism operators; resource sector, logistics companies, Canadian Forces North, and Health officials);
- in Ottawa by LPS AVIA staff (Transport Canada, First Air, and others).

LPS AVIA also polled key oil and gas company aviation department officials to assess projected demand for airport capabilities in the NWT.

LPS AVIA attended the Prospectors and Developers Conference in Toronto to meet with NWT air carriers and to assess natural resource sector activity levels and projected travel demands affecting NWT airports.

2.2.1 Community Survey

In order to determine the views of the airport users a number of consultations were undertaken. The purpose of the various types of consultations was to identify the runway length concerns of the stakeholders.

A mail survey was sent to each community to seek input on how well the airport serves the current social and economic needs of the community. It also sought input on the linkage between potential airport development and viable economic development.

The survey was sent to 27 airports for the community to complete. The respondents varied from community economic development departments through first nation groups to individuals on behalf of the community. Thirteen communities responded and not all respondents answered each question. Therefore the statistics in each category vary based on the number of responses for that item.

The questionnaire asked "Does the airport in your community serve your present social and economic needs?" in the following areas. The yes/no responses are tabulated below.

Needs for	Yes	No
Medevac/Health Care	11	1
Community Re-supply	8	4
Tourism	9	3
Pleasure Travel	9	2
Business Travel	11	1
Exploration/Resource Development	8	4
Other Economic Activities	8	4

The questionnaire also asked "Would airport development create viable economic opportunities?" The responses to this question were yes:7, no:5.

From the table above it can be seen that the current airports serve the social needs (medevac/health care) with one exception (Norman Wells). The results were mixed on the question of the airport meeting the community resupply needs with the "no" responses supported by comments on high prices. The communities felt the airports met the tourism, business and pleasure travel needs but were mixed on the question of meeting the resource development and other types of economic activity needs.

In general terms, the responses indicate:

1. the communities are generally happy with the airports;
2. only in Colville Lake and Rae Lake are there expressed safety concerns with the conditions in the vicinity of the airport;
3. most are concerned with the service, not directly with the runway length;
4. most have taken the opportunity to suggest that a runway extension would be "good for the community" with the resulting improvements in costs, tourism etc.

2.2.2 Air Carrier Survey

Questionnaires were sent to all carriers that currently operate scheduled services within the NWT. These were followed up with multiple telephone conversations but all carriers were reluctant to provide written responses, particularly with respect to future fleet plans. Commercial confidentiality may be a factor as it is expected by the carriers that the report will be a public document.

Based on telephone conversations, discussions at various conferences and other assignments, a number of air carrier observations on runway conditions in the NWT can be summarized. The majority are from the carriers who utilize the runways in the NWT.

Although these observations are anecdotal they come from experienced people and they do identify important issues. The conclusions expressed are not, however, necessarily supported by the subsequent analysis.

The following is a summary of comments made by the air carriers. Where appropriate, the point is followed by a commentary in *italics*.

1. Runway declared distances at a number of community airports are insufficient in light of the newly introduced Transport Canada legislation and regulations. The GNWT's 3000 ft. runways are not adequate for the types of aircraft that could serve the communities more effectively.
2. Aviation service in the NWT is an essential service. It is necessary for fast reliable access to medical services, health services and government services in support of population growth.
3. Gravel operations data does not exist for many aircraft types. Modern aircraft certification is normally based on paved surfaces.

   Gravel runway performance data is necessary when determining acceptable aircraft for many runways in NWT under the new regulations.

4. Many believe that airports are essential for tourism generation.

   The logic appears to be: "bigger runways equals bigger aeroplanes equals reduced cost equals more tourism". There are many other issues involved in tourism generation but a longer runway is often mentioned and aviation services are only one aspect of tourism infrastructure development.

5. Air services in the NWT are very expensive and the limitations of short runways that force the use of inefficient types of aircraft contribute substantially to the high cost.

   Stage length between origin and destination is a greater factor in determining efficient aircraft type for delivery of service.

6. With high capital and operating costs and low traffic levels, most NWT airports require some form of subsidization for any form of development.

   No airports or aerodromes in the NWT system are self sufficient.

7. There are very few comments about the condition of runways. Only one site, Hay River, was consistently considered inadequate because of problems with surface smoothness, flooding, slopes etc.

   GNWT has rectified this situation during the summer of 2007.

8. There was a common theme from carriers that all runways should be 5,000' but they recognize that this may not be readily achievable.

   The realities of funding, resources and O&M costs make this ideal unattainable.

3 Changing Operational Environment

3.1 Changing Aircraft Types

3.1.1 Issues

Regulatory changes, technological advancements, and market growth are driving the introduction of new aircraft types in the NWT. Older and commonly lighter piston aircraft are being replaced with turbo-prop aircraft, which in many cases are larger and heavier.

Some recent examples of fleet growth include the replacement of HS-748 aircraft by ATR-42s at First Air, the introduction of the Dash 8 by Canadian North and Arctic Sunwest, Lockheed Electras with Buffalo Airways, and introduction of Bombardier CRJs by Air Canada Jazz. More modern aircraft generally require longer takeoff and landing runs as they are designed for in-flight efficiency rather than ground performance. They also use high pressure tires which are not designed for soft or gravel runway surfaces. Modern aircraft touchdown speed tends to be significantly higher requiring better runway surface conditions.

The low utilization of aircraft in the north requires low capital costs and insurance to keep fares reasonable. Aircraft retired from high-utlization airline routes and have incurred significant hours and cycles meet this requirement. In general, however, there is no direct relationship between aircraft age and runway length.

Jet operations on gravel runways are becoming increasingly rare as more recent aircraft are not certified for gravel operations. Increasing use of composite materials in aircraft construction is also requiring special procedures at arctic airports.

"Critical aircraft" were established for each airport in the NWT by Transport Canada prior to divestiture in the 1990s. The current critical aircraft documented in this study are those that were identified from Transport Canada documentation in the 1998 Intervistas study on Runway Issues in the NWT. More recent aircraft types must be assessed for their potential to operate from NWT airports, and "critical aircraft" designations for each airport must be re-validated.

In addition, newer aircraft may transition existing services between Part 703 (air taxi), Part 704 (commuter), and Part 705 (airline) category operations necessitating examination of differing rules of operation at certain airports.

Published technical details for aircraft in use in the north generally include runway length requirements for Maximum Certified Take-Off Weight (MCTOW) operations. However the Accelerate Stop Distance (ASD) is also now a critical calculation required by new CARS regulations for Part 704 Scheduled Service operations.

In cases where the ASD Required by the critical aircraft exceeds the ASD Available at the airport, three options exist:

1) the runway may be extended to meet the requirements;

2) the aircraft type may be changed for the service to this airport; or

3) the air carrier may accept a payload or range constraint at the airport thereby reducing the calculated ASD Required.

The third option is currently the most often used. As aircraft are replaced, however, any constraint on payload will limit the potential profitability of the new aircraft, and consequently the type selected for both a specific airport and for the route.

The overall impact of changing aircraft types is that runway extensions may become necessary to avoid excessive payload constraints.

Section 1.2 defined terms used in the assessment of the aircraft types in the NWT. The most important factor is that the analysis is carried out using the performance data at the Maximum Certified Take-Off Weight (MCTOW) for the aircraft type. Carriers seldom operate at MCTOW but rather adjust the load and fuel carried to suit the conditions of the day and to minimize costs and maximize returns. As a result, an aircraft type may be usable on a shorter runway than shown by basic calculations, down to the point of negative profitability.

3.1.2 Performance Characteristics

Performance characteristics of aircraft in use in the north as well as selected types that may be used in the future are included in Table 3-1. This spreadsheet is included as part of the prioritization assistance package that is described in Section 6.

The factors in the chart affect where and how each aircraft type may be used at NWT airports.

In addition to the better understood factors, the following performance criteria also affect each aircraft's potential usability as described:

CAR Operations

This identifies the normal operations for this aircraft type in accordance with the Canadian Aviation Regulations.

Part 703 refers to "Air Taxi Operations" and includes single-engined aircraft or multi-engined aircraft, other than a turbo-jet-powered, that has a Maximum Certified Take-Off Weight (MCTOW) of 8,618 kg (19,000 pounds) or less and a seating configuration, excluding pilot seats, of nine or less.

Part 704 refers to "Commuter Operations" and includes multi-engined aircraft that have a MCTOW of 8,618 kg (19,000 pounds) or less and a seating configuration, excluding pilot seats, of 10 to 19 inclusive and turbo-jet-powered aircraft that has a maximum zero fuel weight of 22 680 kg (50,000 pounds) or less and which has been authorized to carry not more than 19 passengers.

Part 705 refers to "Airline Operations" and includes aircraft weighing more that 8,618 kg and carry 20 or more passengers.

Some aircraft in the table can be used in either Part 703 or Part 704 operations, depending on the seating configuration.

Part 704.45/46/47 Compliance

This column is an indication of whether the type is expected to be compliant with the terms of the new CAR 704.45 and 704.46 regulations related to aircraft certification, accelerate/stop distance requirements and one engine failure performance requirements. See Section 4 for more details.

MCTOW

This is the Maximum Certified Take-Off Weight for the type. This weight applies under all conditions of weather, load, etc. As noted above, carriers seldom operate at MCTOW but rather adjust the load and fuel carried to suit the conditions of the day and to minimize costs and maximize returns.

ASD

This is the certified Accelerate Stop Distance required for the type under a number of standard conditions of altitude, temperature, runway surface etc. The distance shown is for the MCTOW. See Section 4 for details on the impact of ASD regulations.

Gravel Capability

This column is an indication of the required runway length for operations at MCTOW on a gravel surface. If the manufacturer provides specific gravel operations data in the flight manual, the distances may be less. If not, however, the regulations require the addition of a 10% or 15% factor, depending on the propulsion type and the weight of the aircraft. See Section 4 for more details.

Contaminated Landing Distance

When operating Part 705 aircraft on contaminated (wet or snow covered) asphalt surfaced runways, a 15% factor is to be added to the bare and dry landing distance requirements. This column tabulates the requirements. See Section 4 for more details.

MLW

This is the Maximum Landing Weight for the type.

Table 3-1 Aircraft Data

Manufacturer	Type	CARs	704.45/46 Compliant	MCTOW Kg	Pax Cap	Max Payload Kg	TO dist reqd at MCTOW	ASD req'd (ft) at MCTOW	Gravel ASD req'd	Contaminated landing dist. at MLW	Max Landing Weight Kg	Land dist reqd at MLW (ft)	Engine Turbo or Piston	Jet or Prop
Cessna	C206	703	N/A	1,633	5	617	1,860	1,860	2,046	N/A	1,633	1,395	P	P
Piper	Saratoga	703	N/A	1,633	5	546	1,770	1,770	1,947	N/A	1,633		P	P
Cessna	208B Caravan	703	N/A	3,985	9	2,041	2,420	2,420	2,783	2,064	3,985	1,795	T	P
Cessna	208 Caravan	703	N/A	4,000	8	1,427	2,000	2,210	2,431	N/A	3,545	2,450	T	P
Pilatus	PC12	703	N/A	4,510	9	1,282	2,300	2,450	2,695	N/A	4,510	1,830	T	P
Beech	B-99	704	N	5,135	15	1,793		3,675	4,043	N/A			T	P
Raytheon	King Air B100	704	N	5,360	12	1,320		3,050	3,355	N/A	5,095	5,650	T	P
DeHavilland	DHC6	704	Possible	5,670	19	2,328		2,700	2,970	N/A	5,590	2,200	T	P
Raytheon	KingAir B200	704	N	5,670	11	1,120	2,600	3,411	3,752	N/A	5,670	2,845	T	P
Shorts Bros.	Skyvan SC.7	704	?*	5,670	19	2,086	1,680	1,680	1,848	N/A	5,670	1,860	T	P
Cessna	Citation II	704	N/A	5,670	10	3,060	3,360	3,360	3,696	N/A	5,227	2,980	T	J
Embraer	EMB110	704	N	5,912	15	2,272		1,770	2,036	N/A		1,130	T	P
Dornier	D228	704	?*	5,980	19	2,293		2,500	2,875	N/A	5,900	1,450	T	P
BAE	Jetstream 31	704	?*	6,600	19	2,042	2,815	2,815	3,237	N/A	6,759	2,684	T	P
BAE	Jetstream 32	704	N	7,365	19	2,042			0	N/A	7,080		T	P
Beech	1900D	704	Y	7,766	19	1,984		3,813	4,385	N/A	7,605	2,790	T	P
Douglas	DC-3	705	N/A	12,227	-	3,860	3,500	3,500	4,025	N/A			P	P
SAAB	SAAB 340	705	N/A	12,950	35	3,180		4,695	5,399	3,968	12,727	3,450	T	P
DeHavilland	Dash-8 100	705	N/A	15,650	50	4,800	3,090	2,540	2,921	3,427	15,380	2,980	T	P
ATR	ATR42-300	705	N/A	16,700	48	4,915		3,608	4,149	3,565	16,400	3,100	T	P
DeHavilland	DHC-5	705	N/A	18,700	-	5,000	1,225	1,225	1,409	0			T	P
DeHavilland	Dash-7	705	N/A	19,958	50	5,693		2,350	2,703	3,450	19,051	3,000	T	P
HawkerSiddley	HS748	705	N/A	21,135	48	5,120		5,400	6,210	3,910	19,545	3,400	T	P
Bombardier	CRJ 100/200	705	N/A	21,523	50	5,414		4,600	5,290	5,405	20,276	4,700	T	J
Curtis	C46	705	N/A	22,000	-	6,800			0	0			P	P
Douglas	DC 4	705	N/A	33,100	-				0	0	28,800		P	P
Bombardier	CRJ705	705	N/A	36,515	75	10,387		5,833	6,708	6,020	33,345	5,235	T	J
Embraer	ERJ190	705	N/A	47,790	98	12,720		4,281	4,923	4,992	43,000	4,341	T	J
Lockheed	Electra	705	N/A	52,620	-	15,200	5,490	5,490	6,314	3,186	44,500	2,770	T	P
Boeing	B-737-200	705	N/A	53,180	124	16,250	6,800	9,100	10,465	5,290	49,545	4,600	T	J
Boeing	B-737-600	705	N/A	65,680	148	15,070	5,300	6,160	7,084	5,060	55,225	4,400	T	J
Lockheed	L100-30 Herc	705	N/A	70,454	-	23,730		6,200	7,130	5,578	61,360	4,850	T	P

Note: in normal operations, fuel and load are adjusted to suit conditions so the aircraft do not often operate at Maximum Certified Take Off Weight (MCTOW)

* Not yet determined by Transport Canada

3.2 Changing Traffic Patterns

3.2.1 New Demands

A number of factors are influencing traffic patterns in the NWT.

Yellowknife's growing importance from an economic standpoint, as both territorial hub and launching point for rapidly developing resource projects, is impacting carrier traffic patterns in the NWT.

Smaller communities throughout the NWT have witnessed a gradual population flow into Yellowknife over the last decade as people come in search of new employment opportunities in North America's "Diamond Capital".

Resource development revolving around the regional centres of Inuvik and Norman Wells is beginning to have a similar impact on these communities.

Mining firms have also begun flying in large numbers of workers from Alberta directly to NWT mine-sites.

Many Yellowknife residents have been pursuing job opportunities in Alberta, as the province booms with the strength of the oil and gas sector, making more frequent return visits to family in the NWT and increasing demand.

3.2.2 Service Response

With the growth in demand between western Canada and the NWT, carriers have responded with new flight frequencies. Air Canada Jazz has initiated twice daily CRJ-200 service between Calgary and Yellowknife, as well as between Edmonton and Yellowknife. Daily Vancouver-Yellowknife service begins later in 2007.

Ten year forecasts of aircraft movement growth have been prepared for the 19 GNWT airports which report annual movement data to Transport Canada. Three potential scenarios are assumed.

A baseline traffic growth rate assumes current economic and personal disposable income growth. Current resource-based projects in the territory continue and economic benefits flow to communities.

A high growth scenario assumes that the Mackenzie Valley Pipeline project proceeds within the next few years, amplifying growth throughout a large portion of the Territory.

Finally, a low growth scenario pre-supposes a reduction in resource sector activities owing to a combination of declining demand, and cessation of oil and gas sector mega-projects. The flow of economic benefits to communities declines and population migration to larger centres continues.

The three different scenarios are presented below. Owing to the difficulty in allocating economic drivers to particular aircraft types, forecasts by weight group cannot easily be presented.

Table 3-2 Baseline Forecast of Aircraft Movements, GNWT Airports 2007-2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Aklavik	1,300	1,326	1,353	1,380	1,407	1,435	1,464	1,494	1,523	1,554	1,585	1,617
Déline	2,024	2,065	2,106	2,148	2,191	2,235	2,280	2,326	2,372	2,420	2,469	2,518
Fort Good Hope (2005)	2,006	2,046	2,088	2,130	2,173	2,217	2,261	2,307	2,354	2,401	2,450	2,499
Fort Liard	1,019	1,040	1,061	1,082	1,104	1,126	1,149	1,172	1,196	1,220	1,245	1,270
Fort McPherson	515	525	536	547	558	569	580	592	604	616	628	641
Fort Resolution	306	312	319	325	332	338	345	352	359	367	374	382
Fort Simpson	3,320	3,386	3,454	3,523	3,594	3,666	3,739	3,814	3,890	3,968	4,047	4,128
Fort Smith	6,553	6,684	6,818	6,954	7,093	7,235	7,380	7,527	7,678	7,831	7,988	8,148
Gamèti/Rae Lakes	940	959	978	998	1,018	1,038	1,059	1,080	1,102	1,124	1,146	1,169
Hay River	5,582	5,697	5,814	5,933	6,055	6,180	6,307	6,437	6,570	6,705	6,844	6,985
Holman / Ulukhaktok	735	750	765	780	796	811	828	844	861	878	896	914
Inuvik	13,035	13,311	13,592	13,880	14,174	14,475	14,782	15,096	15,417	15,745	16,081	16,423
Lutselk'e	1,426	1,455	1,484	1,514	1,544	1,575	1,607	1,640	1,673	1,706	1,741	1,776
Norman Wells	14,219	14,551	14,891	15,240	15,597	15,964	16,339	16,724	17,119	17,523	17,937	18,362
Paulatuk	850	867	884	902	920	938	957	976	996	1,016	1,036	1,057
Sachs Harbour (2005)	308	314	320	327	333	340	347	354	361	368	375	383
Tuktoyaktuk	2,750	2,806	2,862	2,920	2,979	3,039	3,101	3,163	3,227	3,292	3,359	3,427
Tulita	2,478	2,528	2,579	2,631	2,684	2,738	2,793	2,850	2,907	2,966	3,026	3,087
Wrigley	280	286	292	297	304	310	316	322	329	336	343	350
Yellowknife	61,351	62,745	64,173	65,635	67,132	68,666	70,237	71,846	73,494	75,182	76,911	78,683
Totals	120,997	123,651	126,367	129,145	131,987	134,895	137,871	140,915	144,030	147,217	150,479	153,817

Table 3-3 High Forecast of Aircraft Movements, GNWT Airports 2007-2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Aklavik	1,300	1,352	1,406	1,462	1,521	1,581	1,645	1,710	1,779	1,850	1,924	2,001
Deline	2,024	2,105	2,189	2,277	2,368	2,463	2,562	2,665	2,771	2,882	2,998	3,118
Fort Good Hope (2005)	2,006	2,087	2,170	2,257	2,348	2,442	2,540	2,642	2,749	2,859	2,974	3,094
Fort Liard	1,019	1,060	1,102	1,146	1,192	1,240	1,290	1,341	1,395	1,451	1,509	1,570
Fort McPherson	515	536	557	579	602	626	651	677	704	732	762	792
Fort Resolution	306	318	331	344	358	372	387	403	419	436	454	472
Fort Simpson	3,320	3,453	3,591	3,735	3,884	4,039	4,201	4,369	4,544	4,725	4,914	5,111
Fort Smith	6,553	6,815	7,088	7,371	7,666	7,973	8,292	8,623	8,968	9,327	9,700	10,088
Gamèti/Rae Lakes	940	978	1,017	1,057	1,100	1,144	1,190	1,237	1,287	1,338	1,392	1,448
Hay River	5,582	5,806	6,039	6,282	6,534	6,797	7,071	7,356	7,653	7,962	8,284	8,619
Holman / Ulukhakot	735	764	795	827	860	894	930	967	1,005	1,045	1,087	1,130
Inuvik	13,035	13,570	14,128	14,708	15,314	15,944	16,601	17,286	18,000	18,743	19,518	20,326
Lutselk'e	1,426	1,483	1,542	1,604	1,669	1,735	1,805	1,877	1,953	2,031	2,112	2,197
Norman Wells	14,219	14,842	15,492	16,172	16,882	17,624	18,400	19,211	20,058	20,944	21,870	22,838
Paulatuk	850	884	919	956	994	1,034	1,076	1,119	1,163	1,210	1,258	1,309
Sachs Harbour (2005)	308	320	333	346	360	374	389	405	421	438	455	473
Tuktoyaktuk	2,750	2,860	2,975	3,094	3,218	3,347	3,481	3,621	3,766	3,917	4,074	4,238
Tulita	2,478	2,578	2,681	2,789	2,901	3,017	3,139	3,265	3,396	3,532	3,674	3,822
Wrigley	280	291	303	315	328	341	355	370	385	400	416	433
Yellowknife	61,351	63,983	66,732	69,601	72,598	75,728	78,996	82,409	85,973	89,696	93,585	97,647
Totals	120,997	126,084	131,390	136,924	142,697	148,718	155,000	161,552	168,388	175,521	182,961	190,725

Table 3-4 Low Forecast of Aircraft Movements, GNWT Airports 2007-2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Aklavik	1,300	1,313	1,326	1,340	1,353	1,367	1,380	1,394	1,408	1,423	1,437	1,451
Deline	2,024	2,044	2,065	2,086	2,107	2,128	2,149	2,171	2,193	2,215	2,237	2,260
Fort Good Hope (2005)	2,006	2,027	2,047	2,068	2,089	2,111	2,133	2,154	2,177	2,199	2,221	2,244
Fort Liard	1,019	1,030	1,040	1,051	1,062	1,073	1,084	1,095	1,107	1,118	1,130	1,141
Fort McPherson	515	520	525	531	536	542	547	553	558	564	570	575
Fort Resolution	306	309	312	316	319	322	326	329	333	336	340	343
Fort Simpson	3,320	3,353	3,387	3,421	3,455	3,489	3,524	3,559	3,595	3,631	3,667	3,704
Fort Smith	6,553	6,619	6,685	6,752	6,819	6,887	6,956	7,026	7,096	7,167	7,239	7,311
Gamèti/Rae Lakes	940	949	959	969	978	988	998	1,008	1,018	1,028	1,039	1,049
Hay River	5,582	5,643	5,705	5,767	5,830	5,894	5,959	6,025	6,091	6,158	6,227	6,295
Holman / Ulukhakot	735	742	750	757	765	773	780	788	796	804	812	820
Inuvik	13,035	13,185	13,336	13,490	13,646	13,804	13,964	14,126	14,290	14,457	14,626	14,797
Lutselk'e	1,426	1,441	1,455	1,470	1,485	1,500	1,516	1,531	1,547	1,563	1,579	1,595
Norman Wells	14,219	14,417	14,618	14,823	15,031	15,243	15,459	15,678	15,901	16,128	16,359	16,594
Paulatuk	850	859	867	876	885	893	902	911	920	930	939	948
Sachs Harbour (2005)	308	311	314	317	321	324	327	330	334	337	340	344
Tuktoyaktuk	2,750	2,778	2,807	2,836	2,865	2,895	2,925	2,955	2,986	3,017	3,048	3,080
Tulita	2,478	2,503	2,529	2,555	2,581	2,607	2,633	2,660	2,688	2,715	2,743	2,771
Wrigley	280	283	286	289	292	295	298	301	304	307	311	314
Yellowknife	61,351	62,166	62,995	63,837	64,693	65,562	66,446	67,345	68,258	69,187	70,131	71,090
Totals	120,997	122,492	124,010	125,549	127,112	128,698	130,308	131,941	133,600	135,283	136,993	138,728

3.3 Conclusions

The preceding forecasts indicate a relatively small growth in traffic demand, even in the nominal high growth scenario for the most affected airport, Norman Wells.

At an average annual growth rate of 5.8% (high scenario) the forecast traffic is not large enough, in most cases, to force a change in service aircraft type rather than just an increase in service frequency.

As a result, a strong linkage between increasing demand and changes in the required runway length cannot be demonstrated.

While there may be fleet changes for other reasons, demand is not considered to be a primary driver for changes in aircraft type and size.

Other than Yellowknife, those towns along the MacKenzie Valley where much of the proposed gas pipeline development is to take place, might see a demand spike in a high growth scenario thus resulting in future CRJ/ B737 operations. These runways are already adequate for B737 operations, but perhaps not for CRJ. AC Jazz or other regional operator might consider CRJ use direct from the south into either of these under a high passenger growth scenario as has transpired at Fort McMurray. This is expected to be 5-10 years in the future, however, and dependent on major project approvals.

4 Regulatory Environment

A number of Notices of Proposed Amendment (NPA) to the Canadian Aviation Regulations may have an impact on the determination of effective runway lengths at aerodromes in the NWT. The proposed amendments are closely linked in their content and in their impacts on required runway lengths. The NPAs can be grouped as follows:

- Aircraft Performance Certification
- Take-Off Weight Limitations
- Operations to and from Gravel Runways
- Wet / Contaminated Runway operations
- Runway End Safety Areas

A brief history and overview of the intent, real-life effects and possible impacts is provided below. Note however, that the following interpretation is a summary only of current and proposed regulations and does not supercede the actual published CARS, and amendments as they are approved.

4.1 Aircraft Performance Certification

4.1.1 New Limitations

Two current NPAs relate to certification; NPA 2005-037 and 2005-038. Both relate to wording changes that tighten the requirements for the determination of those aircraft types that can be considered for use in scheduled service carrying 10 or more passengers. The regulation change is to harmonize with FAA regulations that come into effect on December 20, 2010.

Regulation 704.45 can be summarized to say that a takeoff cannot be executed in a large aircraft, a turbojet aircraft, or a propeller aircraft carrying 10 or more passengers in Part 704 scheduled services unless the aircraft is type certified in accordance with Standard CAR724.45A.

This Standard lists six acceptable sources of manufacturer data on takeoff performance that can be used to obtain certification. These 6 sources are:

1. Airworthiness Manual Chapter 523;
2. FAR 23 at amendment 23-34 and later (FAR 23 Commuter Category);
3. SFAR 41C and the performance requirements of ICAO Annex 8;
4. Airworthiness Manual Chapter 525;
5. FAR 25 or equivalent Transport Category Type Certification standards;
6. Data from another source acceptable to the Minister.

Many smaller aircraft (i.e. under 12,500 lb/ 5,680 kg) currently in use in Part 704 (Commuter) operations do not have the required detailed takeoff performance data available from the manufacturer, particularly ASD data. **The impact is that these aircraft can only be used for Part 703 Air Taxi (less than 10 passengers) or charter operations under the new regulations.**

A list compiled by Transport Canada in background research in support of the NPA indicates that the affected aircraft include:

- all Beech King Air models;
- Embraer EMB 110;
- DHC6 Twin Otter.

4.1.2 Exceptions from Limitations

Paragraph (2) of Standard CAR724.45A allows operations without the required certification but only if:

- no more than 9 passengers are carried; or

- the aircraft is used only in charter services.

The foregoing provisions may be bypassed if the operator obtains an Op Spec certification for the specific aircraft and operates in accordance with paragraph (2) of the Standard.

Discussions within the CARAC group indicated that sufficient data may be available that, if compiled and extrapolated, may be data acceptable to the Minister (source f. above) so that an operator may obtain the Op Spec certification for the Twin Otter.

Viking Air, the current certificate holder for the DHC6, is understood to be considering developing a performance supplement to the flight manual for obtaining the type certification. In that case, Op Spec certification would not be required and the aircraft could continue to be used in Part 704 operations.

Both NPAs have been approved by the industry consultation committee (CARAC), and must now be approved by the Transport Canada internal review committee (CARC), be reviewed by the Department of Justice, and pass through the Canada Gazette I and II processes before becoming law. The deadline for all this activity is December 2010 and it is not expected that any further issues will block implementation of the new regulations.

4.2 Takeoff Weight Limitations

Four current NPAs deal with takeoff performance. NPA 2005-039 and NPA 2005-040 deal with Take-Off Weight Limitations **(CAR704-46 and CAR724.46A)**. NPA 2005-041 and NPA 2005-042 deal with Net Take-Off Flight Path **(CAR704.47 and CAR724.47A)**. The NPAs are linked in their possible impact on operations using smaller aircraft and can be considered under one analysis.

Under these regulations, an aircraft may not take-off if the weight of the aircraft exceeds the maximum takeoff weight (MTOW) specified in the aircraft flight manual for the prevailing conditions. Furthermore a takeoff is not permitted if, after allowing for planned fuel consumption enroute to destination or alternate, the aircraft will exceed the permissible landing weight specified in the aircraft flight manual.

CAR 704.46 deals with takeoff weight limitations for commercial air operators, and the circumstances governing aircraft weight in respect of takeoff run available (TORA), takeoff distance available (TODA), and accelerate-stop distance available (ASDA). Aerodrome pressure altitude, ambient temperature, runway slope, headwind and tailwind components must be considered as part of performance calculations.

In determining available maximum take-off weight all aircraft must ensure that the required accelerate-stop distance will not exceed ASDA, and the all-engines operating takeoff distance will not exceed TODA.

An exemption currently exists to the ASDA requirement for small aircraft (under 12,500 lb and propeller driven) until December 20, 2010 for Part 704 (Commuter) operations (under 20 passengers).

Under the proposed regulations, air operators using propeller-driven aircraft need not demonstrate that the required aircraft accelerate-stop distance is less than the ASDA only if the following caveats are met:

1. the aircraft is carrying no more than 9 passengers (i.e. is Part 703), and/or
2. is operating with an MCTOW of 12,500 pounds or less in on-demand (ie: charter) service.

A particular case is the King Air B200 aircraft sometimes used in the NWT for scheduled services. Analysis shows that at 17 NWT airports, the B200's ASD requirements at MCTOW for Part 704 (commuter) operations exceeds the ASDA at the airport. After December 2010 the aircraft cannot be used for Part 704 operations without careful consideration of payload, fuel and conditions for each flight. It is, however, expected to be used for Part 703 operations carrying 9 passengers rather than the current 14.

However, the revised regulations continue to exempt aircraft used in Part 703 operations (less than 10 passengers) or in charter operations. The B200, in medevac configuration, would qualify under either criterion and hence the ASD regulations would not apply to the currently contracted medevac aircraft, even after the 2010 implementation date for the new regulation. In this case, only take-off distance available vs take-off weight would apply.

CAR704.47 deals with obstacle clearance requirements but they are dealt with in a similar fashion to CAR704.46 provisions including single engine failure.

All these takeoff weight provisions apply to the same aircraft described in the Section 4.1.1 (eg: King Air, EMB110, DHC6). Takeoff weight calculations are based on certification data which is not available from manufacturers for many smaller aircraft types. **The overall effect, therefore, is that many aircraft currently in use for scheduled Part 704 operations will, after December 2010 be useful only in scheduled air taxi (Part 703) operations carrying less than 10 passengers or in charter operations.**

The 2010 date was set in accordance with Transport Canada's efforts to harmonize regulations with the United States Federal Aviation Administration (FAA). The FAA has embarked on a process to have the majority of scheduled service providers meet higher regulation standards, effectively subjecting operators of commuter-sized propeller or jet aircraft to the same level of regulation as their larger jet counterparts.

4.3 Gravel Runway Operations

One current amendment (NPA 2003-216) will have an impact on operations from gravel runways. Current regulations **(CAR704.45)** require that all flight calculations be based on data in the approved Aircraft Flight Manual (AFM). As many aircraft types do not have performance data for operations to and from gravel runways in the AFM, operators that use such aircraft on gravel are not currently in compliance with the regulations.

To correct this condition, a new regulation is proposed that will permit operators who cannot obtain manufacturer performance data for currently certified aircraft, to operate using specified performance factors for calculation of required takeoff and landing distances. The regulation will, however, require that any aircraft type certified after the promulgation date must have gravel operations data in the AFM before any gravel operations will be permitted. Most manufacturers are not interested in testing and certifying for gravel operations in view of the limited markets.

Standard **CAR724.44**(3) permits gravel operations for aircraft with a weight of over 12,500lb if a 15% factor is added to calculated distances. For aircraft under 12,500lb, the factor is 10%.

The impact is that for gravel operations under the standard, 10% to 15% (at least) longer take-off distances may be required for existing aircraft types (possibly requiring longer runways) and new gravel-certified aircraft types will be difficult to find to replace existing fleets.

The current medevac aircraft (KingAir B200) would, therefore, be subject to the 10% performance factor in calculating performance from gravel runways.

An anomaly exists, however, in that while the standard 724.44(3) was promulgated in June 2006, the regulation directing its use (CAR704.44) is still in the pre-Gazette I stage and the date of promulgation is not known. The Standard is not regulatory in nature in itself so there is confusion over its current application.

However, at some point, it can be expected that the Regulation will be passed and the provisions of the Standard will be fully in force.

4.4 Wet/Contaminated Runways

Two current amendments NPA 2005-**035 (CAR 705.61)** and the related standard NPA 2005-034 **(CAR 725.55)** are concerned with operations on wet or contaminated runways.

A wet runway is covered with sufficient moisture to cause it to appear reflective, but is not contaminated as defined below.

A contaminated runway has standing water, slush, snow, compacted snow or frost covering more than 25% of the required length and width of its surface.

This regulation applies to hard-surfaced runways which includes only six of NWT runways. The NPA clarifies definitions and extends the applicability to both turbo-jet and turbo-propeller airplanes.

The intent of the regulation is to ensure that Part 705 turbo-jet aircraft use no more than 60% of the landing distance available (70% for a turbo-propeller aircraft) as predicted by the Aeroplane Flight Manual for a dry runway landing.

Landings on a wet or contaminated runway will require at least an additional 15% in length unless the Flight Manual has information to indicate otherwise.

All calculations take into account the pressure altitude, landing weight and wind conditions of the day.

In any case, an aircraft may not be dispatched if the forecast landing conditions do not meet the requirements.

The modified regulation would have no additional impact on the turbo-jet aircraft using the paved runways in the NWT beyond the current operational restrictions. The new regulation will apply to turbo-prop aircraft at those airports.

There is no schedule published by Transport Canada for the implementation of these NPAs.

4.5 Runway End Safety Areas

A runway end safety area (RESA) is defined by Transport Canada as a clear and graded area symmetrical about the extended runway centre line and adjacent to the end of the strip, primarily intended to reduce the risk of damage to an aircraft undershooting or overrunning the runway.

Transport Canada recommends that a RESA be provided at each end of a runway strip where the code number is 3 or 4. The RESA should extend from the end of a runway strip for as great a distance as practicable, but at least 90 m. The width of the RESA should be twice that of the associated runway. Not providing a RESA does not violate airport standards at this time, however, future regulatory changes involving RESAs could have an effect on airports within the NWT.

Consultations with the regulator have revealed that RESA standards are being reviewed within the draft development of CAR 322 (the proposed replacement for TP312-Aerodrome Standards and Recommended Practices). If RESA standards are adopted within CAR 322 (similar to standards currently in place within ICAO Annex 14), airports will be required to provide a RESA extending at least 90 m beyond the runway strip.

Providing mandatory RESAs at NWT's Code 3 and 4 airports is expected to have a significant operational impact on aircraft operations. Since most sites are located in areas where land uses beyond runway ends are severely restricted, providing a 90 m RESA is not always a possibility.

If a clear and graded area can not be provided beyond the runway ends, the airports may be forced to reduce the declared distances on the affected runways, potentially restricting certain aircraft types operating at the airport.

Airports not able to meet the RESA standard could apply for an exemption through Transport Canada, as long as it can be proven that not providing a RESA at the site is an acceptable risk.

Transport Canada has not been specific as to when CAR 322 will be implemented. Regulatory and industry consultations have indicate that the new regulation(s) are not expected to be implemented within the next 2-5 years. As the issue is not yet concluded at Transport Canada and the requirements are not yet defined, it should be monitored closely as the issue is followed through the CARAC process.

It is also not clear at this time if existing airports would be "grandfathered". If this were done, the implementation of RESAs could be delayed until some other runway change was desired. At that time, the RESA would likely have to be included in the enhanced runway construction.

4.6 Conclusions

The impact of the above regulatory changes on the determination of optimal runway lengths can be summarized as follows:

1. Some aircraft will no longer be able to operate in the north in their current configuration and carriers must either modify operating parameters or replace the aircraft.
2. New types may have different requirements for runway length and may have to be identified as the "critical aircraft" at some airports.
3. This new aircraft identification may require changes in airport design to meet runway length requirements.
4. Operations on wet and contaminated runways regulations, when extended to turboprop aircraft, will not have a significant impact on runway

length requirements as the affected airports are already sized for large turbo-jet operations.

5. If RESAs become mandatory, declared runway lengths may be reduced and runway extensions may be required for the “critical aircraft”.

5 Changing Weather

Changing weather may not have a direct impact on runway lengths but may affect construction techniques and materials and maintenance regimes. As such, it will have an impact on costs and should be considered in the overall decision process related to runway extensions.

5.1 Research

In recent years there has been considerable discussion among experts on all aspects of climate change. While there is disagreement about the extent of and the causes of perceived changes in weather conditions in the north, it was considered by many to be a significant issue that needed a full review of existing scientific opinion and research.

The Barrow Ministerial Meeting of the Arctic Council in October 2000 established the Arctic Climate Impact Assessment (ACIA), requesting it to evaluate and synthesize knowledge on climate variability and change. The meeting further requested that the assessment address environmental, human health, social, cultural and economic impacts and consequences, including policy recommendations. Since then, a team of more than 300 leading Arctic researchers, indigenous representatives and other experts from fifteen nations has completed its work on the ACIA and the final report was published in 2005.

5.1.1 Arctic Aviation Experts Conference

The ACIA material is supplemented by additional weather data from Environment Canada as presented to the international Arctic Aviation Experts Conference in Winnipeg in November 2006 (and co-hosted by LPS AVIA). For example, Hanesiak and Wang reported in the Journal of Climate in 2005 that a number of changes in Adverse Weather have been identified in the Arctic from 1953 to 2004, including:

- There has been an increase in frequency of freezing rain events across the Canadian Arctic. Rising temperatures make conditions for freezing rain more favorable.
- Blowing snow has decreased in frequency especially in the spring.
- There has been more frequent fog in the southwestern Arctic, but less frequent elsewhere.
- There has been an increasing trend to low ceilings throughout the Canadian Arctic except for the Hay River and Fort Simpson areas. The strongest trend in winter is in the eastern Arctic; in summer and spring it is in western areas.
- There has been a general decrease throughout the Arctic in “no weather” events (i.e. clear and calm).

These changes may have a direct impact on all transportation modes, either on day-to-day operations or on the installed infrastructure.

5.1.2 Arctic Climate Impact Assessment

The following information is mainly based upon and quoted from the final report of the ACIA, a 1042 page document that is published by the University of Cambridge press and is available online from www.ACIA.uaf.edu. The full report, which was made available for research and policy development purposes, should be consulted for more detailed assessment and research paper citations.

The ACIA report dealt with the entire circumpolar Arctic Region but much is fully relevant to the NWT.

The authors of the overview document of the ACIA identified the following ten key findings:

1. The Arctic climate is now warming rapidly and much larger changes are projected.
2. Arctic warming and its consequences have worldwide implications.
3. Arctic vegetation zones are projected to shift, bringing wide-ranging impacts.
4. Animal species' diversity, ranges, and distribution will change.
5. Many coastal communities and facilities face increasing exposure to storms.
6. Reduced sea ice is very likely to increase marine transport and access to resources.

7. Thawing ground will disrupt transportation, buildings, and other infrastructure.
8. Indigenous communities are facing major economic and cultural impacts.
9. Elevated ultraviolet radiation levels will affect people, plants, and animals.
10. Multiple influences interact to cause impacts to people and ecosystems.

Of these findings, the most significant for a long term runways strategy and its related capital plans are findings 1, 2, 7 and 8.

5.2 Permafrost

5.2.1 Overview

Permafrost is a significant aspect in the design and construction of many infrastructure elements in the NWT. Climate change projections indicate significant changes in permafrost composition, depth and temperature. Figure 5-1 shows the current permafrost extent in Northern Canada along with the projected southern limit of all permafrost by the 2070-2090 time frame. The NWT includes, at present, conditions ranging from continuous permafrost to sporadic discontinuous permafrost and NWT airports are located in all zones.

Climate change is very likely to reduce the area occupied by frozen ground and to cause shifts between the zones of continuous, discontinuous, and sporadic permafrost. These changes can be projected using mathematical models of permafrost driven by scenarios of climate change.

The potential effects of increasing mean annual ground surface temperature on permafrost will be very different for continuous and discontinuous permafrost zones. In the continuous zones, increasing air temperatures are very likely to increase permafrost temperatures and possibly increase the depth of the active layer. Since the temperature of most of this permafrost is presently within a few degrees of the melting point, the permafrost is likely to disappear. Except for the southernmost zone of sporadic permafrost, many centuries will be required for the ground freezing to disappear entirely. However, increases in active-layer depth and thawing of the warmest permafrost from the top have already been observed

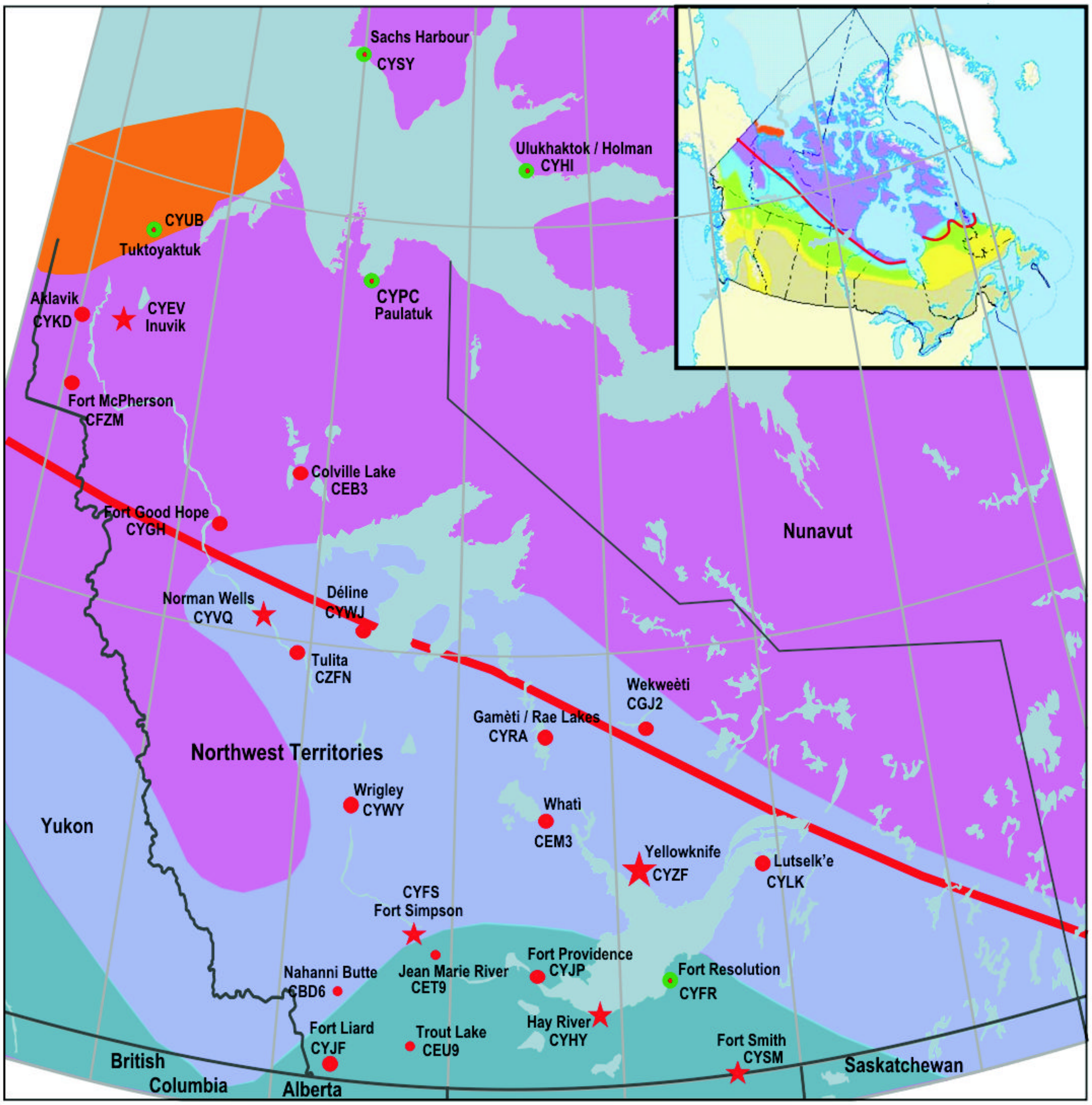
The projections suggest that a progressive increase in active-layer depth and temperature of the frozen ground is likely to be a relatively short-term reaction to climate change in permafrost regions. Changes in seasonal thaw depth are very likely to change the water-storage capacity of near-surface permafrost at local and regional scales, with substantial effects on vegetation, soil hydrology, and runoff, which will ultimately lead to changes in larger-scale processes such as landslides, erosion, and sedimentation. With respect to cold-regions engineering and infrastructure in locations affected by permafrost, the temperature of the frozen ground and the depth of seasonal thawing is of critical importance for effective construction planning and the evaluation of potentially hazardous situations at existing facilities.

Figure 5.1 on the following page illustrates the current permafrost situation and the ACIA projected southerly limit of all permafrost for the 2070 to 2090 timeframe.

5.2.2 Engineering Concerns

The physical and mechanical properties of frozen soils are generally temperature-dependent, and these dependencies are most pronounced at temperatures within 1º to 2º C of the melting point. Engineering concerns related to permafrost warming can be summarized as follows:

- Warming of permafrost body at depth;
- Increase in creep rate of existing piles and footings;
- Increased creep of embankment foundations;
- Eventual loss of adfreeze bond support for pilings;
- Increases in seasonal thaw depth (active layer);
- Thaw settlement during seasonal thawing;
- Increased frost-heave forces on pilings;
- Increased total and differential frost heave during winter;



GNWT Airports
Runway Lengths and Issues Study

NWT Permafrost and Projection

Figure 5-1

Current Permafrost

- Continuous (90-100%)
- Extensive Discontinuous (50-90%)
- Sporadic Discontinuous (10-50%)
- Subsea Permafrost
- ACIA Projected Limit of all Permafrost 2070-2090

LPS AVIA CONSULTING

- Development of residual thaw zones (taliks);
- Decrease in effective length of piling located in permafrost;
- Progressive landslide movements; and
- Progressive surface settlements.

It is possible that projected climate change will be a factor in engineering projects if its effects go beyond those anticipated within the existing conservative design approach. Therefore, engineering design should take into account projected climate change where appropriate and where the potential effects represent an important component of the geothermal design, particularly when contemplating infrastructure projects with a projected long lifespan.

5.2.3 Areas South of Permafrost

In the Arctic and subarctic, there are large land areas south of the permafrost border that experience frost action during winter. Annual freezing of the top soil layer commonly causes frost heave of foundations and structures. Pavement structures and embankments located above the frost-heave zone usually experience increased surface roughness and bumps. During the spring thaw, the bearing capacity of the structure may be considerably reduced, causing breakup of the pavement structure and failure of the embankment.

Large land areas will likely change from permafrost conditions to non-permafrost, with the related impacts.

Figure 5-2 illustrates, for northern Canada, the projected risks to infrastructures due to permafrost thaw to 2070. From this figure, it can be seen that as many as 11 GNWT airports may have a medium to high risk of damage to infrastructure due to permafrost thaw by 2070 to 2090.

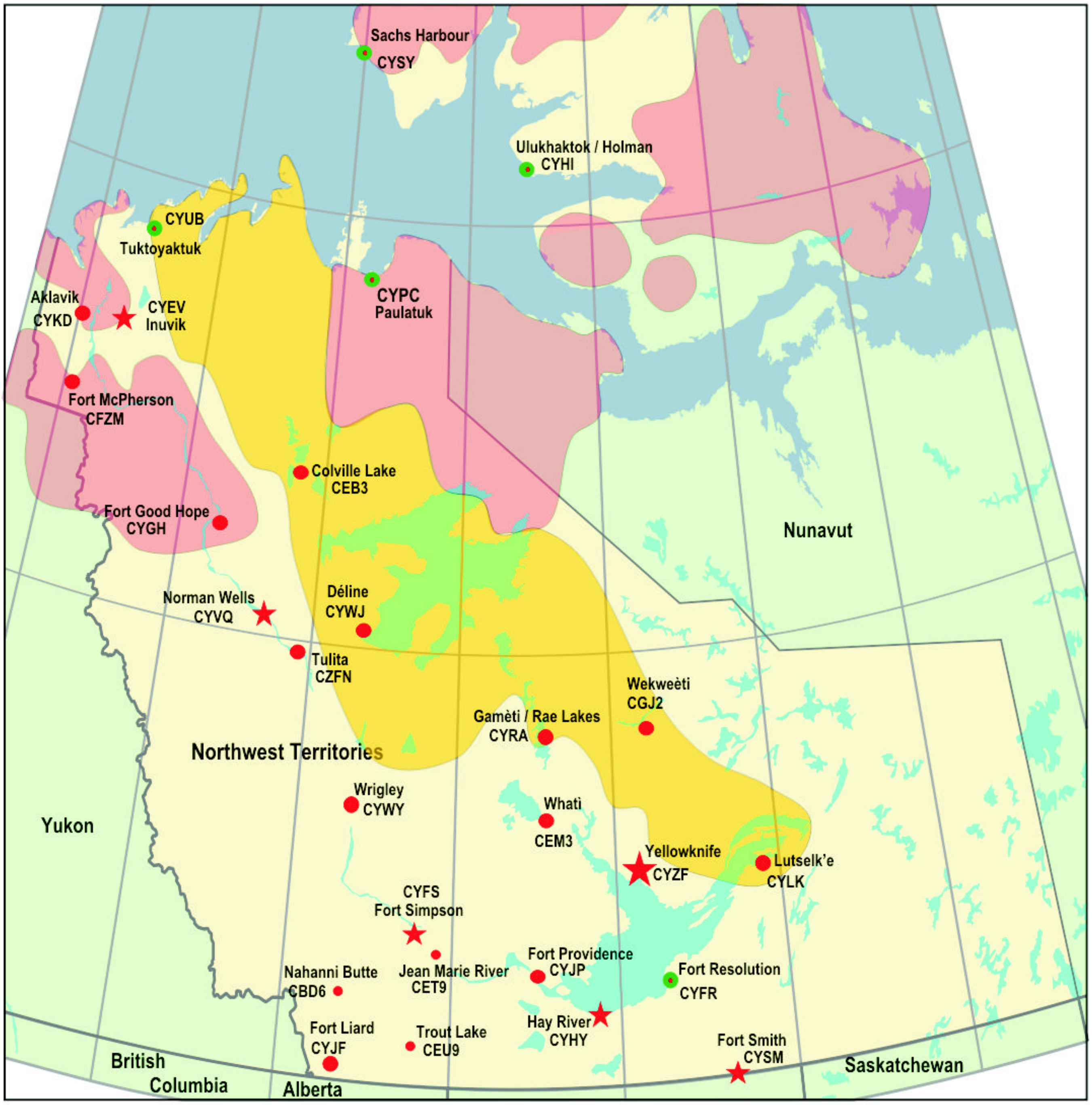
On Figure 5-2, the red areas represent areas in which there is a high risk of infrastructure damage due to permafrost degradation in the future. Those areas are riskier because they fall nearer to the limits of permafrost so a small temperature change may have significant effects. Medium risk areas with the same temperature change, may only be "slightly less frozen" and this will therefore have less impact on the infrastructure.

5.2.4 Infrastructure in the Arctic

Infrastructure is defined as facilities with permanent foundations or the essential elements of a community. It includes schools, hospitals, various types of buildings and structures, and facilities such as roads, railways, airports, pipelines, harbors, power stations, and power, water, and sewage lines. Infrastructure forms the basis for regional and national economic growth.

Engineering works that are likely to be affected by climate change are as follows:

- Slope stability is likely to be an issue in discontinuous permafrost.
- The settlement of shallow pile foundations in permafrost could possibly be accelerated by temperature increases over the design life of a structure (~20 years).
- The availability of off-road transportation routes (e.g., ice roads, snow roads) is likely to decrease owing to a reduction in the duration of the freezing season. The effect of a shorter freezing season on ice and snow roads has already been observed in Alaska and Canada leading to increased requirement for air transport.
- Precipitation changes are very likely to alter runoff patterns, and possibly the ice–water balance in the active layer. It is very difficult to assess the potential effects of these changes on structures such as bridges, runways, dikes, or erosion protection structures.
- The stability of steep slopes, such as open-pit mine walls or runway berms, will possibly be affected where the slopes in permafrost overburden have been exposed for long periods of time.
- Design criteria for runway and taxiway construction will require changes in their application as the ground conditions change at each airport. Re-design and re-construction of existing facilities may be required.



GNWT Airports
Runway Lengths and Issues Study

Permafrost Risk to Infrastructure

Figure 5.2

High Risk of Infrastructure Damage due to Permafrost Thaw

Medium Risk of Infrastructure Damage due to Permafrost Thaw

LPS AVIA CONSULTING

5.3 Aviation Impacts

Within the air mode, climate change will have three major impacts:

1. **Runway and taxiway infrastructure elements will be affected through reduced strength and durability.**
2. Buildings such as hangars and air terminal buildings will be subject to structural impacts including footing deterioration.
3. Airport operations may be affected by changes in weather conditions.

Environment Canada has predicted the following changes in daily weather that will affect air transportation:

1. Less extreme temperatures, but higher frequency of temperatures near freezing;
2. More freezing rain, freezing drizzle events;
3. More frequent extreme weather events;
4. More intense storms, moving further north;
5. Less fog generally but more near open water sources;
6. Fewer blowing snow events
7. Less frequent lower clouds (summer) but more frequent high level, system clouds (winter);
8. Changes in frequency of VFR / IFR weather;
9. Changes in landing / takeoff weather conditions;
10. Changes in wind directions and speeds due to changes in weather systems tracks.

The overall impact of these changes may include requirements for improved navigation aids, reconstruction of runway and taxiway surfaces and increased runway lengths if ice events become more frequent.

6 Runway Expansion Guidelines

6.1 Need for Guidelines

Airport planning in the Canadian north has different imperatives and constraints than in the south. In many cases the airport is the only year round reliable form of transportation for the community. In most cases it is the most predictable form of transportation access.

The conditions of the northern aviation environment require that air services and airport planning utilize a different approach than in the south with larger population centres and multiple surface transportation options to serve the community. Many smaller community airports in the south are focussed on recreational or local needs aviation demand. In the north small communities require an airport as a critical part of the community infrastructure. Without an airport many communities would fail.

The high costs of construction and the limited availability of large scale heavy equipment in the north make decisions on the timing and extent of investment in airport improvements critical. This combined with limited resources to operate an airport system demand well defined and practical decision making processes for airport investment in the north.

Runway extensions and major overlays are among the most expensive capital activities an airport experiences. There will be many parties with varying interests wishing to have a runway extension at a specific airport Therefore it is important to have an approach to prioritizing runway extension choices that is clear, simple and flexible. This will not only aid in decision making but will assist in public transparency and the understanding of interested parties.

6.2 Funding

6.2.1 Government Airport Funding

In Canada there are currently a number of programs to assist smaller airports in making improvements to their facilities. Each of these programs has a priority setting mechanism as part of the decision process.

For example the federally sponsored Airport Capital Assistance Program (ACAP) uses some basic eligibility requirements combined with three evaluation criteria to produce four priorities.

This program is available to all airports that meet the eligibility requirements. The evaluation criteria are focussed on safety, asset protection or operating cost reduction. The program only considers expansion of facilities where it is demonstrated that the current facilities negatively impact safety. This program has been in operation for many years and the approval process is quite transparent. Although runway extensions would not be eligible under this program there are lessons to be learned in terms of criteria and process simplicity.

In 1993 the GNWT Department of Transportation developed two airport classification systems to aid in decision making for airport improvements.

The first system produced an airport classification index that realigned airports in common groups using activity levels, accessibility and airport role rather than the original grouping by runway length.

The second was an airport planning index. This was a measure of the ability of the airport to serve the traffic demand. In this approach the runway length required for the critical aircraft became the key runway length determinant. This approach is useful for the existing situation but not appropriate for evaluating forecast requirements. Again this was a simple and flexible tool to serve the purpose at the time.

6.2.2 Federal Infrastructure Funding

The Federal Government "Building Canada" infrastructure program was announced late in 2006 and discussions continue with the provinces and territories on the application of $33 billion over 7 years from 2007 to 2014.

The plan includes $8.8 billion for highway infrastructure, $2.1 billion for Gateways and border crossings and $22.1 billion for basic infrastructure priorities. A recent press release indicates that discussions with provincial, territorial and municipal authorities on the allocation of the funding is getting under way in the summer of 2007.

The territories have successfully argued in the past that air routes are the northern equivalent to southern roads and highways for essential transportation and that highway infrastructure funding should be applied to airports in the north. This source of funding should be pursued vigorously in the future.

6.2.3 Partnership Funding

A significant source of funding for airport improvements may be resource development projects. For example, the MacKenzie Gas Pipeline Project has identified impacts on a number of existing GNWT airports to support the construction phase of the project. Airports affected range from regional hubs (Inuvik and Norman Wells) through local airports such as Fort Simpson and Fort Smith to small community airports such as Trout Lake.

Required airport improvements, either runways or other infrastructure, should be funded by the project proponent rather than by government.

A similar policy should apply to other resource development initiatives.

6.3 Justification Categories

There are essentially four justifications for undertaking a runway extension project. These include:

- to improve safety;
- to achieve economic benefits;
- for socio-economic purposes; and
- to improve the level of service.

There may be many subsets of the four but the basic need for simplicity and ease of understanding demands that only the basic set be used. Although the list may seem simple the decision involved may be very complex. Therefore it is essential that there is a process that is carefully adhered to and can withstand scrutiny.

6.3.1 Community Safety

The first and always the most important justification is safety. Under Canadian aviation regulation and airport must be "certified" by Transport Canada before it can accept scheduled services. To be certified the airport must meet or exceed a set of standards that by design create a safe operating facility. The standards for runway length will vary by the size of the aircraft serving the site and the weather conditions. Therefore runway length will help define the maximum size aircraft that can safely serve the existing site.

If an airport is certified it is by definition safe for the operation of the existing aircraft. Any proposal to lengthen the runway to accommodate a different category of aircraft or increase in operating weight is a change in level of service.

There are from time to time exemptions permitted to allow certain aircraft with MTOW above the certification limit to serve the airport with the existing runway length. These are unique situations and require the approval of the regulatory authority. If the exemptions were revoked, the current critical aircraft would either have to reduce its MTOW or not use the airport for scheduled service. This is a level of service, economic or social economic issue and not a safety issue.

There are very few instances when an airport would lose certification because of runway length alone. It is important to be cautious about using safety as a reason to increase runway length.

There is an important safety consideration beyond the safety certification of the airport that may be referred to as Community Safety. Citizens of the NWT have an expectation that they will have access to appropriate medical services in an emergency. This public health and safety requirement must be met by having a runway that can safely handle a minimum medical evacuation aircraft. For the NWT the currently contracted aircraft is either a twin engine pressurized aircraft, the KingAir B200 or the Twin Otter. If the current runway cannot accommodate these types of aircraft there is a public health and safety argument for a runway extension. It is necessary to identify the minimum requirements for the medical evacuation aircraft and ensure the runway at all the communities will permit the safe operation of that aircraft before a contract is let. Depending on the aircraft selected (or currently in use) there may be a need to extend some existing runways especially in smaller communities.

In some communities, smaller, unpressurized aircraft are currently used for medevac rather than the normal contracted aircraft because of constraints due to runway length. For some medical conditions, however, pressurization is strongly preferred to minimize significant transportation risk to the patient. This may be a Community Safety issue that would support runway extension to accommodate the larger, pressurized aircraft types.

Another public health and safety issue is the need to evacuate the community in the face of a disaster (forest fire, water contamination, etc.). Although these occurrences are rare it is likely that this requirement could be met using a runway capable of handling the Medevac aircraft with many flights or using rotary wing aircraft to move people to the next community.

6.3.2 Economic Benefit

The second priority would be an economic based decision. It makes good business sense to extend the runway if there is a clear positive economic return to the community (i.e. the people that are using and paying for the goods, mainly stores and individual buyers), the region or the GNWT. In general, if a runway is extended to accommodate larger aircraft with lower unit transportation costs, the lower costs will result in a net benefit. This is based on an assumption, however, that the demand is such that the larger aircraft can be used to capacity and thus be more efficient than many smaller aircraft.

This is a second priority because if there is a net positive economic benefit to the community, the economic benefit accruing to the community should reduce the overall cost to the GNWT of providing support to the community. This money is then available to support other government activities.

To determine if there is a net real economic benefit of any project Benefit/Cost analysis techniques are employed. In a simple Benefit/Cost analysis the sum of the real economic benefits are divided by the sum of the real economic costs to produce a factor. The Benefit -Cost ratio should be greater than one to be a sound economic decision. The higher the value the greater the economic benefit. Any runway extension project with a Benefit/Cost ratio less than one is not a sound economic decision (there would be a net draw on government expenditures) and should be considered in another category.

It is important to be confident that the benefit information is based on solid information and that the benefits used in the calculation are benefits to the community and not to an intermediary in the aviation system. This would usually take the form of a good business case including a contract or written commitment with an operator to provide service (passenger or freight) at a reduced unit price to the end user. This reduced unit price times the number of units (population) is used to define the benefit for the calculation. Other potential economic benefits such as tourism or economic development also need to have a good business case with confirmed commitments for benefits.

The cost information used in the calculation should be the best available estimate of the cost to build and equip the runway extension. This may include incremental costs such as additional runway lighting, relocating navigational aids etc. for the extension. It should not include the cost of redoing entire systems for the whole runway. If the extension results in the need to widen the entire runway then that cost should appear as part of the analysis.

6.3.3 Socio-Economic Considerations

There are often reasons beyond pure economics that would support the need for a runway extension. Governments often use improvements to transportation facilities to advance other government wide social objectives. Improved access can contribute to the delivery of increased health and social service, improved educational/cultural opportunities, enhanced sovereignty, reduced isolation, etc.

Another example may be the potential to take advantage of greater employment or educational opportunities if a different aircraft with a different capabilities could serve the community.

Achieving these objectives is of value to the Government and therefore need to be recognized as part of the benefit of a potential runway extension project.

It is difficult to carry out analysis to create an ordered priority list if the variables being used are both tangible (economic values such as dollars) and intangibles (achieving social objectives). Socio-economic Benefit/Cost analysis is a tool often used when carrying out such analysis.

In this case the achievement of social objective are assigned an economic value (dollars) using a consistent framework. The value to achieve specific social benefit remains constant across all the potential projects (e.g. achieving enhanced sovereignty is worth $X). It is difficult to value these social objectives but since the analytical tool is being used to provide a relative ranking it is not making a value judgement on the social objective. That judgement is made by knowledgeable individuals who have an understanding of the GNWT value and priority of achieving these objectives.

Once the achievement of the social objectives has been quantified the analysis is similar to the economic Benefit/Cost evaluation. The highest value is the highest priority in this category. Any runway extension project with a socio-economic Benefit/Cost of less than one should not remain in this category for funding.

6.3.4 Level of Service

In the North the economic environment can change more frequently and more dramatically than in the south. This causes aircraft operators to change their routings, schedules and equipment more frequently. All of these changes have an impact on the level of service a community receives. There may be instances where a runway extension is requested which does not meet the criteria to be priority one, two or three but there is a reasonable case for extending the runway. An example might be projects that do not currently achieve a greater than one benefit cost ratio in category two or three but there is a high potential opportunity if the runway is lengthened.

This type of project would provide the opportunity for an increase in the level of service for the community.

In analysing these proposals it is very difficult to assign weights and values to future possibilities and hope, especially in a fast changing industry such as aviation.

A technique that may be best suited for this is the use of informed experts peer review. This approach involves putting a group of persons knowledgeable in the areas involved (government employees from different program sectors) together to discuss and come to consensus on the validity and value of the project. These projects would then be ranked within category four based on the output of the expert review.

6.4 Guidelines

6.4.1 Program Basics

The program analysis will be an ongoing program that receives requests on a year round basis. To ensure the development of a reliable planning and budgeting output, the following guidelines should be applied to the development of specific procedures that will integrate with the current Capital Planning process. These considerations should be applied to the annual analysis of runway extension priorities.

1. The updating of the list for potential funding should be done annually at the same time each year.
2. Any runway extensions that are as a result of Federal-Territorial commitments, Political commitments, etc. (such as requirements for military re-supply for sovereignty reasons) should not be competing for funds under this program. They should be funded from other sources such as Federal-Provincial Agreements or one time capital infrastructure funds.
3. Information used in preparation of the submission should be available for validation.
4. Submissions should be submitted to the Department of Transportation via the senior GNWT community government official about 3 months prior to the budgeting process to allow for review and analysis. Submissions should come from any aviation-related organization that is registered to operate in the NWT such as an air carrier, a store, local government or an aviation

association. Individual citizens should not be able to make a submission.

5. Confidentiality rules of the GNWT should be respected in dealing with submissions.
6. Funding for a project should have the capability to be more than one year if circumstances are appropriate.
7. Funding overruns will have to be dealt with according to government policy.
8. A policy decision will need to be made on cost sharing with the private sector on the extension. This may change the priority ranking depending on how costs are calculated (Total project cost or just government cost).

6.4.2 Initial Project Test

When a submission is received it should be screened to ensure the proposal is serious and properly documented before time is spent on review and analysis. This can be done with a checklist of the items identified below.

1. Is there an approved airport Master Plan or Development Plan for the airport?
2. Is the proposed extension consistent with the approved plan?
3. Is the submission complete and submitted by an appropriate organization?
4. Is there sufficient information to carry out a basic analysis?
5. Does the submission meet all the guidelines identified for the program by GNWT policies (e.g. community support, consultation with users, etc.)?

Once this has been established, an analysis is carried out to determine the proper place in the priority list for the proposed project.

In carrying out the analysis described above in section 6.2 it is important to ensure that:

1. For any future economic benefit calculation, is there a solid business case (with written carrier commitments, tourism contracts, economic development agreements signed, etc.) that the identified savings or benefits will be passed on to the community?
2. Have alternative solutions been explored (frequency changes, aircraft type changes, realistic load factors been used, etc.) before a runway extension was proposed? If there is no approved Master Plan, does the proposal make technical sense based on engineering knowledge of the site?
3. Is this part of a Government commitment (Federal-Territorial Agreement, Specific Territorial Budget commitment, etc.)? If so, this should not be funded under this type of ongoing improvement program.
4. The analysis is carried out consistently on all submissions.

6.4.3 Create Initial Priority List

To create the initial priority list each proposal should be evaluated to determine if it falls within one of the four categories. Once the projects are placed within a category it is necessary to place them in priority order within that category.

The list of potential runway extensions is created by placing all priority 1 (safety) projects ahead of priority 2, priority 2 ahead of priority 3, etc.

Within priority 1, the projects can be ranked by the size of community (population served by the airport) based on the logic that the larger the population the more likely the need for a medevac operation.

Within priority 2 economic, the projects are ranked by benefit-cost ratio with the largest being first . This is followed in order by the next largest etc.

Within priority 3 socio-economic, the ranking is done by the socio-economic benefit/cost ratio with the highest being first, the second highest second etc.

Within priority 4 level of service, the projects are ranked based on the results of the expert peer review decisions.

6.4.4 Current Year Project Identification

Once the list has been created with the cost for each project one is able to move down the list and determine which projects can be funded in the current year based on the amount of program funds available in that year.

These projects are then undertaken.

The priority list remains and if additional funds become available the next project on the list can be commenced.

6.4.5 Updating Priority List Annually

The list remains until the next year when it is updated based on any new information that may change the ranking of any particular project currently on the list and add any new acceptable projects.

6.5 Assisted Prioritizing

A procedure and spreadsheet has been developed to assist with the prioritization of runway extension projects. The process is based on the factors in the previous sections and has been implemented in an Excel spreadsheet format that is described below. A printout of the spreadsheet is included in Appendix A.

The spreadsheet will help to prioritize as described above and the weighting factors included can be adjusted to allow for changes in government policies. The data entry values are as objective as possible, to minimize subjective decision points.

Six major determinants have been identified and for each there are a number of elements that make up the definition of the determinant. Each also has an associated weighting factor that can be adjusted in the spreadsheet to reflect current government policies.

In the spreadsheet, a number of columns include data that is imported directly from other worksheets within the overall Excel workbook and some columns (those that are shaded) are entered directly on the calculation worksheet.

Table 6-1 describes the determinants, factors and weights as they are implemented in the spreadsheet. The table is followed by a number of questions that, when answered for each airport, will assist in a consistent application of the policies and the development of figures for insertion into the data columns in the spreadsheet.

The current spreadsheet includes data columns that are set to a constant value and thus have no impact on the output scores. The final recommendations are therefore based on technical inputs. The columns are available, however, for future use by the GNWT as more data becomes available and government priorities and policies change over time.

The spreadsheet output is a prioritization score that should be an objective input in determining the final project priorities along with other, more subjective considerations.

6.5.1 Assessment Inputs

Table 6.1 defines the factors that are included in the assistance spreadsheet and the current weighting factors applied to each.

The following Table 6.2 suggests questions to assist in the determination of the relevant factors for completion of the spreadsheet.

Basic data on NWT airports, operational characteristics of aircraft in use in the NWT, economic factors and air carrier fleet complements are centralized on pages in the Excel workbook and are drawn from as required in evaluating the impact of the various factors.

The worksheets provide as output, the scoring table shown in Appendix A, the presentation graphic shown on page 7-1 and other assessment tables within the workbook.

Table 6-1 Runway Prioritization Factors

Determinant	Elements	Weight	Multiplier Factor
1. Community Safety Issues			
	a. Identified current medevac issues	2	yes(1) OR no(0)
	b. Other runway safety issues	4	yes(1) OR no(0)
	c. Weather changes – reconstruction	2	risk of impact (none= 0.0 low = 0.1, med = 0.5, hi = 0.8, Certain = 1.0)
2. Aircraft Capabilities			
a. Current aircraft	Current length	6	(critical length/current length)-1
	Critical aircraft current required length (MCTOW Accelerate-Stop Distance)		
b. Regulation Changes	Changes in regulations => new critical length	10	((new critical length / current length) – 1) x((10 - years ahead)/10)
	Years to regulation change		
c. Fleet Replacement	Future new critical aircraft required length	6	((new critical length / current length) – 1)) x((10 – years ahead)/10)
	Years to change of aircraft		
3. Economic Demand Change of Aircraft			
	Forecast traffic demand requires new critical aircraft	4	yes (10- years ahead/ 1 0) OR no (0)
	Years to aircraft change		
4. Level of Service			
	% annual economic cost of decreases	4	%
	% annual economic benefits of improvements	2	%
5. Benefit/Cost Analysis			
	Required extension length (in 100s of feet)	2	
	Cost of extension ($ per 100' x amount)		
	Benefits of extension (in $)		
	Benefit/cost ratio		B/C – 1
6. Political Issues			
	Community representations for extension	2	# representations / 5
	Air carrier representations for extension		# representations / 5

Table 6-2 Assessment Questions

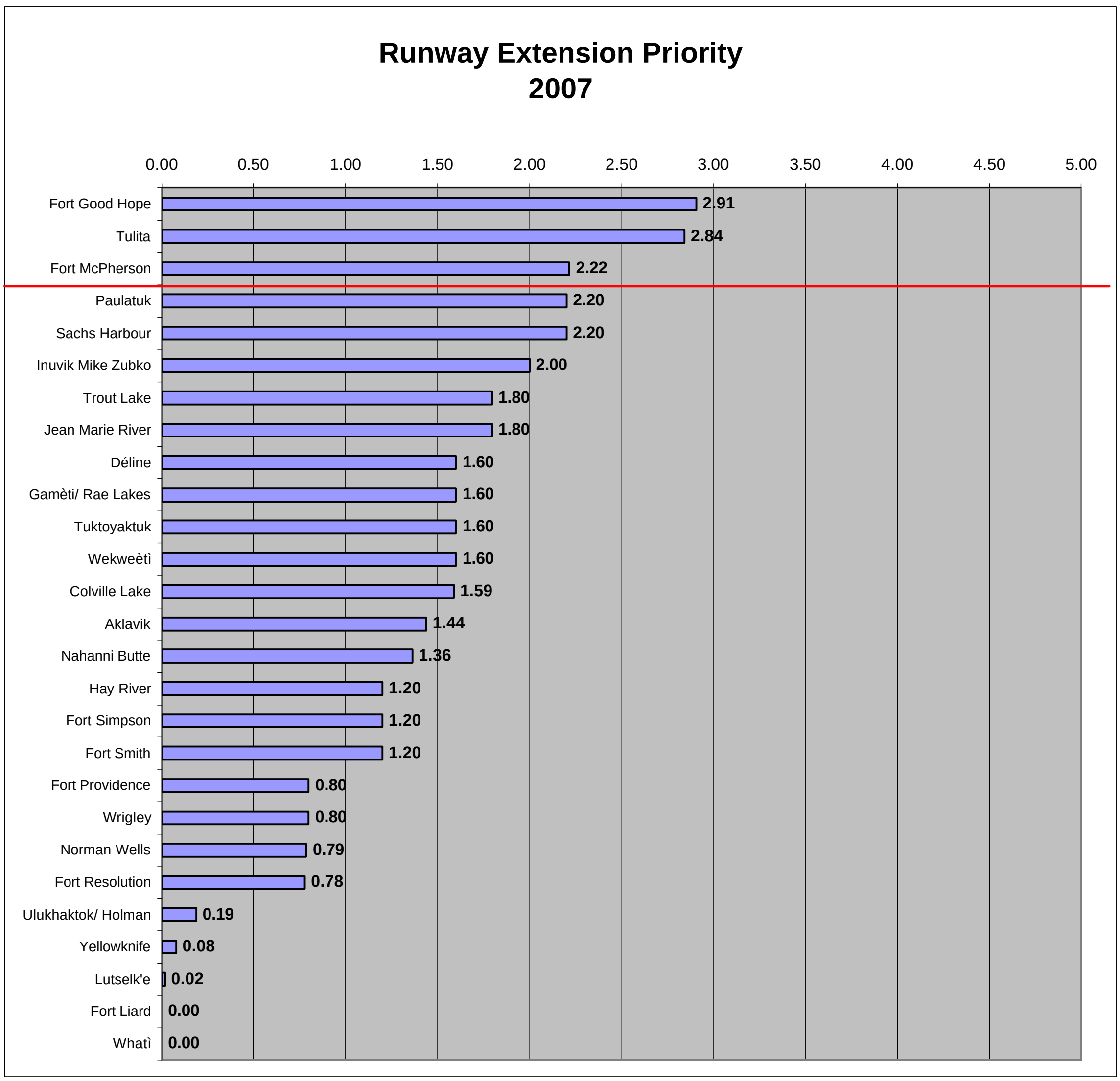
Determinant		Questions
1a	Community Safety	- What accelerate-stop distance is required at each airport for current and future medevac aircraft operations at normal medevac aircraft configuration? - Are current facilities inadequate for these medevac operations? Yes or no. - Are there currently identified safety issues related to runway length? Yes or no. These questions will lead to entries in the "MedevacSafety" worksheet.
1b	Runway Safety	- Are there other runway length-related safety issues identified at the airport such as a need to relocated due to dangerous terrain that impacts runway extension? Yes or no.
1c	Weather Change	- What is the risk that weather changes may require reconstruction or extension to ensure a safe surface? High, medium, low or none.
2a	Current Aircraft	- What is the current runway length? - What is the Accelerate-Stop Distance (ASD) required at MTOW for the critical design aircraft?
2b	Regulation Changes	- Will there be issues as a result of regulation changes that will change the runway length required? - What will the new design critical aircraft requirements be? - How does this compare to the current length? - How many years in the future will this change take effect?
2c	Fleet Replacement	- Will the current design aircraft be replaced in future as a result of fleet replacement activities by the carriers? - What will the new aircraft ASD requirements be and how ill this compare to current length? - How many years in the future will this change take effect?
3	Economic Demand	- Do movement statistics and demand forecasts indicate a requirement to upgrade service to a different, larger aircraft type? - How many years in the future will this change take effect? - Extent of runway length impact is accounted for in factor 2c above.
4	Level of Service	- Are there plans to change the level of service to the community, either increase of decrease? - If this will require an aircraft change, runway length impacts would be captured in factor 2c. - What would be the annual benefit to the community of an increase, expressed as a percentage of current economic activity in the community? - What would be the annual cost to the community of a decrease, expressed as a percentage of current economic activity in the community?
5	Benefit/Cost Analysis	- What runway extension is required in 100s of feet? - What are the costs of any required runway extension in $ per 100 feet of extension? - What are the estimated $ benefits of the extension? - What is the resulting Benefit/Cost ratio?
6	Political Issues	- How many community representations have been made to extend the runway? - How many air carrier representations have been made to extend the runway?

7 Runway Evaluations

The assessments, data and processes described in previous sections are applied to the GNWT airports on an individual basis with the results summarized on individual pages. The pages are sorted in order of runway length, not necessarily in order of priority.

Assessment of Yellowknife Airport is considerably more complex and should be conducted separately as part of the detailed Master Planning process. The runway structure at Yellowknife is adequate to support operations within the territory and extension requests are related to traffic to points outside the territory or to overflights. There are a number of policy issues that must be resolved in support of recommendations for Yellowknife Airport..

The technical analysis in the following pages is summarized in the chart below. Those airports below the red line have either no extension recommendation or a lower priority extension recommendation. Those above the line have higher priority extension recommendations. A single table including the evaluation data for all airports is included in Appendix B.



Aklavik

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Aklavik	594	**CYKD**	**135 0.35W**	**68 13.38N**	**23**	3000 x 75 feet 914 x 23 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NP	Cert	B-99	3675	PCL, MIRL, REIL, APAPI	No	NDB	500 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Aklak Air, North-Wright
Current equipment	B99/DHC6, C208
Current Operating restrictions	B99 payload constraints, DHC6 unrestricted
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes to meet ASD requirements for critical aircraft extend to 4,000’
Extension constraints	Yes, extension to 4,000’ requires new airport location
Risk of climate change impacts	High

Recommendations:

Extension to 4,000’ but as a low priority as the current length is adequate for DHC6 operations and extension costs would be very high and benefits low.

Consider critical aircraft change.

Review annually.

Colville Lake

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Colville Lake	126	**CEB3**	**126 05W**	**67 1.2N**	**850**	2743 x 100 feet 836 X 30 meters	2743	Sand

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Reg	DHC6	2700	PCL, LIRL	No	NDB	VFR

Issues:

Can support medevac aircraft	Not contracted type, others aircraft used
Meets current Critical aircraft MCTOW ASD	No, will require 703 operations of DHC6
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North-Wright Airways
Current equipment	C208/B99
Current Operating restrictions	Only Part 703 aircraft or charter under 5,670Kg are possible C208 not restricted, B99 has payload constraints
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes to accommodate current critical aircraft
Extension constraints	Yes, extension to 4,000' requires new location
Risk of climate change impacts	Medium

Recommendations:

Extension to 3,000' to accommodate current critical aircraft ASD requirements, high priority.

Extension to 3,000' to enable use of larger, pressurized medevac aircraft .

Review annually.

Review at time of medevac rebidding.

Déline

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Déline	525	**CYWJ**	**123 26.15W**	**65 12.6N**	**703**	3933 x 100 feet 1198 x 30 meters	3933	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NP	Cert	DHC6	2700	PCL, MIRL, REIL, APAPI	No	NDB	497 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North-Wright Airways
Current equipment	C208/B99
Current Operating restrictions	C208, B99 not restricted
Expected future aircraft type	Dash-8 in 3 years
Forecast demand to require fleet upgrade	Possible
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Medium

Recommendations:

Extension to 5,000' low priority to facilitate Part 705 operations .

Review annually.

Fort Good Hope

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Good Hope	557	**CYGH**	**128 39.05W**	**66 14.4N**	**268**	3000 x 98 feet 914 x 30 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NP	Cert	B-99	3675	PCL, MIRL, REIL, APAPI	No	VOR-DME, NDB	461 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North-Wright Air
Current equipment	C208 / B99 / DHC6
Current Operating restrictions	C208 not restricted, DHC6, B99 payload constraints
Expected future aircraft type	Dash-8 in 3 years
Forecast demand to require fleet upgrade	Possible
Require Runway extension due to regulation changes	Yes, to meet critical aircraft ASD requirements and to enable Part 705 operations
Extension constraints	No
Risk of climate change impacts	High

Recommendations:

Extension to 4,000’ high priority as the community would be best served by Part 705 operations.

Review annually.

Fort Liard

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Liard	583	**CYJF**	**123 28W**	**60 8.4N**	**708**	2946 x 98 feet 898 x 30 meters	2946	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	208 Caravan	2210	PCL, LIRL, REIL, APAPI	No	NDB	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	Part 703, some Part 704 aircraft possible
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	Possible is support of resource development
Require Runway extension due to regulation changes	Scheduled Part 704 service would be facilitated by extension to 4,000'
Extension constraints	
Risk of climate change impacts	Low

Recommendations:

Extension to 4,000' to enable use of a wider variety of charter aircraft but low priority at this time.

Review annually.

Review at time of medevac rebidding.

Fort McPherson

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort McPherson	776	**CZFM**	**131 51.5W**	**67 24.42N**	**116**	3500 x 100 feet 1067 x 30 meters	3500	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NP	Cert	B-99	3675	PCL, LIRL, REIL, VASIS	No	NDB	524 / 1-3/4

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	B99 payload constraints
Expected future aircraft type	N/A
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes, to meet critical aircraft ASD requirements
Extension constraints	No
Risk of climate change impacts	High

Recommendations:

Extension to 4,000’ high priority to meet needs of critical aircraft, to 5,000’ at a later date.

Review annually.

Fort Providence

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Providence	727	**CYJP**	**117 36.35W**	**61 19.2N**	**524**	3000 x 100 feet 914 x 30 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	Saratoga	1770	PCL, LIRL	No	nil	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	N/A
Expected future aircraft type	Charter only
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No, new critical aircraft definition required
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time.

Review annually.

Review at time of medevac rebidding.

Fort Resolution

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Resolution	484	**CYFR**	**113 41.4W**	**61 10.8N**	**526**	4000 x 100 feet 1219 x 30 meters	4000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3B NP	Cert	DHC6	2700	PCL, MIRL, REIL, PAPI	No	NDB	474 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	None for DHC6, some for other Part 704
Expected future aircraft type	Dash-8 in 5 years
Forecast demand to require fleet upgrade	Possible
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Extension to 5,000’ low priority to facilitate Part 705 operations .

Review annually.

Fort Simpson

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Simpson	1216	**CYFS**	**121 14.2W**	**61 45.6N**	**555**	6000 x 150 feet 1829 x 46 meters	6000	Asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
4C-NP	Cert	B-737-200	9100	MIRL, PAPI	No	VOR-DME, NDB	305 / 1

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	First Air, Air Tindi
Current equipment	C208/ATR-42
Current Operating restrictions	No
Expected future aircraft type	ATR-42, DHC-6
Forecast demand to require fleet upgrade	Possible Gas Pipeline project impacts
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time, constraints will continue.

Expect MacKenzie Gas Pipeline project impacts that should be funded by the project.

Review annually.

Fort Smith

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Fort Smith	2,703	**CYSM**	**-111.9617**	**60 1.32N**	**671**	6000 x 200 feet 1829 x 61 meters 1800 x 100 feet 549 x 30 meters	6000	Asphalt Gravel/asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
4C-NP	Cert	B-737-200	9100	MIRL, REIL, ALS, VASIS	No	VOR-DME, NDB	329 / 1

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North Western Airlease
Current equipment	J31/J32
Current Operating restrictions	No
Expected future aircraft type	No Change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time.

Review annually.

Gamèti/Rae Lakes

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Gamèti/ Rae Lakes	283	**CYRA**	**117 18.6W**	**64 6.0N**	**723**	3000 x 100 feet 914 x 30 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Air Tindi
Current equipment	C208 scheduled, Dash7 charter
Current Operating restrictions	Part 703 and some Part 704 aircraft possible C208 not restricted
Expected future aircraft type	No change, C208 is very efficient for the relevant stage lengths
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	Yes, extension to 4,000' requires relocation
Risk of climate change impacts	Medium

Recommendations:

No Runway extension at this time, an extension to 4,000' would improve aircraft selection possibilities but the community is adequately served at present. Extension would be very expensive.

Review annually.

Review at time of medevac rebidding.

Hay River

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Hay River	4106	**CYHY**	**-115.7825**	**60 50.34N**	**541**	6000 x 150 feet 1829 x 46 meters 4000 x 150 feet 1219 x 46 meters	6000	Asphalt Gravel/asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
4C-P	Cert	B-737-200	9100	PCL, MIRL, HIRL, PAPI, HIALS	Yes	VOR-DME	200 / 1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	First Air, Buffalo, Canadian North
Current equipment	ATR-42/DC-3, Dash-8
Current Operating restrictions	No
Expected future aircraft type	ATR-42, Dash-8 in 2 years
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time, B737 constraints would remain, serious surface problems should be addressed and are considered to be a safety issue.

Review annually.

Inuvik Mike Zubko

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Inuvik Mike Zubko	3,664	**CYEV**	**-133.4825**	**68 18.24N**	**224**	6000 x 150 feet 1829 x 46 meters	6000	Asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
4C-P	Cert	B-737-200	9100	HIRL, ODALS, HIALS, VASIS	Yes	VOR-DME, NDB, DME	250 / 1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Canadian North, First Air, Aklak
Current equipment	C208/B99/B737-200/F100/DHC-6
Current Operating restrictions	B737 constraints
Expected future aircraft type	CRJ-200 in 3 years
Forecast demand to require fleet upgrade	Possible in support of MGP project
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Medium

Recommendations:

No Runway extension at this time, constraints to remain.

Review critical aircraft type.

Review annually.

Jean Marie River

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Jean Marie River	81	**CET9**	**120 34W**	**61 30.96N**	**470**	2500 x 60 feet 762 x 18 meters	2500	Gravel/ clay

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Reg	DHC6	2700	nil	No	nil	VFR

Issues:

Can support medevac aircraft	Not contracted type, others aircraft used
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	Only Part 703 or charter <5,680 Kg aircraft possible
Expected future aircraft type	N/A
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No, but yes if carriers want to use Part 704 aircraft for scheduled service
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Extension to 3,000' to enable use of a wider variety of charter aircraft but low priority at this time.

Extension to 3,000' to enable use of larger, pressurized medevac aircraft.

Review annually.

Review at time of medevac rebidding.

Lutselk’e

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Lutselk'e	318	**CYLK**	**-110-40.35**	**62 25.2N**	**596**	2996 x 100 feet 913 x 30 meters	2996	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Air Tindi, Arctic Sunwest
Current equipment	C208/B99
Current Operating restrictions	Part 703 and some Part 704 aircraft possible C208 not restricted, B99 payload constraints
Expected future aircraft type	B99, C208, some 705 charter Dash 8/ATR-42
Forecast demand to require fleet upgrade	Possible due to modernization
Require Runway extension due to regulation changes	Yes, to enable use of Part 704 aircraft and to enable Part 705 charter as required
Extension constraints	No
Risk of climate change impacts	Medium

Recommendations:

Should extend to 4,000’ to enable larger Part 704 aircraft but low priority as the community is adequately served by current types.

Review annually.

Review at time of medevac rebidding.

Nahanni Butte

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Nahanni Butte	115	**CBD6**	**123 23.35W**	**61 0.6N**	**600**	2475 x 60 feet 754 x 18 meters	2475	Gravel/Earth

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Reg	C206	1860	Nil	No	nil	VFR

Issues:

Can support medevac aircraft	Not contracted type, others aircraft used
Meets current Critical aircraft MCTOW ASD	N/A, Part 703 type aircraft
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	Only Part 703 aircraft or charter < 5,680 Kg possible
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No, but yes if carriers want to use Part 704 aircraft for scheduled service
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Extension to 3,000’ to enable use of larger, pressurized medevac aircraft.

Extension to 3,000’ to enable use of a wider variety of charter aircraft but low priority at this time.

Review annually.

Review at time of medevac rebidding.

Norman Wells

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Norman Wells	761	**CYVQ**	**126 47.9W**	**65 16.92N**	**238**	5997 x 150 feet 1828 x 46 meters	5997	Asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3C NP	Cert	B-737-200	9100	MIRL, REIL, ALS, PAPI	No	VOR-DME, NDB	522 / 1-3/4

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North-Wright Airways, Canadian North
Current equipment	C208/B99/B737-200/F100
Current Operating restrictions	B737 constraints
Expected future aircraft type	CRJ-200 in 2 years
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time, constraints will continue.

Expect MacKenzie Gas Pipeline project impacts that should be funded by the project.

Review annually.

Paulatuk

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Paulatuk	294	**CYPC**	**124 4.5W**	**69 21.66N**	**18**	4000 x 100 feet 1219 x 30 meters	4000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3B NP	Cert	B-99	3675	PCL, MIRL, REIL, APAPI	No	NDB	263 / 1

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Aklak
Current equipment	B99/DHC6
Current Operating restrictions	No
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	High

Recommendations:

No Runway extension at this time.

Review annually.

Sachs Harbour

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Sachs Harbour	122	**CYSY**	**125 14.55W**	**71 59.58N**	**282**	4000 x 100 feet 1219 x 30 meters	4000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3B NP	Cert	B-99	3675	PCL, MIRL, REIL, PAPI	No	NDB	299 / 1

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Aklak
Current equipment	B99/DHC-6
Current Operating restrictions	No
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	High

Recommendations:

No Runway extension at this time.

Review annually.

Trout Lake

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Trout Lake	86	**CEU9**	**121 14.2W**	**60 25.8N**	**1635**	2500 x 60 feet 762 x 18 meters	2500	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Reg	DHC6	2700	PCL, LIRL	No	nil	VFR

Issues:

Can support medevac aircraft	Not contracted type, others aircraft used
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	Only Part 703 aircraft possible, C208 restricted in MTOW
Expected future aircraft type	N/A
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes, to enable use of larger aircraft on charter
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Extension to 3,000’ to enable use of larger, pressurized medevac aircraft.

Extension to 3,000’ to enable use of a wider variety of charter aircraft but low priority at this time.

Review annually.

Review at time of medevac rebidding.

Tuktoyaktuk

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Tuktoyaktuk	870	**CYUB**	**133 1.55W**	**69 25.98N**	**15**	5000 x 150 feet 1524 x 46 meters	5000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3C NP	Cert	B-99	3675	PCL, MIRL, REIL, VASIS	No	NDB	505 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Aklak
Current equipment	B99/DHC-6
Current Operating restrictions	No
Expected future aircraft type	No Change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Medium

Recommendations:

No Runway extension at this time, paving may be requested by oil industry users. If so, the industry should pay for upgrades.

Review annually.

Tulita

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Tulita	505	**CZFN**	**125 34.1W**	**64 54.0N**	**332**	3000 x 100 feet 914 x 30 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	NDB	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	North-Wright Airways
Current equipment	C208/B99
Current Operating restrictions	C208 not restricted, B99 payload constraints
Expected future aircraft type	Dash-8/ATR-42 in 3 years
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes, to enable use of Part 704 aircraft at MTOW and to facilitate introduction of Part 705 services
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Extension to 4,000’ soon, 5,000’ preferred by carriers but not required in near term.

Review annually.

Review at time of medevac rebidding.

Ulukhaktok/Holman

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Ulukhaktok/ Holman	398	**CYHI**	**117 48.35W**	**70 45.78N**	**117**	4300 x 100 feet 1311 x 30 meters	4300	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
3B NP	Cert	HS748	5400	PCL, MIRL, REIL, PAPI	No	NDB	515 / 1-1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	First Air
Current equipment	ATR-42
Current Operating restrictions	No
Expected future aircraft type	Dash-8 in 3 years
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Change of critical aircraft required
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time, to 5,000' at a later date.

Review annually.

Wekweètì

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Wekweètì	137	**CFJ2**	**114 4.55W**	**64 10.8N**	**1206**	3000 x 75 feet 914 x 23 meters	3000	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	C206	1860	PCL, MIRL, REIL, APAPI	No	nil	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Air Tindi
Current equipment	C208
Current Operating restrictions	C208 not restricted, some 704 possible
Expected future aircraft type	No change
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes, to enable use of Part 704 aircraft at MTOW
Extension constraints	Yes, extension to 5,000' requires relocation
Risk of climate change impacts	Medium

Recommendations:

Extension to 4,000' but low priority as C-208 service is very efficient on the relevant stage lengths.

Review annually.

Review at time of medevac rebidding.

Whatì

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Whatì	460	**CEM3**	**117 14.85W**	**63 7.2N**	**882**	2990 x 100 feet 911 x 30 meters	2990	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NI	Cert	208 Caravan	2210	PCL, MIRL, REIL, APAPI	No	nil	VFR

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Air Tindi
Current equipment	C208
Current Operating restrictions	Part 703 and some Part 704 aircraft possible C208 not restricted
Expected future aircraft type	DHC6, KingAir
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Yes, to enable use of Part 704 aircraft at MCTOW
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

Should extend to 4,000' to enable larger Part 704 aircraft but low priority as the community is adequately served by current types.

Review annually.

Review at time of medevac rebidding.

Wrigley

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Wrigley	122	**CYWY**	**123 26.2W**	**63 12.54N**	**489**	3500 x 100 feet 1067 x 30 meters	3500	Gravel

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
2B NP	Cert	DHC6	2700	PCL, LIRL, REIL, VASIS	No	VOR-DME, NDB	526 / 1-3/4

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	Yes
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	None
Current equipment	N/A
Current Operating restrictions	None
Expected future aircraft type	No change, charter only
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	No
Extension constraints	No
Risk of climate change impacts	Low

Recommendations:

No Runway extension at this time.

Review annually.

Yellowknife

Airport	Pop.	ICAO Ident.	Long.	Lat.	Elev (ft ASL)	Runway Dimensions	Longest Runway Length	Type of Runway Construction
Yellowknife	20841	**CYZF**	**-114.4400**	**62 27.72N**	**675**	7500 x 150 feet 2286 x 46 meters 5000 x 150 feet 1524 x 46 meters	7500	Asphalt

Airport Code	Reg/Cert	Critical Aircraft	Critical A/C MCTOW ASD	Runway Lighting	ILS	Navaids	Minima
4C-P	Cert	B-737-200	9100	MIRL, HIRL, REIL, ALS, HIALS, PAPI	Yes	VORTAC, NDB	200 / 1/2

Issues:

Can support medevac aircraft	Yes
Meets current Critical aircraft MCTOW ASD	No
Meets current critical aircraft Part 703 TOD	Yes
Scheduled Carriers	Air Canada Jazz, Air Tindi, Arctic Sunwest, Buffalo Airways, Canadian North, First Air, Northwestern Air, North-Wright Airways
Current equipment	B737, C130, CRJ, B727 various Part 704 and 703 jet and turboprop
Current Operating restrictions	Weight limitations on some Part 705 aircraft
Expected future aircraft type	Any Part 705 types, occasional large Code E aircraft e.g. B777 or A340 in emergency situations
Forecast demand to require fleet upgrade	No
Require Runway extension due to regulation changes	Possible, full study required
Extension constraints	Land ownership
Risk of climate change impacts	Low

Recommendations:

Yellowknife is a special case as it is the territory gateway and runways should be the subject of full master planning procedures to account for all factors. The runways at Yellowknife fully support all operations within the territory but services to points outside the territory may have an impact depending on a number of government policy decisions.

Decisions on future runway extensions are currently pending completion of the update of the Airport Master Plan.

8 Conclusions and Recommendations

8.1 Conclusions

The objective of the study was to recommend a process for determining the optimum runway length for each community for the short and long term, taking into account various factors such as regulatory changes, fleet changes, climate change and public safety.

The following conclusions have been determined:

1. System-wide runway length optimization for the NWT is a complex planning problem that can be simplified if carried out in a structured manner.
2. While there are population shifts within the NWT, population forecasts will **not generally impact** the runway length optimization process.
3. Changes in air carrier fleets **may impact** the runway length optimization process.
4. New regulations **will impact** on runway length optimization, likely requiring runway extension projects at some airports
5. A strong linkage between increasing demand and changes in the required runway length **cannot** be demonstrated.
6. Many airport sites have limited extension potential due to physical limitations.
7. Runway extension projects are anticipated to be very expensive in the NWT at this time especially due to construction demand in Alberta and northern British Columbia.
8. The method of ranking projects should build on previous GNWT work and experience.
9. The ongoing and continuing collection of data, and the analysis of this new data, is essential to support the NWT runway optimization process.

8.2 Recommendations:

The following general recommendations relate to the assessment process. It is recommended that the GNWT follow the runway optimization process on a continuing basis:

1. Start data collection and build a comprehensive database.
2. Prepare a site document form for data collection at each site.
3. Create an initial upgrade priority list based on the optimization model presented herein.
4. Develop an Economic Benefits Assessment for each airport to provide data for the evaluation worksheet.
5. Runway extension projects should be planned and carried out only in accordance with an approved Development Plan for the airport.
6. Update the priority list on an annual basis.
7. Use the priority list for government budgeting purposes.
8. Use the model to respond to stakeholder challenges, inputs, and questions and as an overall decision support tool.
9. Investigate the application of vertical guidance (e.g. PAPI lights) as safety enhancements.
10. Survey each site to ensure declared distances are at maximum possible.

These recommendations are in addition to airport specific recommendations contained in Chapter 7.

Appendix A- Prioritization Assistance Spreadsheet

Table A-1 Assessment Scores

Airport	1a Community Health Weight = 2 Issues?	1a Score	1b Safety Weight = 4	1b Score	1c Weather Changes Weight = 2 Risk	1c Score	2a Performance Weight = 6 Current Length	Critical Length	Severity	2a Score	2b Regs Changes Weight = 10 Critical Length	Years Ahead	2b Score
Aklavik	0	**0.00**	0	**0.00**	0.8	**1.60**	3000	3675	0.23	**1.35**	2970	3	**-0.07**
Colville Lake	1	**2.00**	0	**0.00**	0.5	**1.00**	2743	2700	-0.02	**0.00**	2700	3	**-0.11**
Déline	0	**0.00**	0	**0.00**	0.5	**1.00**	3933	2700	-0.31	**0.00**	3933	10	**0.00**
Fort Good Hope	0	**0.00**	0	**0.00**	0.8	**1.60**	3000	3675	0.23	**1.35**	3000	10	**0.00**
Fort Liard	0	**0.00**	0	**0.00**	0.1	**0.20**	2946	2210	-0.25	**0.00**	2946	10	**0.00**
Fort McPherson	0	**0.00**	0	**0.00**	0.8	**1.60**	3500	4043	0.16	**0.93**	4043	3	**1.09**
Fort Providence	0	**0.00**	0	**0.00**	0.1	**0.20**	3000	1770	-0.41	**0.00**	3000	10	**0.00**
Fort Resolution	0	**0.00**	0	**0.00**	0.1	**0.20**	4000	2700	-0.33	**0.00**	4000	10	**0.00**
Fort Simpson	0	**0.00**	0	**0.00**	0.1	**0.20**	6000	9100	0.52	**3.10**	6000	10	**0.00**
Fort Smith	0	**0.00**	0	**0.00**	0.1	**0.20**	6000	9100	0.52	**3.10**	6000	10	**0.00**
Gamètì/ Rae Lakes	0	**0.00**	0	**0.00**	0.5	**1.00**	3000	2210	-0.26	**0.00**	3000	10	**0.00**
Hay River	0	**0.00**	0	**0.00**	0.1	**0.20**	6000	9100	0.52	**3.10**	6000	10	**0.00**
Inuvik Mike Zubko	0	**0.00**	0	**0.00**	0.5	**1.00**	6000	9100	0.52	**3.10**	6000	3	**0.00**
Jean Marie River	1	**2.00**	0	**0.00**	0.1	**0.20**	2500	2700	0.08	**0.48**	2500	10	**0.00**
Lutselk'e	0	**0.00**	0	**0.00**	0.5	**1.00**	2996	2210	-0.26	**0.00**	2431	10	**0.00**
Nahanni Butte	1	**2.00**	0	**0.00**	0.1	**0.20**	2475	2046	-0.17	**0.00**	2475	10	**0.00**
Norman Wells	0	**0.00**	0	**0.00**	0.1	**0.20**	5997	9100	0.52	**3.10**	5997	10	**0.00**
Paulatuk	0	**0.00**	0	**0.00**	0.8	**1.60**	4000	3675	-0.08	**0.00**	4000	10	**0.00**
Sachs Harbour	0	**0.00**	0	**0.00**	0.8	**1.60**	4000	3675	-0.08	**0.00**	4000	10	**0.00**
Trout Lake	1	**2.00**	0	**0.00**	0.1	**0.20**	2500	2700	0.08	**0.48**	2500	3	**0.00**
Tuktoyaktuk	0	**0.00**	0	**0.00**	0.5	**1.00**	5000	3675	-0.27	**0.00**	5000	10	**0.00**
Tulita	0	**0.00**	0	**0.00**	0.1	**0.20**	3000	2210	-0.26	**0.00**	4043	3	**2.43**
Ulukhaktok/ Holman	0	**0.00**	0	**0.00**	0.1	**0.20**	4300	5400	0.26	**1.53**	4300	10	**0.00**
Wekweètì	0	**0.00**	0	**0.00**	0.5	**1.00**	3000	2046	-0.32	**0.00**	3000	10	**0.00**
Whatì	0	**0.00**	0	**0.00**	0.1	**0.20**	2990	2210	-0.26	**0.00**	2990	10	**0.00**
Wrigley	0	**0.00**	0	**0.00**	0.1	**0.20**	3500	2700	-0.23	**0.00**	3500	10	**0.00**
Yellowknife	0	**0.00**	0	**0.00**	0.1	**0.20**	7500	9100	0.21	**1.28**	7500	10	**0.00**

Data Entry Cells

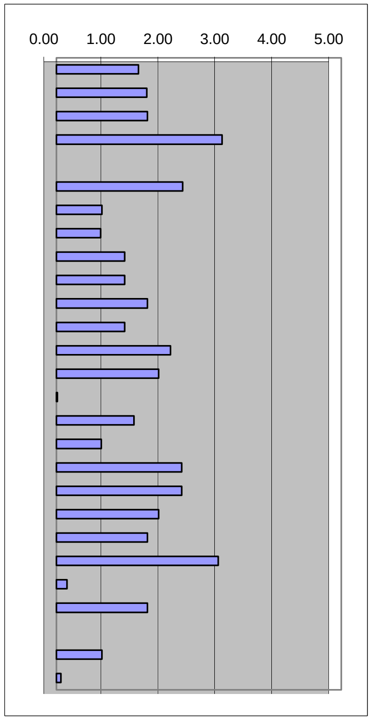
Table A-1 Assessment Scores

Airport	2c Fleet Replacement			3 Demand Change of A/C			4 Level of Service			5 Benefit/Cost					
	Weight = 6			Weight = 4			4	2 = Weight		Weight = 2					
	Critical Length	Years Ahead	**Score**	Change?	Years Ahead	**Score**	% cost of Decrease	% benefit of Improvement	**Score**	Req'd Extension	Cost per 100'	Total Cost	Benefits	B/C Ratio	**Score**
Aklavik	2970	3	**-0.04**	0	0	**0.00**	10.00%	10.00%	**0.60**	6.75	$1,025,000	$6,918,750	$0	0.00	**-2.00**
Colville Lake	2807	3	**0.10**	0	0	**0.00**	10.00%	10.00%	**0.60**	0.64	$815,434	$521,877	$0	0.00	**-2.00**
Déline	2700	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$298,507	$0	$0	1.00	**0.00**
Fort Good Hope	3970	3	**1.36**	0	0	**0.00**	10.00%	10.00%	**0.60**	9.7	$170,000	$1,649,000	$0	0.00	**-2.00**
Fort Liard	4043	5	**1.12**	0	0	**0.00**	10.00%	10.00%	**0.60**	10.97	$166,034	$1,821,395	$0	0.00	**-2.00**
Fort McPherson	4043	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	5.43	$230,000	$1,248,900	$0	0.00	**-2.00**
Fort Providence	3000	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$200,000	$0	$0	1.00	**0.00**
Fort Resolution	3970	5	**-0.02**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$300,000	$0	$0	1.00	**0.00**
Fort Simpson	4600	5	**-0.70**	0	0	**0.00**	10.00%	10.00%	**0.60**	31	$350,000	$10,850,000	$0	0.00	**-2.00**
Fort Smith	4600	5	**-0.70**	0	0	**0.00**	10.00%	10.00%	**0.60**	31	$350,000	$10,850,000	$0	0.00	**-2.00**
Gamètì/ Rae Lakes	3000	5	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$1,025,000	$0	$0	1.00	**0.00**
Hay River	4600	5	**-0.70**	0	0	**0.00**	10.00%	10.00%	**0.60**	31	$350,000	$10,850,000	$0	0.00	**-2.00**
Inuvik Mike Zubko	4600	5	**-0.70**	0	0	**0.00**	10.00%	10.00%	**0.60**	31	$350,000	$10,850,000	$0	0.00	**-2.00**
Jean Marie River	2807	3	**0.52**	0	0	**0.00**	10.00%	10.00%	**0.60**	3.07	$800,000	$2,456,000	$0	0.00	**-2.00**
Lutselk'e	4043	8	**0.42**	0	0	**0.00**	10.00%	10.00%	**0.60**	10.47	$169,323	$1,772,809	$0	0.00	**-2.00**
Nahanni Butte	2807	3	**0.56**	0	0	**0.00**	10.00%	10.00%	**0.60**	3.32	$800,000	$2,656,000	$0	0.00	**-2.00**
Norman Wells	4600	2	**-1.12**	0	0	**0.00**	10.00%	10.00%	**0.60**	31.03	$350,000	$10,860,500	$0	0.00	**-2.00**
Paulatuk	4000	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$220,000	$0	$0	1.00	**0.00**
Sachs Harbour	4000	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$220,000	$0	$0	1.00	**0.00**
Trout Lake	2807	3	**0.52**	0	0	**0.00**	10.00%	10.00%	**0.60**	3.07	$800,000	$2,456,000	$0	0.00	**-2.00**
Tuktoyaktuk	5000	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$240,000	$0	$0	1.00	**0.00**
Tulita	4149	3	**1.61**	0	0	**0.00**	10.00%	10.00%	**0.60**	11.49	$190,000	$2,183,100	$0	0.00	**-2.00**
Ulukhaktok/ Holman	4149	3	**-0.15**	0	0	**0.00**	10.00%	10.00%	**0.60**	11	$278,571	$3,064,286	$0	0.00	**-2.00**
Wekweètì	3000	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$170,000	$0	$0	1.00	**0.00**
Whatì	3411	5	**0.42**	0	0	**0.00**	10.00%	10.00%	**0.60**	4.21	$168,317	$708,614	$0	0.00	**-2.00**
Wrigley	3500	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	0	$230,000	$0	$0	1.00	**0.00**
Yellowknife	7500	10	**0.00**	0	0	**0.00**	10.00%	10.00%	**0.60**	16	$350,000	$5,600,000	$0	0.00	**-2.00**

Data Entry Cells

Table A-1 Assessment Scores

Airport	6 Political Issues Weight = 2 Community Reps	Carrier Reps	Score	Total Score	Airport
Aklavik	0	0	**0.00**	**1.44**	Aklavik
Colville Lake	0	0	**0.00**	**1.59**	Colville Lake
Déline	0	0	**0.00**	**1.60**	Déline
Fort Good Hope	0	0	**0.00**	**2.91**	Fort Good Hope
Fort Liard	0	0	**0.00**	**0.00**	Fort Liard
Fort McPherson	0	0	**0.00**	**2.22**	Fort McPherson
Fort Providence	0	0	**0.00**	**0.80**	Fort Providence
Fort Resolution	0	0	**0.00**	**0.78**	Fort Resolution
Fort Simpson	0	0	**0.00**	**1.20**	Fort Simpson
Fort Smith	0	0	**0.00**	**1.20**	Fort Smith
Gamèti/ Rae Lakes	0	0	**0.00**	**1.60**	Gamèti/ Rae Lakes
Hay River	0	0	**0.00**	**1.20**	Hay River
Inuvik Mike Zubko	0	0	**0.00**	**2.00**	Inuvik Mike Zubko
Jean Marie River	0	0	**0.00**	**1.80**	Jean Marie River
Lutselk'e	0	0	**0.00**	**0.02**	Lutselk'e
Nahanni Butte	0	0	**0.00**	**1.36**	Nahanni Butte
Norman Wells	0	0	**0.00**	**0.79**	Norman Wells
Paulatuk	0	0	**0.00**	**2.20**	Paulatuk
Sachs Harbour	0	0	**0.00**	**2.20**	Sachs Harbour
Trout Lake	0	0	**0.00**	**1.80**	Trout Lake
Tuktoyaktuk	0	0	**0.00**	**1.60**	Tuktoyaktuk
Tulita	0	0	**0.00**	**2.84**	Tulita
Ulukhaktok/ Holman	0	0	**0.00**	**0.19**	Ulukhaktok/ Holman
Wekweètì	0	0	**0.00**	**1.60**	Wekweètì
Whatì	0	0	**0.00**	**0.00**	Whatì
Wrigley	0	0	**0.00**	**0.80**	Wrigley
Yellowknife	0	0	**0.00**	**0.08**	Yellowknife



Data Entry Cells

Appendix B – Evaluation Table

	Aklavik	Colville Lake	Déline	Fort Good Hope	Fort Liard
Can support medevac aircraft	Yes	Not contracted type, others aircraft used	Yes	Yes	Yes
Meets current Critical aircraft MCTOW ASD	No	No, will require 703 operations of DHC6	Yes	No	Yes
Meets current critical aircraft Part 703 TOD	Yes	Yes	Yes	Yes	Yes
Scheduled Carriers	Aklak Air, North-Wright Airways	North-Wright Airways	North-Wright Airways	North-Wright Air	None
Current equipment	B99/DHC6, C208	C208/B99	C208/B99	C208 / B99 / DHC6	N/A
Current Operating restrictions	B99 payload constraints, DHC6 unrestricted	Only Part 703 aircraft or charter under 5,670Kg are possible C208 not restricted, B99 has payload constraints	C208, B99 not restricted	C208 not restricted, DHC6, B99 payload constraints	Part 703, some Part 704 aircraft possible
Expected future aircraft type	No change	No change	Dash-8 in 3 years	Dash-8 in 3 years	No change
Forecast demand to require fleet upgrade	No	No	Possible	Possible	Possible is support of resource development
Require Runway extension due to regulation changes	Yes to meet ASD requirements for critical aircraft extend to 4,000'	Yes to accommodate current critical aircraft	No	Yes, to meet critical aircraft ASD requiurements and to enable Part 705 operations	Scheduled Part 704 service would be facilitated by extension to 4,000'
Extension constraints	yes, extension to 4,000' requires new airport location	Yes, extension to 4,000' requires new location	No	No	
Risk of climate change impacts	High	Medium	Medium	High	Low
Recommendations	Extension to 4,000' but as a low priority as the current length is adequate for DHC6 operations and costs would be very high	Extension to 3,000' to accommodate current critical aircraft ASD requirements, high priority	Extension to 5,000' low priority to facilitate Part 705 operations	Extension to 4,000' high priority as the community would be best served by Part 705 operations	Extension to 4,000' to enable use of a wider variety of charter aircraft but low priority at this time
		Extension to 3,000' to enable use of larger, pressurized medevac aircraft			Review at time of medevac rebidding
		Review at time of medevac rebidding			

	Fort McPherson	Fort Providence	Fort Resolution	Fort Simpson	Fort Smith
Can support medevac aircraft	Yes	Yes	Yes	Yes	Yes
Meets current Critical aircraft MCTOW ASD	No	Yes	Yes	No	No
Meets current critical aircraft Part 703 TOD	Yes	Yes	Yes	Yes	Yes
Scheduled Carriers	None	None	None	First Air, Air Tindi	North Western Airlease
Current equipment	N/A	N/A	N/A	C208/ATR-42	J31/J32
Current Operating restrictions	B99 payload constraints	N/A	None for DHC6, some for other Part 704	No	No
Expected future aircraft type	N/A	Charter only	Dash-8 in 5 years	ATR-42, DHC-6	No Change
Forecast demand to require fleet upgrade	No	No	Possible	Possible Gas Pipeline project impacts	No
Require Runway extension due to regulation changes	Yes, to meet critical aircraft ASD requirements	No, new critical aircraft definition required	No	No	No
Extension constraints	No	No	No	No	No
Risk of climate change impacts	High	Low	Low	Low	Low
Recommendations	Extension to 4,000' high priority to meet needs of critical aircraft, to 5,000' at a later date	No Runway extension at this time	Extension to 5,000' low priority to facilitate Part 705 operations	No Runway extension at this time, constraints will continue	No Runway extension at this time
		Review at time of medevac rebidding		Expect MacKenzie Gas Pipeline project impacts that should be funded by the project	

	Gamèti/ Rae Lakes	Hay River	Inuvik Mike Zubko	Jean Marie River	Lutselk'e
Can support medevac aircraft	Yes	Yes	Yes	Not contracted type, others aircraft used	Yes
Meets current Critical aircraft MCTOW ASD	Yes	No	No	No	Yes
Meets current critical aircraft Part 703 TOD	Yes	Yes	Yes	Yes	Yes
Scheduled Carriers	Air Tindi	First Air, Buffalo, Canadian North	Canadian North, First Air, Aklak	None	Air Tindi, Arctic Sunwest
Current equipment	C208 scheduled, Dash7 charter	ATR-42/DC-3, Dash-8	C208/B99/B737-200/F100/DHC-6	N/A	C208/B99
Current Operating restrictions	Part 703 and some Part 704 aircraft possible, C208 not restricted	No	B737 constraints	Only Part 703 or charter <5,680 Kg aircraft possible	Part 703 and some Part 704 aircraft possible, C208 not restricted, B99 payload constraints
Expected future aircraft type	No change, C208 is very efficient for the relevant stage lengths	ATR-42, Dash-8 in 2 years	CRJ-200 in 3 years	N/A	B99, C208, some 705 charter Dash 8/ATR-42
Forecast demand to require fleet upgrade	No	No	Possible in support of MGP project	No	Possible due to modernization
Require Runway extension due to regulation changes	No	No	No	No, but yes if carriers want to use Part 704 aircraft for scheduled service	Yes, to enable use of Part 704 aircraft and to enable Part 705 charter as required
Extension constraints	Yes, extension to 4,000' requires relocation	No	No	No	No
Risk of climate change impacts	Medium	Low	Medium	Low	Medium
Recommendations	No Runway extension at this time, an extension to 4,000' would improve aircraft selection possibilities but the community is adequately served at present. Extension would be very expensive.	No Runway extension at this time, B737 constraints would remain, serious surface problems should be addressed and are considered to be a safety issue.	No Runway extension at this time, constraints to remain	Extension to 3,000' to enable use of a wider variety of charter aircraft but low priority at this time	Should extend to 4,000' to enable larger Part 704 aircraft but low priority as the community is adequately served by current types
	Review at time of medevac rebidding			Extension to 3,000' to enable use of larger, pressurized medevac aircraft	Review at time of medevac rebidding
				Review at time of medevac rebidding	

	Nahanni Butte	Norman Wells	Paulatuk	Sachs Harbour	Trout Lake
Can support medevac aircraft	Not contracted type, others aircraft used	Yes	Yes	Yes	Not contracted type, others aircraft used
Meets current Critical aircraft MCTOW ASD	N/A, Part 703 type aircraft	No	Yes	Yes	No
Meets current critical aircraft Part 703 TOD	Yes	Yes	Yes	Yes	Yes
Scheduled Carriers	None	North-Wright Airways, Canadian North	Aklak	Aklak	None
Current equipment	N/A	C208/B99/B737-200/F100	B99/DHC6	B99/DHC-6	N/A
Current Operating restrictions	Only Part 703 aircraft or charter < 5,680 Kg possible	B737 constraints	No	No	Only Part 703 aircraft possible, C208 restricted in MTOW
Expected future aircraft type	No change	CRJ-200 in 2 years	No change	No change	N/A
Forecast demand to require fleet upgrade	No	No	No	No	No
Require Runway extension due to regulation changes	No, but yes if carriers want to use Part 704 aircraft for scheduled service	No	No	No	Yes, to enable use of larger aircraft on charter
Extension constraints	No	No	No	No	No
Risk of climate change impacts	Low	Low	High	High	Low
Recommendations	Extension to 3,000' to enable use of larger, pressurized medevac aircraft	No Runway extension at this time, constraints will continue	No Runway extension at this time	No Runway extension at this time	Extension to 3,000' to enable use of larger, pressurized medevac aircraft
	Extension to 3,000' to enable use of a wider variety of charter aircraft but low priority at this time	Expect MacKenzie Gas Pipeline project impacts that should be funded by the project			Extension to 3,000' to enable use of a wider variety of charter aircraft but low priority at this time
	Review at time of medevac rebidding				Review at time of medevac rebidding

	Tuktoyaktuk	Tulita	Ulukhaktok/ Holman	Wekweètì	Whatì
Can support medevac aircraft	Yes	Yes	Yes	Yes	Yes
Meets current Critical aircraft MCTOW ASD	Yes	Yes	No	Yes	Yes
Meets current critical aircraft Part 703 TOD	Yes	Yes	Yes	Yes	Yes
Scheduled Carriers	Aklak	North-Wright Airways	First Air	Air Tindi	Air Tindi
Current equipment	B99/DHC-6	C208/B99	ATR-42	C208	C208
Current Operating restrictions	No	C208 not restricted, B99 payload constraints	No	C208 not restricted, some 704 possible	Part 703 and some Part 704 aircraft possible, C208 not restricted
Expected future aircraft type	No Change	Dash-8/ATR-42 in 3 years	Dash-8 in 3 years	No change	DHC6, KingAir
Forecast demand to require fleet upgrade	No	No	No	No	No
Require Runway extension due to regulation changes	No	Yes, to enable use of Part 704 aircraft at MTOW and to facilitate introduction of Part 705 services	Change of critical aircraft required	Yes, to enable use of Part 704 aircraft at MTOW	Yes, to enable use of Part 704 aircraft at MCTOW
Extension constraints	No	No	No	Yes, extension to 5,000' requires relocation	No
Risk of climate change impacts	Medium	Low	Low	Medium	Low
Recommendations	No Runway extension at this time, paving may be requested by oil industry users. If so, the industry should pay for upgrades.	Extension to 4,000' soon, 5,000' preferred by carriers but not required in near term	No Runway extension at this time, to 5,000' at a later date.	Extension to 4,000' but low priority as C-208 service is very efficient on the relevant stage lengths.	Should extend to 4,000' to enable larger Part 704 aircraft but low priority as the community is adequately served by current types
		Review at time of medevac rebidding		Review at time of medevac rebidding	Review at time of medevac rebidding

	Wrigley	Yellowknife
Can support medevac aircraft	Yes	Yes
Meets current Critical aircraft MCTOW ASD	Yes	No
Meets current critical aircraft Part 703 TOD	Yes	Yes
Scheduled Carriers	None	Air Canada Jazz, Air Tindi, Arctic Sunwest, Buffalo Airways, Canadian North, First Air, Northwestern Air, North-Wright Airways
Current equipment	N/A	B737, C130, CRJ, B727 various Part 704 and 703 jet and turboprop
Current Operating restrictions	None	Weight limitations on some Part 705 aircraft
Expected future aircraft type	No change, charter only	Any Part 705 types, occasional large Code D aircraft e.g. B777 or A340 in emergency situations
Forecast demand to require fleet upgrade	No	No
Require Runway extension due to regulation changes	No	Possible, full study required
Extension constraints	No	Land ownership
Risk of climate change impacts	Low	Low
Recommendations	No Runway extension at this time	Decisions on future runway extensions are currently pending completion of the update of the Airport Master Plan.

LPS AVIA CONSULTING

One Antares Drive, Suite 250

Ottawa, ON K2E 8C4

Telephone: (613) 226-6050

Fax: (613) 226-5236

e-mail: info@lpsaviation.ca

www.lpsaviation.ca