SNC·LAVALIN

REPORT for:

Runway Extension Assessment
Medicine Hat Regional Airport

October 2012

Submitted to:

Medicine Hat Regional Airport
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Medicine Hat, Alberta
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LONG TERM AIRPORT PLANNING
360° SUPPORT TO CLIENTS
INTEGRATED AVIATION INFRASTRUCTURE
MANAGEMENT, OPERATION & DEVELOPMENT

Table of Contents

EXECUTIVE SUMMARY

The Medicine Hat Regional Airport (YXH) currently has a 5,000-foot paved runway capable of handling smaller DHC-8-300 size (Dash 8, 56 seats) aircraft but is too short for most commercial passenger jet aircraft operations. To this end, the City of Medicine Hat contracted SNC-Lavalin Inc. to undertake a needs assessment with respect to the feasibility of extending the runway at YXH.

PURPOSE OF THE STUDY

The purpose of the study is to either confirm that an extension would be required for the airport runway to adequately meet the needs of the community in terms of commercial air service, business aviation and military air transport, or to put the issue to rest for the foreseeable future.

METHODOLOGY

The study examined potential new commercial airline services, business aviation and military related traffic at YXH, the airport facility requirements for those services, and likelihood of operating in the next 20 years if those facilities were available. Specifically, the assessment includes an examination of the runway length required at YXH for operating the DHC-8-Q400 (Q400, 78 seats) that will be used in the near future by the new regional subsidiary of WestJet Airlines and Air Canada Express, and the Canadair Regional Jet (CRJ 705, 75 seats) for service to Toronto, and Boeing 737/Airbus A320 (+/-160 seats) aircraft serving US and Mexican vacation destinations. In addition, an examination was made of the potential for using YXH for transporting military personnel between the nearby Canadian Forces Base Suffield and the U.K., rather than Calgary International Airport which they currently use.

Options for extending the runway were developed and the benefits and costs of each option were examined. Other facility requirements for the potential new air services were also identified and rough costs provided for any major facility improvements.

FINDINGS

The status quo and three runway extension options were examined and are summarized below. For all of the three extension options, the road to the south-west of the airport would have to be realigned at a cost of approximately $42 million, possibly more for the longer extensions. This cost is not included in the runway extension costs given below. Canada Customs (CBSA) services/Port of Entry status should be sought under each option. The airport is currently planning an expansion of the terminal building to a capacity of 80-100 passengers to accommodate Q400 service. The size of the terminal required under each option and the approximate cost of the **additional** capacity above the currently planned level of 80-100 are given.

Status Quo/No Runway Extension

- Allows Q400 aircraft service to Calgary (YYC) and Vancouver (YVR), and B737-700 or A320 aircraft service to Las Vegas (LAS) at 90% load factors and one-stop service to Cancun
- Allows business jet service to North America, excluding Nova Scotia, Newfoundland and Florida
- No change to current plans to expand terminal complex to capacity of 80-100

- Apron area would need to be strengthened for narrow-body jet service to be accommodated

Extend Runway to 6,600 ft. (1,600 ft. Extension)

- Allows unrestricted Q400 service, CRJ705 service to YYZ, B737-700 service to Las Vegas, and one-stop B737-700, A320 or B737-800 service to Cancun
- Allows business jet service to all North American destinations and the Caribbean
- Cost of runway extension approximately $13.2 million, plus costs for changes to navigational aids, site preparation and strengthening of apron pavement; small additional annual operating expenses
- Additional airport revenues of approximately $35,000-50,000 per year, possibly increasing to $420,000 in 15-20 years if CRJ Toronto service is realized
- The annual payments to cover the cost of the runway extension is $860,000 (30-year period at 5% interest rate), much higher than the additional airport revenues, even with a CRJ Toronto service
- Small economic benefits to community, possibly significant benefits in long term if CRJ service to Toronto is realized
- No change to current plans to expand terminal complex to capacity of 80-100.

Extend Runway to 7,350 ft. (2,350 ft. Extension)

- In addition to above, allows B737-700/A320 non-stop plus B737-800 one-stop service to Cancun
- Allows business jet service all North American, Caribbean and some services European destinations
- Cost of runway extension approximately $20.9 million, plus costs for changes to navigational aids, site preparation and strengthening of apron pavement; small additional annual operating expenses
- Additional airport revenues of approximately $87,000 per year, possibly increasing to $455,000 in 15-20 years if CRJ Toronto service is realized
- The annual payments to cover the cost of the runway extension is $1,365,000, much higher than the additional airport revenues, even with a CRJ Toronto service
- Small economic benefits to community, possibly significant benefits in long term if CRJ service to Toronto is realized
- Expansion of terminal building to increase capacity to 100-140 passengers required

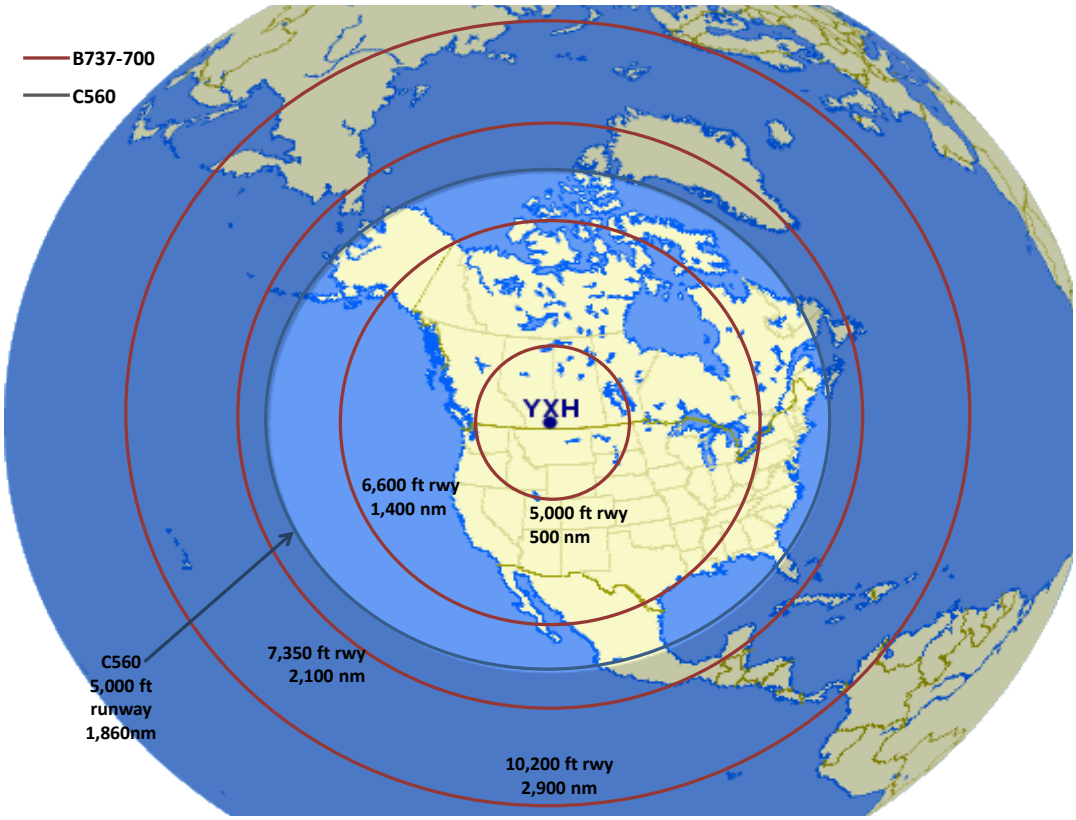
Extend Runway to 10,200 ft. (5,200 ft. Extension)

- In addition to above, allows Airbus A330 and Boeing B777 (over 250 seats) service to the UK
- Allows business jet service all North American destinations, the Caribbean and Europe
- Expansion of terminal to 250-300 capacity, parallel taxiway, Instrument Landing System, Category 8 firefighting services
- Cost of runway extension approximately $50 million, plus costs for changes to navigational aids, site preparation and strengthening of apron pavement; large increase in additional annual operating expenses
- Additional airport revenues of approximately $610,000 per year, possibly increasing to $975,000 in 15-20 years if CRJ Toronto service is realized
- Additional cost of over $67 million also required for terminal expansion ($24 million), taxiways ($6.6 million), ILS ($26 million) and firehall ($10 million)

- The annual payments to cover the cost of the runway extension and other required facilities is $7.6M, much higher than the additional airport revenues, even with a CRJ Toronto service
- Economic benefits to community would be substantial

The areas that can be served by the B737-700 with full passenger loads under each runway extension option and by the Cessna 560 business jet from current runway are presented below. Ranges are a little longer than the B737-700 for the A320 and a little shorter for the B737-800. The inner circle representing the 500 nm range is also applicable to the Q400 from the current runway.

Range of B737-700 under Each Runway Extension Option and Range of Cessna 560 from Current Runway



The costs of the runway extension options are very high in relation to the additional revenues expected to the airport for all three runway extension options. With the projected high cost of the road realignment required for the runway extension, funding from the Provincial Government for the runway extension is unlikely. Even with increases in the aeronautical fees and charges and some Airport Capital Assistance Program funding, the costs are well beyond the capacity of the airport to recover such capital investment. Significant additional funding would be required from the City.

There are three scenarios where expansion of the airport runway and airport infrastructure would be warranted in the future:

1. Increased demand generated from population growth and the associated air passenger market, i.e. population to exceed 100,000 residents and/or passenger demand exceeds 400,000 within the next twenty years. Larger airport would be needed to accommodate increased travel demand from residents and businesses.
2. To accommodate a specific air service opportunity such as leisure charter service. This would typically attract 100-200 flights per year, and may not be justified in terms of an economic return on investment, but could be warranted based on community demand for the service and the associated improvement to the quality of life and attraction and retention of businesses and residents.
3. A specific economic and employment opportunity such as a decision by BATUS to relocate aviation support for their CFB Suffield activities from Calgary to Medicine Hat, or the attraction of an aviation related business such as a maintenance and repair facility with a large number of high tech, well-paying jobs. These would be specific economic opportunities triggering an expansion of airfield and infrastructure to support operations.

It would be prudent over the longer term, to plan for future air service or aviation business opportunities which may require an extended runway. With continued economic and population growth, the City of Medicine Hat may be able to attract and sustain new commercial air services in the future. It is recommended therefore that land development be restricted in the area to the south-east of the airport and the appropriate land be acquired to preserve the option of extending the runway for future aviation purposes if the need arises. Proceeding with this strategy at this time is vital before the required land is further developed and the associated acquisition cost makes this option cost prohibitive.

CONCLUSIONS

1. Explore opportunities, including zoning restrictions, possible strategic land acquisitions, and working with Alberta Transportation, to preserve the ability/option for the extension of the runway to 7,350 feet to accommodate leisure charters and regional jet service to eastern Canada in the future.
2. Continue with detailed planning of the expansion of the terminal building to accommodate up to 100 passengers and serve the Q400 and B737-800 (partial load) aircraft with construction to begin in 2013
3. Update the Airport Master Plan before proceeding with a particular extension option as further analysis of various land, aerodrome, navigation, noise and terminal factors is recommended.

1.0 INTRODUCTION

The Medicine Hat Regional Airport (YXH) currently has a 5,000-foot asphalt runway and a 2,820-foot asphalt cross wind runway. The longest runway is capable of handling DHC-8-300 size aircraft but is too short for commercial passenger jet aircraft without suffering payload penalties. The runway length is also less than that required for operating the DHC-8-Q400 (Q400) at maximum take-off weight. The Strategic Master Plan for YXH prepared in December 2006 stated "there is no requirement for a runway extension over the life of this plan [25 year period to 2032]. However, based on the potential for larger aircraft, the City should continue to protect the option for a runway extension".

Another issue raised in the 2006 Strategic Master Plan is the use of air transport by the British military to move large numbers of personnel to/from Canadian Forces Base (CFB) Suffield in south-western Alberta for military training. Currently they fly into Calgary International Airport and use ground transportation to the base (three hour travel time), but YXH is much closer and they would prefer to use that airport if the required runway and terminal facilities were available. The Master Plan indicated that a new airport with a 12,000 ft. runway would be required to handle the wide-body transcontinental military flights and that it would not be cost-effective for the City to pursue this opportunity. A more detailed review, however, was requested to explore the opportunity further.

The 5,000 ft. runway has been seen by many stakeholders in the community as an obstacle for attracting new air service to Medicine Hat as jets would typically be used on the more distance inter-provincial or international routes. With the recent announcement by WestJet that it is creating a regional affiliate using the Q400 aircraft, the Municipality wanted a more thorough examination of the need and economic feasibility to extend the runway.

The City has contracted SNC-Lavalin Inc. to undertake a needs assessment with respect to extending the runway in the future.

1.1 PURPOSE

The purpose of the study is to either confirm that an extension would be required for the airport runway to adequately meet the needs of the community in terms of commercial air service, business aviation and military air transport, or to put the issue to rest for the foreseeable future. The output of the study will be a high level business case to support a recommendation of extending the runway or to support the status quo.

1.2 METHODOLOGY

The approach taken to assessing the need for an extension of the runway was as follows:

- Review the 2006 YXH Master Plan and the 2011 Genivar study, *Study Aeronautical Planning and Zoning Runway 03-21 Extension Functional Plan - Technical Summary;*
- Examine potential new commercial airline services, including their likely passengers demand, aircraft used, flight frequency and routing, and the likelihood of the service operating in the next 20 years if appropriate airport facilities were available;
- Review business aviation at the airport and the need for a runway extension for business aircraft operations, including surveying businesses in the area, and determine the possible additional business flights if the runway was extended;

- Review the future demands of military aviation generated by CFB Suffield, including Canadian DND operations, British military operations (BATUS) and other foreign military operations including NATO, and the facilities and services that would be required at YXH for these operations to move to the airport;
- Identify the set of aircraft types that could potentially use YXH and destinations they would serve from the airport, and determine the runway length required to serve those destinations;
- Identify options for runway extensions and the potential services the runway extension would accommodate;
- For each option, determine the additional airport revenues from the potential new services, the approximate cost of the runway extension required, and provide a qualitative assessment of the economic benefits to the region;
- Identify other facility improvements required for the identified potential new services and rough costs for any major facility improvements; and
- Make recommendations on the need for a runway extension and the length of any extension.

2.0 POTENTIAL FOR EXTENDING RUNWAY

An overview of the airport and surrounding lands is provided in Exhibit 2-1. The airport is bounded by Gershaw Drive SW to the northeast, north and southwest of airport lands. The southern perimeter is bounded by 30th Street SW, while the eastern perimeter is bounded by 10th Avenue SW. Non-airport lands to the northeast are largely developed with several industrial buildings, housing and a cemetery located in close proximity to airport property. Lands southwest of the airport are less developed with a few industrial buildings and fuel storage located to the south and open fields located to the southwest.

Exhibit 2-1: Overview of YXH and Surrounding Lands

Runway 03/21 extends from the north-eastern corner of airport property to the southwest corner with limited airport property available for extension beyond each end of the runway. This means that extension of the runway requires expansion of airport property. The runway could be extended to the north by only 100 ft. due to the sloping terrain and urban area encroachment and therefore does not justify consideration of any extension in that direction due to the high cost of reconstructing the safety area at the end of the runway (see top photo next page). The expansion could be accommodated on lands to the southwest where there are fewer man-made structures and relatively flat terrain although there is a need to relocate the adjacent highway adjacent to the end of the runway.

3.0 POTENTIAL NEW AIR SERVICES

3.1 COMMERCIAL AVIATION

Based on the results of the 2012 air service update study[1], the following possible services were examined to determine if there would be a reasonable likelihood of the airline operating the service in the next 20 years if sufficient runway was available.

1. WestJet Q400 service to Calgary (YYC)
2. WestJet or Air Canada Q400 service to Vancouver (YVR)
3. Air Canada CRJ service to Vancouver (YVR)
4. Air Canada ERJ-90 or CRJ-705 service to Toronto (YYZ)
5. Seasonal charter flight to Las Vegas or Mexico using narrow-body jet (A320, B737-800)

The potential was assessed using the 2012 Air Service study findings and allowing for growth in air travel demand. The population of Medicine Hat grew by an average of 1.2% per year between 2006 and 2011. Passenger traffic at YXH is currently slightly below the 2005 level, but this traffic accounts for only 25% of total area demand (including those driving to YYC) and area demand almost certainly has increased. It is assumed that area demand will increase by 2% per year, excluding any stimulatory effects of new air service or reductions in fares.

Other potential short haul routes with potential for non-stop service – Kelowna, Edmonton and Fort McMurray – are all closer than YVR and would likely be served by small turboprop aircraft (BE1900 or DHC-8-200). Winnipeg is slightly further (962 km compared to 901 km to YVR), but demand to Winnipeg is very low (2-3 enplanements/day) and Q400 service is very unlikely.

Other Canadian airlines operating scheduled service which could potentially service YXH all operate turboprop aircraft which can either operate from the existing runway (e.g., Perimeter Airlines using DHC-8-200s) or the aircraft type and route is covered above (e.g., Porter Airlines using Q400).

No US airline will serve YXH given the small market size and the large number of options available for US bound travellers from both YYC and, for the price conscious traveller, Great Falls (Montana). In addition to Air Canada and WestJet, United, Delta, American, Alaska and US Airways serve YYC, while Delta, United, Frontier and Alaska/Horizon all serve Great Falls.

WESTJET Q400 OR AIR CANADA Q400/DASH 8 TO CALGARY

With WestJet establishing a regional airline to feed passengers from smaller communities to their hub airports, service using their DHC-8-Q400 aircraft is very likely in the next 3 years. With the expected stimulation generated by new WestJet services and the service recapturing a significant proportion of demand that currently drives to YYC to fly, there is currently sufficient demand for at least a daily service to Calgary. Air Canada may also consider up-gauging the aircraft used for the current daily service from a B-1900 to a Dash 8 100/300, or Q400 aircraft which they plan to deploy in western Canada beginning in March, 2013.

[1] Update of market sizes from the 2010 Air Service Development Study by LeighFisher

WESTJET OR AIR CANADA Q400 TO VANCOUVER

Demand for Q400 service to Vancouver is currently marginal and load levels will depend on the degree of stimulation and the numbers of passengers using the service to connect to other flights at YVR. High stimulation would be expected if WestJet operates the service. Currently more connecting passengers would be expected if Air Canada operates the service as YVR is one of its hub airports, but as WestJet starts serving more regional markets with its Q400s from YVR, the number of connecting passengers would increase. The high level of stimulation generated by WestJet with their introduction of jet service to many medium sized communities and more recently Porter Airlines using Q400s to northern Ontario communities indicates that the required levels of stimulation of 50-80% for the service are possible. While service to YVR using a Q400 is unlikely in the next 3 years, it is reasonably likely over the next 5-10 years provided there is sufficient runway to operate the service and WestJet continues to expand its regional aircraft fleet and serve more destinations from YVR.

AIR CANADA CRJ TO VANCOUVER

There is currently sufficient demand for Air Canada to operate a daily DHC-8-200 (37-seat) service to YVR and achieve load factors of 80%. Air Canada has chosen not to operate the service, preferring to funnel all its passengers through YYC so it can maintain a frequency of 4 flights per day to YYC to better serve connecting traffic. This strategy has resulted in most Vancouver passengers driving to YYC to catch a flight. Using a 50-seat CRJ, demand would be slightly higher due to the shorter flying time (1:30 compared to 2:30 using DHC-8-200), but would likely give a load factor of around 60%. This could increase to a level where the service is feasible over the next 5-10 years, particularly if fares decrease stimulating demand.

The CRJ, however, has poor fuel economy on a per passenger-km basis, as well as maintenance issues, and airlines have been phasing them out in favour of more fuel efficient aircraft such as the Q400 or larger regional jets. The operating costs of the Q400 are reportedly the same as those of the CRJ despite being able to carry 56% more passengers. Flight times are only slightly longer using the Q400, for example, 1:54 YXH to YVR compared to 1:50 using the CRJ. With fuel prices likely to continue to rise over the next decade, the advantage of the Q400 will grow and CRJs will continue to be phased out in favour of these more fuel efficient aircraft. Air Canada Express will have 20 Q400s in their fleet and 6 in western Canada by late 2013.

Any service by Air Canada to YVR is unlikely to commence for at least 3 years, and the service would very likely be operated by a Q400 in preference to a CRJ. Since the Q400 requires a shorter runway than the CRJ, the runway should not be extended for a CRJ YXH-YVR service beyond that required for a Q400 YXH-YVR service.

AIR CANADA ERJ-90 OR CRJ-705 TO TORONTO

Toronto is Medicine Hat's largest air travel market and being the major hub for Air Canada offers connections to other Ontario, Quebec, Atlantic Canada, Eastern US and European markets. Demand to these destinations is, however, modest, and market shares for markets requiring a connection will only be in the 30-50% range due to the competition offered by flights from Calgary on WestJet and US network carriers, as well as Air Canada. The market sizes, likely market shares and stimulation for each market are summarized in Exhibit 3-1.

Exhibit 3-1: Likely Loads on a Daily Flight to Toronto-Pearson

Traffic Segment	Current Enplaned	Passengers to use service		Stimulation		Total Daily Enplaned
		Capture Rate	Enplaned	Rate	Enplaned	
Toronto O/D	18.7	80%	15.0	35%	5.2	20.2
Connecting to:						
Ontario	15.4	40%	6.2	15%	0.9	7.1
Quebec	5.5	35%	1.9	15%	0.3	2.2
Atlantic	8.2	35%	2.9	15%	0.4	3.3
Florida	7.3	35%	2.6	10%	0.3	2.8
North East	2.0	35%	0.7	10%	0.1	0.8
New England	0.3	35%	0.1	10%	0.0	0.1
South East	0.4	35%	0.2	10%	0.0	0.2
South Central	3.0	35%	1.1	10%	0.1	1.2
Europe	11.9	35%	4.2	10%	0.4	4.6
Caribbean	1.4	35%	0.5	10%	0.0	0.5
Middle East	0.7	35%	0.2	10%	0.0	0.3
Africa	0.6	35%	0.2	10%	0.0	0.2
Total	56.8	36%	20.6	13%	2.6	23.3
Total	75.5		35.6		7.9	43.5
Total allowing for 40% growth by time service is implemented						60.9

The probable load of 43.5 enplanements per flight provides a load factor of only 47% using an ERJ-90. Over the next 10-20 years Medicine Hat's air travel market will likely increase by 20-40%. A 40% increase in the likely loads would still provide a load factor of only 65% using an ERJ-90, well below the 80+% required by Air Canada to be interested in serving the market.

A smaller aircraft such as the CRJ-705 could achieve a 80% load factor, and although the CRJ-705 has the range to serve the route, Air Canada does not use such aircraft on routes of this length preferring instead to route passengers through its nearby hubs, in this case YYC. Air Canada has operated a CRJ-705 on a marginally shorter route between Saskatoon and Toronto, a distance of 2,200 km compared to 2,450 km from YXH. However, unlike Medicine Hat, routing Saskatoon passengers through its western hub, YYC, would involve significant back-tracking thereby increasing costs and travel times. Use of the small CRJ-705 aircraft makes sense for the YXE-YYZ route despite its higher operating costs than the narrow-body aircraft used between YYC and YYZ.

Thus, it is unlikely that Air Canada would serve Toronto using either an ERJ-90 or CRJ-705 in the next 20 years even if sufficient runway was available for such a service. Demand would be insufficient for WestJet to serve the route, even with their typically high levels of stimulation, as Westjet would use a 737 with even greater seat capacity than the regional jets as. the route is too long for the Q400.

SEASONAL CHARTER FLIGHT TO LAS VEGAS OR MEXICO USING NARROW-BODY JET

Cheap flights to US vacation destinations are available from Great Falls, Montana. Allegiant, an ultra low-fare leisure airline offers service to Las Vegas, while Delta, United, Frontier and Horizon serve other US destinations at fare levels lower than what could be offered by services from YXH. It is therefore extremely unlikely that any carriers would offer services to Las Vegas or other US vacation destinations from YXH using narrow-body or even regional jet aircraft.

Seasonal charter flights to Mexico are perhaps the most likely service to require a longer runway at YXH. Currently, the Medicine Hat area demand for Mexico service is approximately 5,000 E/D passengers per year, including 2,000 to Cancun. This level of demand could be served by a weekly flight for 14 weeks using a 136-seat B737-700 at 80-85% load factor assuming the flight captures 50% of the area demand and has a 25% stimulation rate – reasonable assumptions based on past experience. Using the larger 737-800 aircraft operated by Sunwing, the load factor would be only about 60% and not attractive to the airline unless tagged with another community such as Lethbridge or Regina. Under this scenario passengers to Mexico would board at both Canadian cities and the flight could originate in either community, although, the airport of departure to Mexico will need a runway over 8,000 ft. and the first point of re-entry to Canada would require CBSA customs services. Lethbridge has only a 6,500 ft. runway and a tagged service with Lethbridge would require YHX to have a runway over 8,000 ft. (or Lethbridge to extend their runway). Sunwing plans to operate a similar tagged service, Grande Prairie – Fort McMurray – Puerto Vallarta return, during the 2012-13 winter season.

Achieving over a 50% share of the Mexico market required for a stand-alone service may be difficult with service for only 14 weeks given the wide range of flights available and competitive fares to Mexico from YYC, only 3 hours drive away. However, with the flight tagged to another community a lower market share of 40-45% would be required and the 737-800 service would be feasible and less for a 737-700 service. Charter carriers such as Sunwing are famous for its 'bringing our plane to your door' program, serving communities across Canada with direct air service to the sunspot destinations and capturing the customer at the source for many smaller communities such as Medicine Hat. Note that the seasonal service could potentially be shortened to 10 peak weeks to increase loads, but the costs of the empty return flight on the first flight of the season and empty outbound flight on the last flight of the season reduce the attractiveness of charter services for short periods.

Growth in air travel demand over the next 10-20 years of 20-40% would make non-stop seasonal weekly air service to a popular Mexican holiday destination such as Cancun even more attractive to an airline. With 40% growth, a Sunwing 737-800 non-stop service for 14 weeks could possibly achieve an average load factor of 80-85%. Loads using a smaller 737-700 would achieve loads of over 90% with 16 week schedule. Flights which are not tagged to another Canadian airport would carry more O/D passengers from Medicine Hat and provide higher revenues to the airport.

Thus, a seasonal service to Mexico or other sunspot market is feasible, possibly as soon as appropriate runway and terminal facilities are in place, as there will likely be sufficient demand for a service to be feasible for a 14-16 week period.

3.2 BUSINESS AVIATION

Information was collected to determine the extent to which business aviation would increase their use of YXH if a longer runway was available. The information was collected from surveys of businesses and interviews with the airport operator, the FBO operator and the business aviation community.

The Canadian Civil Aircraft Registry indicates that no business jets are based at the airport. The largest aircraft based at the airport are 6,950 kg. Jetstream 31 turboprop aircraft for which the current runway is more than sufficient for take-off and landing.

In the 2008 survey of business, only one company indicated that it had a company aircraft (a Piper-31 turboprop), while 4 indicated they sometimes charter aircraft at YXH. The list of companies that

responded is provided in Appendix A. In terms of business jets, only two of the major companies in Medicine Hat own business jets:

- TELUS, Cessna 750 based in Vancouver
- Canadian Pacific Railway (350 employees in Medicine Hat), Cessna 680 based at YYC

Both aircraft are based elsewhere in Western Canada and would likely only fly to YXH occasionally even if the runway was extended. Both are capable of flying between their base airport and YXH on the current 5,000 ft. runway. In August 2012 all major businesses in the Medicine Hat area and air carriers based at the airport were sent a short survey on their use of business jets and their need for a longer runway (see list of those contacted in Appendix A). Only three replies were received and none indicated they needed a longer runway. The low response is also likely an indication that they do not use business jets and the issue was of little relevance to them.

A small number of business jets currently use YXH. Billing data provided by the airport indicated that in the 17 months, January 2011 to May 2012, 74 business jets landed at YXH. This data (see Exhibit 3-2) indicates that the Cessna C560 was the most common business jet at YXH with 21 landings, while the Gulfstream IV and V were the largest (GLF-IV is 33 tonnes with 6 landings, and GLF-V is 41 tonnes with 1 landing). The data did not include the origin airport. The data indicates that many business jets can operate at YXH despite the short runway, although they may be restricted in the loads they can carry and routes they can operate on. Flight tracker data[2] indicates that the 12.7 tonne H25B operates on routes as far as Eagle Creek, CO (1,190 km).

[2] Flightaware.com

Exhibit 3-2: Numbers of Landing of Business Jets at YXH by Type – Jan. 2011 to May 2012

Aircraft	Weight (t)	# Flights	Avg. Passengers
E500	2.7	1	0.0
C425	3.9	1	6.0
C525	3.9	9	5.6
C500	5.3	1	1.0
C501	5.4	1	0.0
C550	6.6	1	4.0
C560	7.5	21	2.8
LJ35	7.7	3	2.0
LJ45	9.5	4	5.3
C650	9.8	1	8.0
C56X	10.4	2	2.5
C680	11.1	1	3.0
G150	11.8	6	2.2
H25B	12.7	4	3.3
H25C	15.0	1	5.0
C750	16.2	3	4.7
CL30	17.6	1	4.0
CL60	19.8	1	0.0
F900	20.9	4	2.8
CRJ1	23.0	1	7.0
GLF4	33.2	6	9.5
GLF5	41.4	1	14.0
Total		74	4.1

Source: Medicine Hat Regional Airport

Aircraft movement data published by Statistics Canada indicated that there were 308 jet movements (154 landings assuming each arrives and departs once) at YXH in 2011. To gauge the potential number of additional jet aircraft movements at YXH if the runway was extended, the number of jet movements at YXH was compared with the number at two other small Alberta cities each with similar populations and an airport with longer runway lengths. The two cities and the runway lengths were:

- Lethbridge Population: 87,882 Runway: 6,500 ft.
- Red Deer Population: 90,564 Runway: 5,528 ft.

Comparisons were not made with Grande Prairie or Fort McMurray as these cities have scheduled jet service and it is not possible to isolate the private jet movements from the scheduled movements from the published Statistics Canada data. Medicine Hat has a population of 61,305, 30-32% less than Lethbridge and Red Deer. The numbers of jet and turboprop movements at each airport by engine category and the percent of jet aircraft movements are provided in Exhibit 3-3. YXH has the lowest percentage of jet movements, 5%. Lethbridge, a close by, similar sized city to Medicine Hat, but with a 6,500 ft. runway and Port of Entry Status with Canada Customs services provided at its airport, has almost double the proportion of jet movements (9.8%). Red Deer with around 5,528 ft. runway has 12.8% jet movements. If YXH had the same proportion of jet movements as Lethbridge, it would have an

additional 295 jet movements (based on average movements over 5 years 2007-2011). Comparisons with Lethbridge are the most valid given their similarity in size, economy and location of the two cities.

Exhibit 3-3: Numbers of Jet and Turboprop Movements and Small Alberta City Airports 2007 to 2011

	Jet	Turboprop	% Jet*
Medicine Hat			**5.0%**
2011	308	6,307	4.7%
2010	258	5,552	4.4%
2009	303	5,367	5.3%
2008	325	5,798	5.3%
2007	338	6,018	5.3%
Lethbridge			**9.8%**
2011	777	6,187	11.2%
2010	609	5,953	9.3%
2009	583	6,469	8.3%
2008	784	7,447	9.5%
2007	968	7,876	10.9%
Lloydminster			**5.7%**
2011	175	3,159	5.2%
2010	92	2,166	4.1%
2009	169	2,097	7.5%
2008	170	2,459	6.5%
2007	157	2,934	5.1%
Red Deer			**12.5%**
2011	725	4,327	14.4%
2010	601	4,176	12.6%
2009	627	3,329	15.8%
2008	650	5,181	11.1%
2007	537	5,779	8.5%

* Average over 5 years given in bold

Source: Statistics Canada

3.3 MILITARY AVIATION

The British Army Training Unit Suffield (BATUS), a unit of the British Army, is located at the training area of CFB Suffield in Alberta, 44 km north-west of YXH, approximately 36 minutes drive time. BATUS conducts training at the Suffield base from May to October each year and flies approximately 6,000 personnel and military equipment from and to the UK to take part in military training exercises. The flights currently use Calgary International Airport (YYC) which is a 3 hour drive from the base. DND also uses YYC for its flights associated with the base, although most personnel and equipment are transported by road, mostly from Edmonton and Winnipeg. NATO Counter-Terrorism training also takes place at Suffield involving 250 military personnel from 10 countries. BATUS and DND have indicated that they would rather use YXH rather than YYC if the appropriate facilities were available at YXH due to the saving in travel time and ground transport costs.

The current aviation activity generated by BATUS is as follows:

- Approximately 11,000 annual passenger and 200 tonnes of cargo on flights from the UK
- 180 aircraft movements annually from UK
- Cargo freighters carry heavy equipment plus hazardous materials (weapons)
- Aircraft used include A300, A320, A330, KC330 (air force version of A330), B777, C130, Globe Master
- Primary aircraft to be used in future is the KC330 which will generate 96% of total aircraft movements and is used for passenger transport. The aircraft weighs 233 tonnes carries approximately 75 tonnes of freight and 250 passenger on each flight
- Cargo is moved using B777F aircraft, these represent only 4% of operations to/from the UK
- NATO Counter-Terrorism training – 250 military personnel from 10 countries (10-30 per country) from countries other than Canada and the UK – occurs every July
- Movement of military families to/from UK of approximately 250 X 4 = 1,000 people
- Small groups of personnel from Australia and USA for training
- Other airfreight services (small packages) provided by DHL

The BATUS traffic would be seasonal with most operations between April 1st and October 31st each year.

DND has also indicated that they would send more military personnel from across Canada to YXH if air service was expanded as there is insufficient capacity on current AC Express flights. DND had approximately 200-250 personnel fly out of YXH in 2011, and another 50 (approximately) flew out of YYC while conducting military business. They also indicated that many DND staff travel for personal reasons and that at least 90% fly out of YYC. This is consistent with the high leakage in air travel demand mentioned previously given the location of CFB Suffield, 44 km N-W of Medicine Hat towards Calgary.

BATUS has indicated that the following facility and service would be required at YXH – in brackets is the current level of these facilities/services at YXH:

- An expanded ATB that can handle up to 250 - 300 passenger both inbound and outbound operations concurrently [15,000 sq. ft., capacity 17 passengers]
- Runway length of 10,000 ft. x 150 ft. with parallel taxiway [5,000 ft., no parallel taxiway]
- Crash Fire Rescue service to be consistent with ICAO Category 8 for passenger flights and Category 5 for cargo flights [No ERS services]
- Catering service [None]
- Fuel – Jet A1 – two fuel trucks (60 tonnes) required per A330 aircraft fill [50,000 litres Jet A-1. Fuel bowser]
- Staging/parking area for up to 7 buses – 55 passenger motor coaches to transport military personnel to/from CFB Suffield [110 cars / 2 buses]
- ILS and other appropriate nav aids [NBD, VOR/DME, GPS-RNAV]
- Freight handling facilities for up to 75 tonnes
- Office space in ATB desirable
- Security upgraded and expanded to handle 300 passengers per flight [1 x-ray, handles 17 passenger flights]

- Ground handling services for wide-body aircraft [Commuter aircraft]
- Customs and Immigration for approx 4 flights per week [None]
- Survey of impacts of noise pollution from large military aircraft
- Security G2 survey for basing of any future assets
- Car rental operations expanded with more service providers [One operator (Avis)]

Military would provide their own heavy lift loader, fork lift, trucks etc. They indicated that currently *Cara* provides catering services, *Service Air* provides ground handling, and *PLH* supplies their fuel at YYC. They also indicated that they will work around the hours of CBSA and CATSA.

The list of requirements indicates that many facilities and services will need to be expanded in addition to the extension of the runway for BATUS and DND to consider moving their air transport operations to YXH.

BATUS also indicated that 4 full-time staff and their families would move with the operation to YXH and that military personnel would use local hotel rooms regularly – up to 250 rooms at one time while waiting for international flights. They would definitely use the training base more frequently if they could use the local airport, but are not sure by how much as the base has a finite limit.

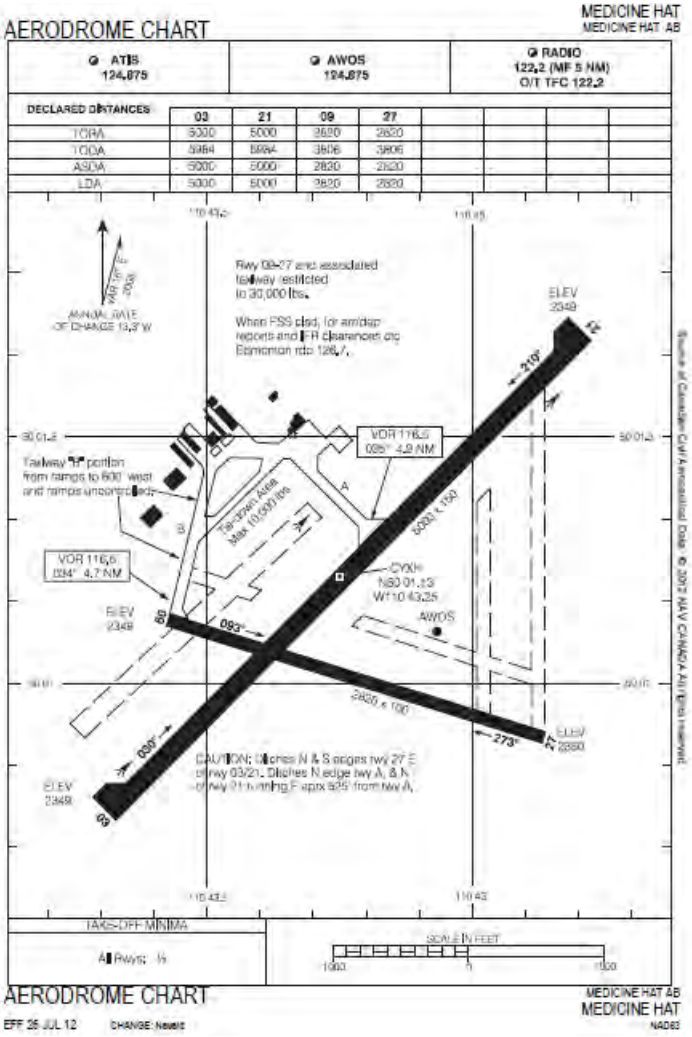
Suffield has been open for 40 years and is training more military personnel than ever. BATUS and DND will be able to make a firm commitment as to their long term tenancy at the airport if expanded to meet their requirements by next year.

4.0 RUNWAY LENGTH REQUIREMENTS

In accordance with Transport Canada (TC) and International Civil Aviation Organization (ICAO) guidelines, the runway length of the primary runway at YXH, Runway 03/21, should be adequate to meet the operational requirements of the aircraft forecast to use the airport. This runway length should not be less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aircraft.

The Aerodrome Chart showing all the runways and taxiways and details on the airport is presented in Exhibit 4-1.

Exhibit 4-1: YXH Aerodrome Chart



4.1 AIRCRAFT

Based on the findings in Section 3, the aircraft types considered in this runway length analysis are listed in Exhibit 4-2.

Exhibit 4-2: Aircraft Types Considered in Evaluating Runway Extension

Aircraft Type	Variants by Engine Type	Max Take-off Weight kg (lbs)	Max Landing Weight kg (lbs)	Passenger Capacity
Turbo-prop Aircraft				
Q200*	Model 202 PW123D	16,466 (36,300)	15,650 (34,500)	37
Q400*	Model 402 PW150A	29,257 (64,500)	28,009 (61,750)	78
Regional Aircraft				
CRJ100	GE CF34-3A1	21,523 (47,450)	20,276 (44,700)	50
CRJ100ER	GE CF34-3A1	23,133 (51,000)	21,319 (47,000)	50
CRJ200	GE CF34-3B1	21,523 (47,450)	20,276 (44,700)	50
CRJ200ER	GE CF34-3B1	23,133 (51,000)	21,319 (47,000)	50
CRJ705	GE CF34-8C5	38,328 (84,500)	33,340 (73,500)	75
Narrow-body Aircraft				
B737-700/700W	CFM56-7B20/-7B22/-7B24	70,080 (154,000)	58,604 (129,200)	136
B737-800/800W	CFM56-7B24/-7B26/-7B27	174,200 (79,016)	66,361 (146,300)	189
A320-200	CFM56-5B	75,500 (166,448)	64,500 (142,197)	150
Wide-Body Aircraft				
A330-200	RB211 – Trent	233,000 (513,676)	182,000 (401,240)	380
B777F	GE90-115BL	347,815 (766,800)	260,816 (575,000)	N/A
Business Jets				
Cessna 560 Citation Encore	PW535A	7,543 (16,630)	-	2 Crew + 11 Pax
Cessna 560 Citation Excel	PW545B	9,163 (20,200)	-	2 Crew + 12 Pax
Gulfstream IV	Rolls Royce Tay MK 611-8	33,203 (73,200)	-	2 Crew + 19 Pax

Source: Aircraft Planning Manuals (Bombardier, Boeing, Airbus), Cessna and Gulfstream websites.
* DHC-8-Q200 and DHC-8-Q400

4.2 AIRCRAFT OPERATIONS

Aircraft operations are dictated by the performance characteristics of aircraft, the destinations served and local conditions at YXH.

PERFORMANCE CHARACTERISTICS

The performance characteristics for each aircraft encompass the following:

- The length of runway required for take-off at a given take-off weight;
- The length of runway required for landing at a given landing weight;
- The amount of weight that can be taken on as payload (passengers or cargo) or fuel depending on the distance of the destination from YXH.

Performance curves are published by Boeing, Airbus and Bombardier and are based on zero wind conditions and a typical flight profile which accounts for additional trip fuel allowance, holding time and a diversion airport.

In determining length of runway for landing, it is assumed that an aircraft could be forced to land on the runway following take-off due to an emergency (i.e. engine failure). In such a case, aircraft weight would be almost the same as at take-off, but it must not exceed maximum landing weight (MLW) and, if necessary, the aircraft must dump fuel to reduce weight to MLW.

Also, the length of runway required for landing is based on the assumption that the runway is wet as runways are wet approximately 10% of the time and no carrier will operate a regular service if it is not possible to land when the runway is wet. Wet runways have only a very small effect on the runway length required on take-off under current regulations and take-off field lengths are based on dry runway conditions.

DESTINATIONS

Based on the discussion of potential services from YXH, destinations that could potentially be served by specific aircraft are summarized in Exhibit 4-3.

Exhibit 4-3: Potential New Services Examined

Aircraft	Destination	Flight Distance (nm)
Q200 and Q400	Vancouver (YVR)	488
CRJ100/100ER	Vancouver (YVR)	488
CRJ200/200ER	Vancouver (YVR)	488
CRJ705	Toronto (YYZ)	1,325
B737-700W/800W and A320-200	Cancun (CUN)	2,073
B737-700W/800W and A320-200	Las Vegas (LAS)	858
B737-700W/800W and A320-200	Regina (YQR) as stop on service to Cancun	235
A330-200	London-Gatwick (LGW)	3,789
B777F	London-Gatwick (LGW)	3,789
Cessna 560 Citation Encore	Domestic	1,780
Cessna 560 Citation Excel	Domestic	1,858
Gulfstream IV	Domestic/International	4,125

LOCAL CONDITIONS

Local conditions that are taken into account include aerodrome elevation, temperature, runway slope and runway surface characteristics. Based on information contained in the Airport Operations Manual (AOM) at YXH:

- Aerodrome elevation is 716.88 m (2,352ft.) above sea level (ASL);
- Effective runway gradient is 0%;
- Average maximum temperature is 27.3°C;
- The temperature in the standard atmosphere for an elevation of 716.9 m is 10.34°C.

These conditions are used when selecting the aircraft performance curves most representative of local conditions at YXH. As an example, the take-off runway length curves for a Standard Day + 15°C for all Airbus, Boeing and CRJ aircraft are used in determining runway length at take-off.

Correction factors are applied in accordance with the ICAO Aerodrome Design Manual Part I Runways and the FAA's Advisory Circular 150/5325-4B Runway Length Requirements for Airport Design.

For runway length at take-off:

- An elevation correction factor increases the length at a rate of 7% per 300 m elevation (ICAO);
- A temperature correction factor of 1% is applied to the runway length for every 1°C that the average maximum temperature exceeds the temperature in the standard atmosphere (ICAO). A temperature correction factor of 1.0195972 is applied to the take-off length when performance curves representing Standard Day + 15°C are used (27.3°C - 15°C – 10.34°C = 1.96°C).
- A runway slope correction factor increases the length at a rate of 10% for each 1% of the runway slope (ICAO). At YXH, this is not applicable because slope is negligible on Runway 03/21.

For runway length at landing:

- An elevation correction factor increases the length at a rate of 7% per 300 m elevation (ICAO);
- A runway slope correction factor increases the length at the rate of 10% for each 1% of the runway slope (ICAO). At YXH, this is not applicable because slope is negligible on Runway 03/21.
- A wet runway factor increases landing length by 15% for turbojet-powered aircraft (FAA).

4.3 *RUNWAY 03/21: EXISTING LENGTH*

The existing length of Runway 03/21 permits the take-off and landing of all aircraft types with the exception of the A330-200 and B777F as highlighted in Exhibit 4-4. The majority of aircraft, however, are limited in terms of take-off and landing weight, which translates into reduced payload when serving the forecast destinations. Key observations include the following:

- Turbo-prop aircraft are the least penalized with the Q200 capable of taking off at MTOW and the Q400 capable of departing at take-off weights near MTOW depending on the flap setting. A higher take-off weight can be accommodated at a higher flap setting. Operators typically use a lower flap setting on take-off to improve fuel efficiency, but would use the higher flap setting if

required given the loads and runway length and condition. Services to Vancouver can be expected to operate with no restrictions on payload.

- Business jets are also marginally penalized – most destinations within North America are within range for the Cessna 560 Citation Excel and Encore departing from the 5,000 ft. runway at YXH (Exhibit 4-5).
- Regional jets can be expected to suffer payload penalties on flights to Vancouver and Toronto that vary from 30% for the standard CRJ100/200 to Vancouver to 60% for the CRJ705 to Toronto, both due to landing weight limitations. Payload penalties are slightly less than this on take-off for the CRJ aircraft.
- Take-off and landing weight and range are all key factors for narrow-body jets such as the B737 and A320 aircraft families.

    - The B737-800 is limited by the landing weight, 45,360 kg (100,000 lb), that can be accommodated by the runway. This translates into a 75% reduction in payload or approximately 40 passengers in a 189-seat configuration.

    - The B737-700 and A320-200 aircraft can operate from the existing 5,000 ft. runway but suffer some payload penalties.

        - To longer haul destinations, such as Cancun, a 50% passenger payload penalty on take-off can be expected as additional fuel must be taken on at the expense of payload. Passenger payload penalties to Cancun are as follows:

            - 55% for a B737-700 (62 passengers in a 136-seat configuration)
            - 45% for an A320-200 (82 passengers in a 150-seat configuration)

        - On short haul flights, such as those serving Las Vegas, the penalties are considerably lighter as less fuel is required allowing for more payload. Passenger payload penalties are 1-2% for the A320 and 10% for the B737-700. It should be noted, however, that at these passenger loads if forced to land at YXH just after take-off it may be necessary to dump some fuel if runway is wet and temperatures are above 15°C.

        - One-stop service to Cancun is possible for both aircraft if the aircraft stops at a close-by Canadian airport with at least 7,400 ft. runway such as Regina. Due to the small fuel load, full passenger loads are possible, although passengers could board at the stop-over airport to improve load factors if necessary.

- Wide-body aircraft, such as the A330-200 and B777F, are not capable of operating from the existing runway length.

Exhibit 4-4: Existing Runway Length – Maximum Allowed Take-off and Landing Weights from YXH and Payload by Aircraft and Destination

Aircraft	Take-off Weight kg (lb)	Landing Weight kg (lb) [6]	Destination	Payload	Payload Penalty
Q200[1]	MTOW	MLW	YVR	Full	No
Q400 High Gross Weight	24,720 (54,500)[2]	MLW	YVR	67 Pax + Baggage	Yes
Q400 High Gross Weight	26,535 (58,500)[3]	MLW	YVR	78 Pax + Baggage	No
CRJ100	18,600 (41,000)	16,960 (37,400)[4]	YVR	34 Pax + Baggage	Yes
CRJ100ER	18,600 (41,000)	16,960 (37,400)[4]	YVR	34 Pax + Baggage	Yes
CRJ200	18,400 (40,500)	16,960 (37,400)[4]	YVR	34 Pax + Baggage	Yes
CRJ200ER	18,400 (40,500)	16,960 (37,400)[4]	YVR	34 Pax + Baggage	Yes
CRJ705	29,800 (65,650)	24,000 (53,000)[4]	YYZ	28 Pax + Baggage	Yes
B737-700W	55,000 (121,250)	49,520 (109,170)	CUN	62 Pax + Baggage	Yes
B737-700W	55,000 (121,250)	49,520 (109,170)	LAS	122 Pax + Baggage	Yes
B737-800W	58,000 (128,000)	45,360 (100,000)[4]	CUN	~40 Pax + Baggage	Yes
B737-800W	58,000 (128,000)	45,360 (100,000)[4]	LAS	~40 Pax + Baggage	Yes
A320-200	62,700 (138,300)	58,100 (128,000)	CUN	82 Pax + Baggage	Yes
A320-200	62,700 (138,300)	58,100 (128,000)	LAS	145 Pax + Baggage	Yes
A330-200	Insufficient runway length for take-off at operating empty weight				
B777F	Insufficient runway length for take-off at operating empty weight				
Cessna 560 Citation Encore	MTOW	MLW	1,780nm	Full	No
Cessna 560 Citation Excel	MTOW	MLW	1,858nm	Full	No
Gulfstream IV[5]	Reduced Weight	MLW	Reduced Range	Reduced Payload	Yes

Source: Aircraft Planning Manuals (Bombardier, Boeing, Airbus), Cessna and Gulfstream websites.

1 – Take-off flap setting 0^0 (lowest flap setting in Q200 Airport Planning Manual).

2 – Take-off flap setting 5^0 (lowest flap setting in Q400 Airport Planning Manual).

3 – Take-off flap setting 10^0.

4 – Landing weight dictates payload.

5 - At MTOW, the Gulfstream IV requires a runway length of 2,270 m (7,450ft.). When 12-13 pax + 2 crew onboard, maximum range is 5,204nm and average range is 4,125nm (www.jetadvisors.com).

6 – Maximum landing weight required when runway is wet

Note: The landing weight given in the exhibit is the maximum at YXH for that aircraft and if the aircraft was forced to land just after take-off, it would be forced to dump fuel to meet the allowable landing weight as the take-off weight is greater than the landing weight.

Exhibit 4-5: Range from Existing Runway 03/21 for Cessna 560 Citation Encore and Excel Models

It should be noted that while the Q400 will be able to operate with full loads (78 passengers plus baggage) to Vancouver on almost all days, there will be a small number of days when conditions may restrict the payload or cause delays until the runway condition improves. These include take-offs in very hot conditions (temperatures over 30°C) or when the runway has significant snow/slush/water contamination (water equivalent depth of 3 mm or greater). The frequency of these conditions is low, possibly 5 to 10 days per year, and could be reduced by scheduling Q400 departures to YVR in the morning in summer when temperatures are cooler.

4.4 RUNWAY 03/21: EXTENSION

While Runway 03/21 offers sufficient length for the take-off and landing of turbo-prop aircraft and most business jets, the potential for jet service to Toronto and vacation destinations plus charter and cargo flights to the United Kingdom can only be realized by an extension of the runway. How much of an extension depends on the aircraft operating the flights and the runway length required for take-off and landing operations. These are summarized in Exhibit 4-6 and 4-7, respectively. Key observations include the following:

- While the Q400 can operate on the current runway at high flap settings (10^0) with no payload restriction to YVR, an extension of 137 m (450 ft.) would allow it to operate with 78 passengers and baggage at the lower, more fuel efficient, flap setting (5^0).
- Many of the potential services from YXH require take-off weights close to maximum landing weight. This results in landing length exceeding take-off length for some aircraft-destination pairings and dictating runway length requirement.

- A non-stop service to Toronto operated by CRJ705 aircraft with a full passenger load requires a runway extension to 2,010 m (6,600 ft.). This represents the aircraft's landing runway length. The aircraft's take-off runway length is 1,740 m (5,800 ft.).
- A non-stop service to Cancun operated by a B737-800 aircraft with a full passenger load requires a runway extension to 2,560 m (8,400 ft.). A smaller runway extension of 2,240 m (7,350 ft.) is required if the service is provided by B737-700 aircraft or by reducing its payload.
- If the Cancun service involves a stop in Regina with approximately half the passengers boarding at YXH and reduced fuel to lighten aircraft weight, a reduction in runway extension to 1,740 m (5,700 ft.) is required for the B737-800. As mentioned previously, the 737-700 and A320 can operate one-stop service via Regina on the current runway.
- A non-stop service to Las Vegas with a full passenger load operated using B737-800 aircraft requires a runway extension to 2,530 m (7,100 ft.), or 5,700 ft. using a 737-700 or A320.
- A non-stop service to London-Gatwick operated by the A330-200 with a full passenger load requires a runway extension to 2,740 m (9,000 ft.). If service is also required using a B777F with a full payload, the runway requires an extension to 3,110 m (10,200 ft.).
- Smaller business jets such as the Citation 560 can operate at full payload to most airports in North America, including as far east as Moncton, New York, Washington and Atlanta, but destinations in Nova Scotia and Newfoundland and Florida are out of range.
- Large business jets such as the Gulfstream IV can serve North American destinations at full payload, but will be weight restricted to most other international destinations.

Exhibit 4-6: Take-Off Runway Length Required

Aircraft	Destination	Payload	Take-off Weight kg (lbs)	Runway Length[1] m (ft)
Q200[2]	Vancouver 488nm	Full Pax (37 + Baggage)	15,150 (33,400)	1,320 (4,300)
Q400 High Gross Weight[3] (Air Canada)	Vancouver 488nm	Full Pax (74 + Baggage)	25,400 (56,000)	1,615 (5,300)
Q400 High Gross Weight[3] (Westjet)	Vancouver 488nm	Full Pax (78 + Baggage)	25,850 (57,000)	1,660 (5,450)
CRJ100	Vancouver 488nm	Full Pax (50 + Baggage)	19,700 (43,400)	1,720 (5,640)
CRJ100ER	Vancouver 488nm	Full Pax (50 + Baggage)	19,500 (42,990)	1,690 (5,540)
CRJ200	Vancouver 488nm	Full Pax (50 + Baggage)	19,400 (42,700)	1,700 (5,600)
CRJ200ER	Vancouver 488nm	Full Pax (50 + Baggage)	19,140 (42,200)	1,550 (5,100)
CRJ705	Toronto 1,325nm	Full Pax (75 + Baggage)	32,200 (71,500)	1,740 (5,800)
B737-700W	Cancun 2,073nm	Full Pax (136 + Baggage)	63,500 (140,000)	2,240 (7,350)
B737-700W	Cancun via Regina 235nm	Reduced Pax (69 + Baggage)	47,500 (104,700)	1,160 (3,800)

Aircraft	Destination	Payload	Take-off Weight kg (lbs)	Runway Length[1] m (ft)
B737-700W	Las Vegas 858nm	Full Pax (136 + Baggage)	57,150 (126,000)	1,630 (5,350)
B737-800W	Cancun 2,073nm	Full Pax (189 + Baggage)	74,400 (164,000)	2,560 (8,400)
B737-800W	Cancun via Regina 235 nm	Reduced Pax (90 + Baggage)	53,520 (118,000)	1,325 (4,350)
B737-800W	Las Vegas 858 nm	Full Pax (189 + Baggage)	66,900 (147,500)	2,010 (6,600)
A320-200	Cancun 2,073 nm	Full Pax (150 + Baggage)	72,100 (159,000)	2,130 (7,000)
A320-200	Cancun via Regina 235 nm	Reduced Pax (75 + Baggage)	53,500 (118,000)	1,250 (4,100)
A320-200	Las Vegas 858 nm	Full Pax (150 + Baggage)	63,700 (140,500)	1,620 (5,300)
A330-200	London, UK 3,789 nm	Full Pax (380 + Baggage)	210,010 (463,300)	2,740 (9,000)
B777F	London, UK 3,789 nm	Full Payload[4]	325,076 (716,670)	3,110 (10,200)
Cessna 560 Citation Encore	1,780 nm	Full Pax (11 + Baggage)	MTOW	1,480 (4,860)
Cessna 560 Citation Excel	1,858 nm	Full Pax (12 + Baggage)	MTOW	1,490 (4,890)
Gulfstream IV	4,125 nm	Full Pax (12-13 + Baggage)	MTOW	2,270 (7,450)

Source: Aircraft Planning Manuals (Bombardier, Boeing, Airbus), Cessna and Gulfstream websites.

1 – Take-off runway length corrected for elevation and temperature conditions at YXH.

2 – Flap setting 0^0 (lowest flap setting in Q200 Airport Planning Manual).

3 – Flap setting 5^0 (lowest flap setting in Q400 Airport Planning Manual).

4 – Full payload: 103,737 kg /228,700 lb (Boeing 777-200LR/-300ER/-Freighter Airplane Characteristics for Airport Planning)

Exhibit 4-7: Landing Runway Length Required

Aircraft	Landing Weight kg (lbs)[1]	Runway Length m (ft)[2]
Q200	15,150 (33,400)	540 (1,770)
Q400 High Gross Weight	25,200 (55,600)	870 (2,850)
CRJ100	19,700 (43,400)	1,720 (5,635)
CRJ100ER	19,500 (42,990)	1,700 (5,580)
CRJ200	19,400 (42,700)	1,680 (5,520)
CRJ200ER	19,140 (42,200)	1,660 (5,460)
CRJ705	32,200 (71,500)	2,000 (6,560)
B737-700/700W to CUN	MLW	1,860 (6,100)
B737-700/700W to CUN via YQR	47,500 (104,700)	1,460 (4,800)
B737-700/700W to LAS	57,150 (126,000)	1,740 (5,700)
B737-800/800W to CUN	MLW	2,530 (7,100)
B737-800/800W to CUN via YQR	53,520 (118,000)	1,740 (5,700)
B737-800/800W to LAS	MLW	2,530 (7,100)
A320-200 to CUN	MLW	1,800 (5,900)
A320-200 to CUN via YQR	53,500 (118,000)	1,430 (4,700)
A320-200 to LAS	63,700 (140,500)	1,750 (5,750)
A330-200	MLW	2,130 (7,000)
B777F	MLW	2,255 (7,400)
Cessna 560 Citation Encore	MLW	1,200 (3,900)
Cessna 560 Citation Excel	MLW	1,300 (4,270)
Gulfstream IV	MLW	1,305 (4,280)

Source: Aircraft Planning Manuals (Bombardier, Boeing, Airbus), Cessna and Gulfstream websites.

1 – Landing weights are equal to take-off weights identified in Table Y-4 or Maximum Landing Weight (MLW), whichever is less, as in emergencies the aircraft may be required to land just after take-off.

2 – Landing runway length corrected for elevation and wet runway conditions (applied to jet aircraft only as per FAA guidelines).

4.5 RUNWAY EXTENSION OPTIONS

The take-off and landing runway lengths can be grouped into three runway extension options:

- Extension to 3,110 m (10,200 ft.)
- Extension to 2,240 m (7,350 ft.)
- Extension to 2,010 m (6,600 ft.)

Extension to 3,110 m (10,200 ft.)

This extension accommodates all potential services from YXH, but requires 1,585m (5,200ft) of new runway.

Extension to 2,240 m (7,350 ft.)

A 716m (2,350 ft.) extension of Runway 03/21 accommodates potential services to all domestic destinations, Cancun and Las Vegas with full passenger loads with the exception of the B737-800/800W, which on a hot day, can be expected to suffer a reduction in payload (maximum of 163 passengers or a 14% reduction in passengers if temperature is 27.3). B737-800/800W flights with one-stop service to Cancun would be accommodated.

Extension to 2,010 m (6,600 ft.)

This extension entails 488m (1,600 ft.) of new runway surface and accommodates potential services to Vancouver, Toronto, Las Vegas and a one-stop service to Cancun. The one-stop service should include an airport within a 250 nm range of Medicine Hat. In the analysis, Regina (235 nm) was used, but other airports within this range include Saskatoon (200 nm) and Calgary (142 nm). This extension would also allow the Q400 to operate without payload restrictions to Vancouver when the temperature is very hot, 35°C or higher, which occurs on average 2.3 days per year (based on Environment Canada data for 1971-2000), and when the runway has a small amount of snow/slush/water or treated ice contamination.

5.0 ADDITIONAL AIRPORT REVENUE

The additional revenue to the airport was estimated using the likely additional aircraft arrivals for each type of service and the current airport fee schedule but with several new categories for larger aircraft to reflect the higher costs to the airport of these aircraft. Currently the highest landing fee category is "45,000 kg and over". A new category has been added, similar to YYC, "125,000 kg and over" with same rate as YYC as shown in Exhibit 5-1. A new category for the passenger fee has also been added for international passengers with same rate as the Airport Improvement Fee (AIF) for YYC (allowing for YYC being only applied to enplaning passengers). The passenger, landing and terminal fees given in Exhibit 5-1 were used. Revenues from other fees such as parking and fuel sales are expected to be minimal based on current fee rates and expected usage and were not determined.

Exhibit 5-1: YXH Fees and Charge Rates Used in Estimating Additional Revenues

Landing Fee		Passenger	Terminal Fee	
Gross Weight	Rate/1000 kg	Fee^	# of Seats	Fee
<21,000 kg	$4.95	Dom: $8.75	8 - 15 Seats	$26.00
21,001 - 45,000 kg	$6.20		16 - 25 Seats	$45.50
45,001 – 125,000 kg*	$7.25	Int'l: $15.00**	26 - 45 Seats	$82.00
> 125,000 kg	$8.19*		46 - 60 Seats	$116.00
			61 - 89 Seats	$259.00
			90 - 126 Seats	$305.00

Source: YXH web site, July 2012

^ Passenger fee applies to both enplaning and deplaning passengers

* Current highest landing fee category is >45,000 kg. A new category has been added, similar to YYC with same rate as YYC

** A new category has been added for international passengers with same rate as AIF for YYC allowing for YYC being only applied to enplaning passengers

The General Terminal Fee applies to all aircrafts using the terminal or public apron facilities and aircraft with eight seats or greater but are not charged if the passenger fee is paid or the aircraft is registered to airport tenants. The number of seats is determined by the certified maximum seating capacity for the aircraft type and does not include aircrew seats. The terminal fee schedule only covers aircraft of 126 seats or less. For aircraft with more than 126 seats, it was assumed that additional categories would be added and the rate per seat for the 90-126 seat category ($306/126 = $2.42 per seat) was used in estimating a fee. All additional flights are assumed to be subject to the landing fees while the scheduled and major charter flights subject to the passenger fee and other flights are subject to the terminal fee. Thus no allowance was made for some of the additional flights being cargo flights or aircrafts based at the airport and registered to tenants (who are exempt from General Terminal Fees).

In calculating the additional revenues it is assumed that WestJet would not require an extension of the runway to operate Q400 service to Vancouver as the service would rarely suffer any payload restriction. There will likely be a small number of flights would have payload restrictions due to temperature or snow/ice runway contamination, but it is unlikely that these flights would not be cancelled. These could be reduced even further by scheduling morning departures from YXH. Thus, there would be no additional revenue to the airport from the WestJet Q400 Vancouver flights due to the runway extension.

The additional aeronautical revenues from the various potential sets of additional flights are presented in Exhibit 5-2. Additional revenues from seasonal charter flights to Mexico will be of the order of $48,000 to $75,000 per year, while an additional $20,000 could be expected from additional business jet movements. Additional revenues from CFB Suffield military flights switching from YYC to YXH, including flights chartered by the British military, would be of the order of $500,000 per year.

Exhibit 5-2: Additional Aeronautical Revenues from Potential Sets of Additional Flights

Additional flights	Aircraft	Arrivals /year	Weight (t)	Pax Seats	Avg. Load Factor	Avg. Pax	Fee Per Arrival				Total Annual Fees
							Landing	Pax	Terminal	Total	
WestJet to Mexico	737-700	16	70.08	136	90%	122	$508	$3,660	n.a.	$4,168	$66,689
Sunwing to Mexico via Regina or Lethbridge	737-800	14	79.01	189	50%	95	$573	$2,850	n.a.	$3,423	$47,920
Sunwing to Mexico	737-800	14	79.01	189	85%	161	$573	$4,830	n.a.	$5,403	$75,640
AC to Toronto	CRJ705	312	32.2	75	75%	56	$200	$980	n.a.	$1,180	$368,048
Additional Jet Flights	Various	148	18	19			$89	$0	$46	$135	$19,921
CFB Suffield	A330/K330	24	233	380	66%	250	$1,908	$7,500	n.a.	$9,408	$225,798
	A330/K330	62	233	380	0%	0	$1,908	$0	n.a.	$1,908	$118,313
	B777F	4	348	0	0%	0	$2,850	$0	n.a.	$2,850	$11,400
	C-170	10	265	400	10%	40	$2,170	$1,200	n.a.	$3,370	$33,704
	C-130	20	70.3	0	10%	0	$510	$0	n.a.	$510	$10,194
	A320	20	78	164	80%	131	$566	$2,296	n.a.	$2,862	$57,230
	A310	10	157	194	75%	146	$1,286	$4,380	n.a.	$5,666	$56,658
Total CFB Suffield		150					$11,198	$15,376	$0	$26,574	$513,297

If, in the future, Medicine Hat were to get daily service to Toronto using the long range CRJ705 aircraft, the annual airport revenues from this flight would be approximately $368,000 per year (assuming 6 flights per week at 75% load factor).

There will also be an increase in revenues to the airport generated by sales at the food and beverage concessions and car rentals. These are estimated to be approximately $1.00 per enplaned passenger and increase the revenues provided in Exhibit 5-2 by 3-5%. There would also be some additional revenues from fuel sales and public parking, but these will be relatively small and were not determined.

6.0 APPROXIMATE COST OF RUNWAY EXTENSION

There is only one option to lengthen the runway and that is to the south, away from the developed urban area. The City of Medicine Hat has already begun the acquisition of land for this purpose and has spent $3.3 million on 18 acres off the end of the runway to date. However, more land will need to be purchased. The cost per acre is estimated to be approximately $183,333 based on the previous acquisition of 18 acres. There would be a major cost of approximately $42M in relocating the highway off the south end of the runway if the runway is to be extended. It is assumed for the purposes of this study that relocation costs would be covered by the Province of Alberta.

A recent study for YXH by Genivar examined the additional airport land area required to upgrade the navigation aids to an Instrument Landing System (ILS) and extend the runway. They calculated the following:

- 28.44 ha (68.7 acres) is required to upgrade the existing 5,000 ft. runway to a Code 3D ILS
- 66.69 ha (161.2 acres) is required to extend the runway to 7,000 ft. with a Code 4D ILS
- 92.85 ha (224.4 acres) is required to extend the runway to 9,000 ft. with a Code 4D ILS

At this time, the Airport is not considering obtaining an ILS, but would require an ILS if the CFB Suffield air transport operations were moved to YXH. The first two options above involve installing or changing the ILS which contributes to the additional land required. The third option does not include any change to the ILS and, based on the increase in the land required (63.2 acres) and the increase in the runway length (2,000 ft.) from the second option, it is estimated that an additional 31.6 acres is required for each additional 1,000 ft. of runway. Thus, a 1,600 ft. extension would require an additional 51 acres. Accounting for the 18 acres the Airport has recently acquired, an additional 33 acres would need to be purchased. This would cost approximately $6.0 million at the same price per acre recently paid by the airport.

The cost to construct the actual additional runway is estimated to be approximately $4.2M for a 1,600 ft. extension. The strength of the current runway, as measured by its Pavement Classification Number (PCN) is 70 which would allow it to handle narrow-body aircraft and small wide-body Code D/E aircraft such as the B767 and A330. It is assumed the extension will be built to the same PCN and same width (150 ft.) as the current runway and that minimal grading and earthworks will be required.

Installing an ILS will result in increased height restrictions on the approaches to the runway and approximately 98 additional acres would be needed to accommodate a Code D ILS based on the Genivar analysis [3]. Genivar's drawings show half of this additional land is required beyond each runway end and that housing to the northeast would be impacted. This impact could be overcome by shifting the runway south-westward, but this would mean that approximately 2,000 ft. of the existing runway could not be used (except as an overrun area) and the runway would have to be extended by a similar length to the southwest just to maintain the 5,000 ft length. The cost for shifting the runway 2,000 ft to the southwest would be approximately $5.3 million.

The cost for high intensity runway lighting for a 1,600 ft. extension is estimated to be approximately $3.0M based on the reported costs for a recent similar extension of the runway at Nanaimo Airport.

[3] Estimated by the sum of the 68.7 acres indicated in 1st bullet above plus the additional 92.5 acres required for the 2nd bullet less the area required for the 2,000 ft extension of 63.2 acres

In determining the costs of the 1,600 ft. and 2,350 ft. extensions, it is assumed that no extension of the taxiway will be required and aircraft using the runway extension will use the runway for taxiing the additional distance. This will reduce the capacity of the runway, but few aircraft will need to use the additional runway and currently the runway is operating significantly below capacity, even at peak times. In January to June 2012 the maximum movements in an hour was 20 for itinerant movements and 37 for all movements. A maximum of 89 movements in an hour was recorded in July 2012 during an air cadet program, but most (76) were local and would not have used the additional runway distance. The need for a parallel taxiway to runway 03-21 should be monitored and possibly extended in the future.

There are some other additional costs which were not determined. These include demolition or relocation of some buildings including a fuel storage site south east of the current airport and preparation of the site for the runway. Cost of any earthworks and major drainage works were not considered, nor were changes to the changes to the navigation aids.

The estimated costs for extending the runway under each of the three extension options are summarized in Exhibit 6-1. Costs considering the land purchase, runway construction and runway lighting components range from $13.2M for a 1,600 ft. extension to $50M for a 5,200 ft. extension. Note that these are only approximate costs based on experience at other airports and land costs in the area and may differ depending on timing and local factors. It is assumed that the costs for the relocation of the highway, approximately $42M, possibly higher for longer runway extensions, would be covered by the Alberta Government.

Exhibit 6-1: Costs of Extending the Runway under Each Option

	Runway Extension (ft)		
	1,600	**2,350**	**5,200**
Land purchases			
Additional area (acres)	51	74	164
Cost/acre	$183,333	$183,333	$183,333
Acres to purchase	33	56	146
Cost (million)	$6.0	$10.3	$26.8
Runway construction			
Strength (PNC)	70	70	70
Width (ft.)	150	150	150
Area (sq.ft.)	240,000	352,500	780,000
(sq.m.)	22,297	32,748	72,464
Cost $/100 sq.m	*$190*	*$190*	*$190*
Cost (Million)	$4.24	$6.2	$13.8
Lighting			
Cost/ft	*$1,875*	*$1,875*	*$1,875*
Cost (Million)	$3.00	$4.4	$9.7
TOTAL	$13.2	$20.9	$50.4
Other costs (Million)			
Design costs	To be determined		
Taxiway	Not required	Not required	$6.6
ILS + Land for ILS + shift rwy	Not required	Not required	$3 + $18 +$5.3
Other Nav Aids	To be determined		
Demolish Building, prepare site		To be determined	
Relocation of Highway	$42	$42+	$42+

The cost of a 1,600 ft. extension is comparable with similar runway extension planned or completed at airports in Western Canada. Nanaimo completed a 1,600 ft. runway extension in 2009 at a cost of $16.4M. This included high intensity runway lighting, navigation aids and a 2,400 ft. extension of the taxiway. Grande Prairie has started design works for a rehabilitation of their main runway and a 2,000 ft. extension with total costs estimated to be $19.5M. Fort McMurray is also planning an extension of their runway by 1,500 ft. and additional taxiways to the new terminal building with an estimated cost of approximately $25M.

Potential sources of funding include the Government of Alberta, federal Airport Capital Assistance Program (ACAP), AIF and other airport revenues.

There would also be additional airport operating costs for runway maintenance, snow clearing, grass cutting, firefighting, etc. associated with the additional runway and airport property. Airport firefighting, in particular, is very expensive and if required would likely consume most of the additional airport revenues generated from the BATUS and DND flights.

7.0 OTHER IMPROVEMENTS TO AIRPORT FACILITIES AND SERVICES REQUIRED

To realize the benefits of a runway extension, other improvements to the airport will be required in some cases.

The current terminal has a capacity of only 17 departing passengers. Although the current terminal space maybe used more efficiently, the terminal will need to be expanded to accommodate larger aircraft. Terminal expansion planning and implementation need to be undertaken in the short term to accommodate Q400 flights with up to 78 passengers. Additional capacity up to 100 passengers would be required for B737 flights to Mexico tagged with another Canadian city or 190 passengers if not tagged, and 250-300 passengers would be required for wide-body flights using A330 aircraft for the British military.

The current apron areas have a strength rating of approximately 5 (PCN/ACN of 11-12). To allow narrow-body jets to operate at the airport the part of the apron to accommodate these aircraft will need to be strengthened to a rating of 11 (PCN/ACN of 70), similar to the strength of the runway and taxiway.

An area for CBSA to provide customs and immigration services would be required for flights to Mexico or the UK if the aircraft does not stop first at another Canadian airport on the inbound segment. CBSA services are also required in order to secure international business aviation.

The deicing equipment may also have to be upgraded to service the larger aircraft.

The costs of the two major airport improvements to accommodate BATUS and DND other than the airfield costs discussed previously are as follows.

- Airport terminal building with a capacity of 250 passengers (minimum) – based on the lowest value in the IATA and FAA design guides of 24m^2 per total peak hour passenger (assuming a ratio TPHP to enplanements of 1.6) and a low cost value of $3,000/m^2, a low-cost value for the additional terminal area required would be $24 M.
- Emergency responses services to ICAO Category 8 standard would require a minimum of 3 firefighting vehicles with a capacity of 18,200 L of water, 450 kg of complementary agents and a total discharge capacity of 7,200 litres per minute. A firehall would be required to house the vehicles, equipment and crew, and a crew of approximately 10 firefighters would be required to

be on standby for scheduled flights. Firefighting trucks cost around $700,000 each, or $2.1 million for the three vehicles. A firehall would cost between $5 and $10 million depending on the size. The Victoria Airport, a Category 7 airport requiring only 2 firefighting vehicles, built a new $9.4 million 2,252 m^2 building in 2008 for the firehall and space for airport operations. Waterloo Airport, also a Category 7 airport, spent $7.1 million on a combined firehall and operations building in 2011. Emergency response at the Medicine Hat Airport is currently uncategorized, but meets the existing Canadian Aviation Regulation standard for response for airports with scheduled air service.

BATUS and DND indicated that they would be self sufficient in terms of ramp handling equipment including heavy lift loaders, fork lift trucks, tugs, etc.

Note that the Mexico charter flights which are tagged to another Canadian Airport such as Regina with the service attracting approximately half its load at Medicine Hat and the flight originating and ending at YXH (e.g., YXH-YQR-CUN-YQR-YXH) would not require a larger terminal than that planned for the Q400 service (78 passengers). There would be only around 95 passengers enplaning and deplaning on the Mexico flights at YXH and these could be accommodated in a terminal with a capacity of 78, but the level of service would be lower. It would be preferable, however, if the capacity of the terminal was increased to 100 to cater to these flights and the Q400 flights.

Runway length is not the only factor affecting business aviation at YXH. Business jet operations of any size would be facilitated at the airport if:

- Immigration / customs services were available;
- Improved business aircraft parking and hangar facilities at the airport; and
- Improved FBO services.

For example, Lethbridge has customs services provided by CBSA 5 day per week, compared to no service at YXH, and attracts business aviation operations due to this service as they are the first point of entry into Canada from the US. One local corporate operator parks his aircraft at Lethbridge because of customs service availability.

8.0 ECONOMIC IMPACT

8.1 REGULAR SCHEDULED AIR SERVICE

The economic benefits of the runway extension due to additional regular scheduled air service are likely to be small, at least in the short to medium term. An extension is not necessary for airlines to provide scheduled services using Q400 flights to YYC or YVR. An extension of the runway to 6,600 ft. would allow all Q400 flights to operate without payload restrictions, even on very hot days and in contaminated runway conditions, thus improving the reliability of the service and reducing delays. However, the frequency of these conditions is low, likely less than 20 flights per year, and in many cases passenger demand will not be very high and all passengers booked on the flight will be able to be accommodated with the restricted payload. Thus, the economic benefits to the region will be small.

An extension to 6,600 ft. would allow non-stop service to Toronto which would provide significant economic benefit to the area. However, as discussed previously, passenger demand for such a service will not be sufficient for the service to be feasible for 10 to 15 years and airlines have a preference for routing passengers through their hub airports rather than operating long flights using 50 or 75-seat regional jets.

8.2 SEASONAL CHARTER FLIGHTS TO MEXICO

The direct benefits of seasonal charter flights to Mexico are small. The aircraft would not be based at the airport and the only direct employment associated with the flight would be the refuelling, parking, catering, ticketing and ground handling services provided at the airport. The flight would not bring visitors to Medicine Hat so there would be no direct benefit to local businesses serving visitors such as hotels, restaurants, etc.

The major benefit of seasonal charter flights to Mexico is that it makes this type of vacation travel easier for residents and increases the attractiveness of Medicine Hat as a place to live and work. This creates many indirect benefits including attracting skilled workers and retired residents who are required for the area to grow and prosper, increased real estate values, increased municipal taxes, and corresponding increases in expenditure supporting businesses in the community, etc. The indirect benefits are very difficult to quantify, but are real. It should be noted, however, that the degree to which this service makes vacation travel easier is not great compared to many communities as numerous charter flights to Mexico and the Caribbean are available from YYC, only 3 hours drive away, at very competitive fares. Based on experience elsewhere, it is likely that around half the Medicine Hat residents going to Mexico will still drive to YYC to get lower fares or service to a different Mexican or sunspot destination.

8.3 ADDITIONAL BUSINESS JET MOVEMENTS

The economic impact of additional business flights possible due to an extension of the runway is difficult to quantify, but will likely be relatively small. All turboprop and most jet aircraft operated for business purposes can operate from the current runway. Only flights to Florida, Nova Scotia and Newfoundland and other destinations outside North America would benefit from the longer runway. None of the businesses replying to the survey indicated that they would benefit from a longer runway, and none of the major businesses in Medicine Hat, including those with headquarters elsewhere, operates large intercontinental business jets. A longer runway could potentially be a factor in a large multi-national

company establishing a base in Medicine Hat, although other factors such as scheduled air services and availability of CBSA services would likely be far more important.

8.4 MILITARY OPERATIONS

In the short-term, construction of the runway, taxiway, apron, terminal and firehall would generate many jobs in Medicine Hat over a 2-year period. In the longer term, the military operations will generate approximately 12,000 international passenger movements and another 5,000 to 10,000 domestic passenger movements, and approximately 300 aircraft movements through Medicine Hat.

There are many direct benefits to the community associated with this traffic including:

- Increased employment at the airport including firefighters, maintenance and ramp crew, and concession staff, likely totalling 10-20 FTE positions;
- Catering business would locate in area to service the flights; and
- Increased fuel sales, both at the airport and at services stations in the City.

In addition, there are many indirect benefits to the community including:

- Regular use of hotel rooms, up to 250 rooms at one time;
- Increased use of restaurants and retail shops;
- Increased use of taxi, car rental and other transportation services; and
- Military personnel (FTEs) locating to the community – 4 full-time staff and their families would move with the operation to YXH – increasing business in the community.

The above direct and indirect benefits would increase municipal taxes.

Also, many of the airport improvements will provide safety and operational benefit to other operations at the airport such as the longer runway for stopping aircraft in an emergency, availability of high level emergency response services, the ILS, improved terminal, concessions and services, etc.

8.5 OTHER BUSINESS OPPORTUNITIES

A longer runway opens up the possibility of other unforeseen business opportunities in the area such as aircraft maintenance and overhaul, aircraft painting and refurbishing, etc. While businesses providing these services could operate currently at YXH servicing smaller aircraft, such as regional jets, B737-700 and A320 aircraft, an extension of the runway to even 6,600 ft. would allow B737-800, B767 and A330 size aircraft to access the airport, thus significantly widening the possible range of aviation business.

9.0 SUMMARY

Each of the runway extension options is summarized in Exhibit 9-1 and below. Under the three options where the runway is extended, the road would have to be realigned at a cost of approximately $42 million, possibly more for the longer extensions, although this work will likely be funded by the Alberta Government. Canada Customs (CBSA) services/Port of Entry status should be sought under each option below. The airport is currently planning an expansion of the terminal building to a capacity of 80-100 passengers to accommodate Q400 service which will likely cost $6-8 million. The size of the terminal required under each option and the approximate cost of the **additional** capacity above the currently planned level of 80-100 are given.

Exhibit 9-1. Summary of Options for Extending the Runway

	Option 1	Option 2	Option 3	Option 4	Comment
Runway Length (ft)	5,000	6,600	7,350	10,000	
Extension (ft)	0	1,600	1,350	5,200	
Services Possible					
Q400 service	YYC, YVR*	All possible	All possible	All possible	* Small penalty if temp. >30C
B737-700/A320 - Las Vegas	Yes, small penalty^	Yes	Yes	Yes	^ Load factor 737 90%, A320 98%
B737-700/A320 - Cancun	No	1-stop	Non-stop	Non-stop	
B737-800 - Cancun	No	1-stop	1-stop	Non-stop	
Business jet service	N.America excl. NS, NF, Florida	N.America, Caribbean	N.America, Caribbean, UK	No restriction	
Military releated service	No	Not required	No	Yes	
Other facility improvements req.					
Terminal	80-100	80-100	100-140	250-300	
Parallel taxiway	Not required	Not required	Not required	Yes	Possibly req. in 15-20 years
ILS	Not required	Not required	Not required	Yes	
Firehall & fire trucks	Not required	Not required	Not required	Yes (Cat. 8)	
Cost of runway extension	$0	~$13.2 million	~$20.9 million	~$50 million	Plus costs for changes to nav aids, site preparation & strengthen rwy
Cost of other req. facilities	$0	$0	~$6 million	~$67 million	Excl. terminal 80-100 pax
Total facility costs	$0	~$13.2 million	~$27 million	~$117 million	See notes above
Additional operating costs	Small	Small	Small - Moderate	Large (ERS)	
Additional airport revenues/yr	$0	~$35,000-50,000	~$87,000	~$610,000	Excluding Q400 service
With CRJ705 YYZ service	$0	$420,000	$455,000	$975,000	Possibly in 15-20 years
Annual payments to cover upgrades	$0	$860,000	$1,365,000	$7.6 million	30-year, 5% interest, excl. cost of terminal for 80-100 pax
Economic benefits to community	Small	Small	Small	Substantial	
Road realignment	$0	$42 million	$42+ million	$42+ million	Alberta Gov. likely cover
Port of Entry / CBSA services	Required	Required	Required	Required	Space in upgraded terminal req.

Status Quo/No Runway Extension

- Allows service using Q400s to YYC and YVR, one-stop service to Cancun using B737-700 or A320 aircraft, and service to Las Vegas using A320 (up to 98% load factor) or B737-700 (up to 90% load factor)
- Allows business jet service to most of North America, excluding Nova Scotia, Newfoundland and Florida
- No change to current plans to expand terminal complex to capacity of 80-100
- Apron would need to be strengthened for services by narrow-body jets to be accommodated
- No cost for runway extension

Extend Runway to 6,600 ft. (1,600 ft. Extension)

- Allows unrestricted Q400 service, CRJ705 service to YYZ, B737-700 service to Las Vegas, and one-stop B737-700 or B737-800 service to Cancun
- Allows business jet service to all North American destinations and the Caribbean
- Cost of runway extension approximately $13.2 million, plus costs for changes to nav aids, site preparation and strengthening of apron pavement; small additional annual operating expenses
- Additional airport revenues of approximately $35,000-50,000 per year, possibly increasing to $420,000 in 15-20 years if CRJ Toronto service is realized
- The annual payments to cover the cost of the runway extension over a 30 year period at 5% interest rate is $860,000, much higher than the additional airport revenues, even with a CRJ Toronto service
- Small economic benefits to community, possibly significant benefits in long term if CRJ service to Toronto is realized
- No change to current plans to expand terminal complex to capacity of 80-100

Extend Runway to 7,350 ft. (2,350 ft. Extension)

- In addition to above, allows B737-700/A320 non-stop plus B737-800 one-stop service to Cancun
- Allows business jet service all North American destinations, the Caribbean and some services to Europe
- Cost of runway extension approximately $20.9 million, plus costs for changes to nav aids, site preparation and strengthening of apron pavement; small additional annual operating expenses
- Additional airport revenues of approximately $87,000 per year, possibly increasing to $455,000 in 15-20 years if CRJ Toronto service is realized
- The annual payments to cover the cost of the runway extension over a 30 year period at 5% interest rate is $1,365,000, much higher than the additional airport revenues, even with a CRJ Toronto service
- Small economic benefits to community, possibly significant benefits in long term if CRJ service to Toronto is realized
- Expansion of terminal to capacity of 100-140 required

Extend Runway to 10,200 ft. (5,200 ft. Extension)

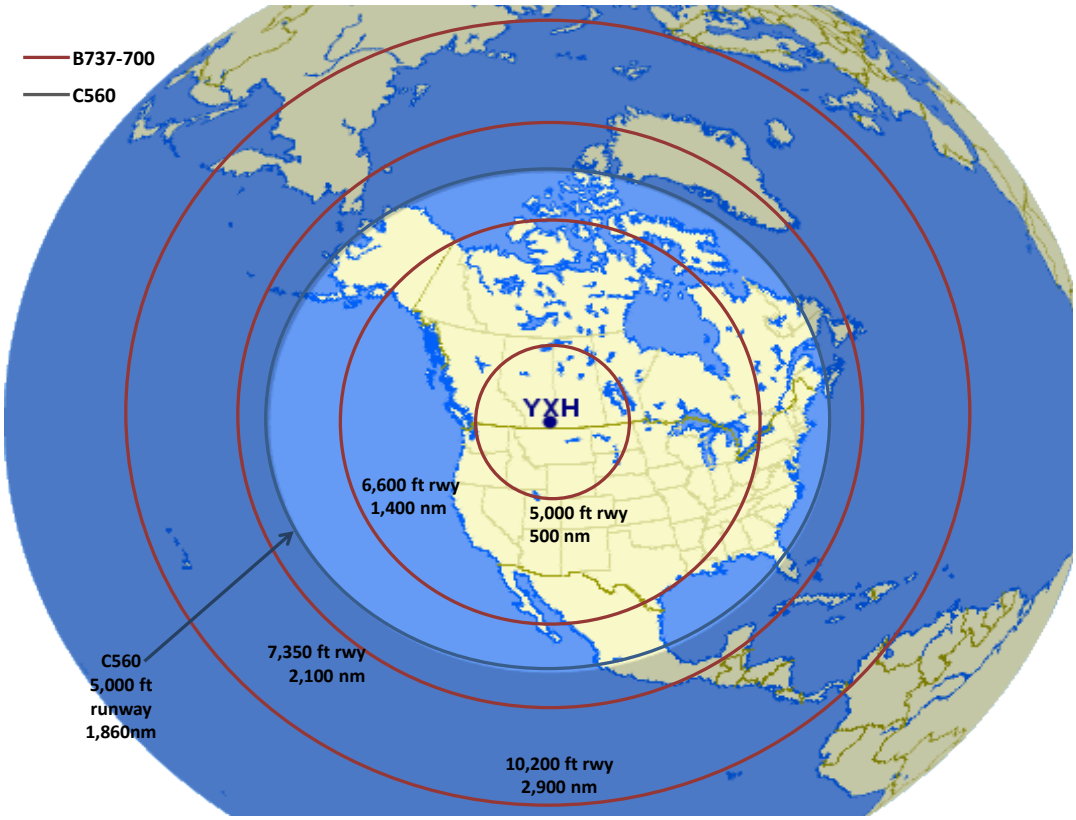
- In addition to above, allows A330 and B777 service to the UK
- Allows business jet service all North American destinations, the Caribbean and Europe
- Expansion of terminal to capacity of 250-300, parallel taxiway, ILS, Category 8 firefighting services required
- Cost of runway extension approximately $50 million, plus costs for changes to nav aids, site preparation and strengthening of apron pavement; large increase in additional annual operating expenses
- Additional airport revenues of approximately $610,000 per year, possibly increasing to $975,000 in 15-20 years if CRJ Toronto service is realized
- Other high cost improvements also required to realize these additional revenues including terminal expansion ($24M), taxiways ($6.6M), ILS ($26M including cost of additional land and

shifting runway 2,000 ft. to the southwest) and fire trucks and firehall ($10M), totalling approximately $67M

- The annual payments to cover the cost of the runway extension and other required facilities over a 30 year period at 5% interest rate is $7.6M, much higher than the additional airport revenues, even with a CRJ Toronto service
- Economic benefits to community would be substantial

The areas that can be served by the B737-700 with full passenger loads under each runway extension option and by the Cessna 560 from current runway are presented in Exhibit 9-2. Ranges are a little longer than the B737-700 for the A320 and a little shorter for the B737-800. The inner circle representing the 500 nm range is also applicable to the Q400 from the current runway.

Exhibit 9-2: Range of B737-700 under Each Runway Extension Option and Range of Cessna 560 from Current Runway



The costs of the runway extension options are very high in relation to the additional revenues expected to the airport in all three runway extension options. With the Provincial Government funding the high cost of the road realignment required for the runway extension, additional funding from them is unlikely. Even with increases in the aeronautical fees and charges and some ACAP funding, the costs are well beyond the capacity of the airport to recover such capital expenditure investment. Significant additional funding would be required from the City. Given the limited economic benefit identified to the community, at least in the short to medium term, it is not recommended that the runway be extended at this time.

There are three scenarios where expansion of the airport runway and airport infrastructure would be warranted in the future:

1. Increased demand generated from population growth and the associated air passenger market, i.e. population to exceed 100,000 residents and/or passenger demand exceeds 400,000 within the next twenty years. Larger airport would be needed to accommodate increased travel demand from residents and businesses.
2. To accommodate a specific air service opportunity such as leisure charter service. This would typically attract 100-200 flights per year, and may not be justified in terms of an economic return on investment, but could be warranted based on community demand for the service and the associated improvement to the quality of life and attraction and retention of businesses and residents.
3. A specific economic and employment opportunity such as a decision by BATUS to relocate aviation support for their CFB Suffield activities from Calgary to Medicine Hat, or the attraction of an aviation related business such as a large maintenance and repair facility with a large number of high tech, well-paying jobs. These would be specific economic opportunities triggering an expansion of airfield and infrastructure to support operations.

It would be prudent over the longer term to plan for future air service or aviation business opportunities which may require an extended runway. With continued economic and population growth, the City of Medicine Hat may be able to attract and sustain new commercial air services in the future. It is recommended therefore that land development be restricted in the area to the south-east of the airport and the appropriate land acquired to preserve the option of extending the runway for future aviation purposes if the need arises. Continued discussions with Alberta Transportation are essential, as well, to ensure the Highway 3 corridor is protected from incompatible development, and to explore its participation in future highway relocation plans. Proceeding with this strategy is vital at this time before the required land is further developed and the associated acquisition cost makes this option cost prohibitive.

10.0 CONCLUSIONS

Based on the above analysis we conclude that the following actions should be taken:

1. Explore opportunities, including zoning restrictions, strategic land acquisitions, and working with Alberta Transportation, to preserve the ability/option for the extension of the runway to 7,350 feet to accommodate leisure charters and regional jet service to eastern Canada in the future.
2. Continue with detailed planning of the expansion of the terminal building to accommodate up to 100 passengers and serve the Q400 and B737-800 (partial load) aircraft with construction to begin in 2013.
3. Update the Airport Master Plan before proceeding with a particular extension option as further analysis of various land, aerodrome, navigation, noise and terminal factors is recommended.

Before proceeding with a particular extension option, further analysis of the following factors is recommended:

- Verification of the additional land required and cost;
- Airfield capacity analysis to determine the need for additional taxiways;
- Air Service Strategic Plan preparation (underway);
- Runway earthworks (addressing cut and fill requirements);
- Relocation of lighting, ILS and other visual aids installations;
- Length of airside perimeter service road and fencing;
- Removal of natural and man-made objects to ensure non-infringement of the obstacle limitation surfaces extending from the runway;
- Noise exposure forecast contours;
- Taxiway and apron extension requirements;
- Relocation of provincial highway; and
- Expansion of the terminal building capacity.

APPENDIX A - LIST OF COMPANIES SURVEYED

2008 Survey - Businesses and Organizations that Responded

Box Springs Business Park
Auto-Star Compusystems Inc
Criterion Catalysts & Technologies Canada, Inc.
Bromley Mechanical Services, a Division of Argo Sales Ltd.
Cerpro Energy Services Inc.
Focus Corporation
Amtech Aeronautical Limited
Halliburton
Medicine Hat School District 76
TELUS
Polycore Tubular Linings Corp
Medicine Hat College
Weddingstar
Alberta Finance and Enterprise
Medican Group of Companies
Meggitt Training Systems Canada
Canadian Fertilizers Limited
Palliser Health Region
I-XL Industries Ltd.
Economic Development Alliance of Southeast Alberta
Canadian Centre for Unmanned vehicle Systems

2012 Survey of Businesses/Organizations and Air Carriers on Use of Business Jets

Businesses and Air Carriers that responded
Amtech Aeronautical Limited
Meggat Training Systems
North Caribou Air

Business/organizations that did not respond
ADM Milling Company
The Bay
Canada Safeway Ltd
Canadian Tire
Canadian Pacific Railway
Auto Star Compusystems Inc
Blinds by Vertican Inc
Canadian Fertilizers Ltd
Cancarb Limited
Costco
Criterion Catalysts and Technologies Canada Inc
Medicine Hat Catholic Board of Education
Medicine Hat Co-Op

Medicine Hat Regional Hospital
Methanex Corp
Moduline Industries-Medicine Hat A Division of Champion Canada International ULC.
Goodyear Canada Inc
Mcdonald's Restaurants
Medicine Hat College
Medicine Hat Lodge
Medicine Hat School District
Sears Canada Inc
TELUS
The Real Canadian Superstore
Walmart
Zellers
Meggitt Defence Systems Canada
Amtech Aeronautical Limited
Zanthic Technologies
Shaw Cablesystems Ltd
Sanjel Corp.
Cenovus Energy Inc
ConocoPhillips Canada Empress Gas Plant

Air Carriers that did not respond
Sunwest Aviation
Flair Air
Northgate Aviation
Enerjet