Cargo Airships: Applications in Manitoba and the Arctic

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Everything old
is new again

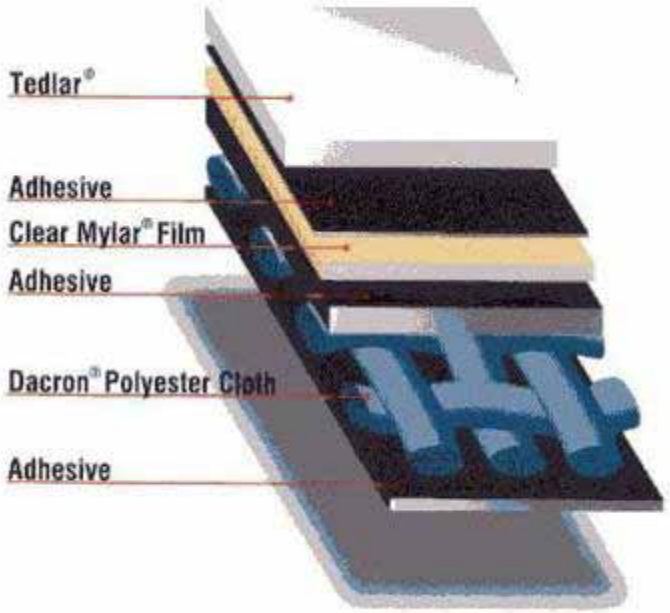
The same technological advances that have been applied to wind power have also been applied to a new generation of airships

2005


1935

Keys to a new Generation Cargo Airships

- Better materials, new designs, lower cost
- Environmentally benign, fuel efficient
- Potential for large indivisible loads
- Relativity lower ton-mile costs
- Year-round freight service



Airship Options

Hybrid Lifting Body

Symmetrical

Conventional Ellipsoid

Outline

- overview of northern transportation
- two logistics case studies for cargo airships
- benefits to Canada
- the state of the international airship industry
- next steps

Sustainable Transportation in Northern Canada

- Vast distances
- Thin markets / low incomes
- Arctic weather conditions
- Fragile environment / climate change
- Rare wildlife / aboriginal rights
- Limited transportation infrastructure
- Few backhaul opportunities
- Monopoly service providers

Northern Canada: Logistics Alternatives

Sea-lift

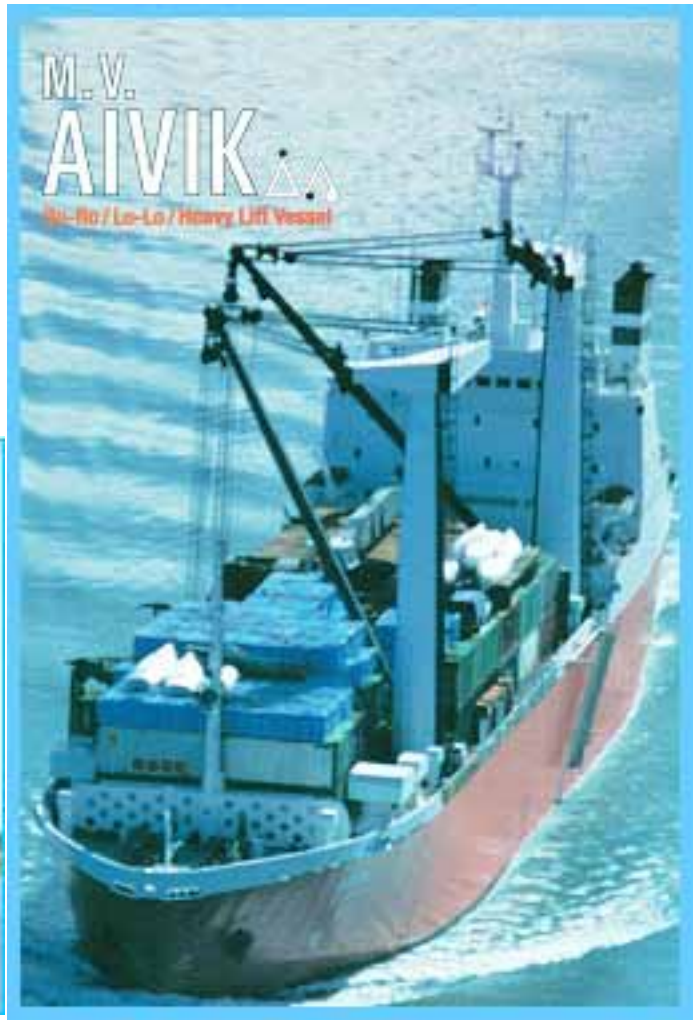
Barge

Airplanes

Ice Roads

Northern Logistics Alternatives: Sea-lift

lowest cost, summer coastal service, potentially large environmental hazard



Northern Logistics Alternatives: Barge

transshipment plus marine costs, summer coastal and river service, smaller shipments

Northern Logistics Alternatives: Air Cargo

very high costs,

limited to landing strips,

restricted by freight dimensions,

but year round passengers and freight service

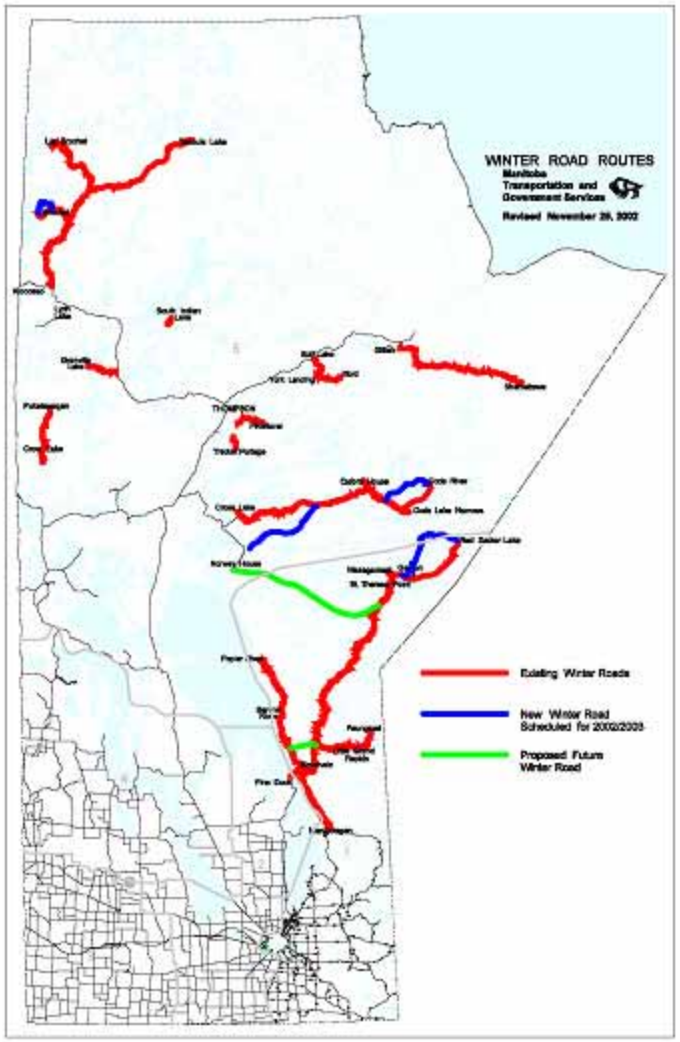
Modifications for Northern Transport

Northern Logistics Alternatives: Winter Roads

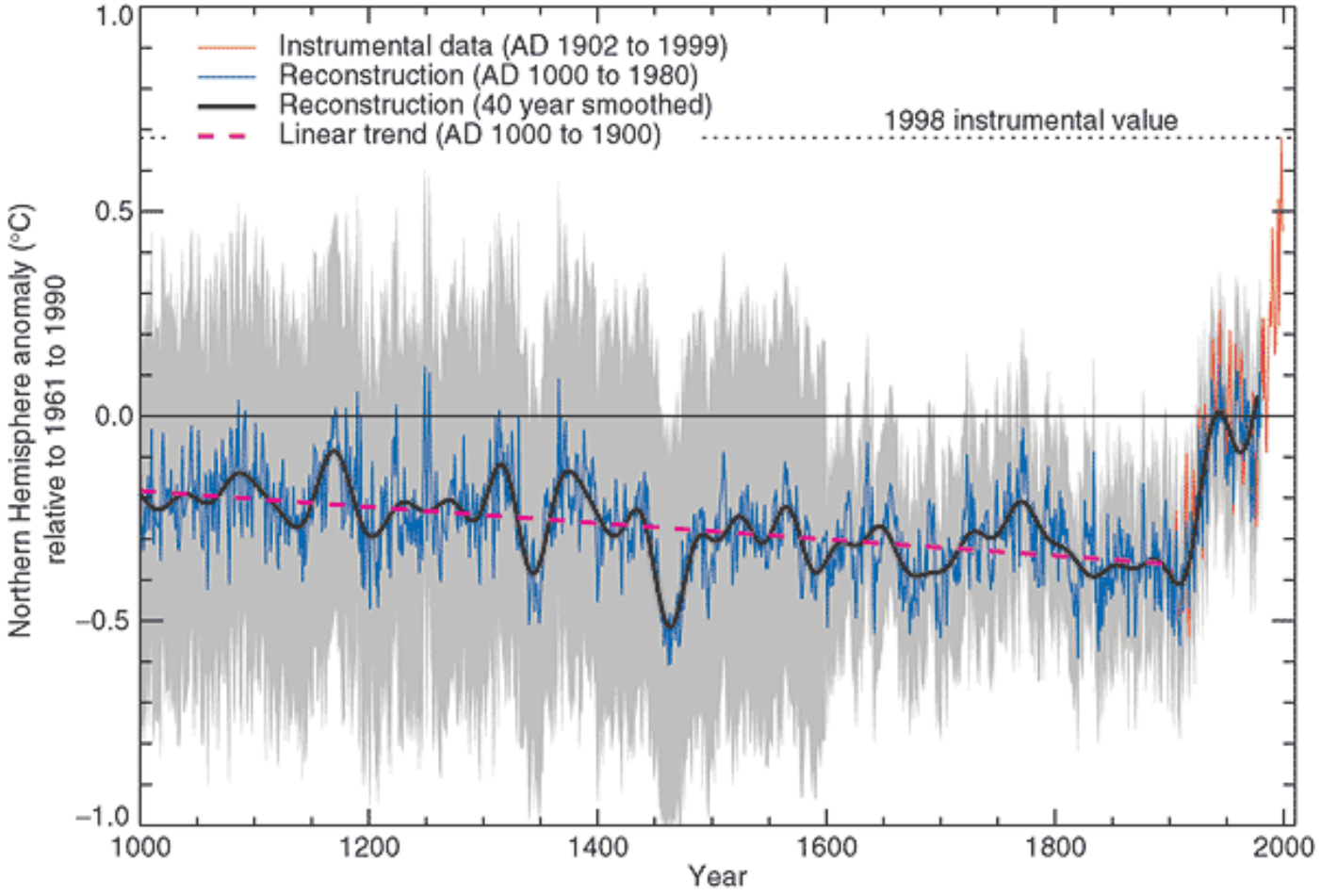
higher than “southern” trucking costs,
unpredictable season length,
vulnerable to climate change,
necessary for heavy loads

Evidence of Climate Change

- 28 communities in northern, central and eastern Manitoba rely on these seasonal roads.
- A total of 25,000 to 30,000 people live in these communities. This population is expected to double within 20 years.
- Every year, Manitoba builds enough winter roads to stretch from Winnipeg to Vancouver.
- Cost of replacement by all-weather gravel roads: $1 billion

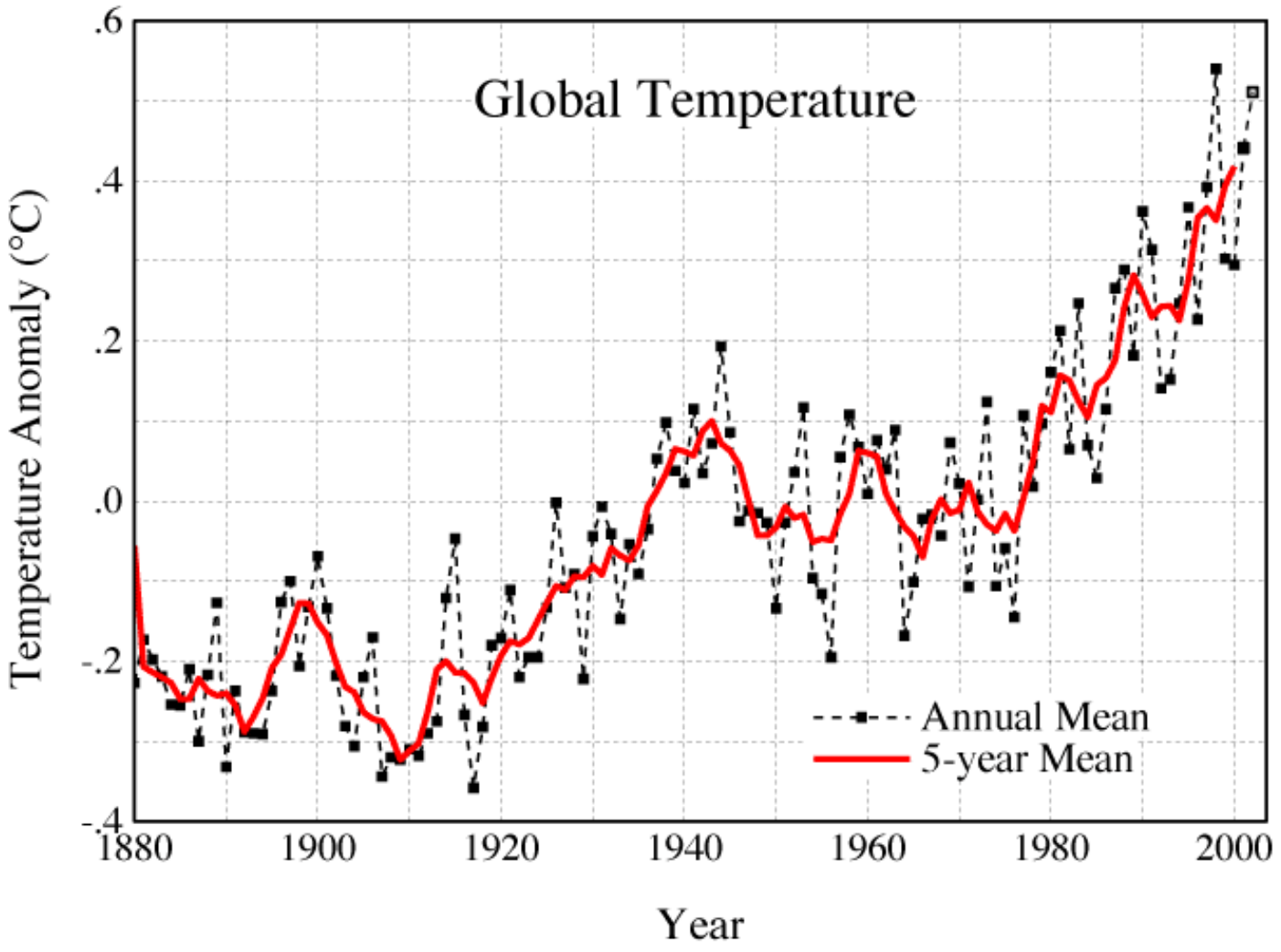


The Climate is Warming Rapidly

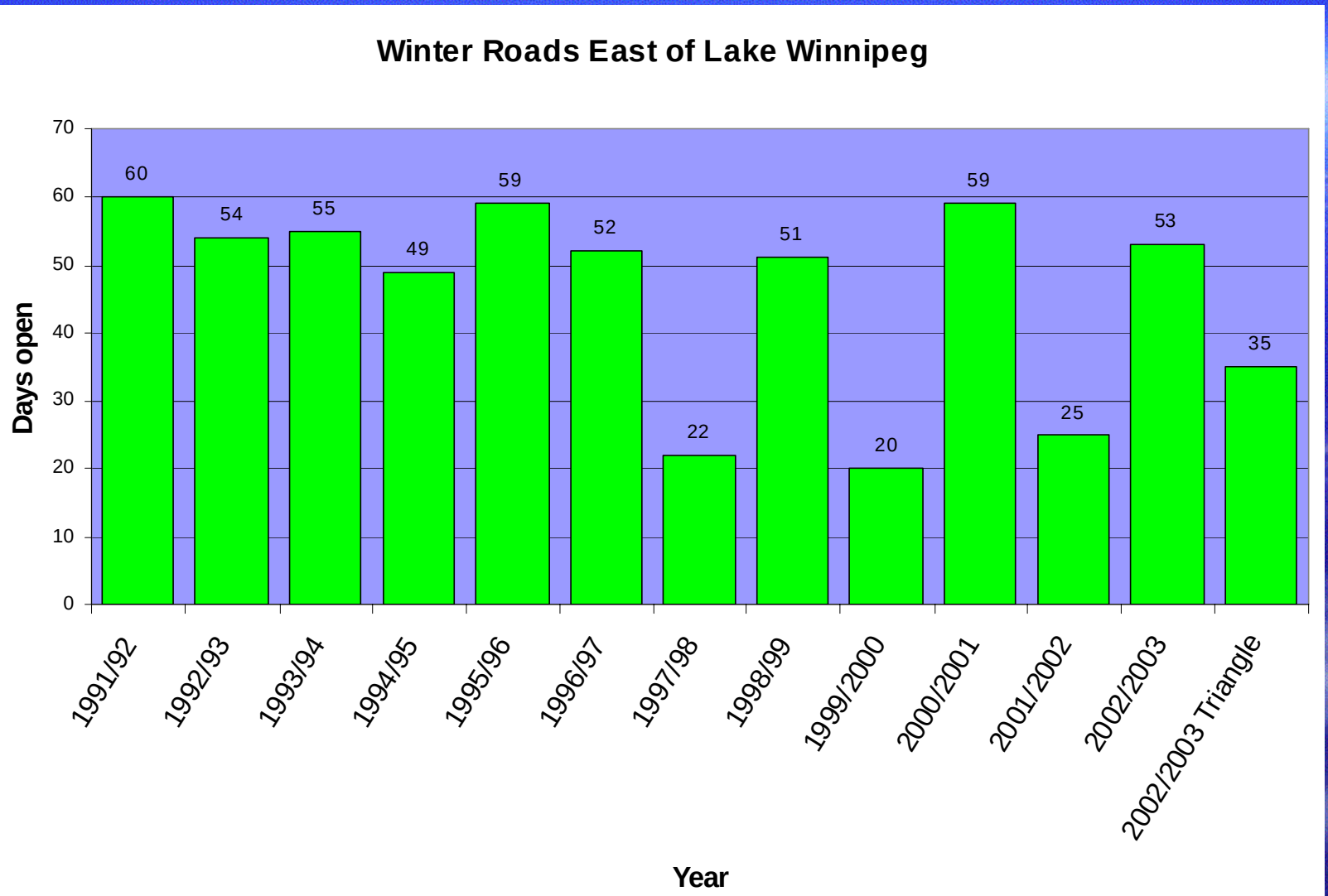


M.E. Mann & R.S. Bradley, *Geophysical Research Letters*, Vol. 26, No. 6, p.759-762

2005: will be 2nd or 3rd warmest?



TRADE
TOURISM
LOGISTICS
E-COMMERCE



Source: Don Kuryk, Manitoba Department of Transportation

Commercial and Public Sector Applications for Airships

		Commercial Uses	Public Uses
Mining and Energy Development		✦	
Hydro-electric and Pipeline Construction		✦	✦
Forestry		✦	
Research:	Environmental Studies		✦
	Resource Exploration	✦	
Emergencies:	Accidents	✦	✦
	Search and Rescue		✦
Defence:	Surveillance		✦
	Heavy lift		✦
Eco-tourism		✦	
Advertising		✦	
Essential Goods and Services Re-supply			✦
Communications		✦	✦

Economic Development of Natural Resources

Low hanging fruit

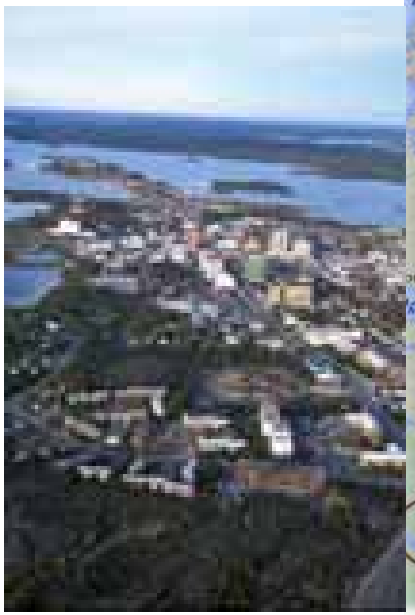
- Products so valuable, they can be transported in a suitcase.
- Gold and Diamonds

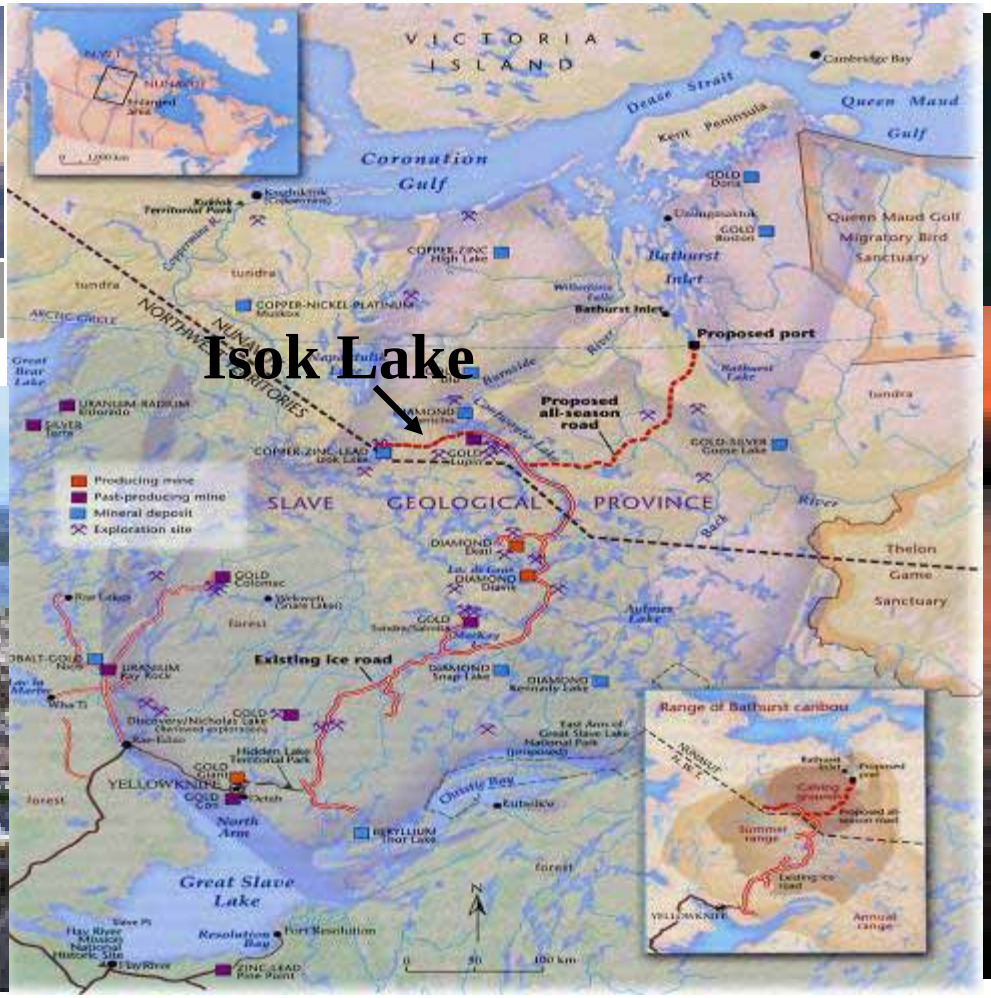
High hanging fruit

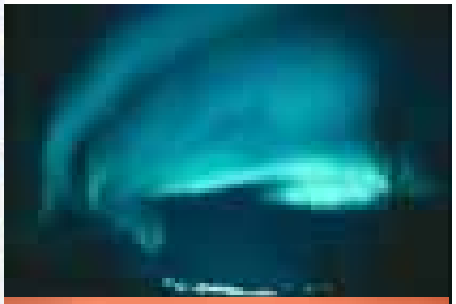
- Construction of multi-million dollar access roads required.
- Copper and Zinc

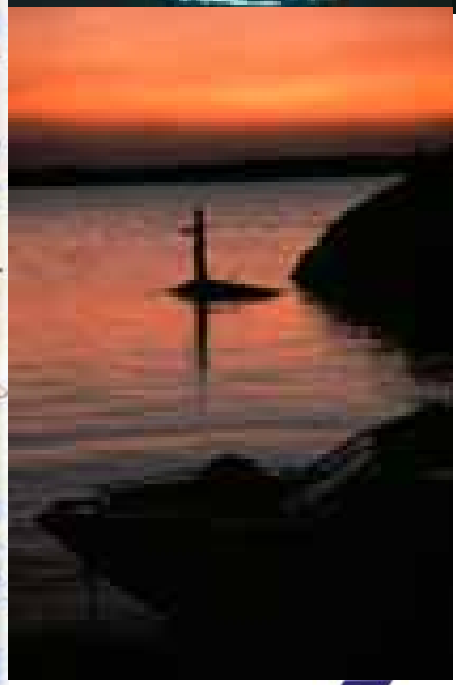
Whenever roads are proposed in the north, there are always environmental concerns.

Business





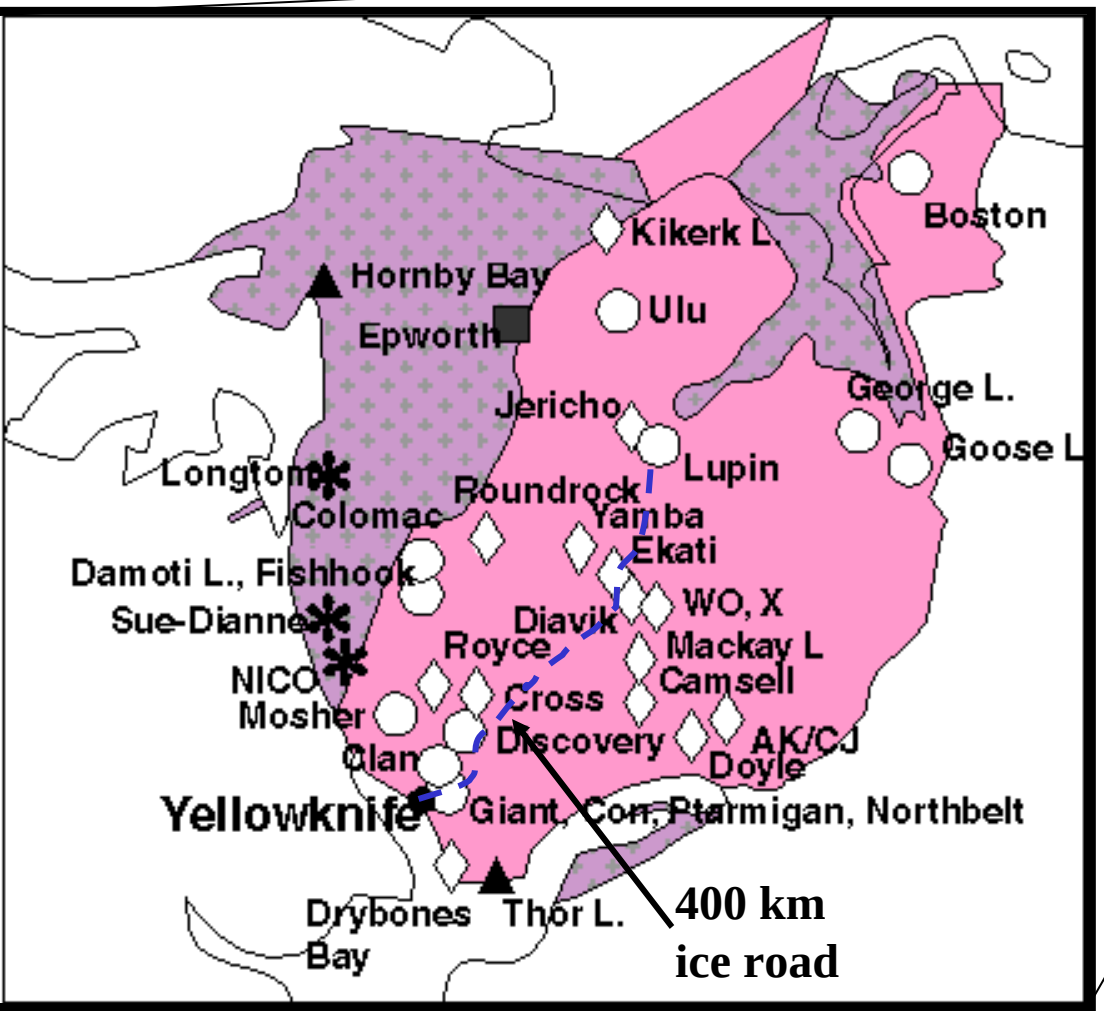


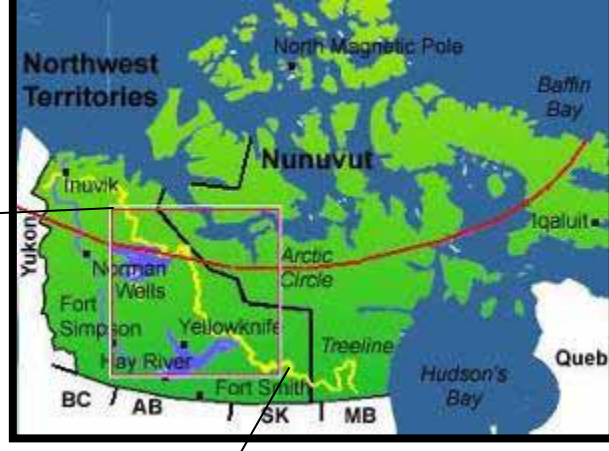


Business Case I:
Ekati Diamond Mine, NTW

Total fuel requirements (litres)	180,000,000
Total landed cost of fuel	$150,000,000
Ice road operations	12–16 week period
Distance	400-kilometer
Transportation cost	$40 million

Extensive mining prospects for diamonds and precious metals, limited to winter road access

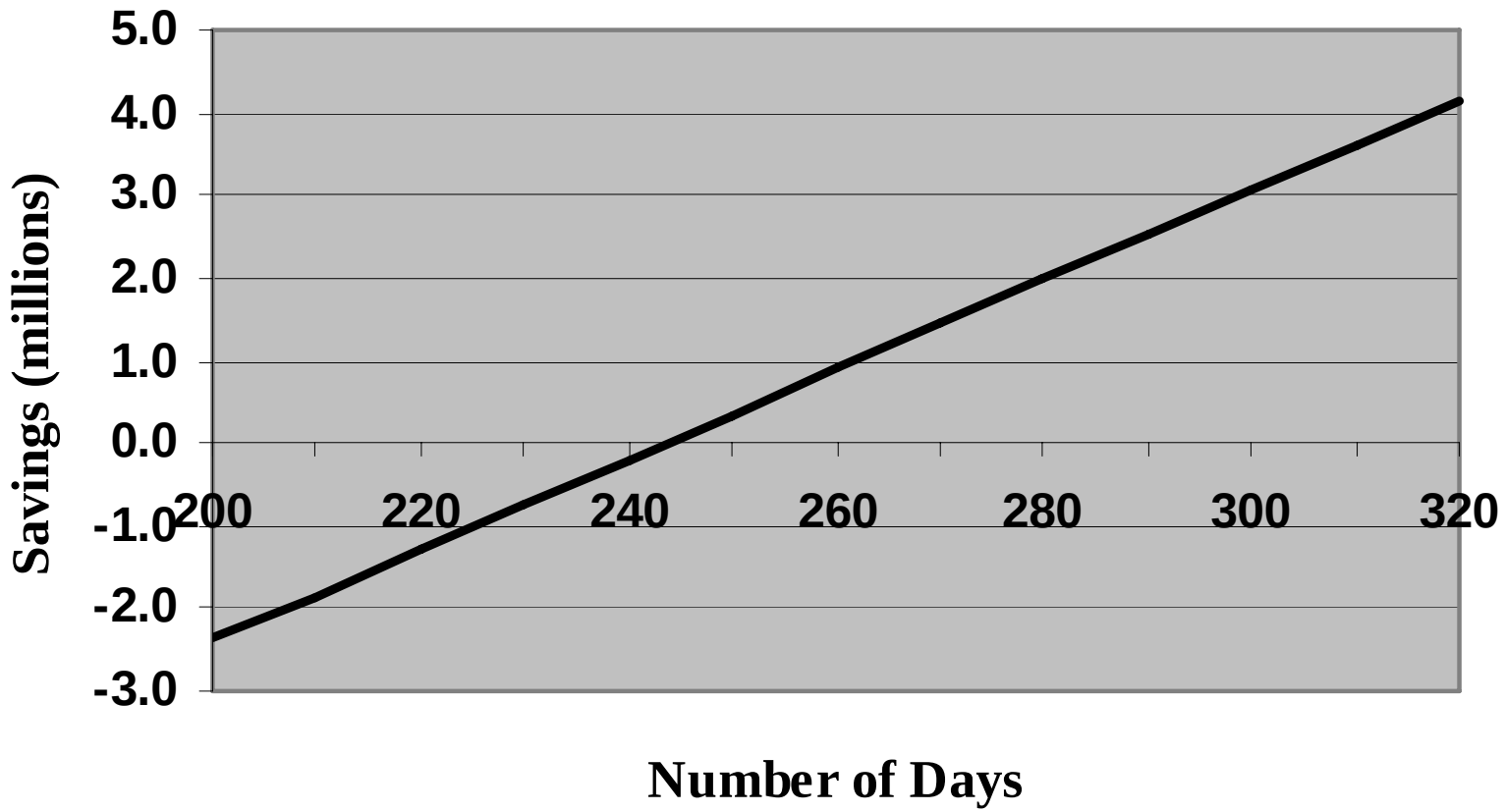




Economic Model of Fuel Haul to Ekati

- Key Assumptions
  - Vehicle size 84 tonnes/100,000 litres
  - Flying distance 380 kilometers
  - Average flight speed 161 kph
  - 24 hour operation
  - Purchase price $60 million
  - Return on invested capital 10 percent

Airship Utilization Breakeven Analysis
(3 flights/day)

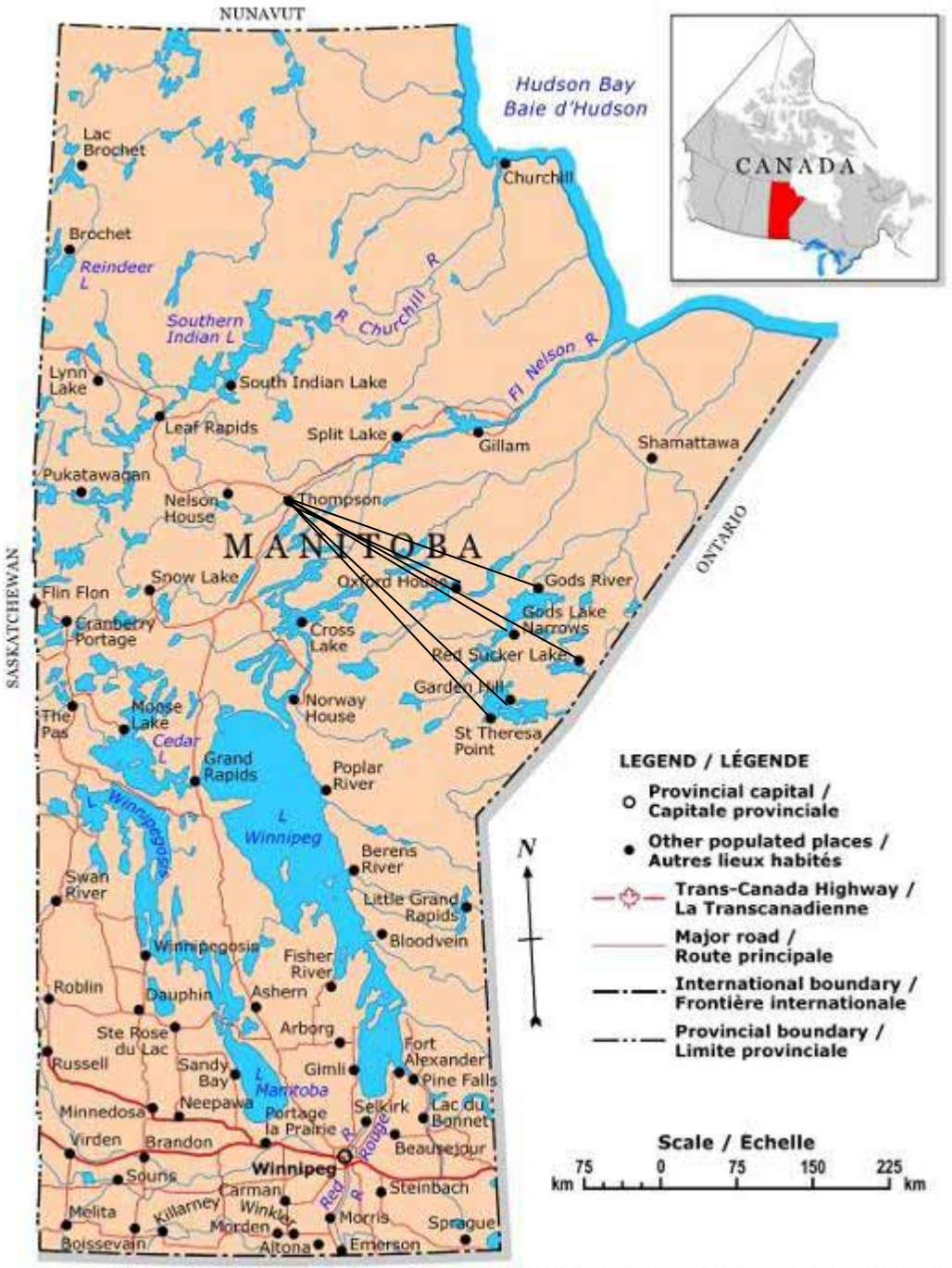


Large volumes of fuel and heavy equipment to move

Problems with indivisible loads

Business Case II

Re-Supply to Manitoba First Nations villages that are dependent on seasonal roads and small airplanes



Analysis based on direct out and back flights from Thompson to the six First Nations villages

Community Profiles

COMMUNITY	POPULATION	ESTIMATED ANNUAL FREIGHT	NUMBER OF PASSENGERS	NUMBER OF FLIGHTS
St. Theresa Point /Wasagamach	4,021	11,600	14,127	6,061
Garden Hill/Island Lake	3,204	13,000	37,933	11,245
Red Sucker Lake	773	3,200	6,073	1,923
Oxford House	1,998	8,150	9,649	3,102
God's Lake Narrows	1,393	6,260	9,741	3,396
God's River	466	2,100	5,957	2,399

Source: ***Manitoba 2020 Task Force*** (2003) for conventional transport

TRADE
TOURISM
LOGISTICS
E-COMMERCE

ASSUMPTIONS	ATTRIBUTES 30 Ton	ATTRIBUTES 150 Ton
Payload	30 tons	150 tons
Configuration	dual cargo passenger	same
Flight speed	70 knots or 130 kph	same
Fuel costs	$3.52 USD per US gallon	same
Operations	9 hours operation per day with 285 days of weather available flight conditions	same
Ground support	All ground handling and maintenance costs are included plus fees for airport landings	same
Routes	Point-to-point operations for Thompson based on one-way loads	same
Financing Purchase price Interest rate	C$40 million (US$30 million) 4.51 percent	C$150 million (US$112million)
Insurance	2.90 percent of hull value	same
Depreciation	80 percent straight line based on a 15 year useful life or 5.3 percent annually	same
Trucking costs Winnipeg to Thompson	$1,995 per truckload	same
Passenger airfare	Equivalent to fixed-wing scheduled air services	Not included
Profit and overhead	Administrative overhead of 5 percent and a profit factor of 15 percent of the estimated per flight costs	same
Crew costs	$2.7 million based on FAA requirements	same

Comparative Costs for a 30-Ton Hybrid

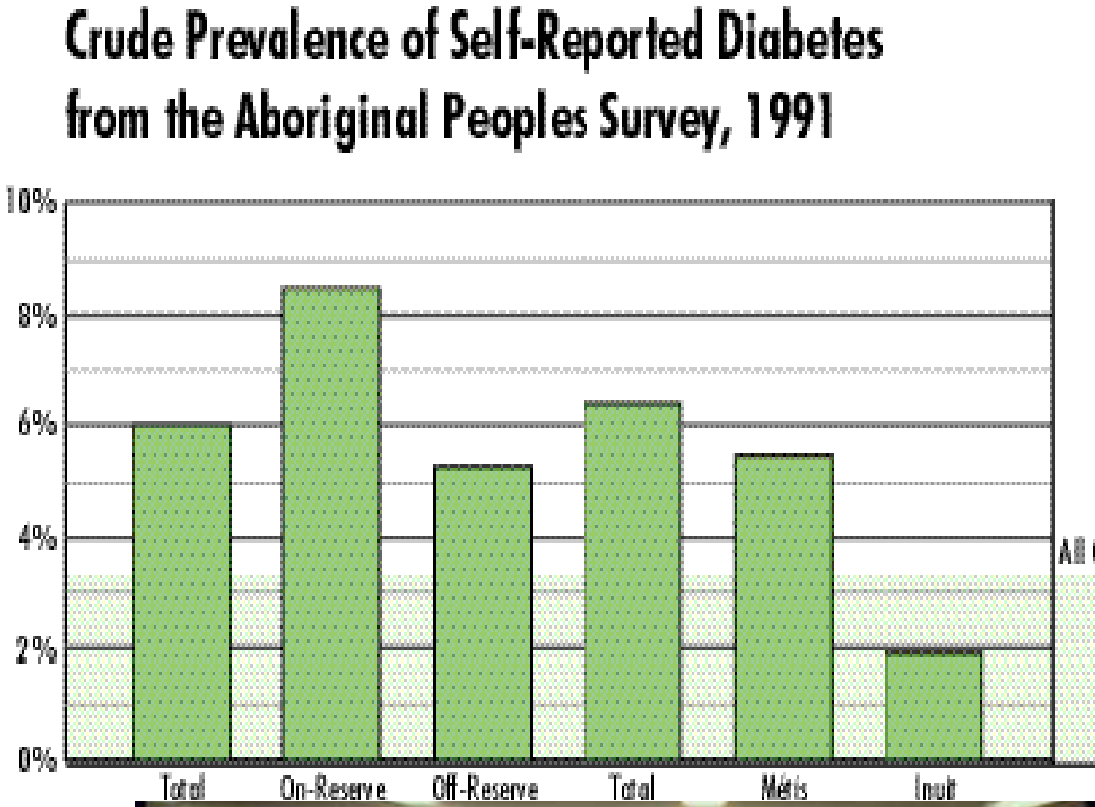
DESTINATION	CONVENTIONAL COSTS ($/TONNE)	HYBRID NO PASSENGERS ($/TONNE)	HYBRID WITH PASSENGERS ($/TONNE)
St. TheresaPoint/ Wasagamach	$435	$671	$304
Garden Hill/Island Lake	$450	$676	$366
Red Sucker Lake	$500	$696	$550
Oxford House	$530	$591	$456
God's Lake Narrows	$500	$648	$502
God's River	$525	$650	$552

Comparative Costs for a 150-Ton Hybrid
(fuel haul only)

DESTINATION	CONVENTIONAL COSTS ($/TONNE)	HYBRID NO PASSENGERS ($/TONNE)
St. Theresa Point/Wasagamach	$435	$301
Garden Hill/Island Lake	$450	$305
Red Sucker Lake	$500	$219
Oxford House	$530	$249
God's Lake Narrows	$500	$285
God's River	$525	$286

Source: ***Diabetes in Aboriginal People in Canada: The Evidence,*** Health Canada, 2000.

Poverty, Food Prices and Healthcare



Airships Make Sense for the North

- Attributes of a “Killer Application”
  - high margins
  - minimal competition
  - large potential market
- Reduction of indirect costs (holding inventories)
- Environmental and social benefits
- Safety and Security
- Civilian-Military Partnership

Explosion of Worldwide Interest in Airships

Leading airship/aerostat developers

U.S.A.	Lockheed-Martin	- Akron, Ohio
	TCOM	- Elizabeth City, N.C.
	AeroVehicles Inc.	- Santa Maria, California
	World Aeros	- Canoga Park, California
	Air Management Services	- Greenwich, Connecticut
	American Blimp Company	- Hillsboro, Oregon
	Ohio Airships	- Akron, Ohio
Europe	Zeppelin Luftschifftechnik	- Friedrichshafen, Germany
	Advanced Technologies Group	- Bedford, England
Canada	21st Century Airships	- Newmarket, Ontario
Russia	RosAeroSystems	- Moscow, Russia
China	Vantage Airship Co., Ltd.	- Shanghai, China

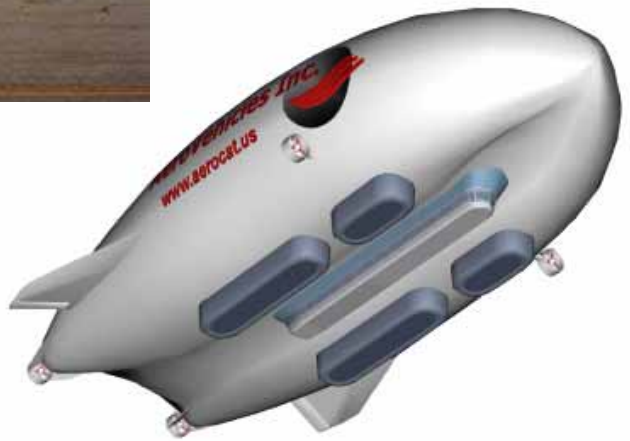
Status of Airship Manufacturers

Company	Aerostats	LTA Vehicles	Hybrid Vehicles
Lockheed-Martin		active	potential
TCOM	active		
AeroVehicles Inc.			design
World Aeros	active	active	design
Air Management Services		active	
American Blimp Company		active	
Ohio Airships			model testing
Zeppelin Luftschifftechnik		active	
Advanced Technologies Group		active	model testing
21st Century Airships		model testing	
RosAeroSystems	active	active	
Vantage Airship Co., Ltd.		active	

Airships: Present Availability


ZEPPELIN NT
Foto: © Stanko Petek www.luftbild.com

A2A3



Airships to the Arctic Symposiums Winnipeg: 2002, 2003, 2005

- Key insights
  - Worldwide LTA interests
  - Window of opportunity for Canada to gain a new industry/logistics capability
  - Enforce Canadian sovereignty in the Arctic and Stretch DND budgets
  - Need for better northern transportation
  - Pro-Kyoto/ pro-Boreal Forest technology

ISO Polar Airships Inc.

- **Not-for-profit Research Institute**
- **IsoPolar Airship Association**
- **Cold weather testing & certification**
- **Airship pilot training in Manitoba**
- **Economic analysis**
- **Engineering**
- **Demonstration projects**

Next Steps

Northern Re-supply Airship Demonstration Project
*** subject to further review ***

IsoPolar Airships Inc.

21st Century Airships

Province of Manitoba

In-kind Business Support

First Nations

Next Steps

Invitation to Phase II Funding

Demonstration of a new design for a vertical delivery medium heavy lift airship

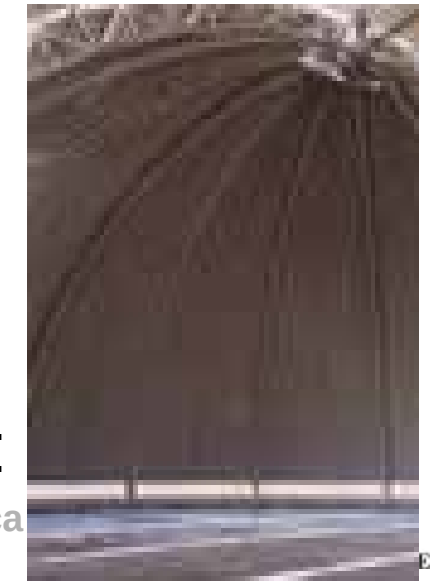
Partners: Airborne, EnCana, ATC, 21st Century Airships, others TBD

Next Steps

The Hangar: Critical Infrastructure

- Necessary for assembly, repairs and cold weather testing
- Very large, expensive structures
- Wind and snow loading
- Heating and cooling issues
- Entry and exit accident risk

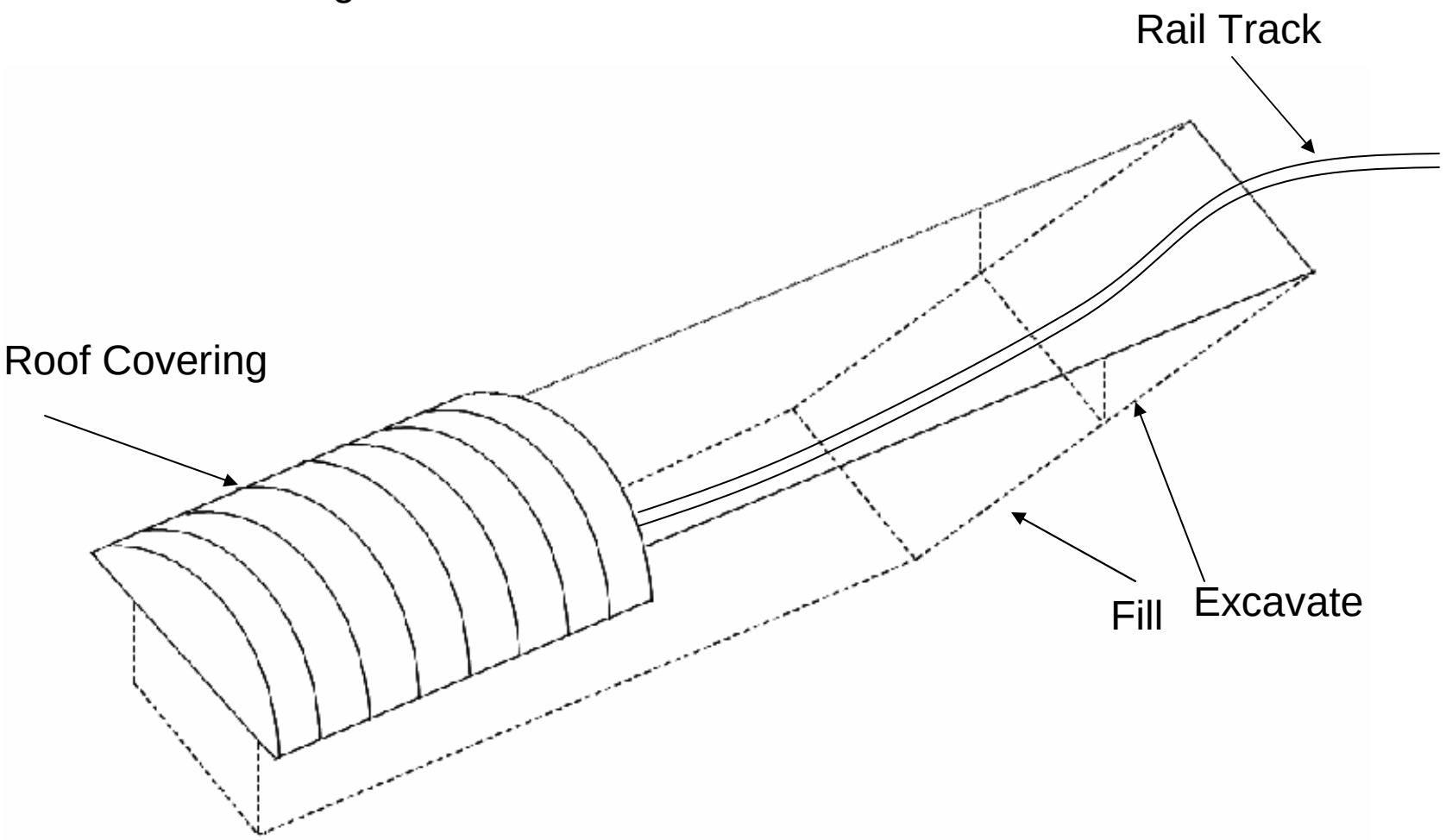
360-meters in length, 210-meters in width and 107-meters in height



Could an open pit mine be converted into an airship hangar?

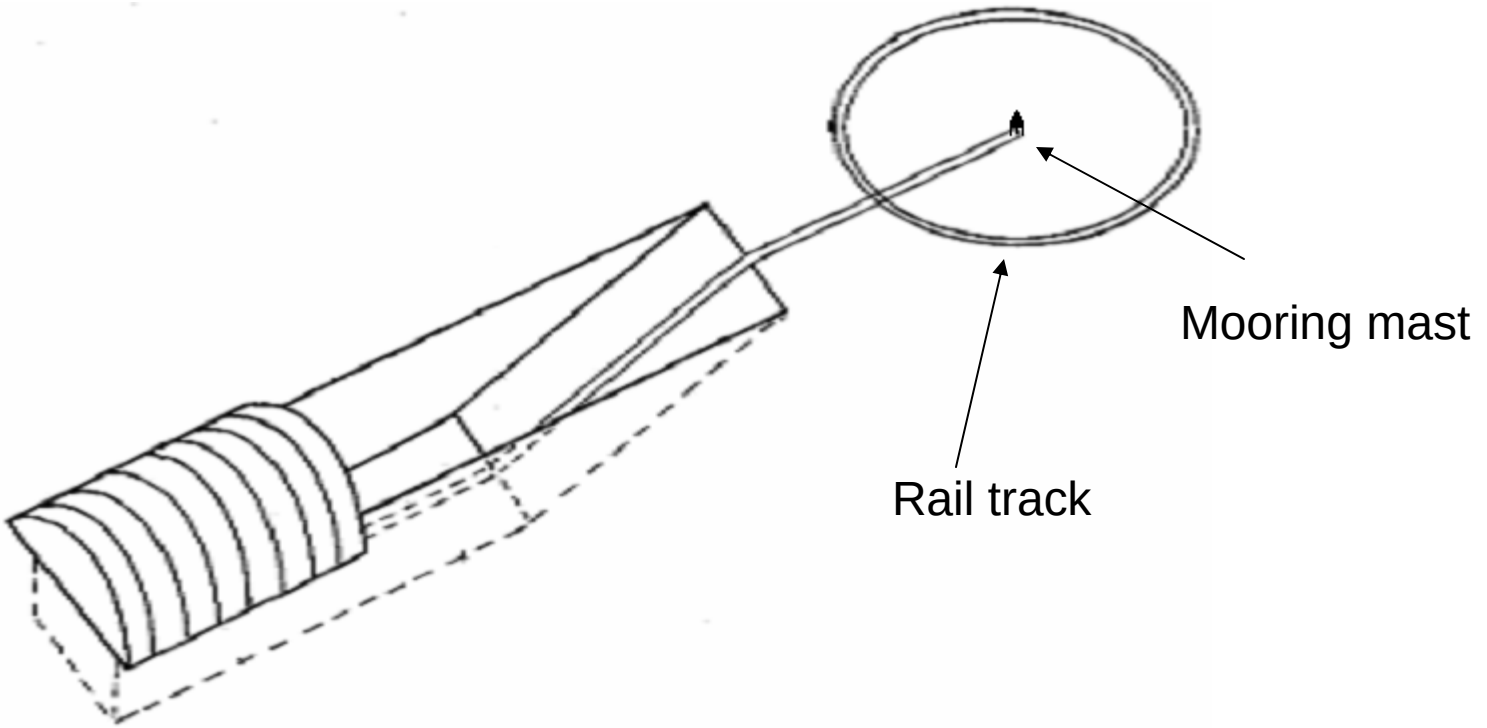
Top View

Prentice Pit Hangar



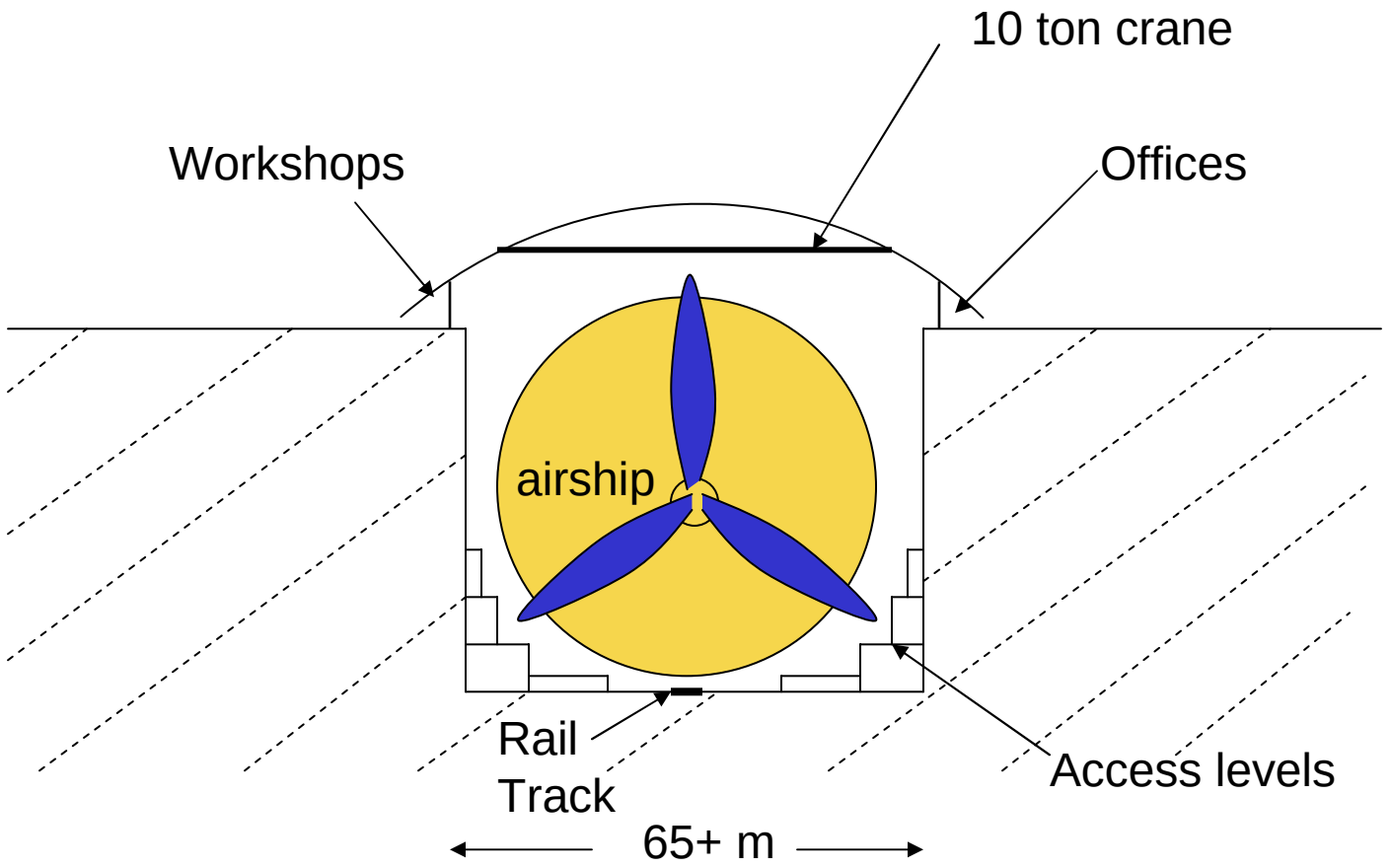
Top View

Prentice Pit Hangar

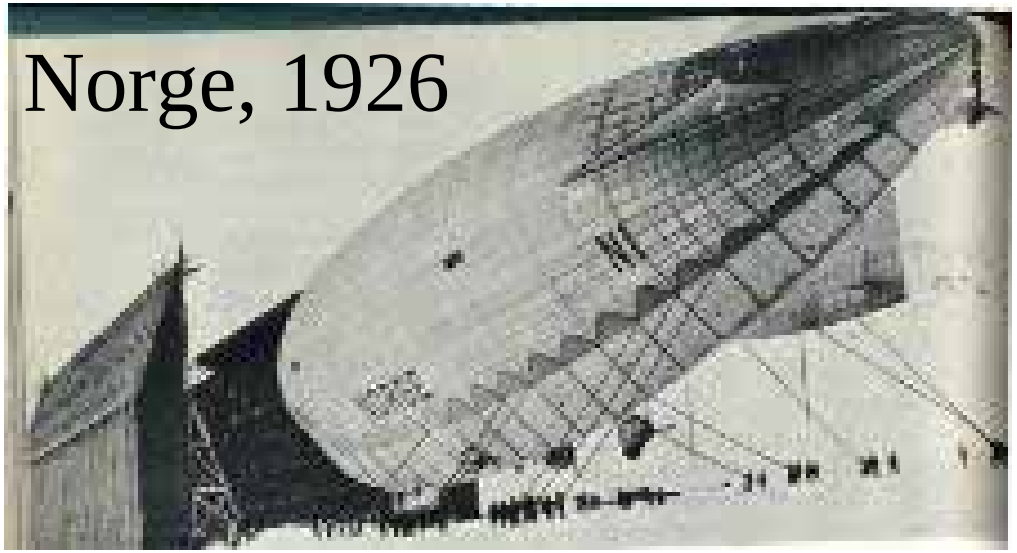


End View

Prentice Pit Hangar



It’s not rocket science.



It’s just balloon science.