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Collaborative Operational Improvements

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NAV CANADA





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NAV CANADA

- Safety is number one
- Programs and projects to improve air navigation system efficiency
- Leverage emerging technology
- Upgrades to systems, equipment, infrastructure of \$1.4 billion since 1996



ADS-B site – Hudson Bay





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What is CIFER?



- Programs that support improved efficiency and reductions in GHG emissions
- Progress report
 - identifies reductions in CO₂e equivalents and fuel savings from 1996 to 2008
 - Forecasts GHG reductions and fuel savings from 2009 to 2016
 - Living document – updated annually



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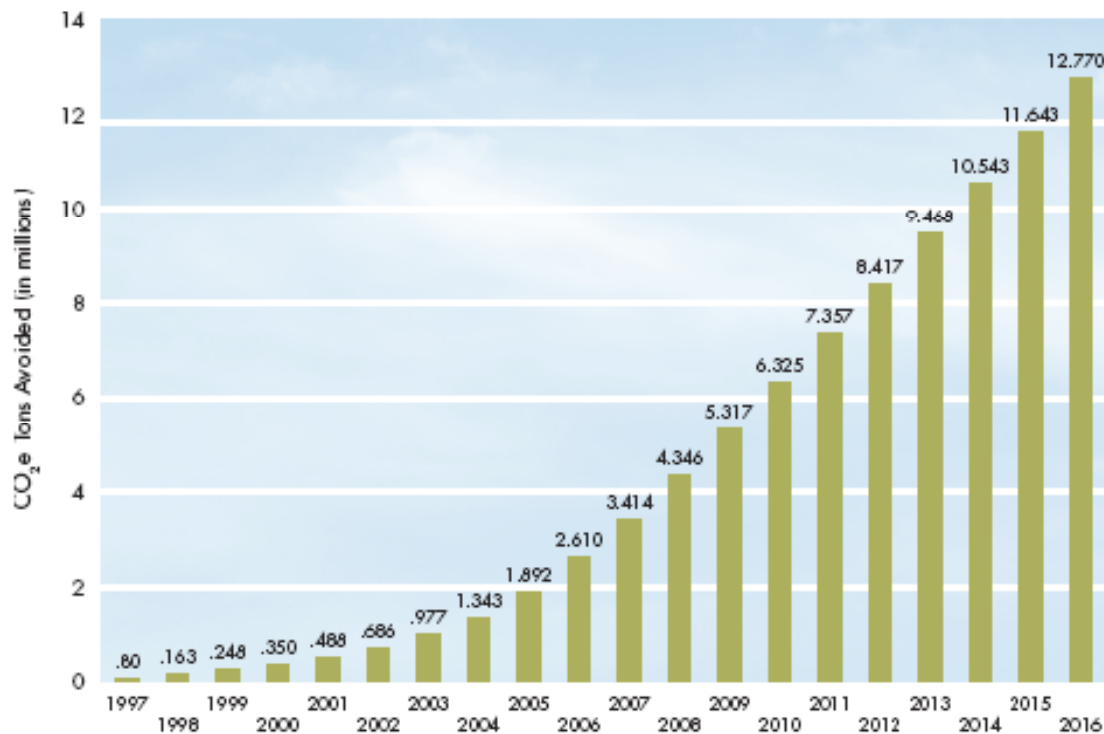
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Avoided CO₂e Emissions from NAV CANADA programs since 1996

Cumulative Tons of CO₂ Equivalent Avoided Since 1996



Source: NAV CANADA

- Total cumulative reductions by year out to 2016
- 4.35 million metric tons of CO₂e emissions have been avoided to date



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Avoided Fuel Costs since 1997



Annual Tons of CO₂ Equivalent Avoided and Annual Millions of Dollars of Fuel Saved



Source: NAV CANADA

- 2008 annual avoided fuel costs estimated to be CAD \$331 million
- 2008 annual GHG emissions reduced by ~ 1 million metric tons

Total avoided fuel costs equates to 10,000 B-777 flights around the world



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Putting Programs in Place *Efficiency in En route Operations*



ADS-B Hudson Bay

- Provides radar-like surveillance for equipped aircraft
- Allows better and more flexible routing and reduced separation.
- **Total Benefits 2009 - 2016**
 - GHG 547,000 t CO₂e
 - CAD \$195 Million in avoided fuel costs



ADS-B Oceanic

- Will extend the range of surveillance south and east of Greenland,
- Will permit reduced separation, earlier climbs and more direct routings
- **Total Benefits 2009 - 2016**
 - 131,000 t CO₂e
 - CAD \$50 Million in avoided fuel costs



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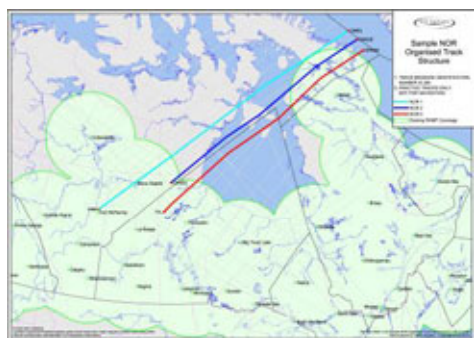
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Putting Programs in Place *Efficiency in Enroute Operations*



Northern Radar Program

- Seven new radars in North
- Enhanced capacity, efficiency and safety for traffic on polar routes, in domestic airspace and enroute to Europe and Asia
- **Total Benefits to 2016**
 - 1,107,000 t CO₂e
 - CAD \$392 Million in avoided fuel costs



Northern Organized Track System

- Provides most efficient routing for aircraft departing Europe for cities in middle and western North America
- After ADS-B Phase II, will no longer be required
- **Total Benefits to 2016**
 - 168,000 t CO₂e
 - CAD \$55 Million



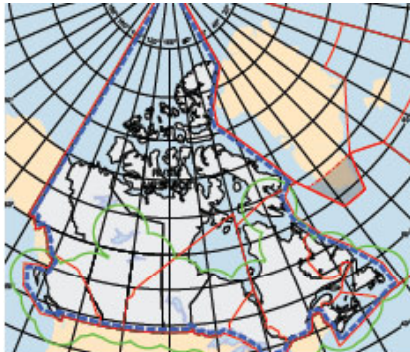
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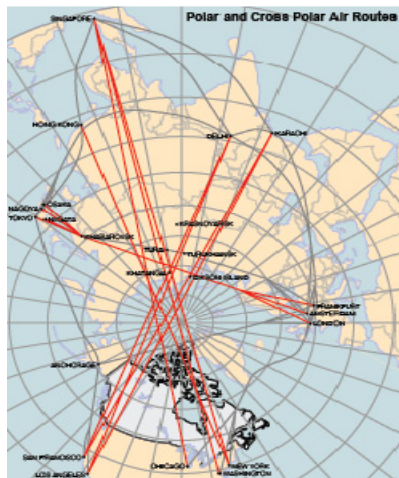


Putting Programs in Place *Efficiency in En route Operations*



RVSM

- Increased capacity of available airspace by reducing vertical aircraft separation requirement from 2,000 feet to 1,000 feet between Flight Level (FL) 290 and FL 410 inclusive
- **Total Benefits to 2016**
 - 3,970,000 t CO₂e
 - CAD \$1,256 Million in avoided fuel costs



Polar Routes

- Significantly reduces flight times and the need for connecting flights or refuelling stops
- **Total Benefits to 2016**
 - 3,577,000 t CO₂e
 - CAD \$1,143 Million



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Putting Programs in Place

Improving Efficiency



Canadian Automated Air Traffic System (CAATS) Gander Automated Air Traffic System (GAATS)

- Leading-edge flight data processing system
- Enables collaborative decision making in flight planning
- Improved functionality enhances fuel saving capabilities.



Scheduling and Sequencing System (SASS)

- Arrival manager
- Generates arrival schedules that optimize traffic flow
- Cost savings accrue to operators

– **Total Benefits to 2016**

- 550,000 t CO₂e
- CAD \$178 Million



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Performance Based Navigation



Area Navigation (RNAV)

- RNAV equipped and certified aircraft have better access to and flexibility for point to point operations
- **Total Benefit to 2016**
 - 1,759,000 t CO₂e
 - CAD \$440 Million in avoided fuel costs



Required Navigation Performance (RNP)

- RNP terminal procedures reduce the number of minutes flown and can include constant descent approaches
- **Total Benefit to 2016**
 - 231,000 t CO₂e
 - CAD \$82 Million in avoided fuel costs



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Looking to the Future



- Implement new capabilities
- Be cognizant of international developments
- Apply a systematic and balanced approach
- Collaborate with employees, customers and stakeholders
- Focus on:
 - Performance Based Navigation
 - Enroute surveillance and communications in remote and oceanic airspace
 - Airport operations improvements and decision support tools
 - Airspace utilization



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CIFER

*Collaborative Initiatives
for Emissions Reductions*

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