

NATIONAL AIRLINES COUNCIL OF CANADA
CONSEIL NATIONAL DES LIGNES AÉRIENNES DU CANADA



**Voluntary Agreement for the Reduction of
Greenhouse Gas Emissions**

Annual Report | 2011

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1. Context/Background

1.1 The National Airlines Council of Canada

The National Airlines Council of Canada (NACC) was founded by Canada's four largest passenger air carriers: Air Canada, Air Transat, Jazz Air LP, and WestJet. It was incorporated on September 4, 2008 and officially launched on January 21, 2009. NACC is a trade association dedicated to issues of concern to the Canadian and international commercial airline industries.

1.2 Memorandum of Understanding (MOU) - Voluntary Agreement for the Reduction of Greenhouse Gas (GHG) Emissions

The NACC member airlines are committed to conducting their activities in an environmentally responsible manner. Therefore, they are continuing to support the Memorandum of Understanding (MOU) signed on June 19, 2005 between the previous Canadian industry association to which they belonged and Transport Canada. The voluntary agreement was based on the Template and Guidance on Voluntary Measures from the International Civil Aviation Organization (ICAO). The NACC strongly supports the objective of the 2005 voluntary Memorandum of Understanding (MOU) to reduce emissions of greenhouse gas per unit of output from aviation in Canada. Therefore, it has undertaken to encourage its members to improve the fuel efficiency of their fleets and collectively reduce their greenhouse gas emissions on a per unit basis. The fuel efficiency improvement specified in the MOU is the reduction of litres of fuel per revenue tonne-kilometre by an average of 1.1 percent per annum with a cumulative improvement of 24 percent in 2012 compared to the 1990 base case scenario. At the time of the signing of the MOU, the 1.1% reduction target was consistent with the approach being taken by the International Air Transport Association (IATA), of which some of the NACC carriers are members. The IATA carriers had committed to achieving a fuel efficiency goal of 41.50 litres of fuel per 100 revenue tonne-kilometres by 2012.

The NACC and its members are committed to the GHG emissions reduction goal and are assuming the responsibilities set out in the Agreement, including collection and reporting of data. In its first report, for the year 2008, all of the member airlines contributed additional data for the years 2005 to 2007 inclusive, which allowed for the establishment of historical trending of efficiency improvements. This report, for the year 2011, continues to fulfill the commitment and responsibilities of NACC members to the MOU. It also contains revised data for the previously reported years 2005 through 2010 inclusive.

Building on the success of the MOU to address greenhouse gas (GHG) emissions from aviation, the Government of Canada and the Canadian aviation industry have developed Canada's Action Plan to Reduce Greenhouse Gas Emissions from Aviation (the Action Plan). The Action Plan was released on June 4, 2012.

The NACC fully supports the Action Plan and is a signatory to it. The plan sets an ambitious goal to reduce GHG emissions from both domestic and international operations, which is expected to contribute to global efforts to minimize aviation's carbon footprint.

This will be the last report as part of the MOU, as future reporting will be part of the reporting requirements of the Action Plan.

2. Data and Results

2.1 GHG Emissions Reporting System

For the reporting of the necessary data under the MOU, the NACC has adopted the reporting system of one of its member carriers. The reporting system has been standardized to fulfill the reporting requirements under the MOU.

The use of this system has ensured that the other member carriers are reporting their data in a consistent and standardized manner. The NACC has contracted an independent third party to collect and maintain all carrier data. The third party operates under a non-disclosure agreement with the NACC, and all data collected is handled on a confidential basis.

The data has been compiled and reported in a consolidated manner in order to ensure that it is de-identified and no one carrier can be identified.

The GHG emissions reported in the NACC database pertain to aircraft fuel use and do not include fuel used in ground equipment or facilities. The reporting includes domestic, trans-border and international operations. All NACC members, that is, Air Canada, Air Transat, Jazz Air LP, and WestJet, contributed 2011 data. This report revises data contained in previous reports. The revisions were the result of revised cargo available ton-mile (ATM) data from one of the carriers and cargo revenue ton-mile (RTM) data from another carrier for the years 2005 through 2010 inclusive.

2.2 Data Input

The NACC member carriers provided the following 2011 data:

- Cargo Available ton-miles (ATM)
- Cargo Revenue ton-miles (RTM)
- Available seat-miles (ASM)
- Revenue passenger-miles (RPM)
- Litres of fuel burned per year

Members were also asked to provide information on any activities or initiatives in the following areas:

- Aircraft modification and maintenance
- Aircraft operating procedures
- Cargo and baggage operations
- In-flight/catering

2.3 Data Output

The output data reported for 2011 included the following:

- Cargo Revenue tonne-kilometres (RTK)
- Revenue passenger-kilometres (RPK)
- Total Revenue tonne-kilometres (Total RTK) (100 kg per passenger)
- Litres of fuel burned per year
- Litres per 100 Revenue tonne-kilometres (L/100 RTK)
- Litres per Revenue tonne-kilometre (L/RTK)
- Cargo Available tonne-kilometres (ATK)
- Passenger Available tonne-kilometres (ATK) (100 kg per passenger)
- Total Available tonne-kilometres
- Litres per 100 Available tonne-kilometres (L/100 ATK)
- Tonnes of CO₂ equivalent (CO₂e) Emissions
- CO₂e emissions per Revenue tonne-kilometre
- CO₂e emissions per Available tonne-kilometre

2.4 CO₂ Emissions and Conversion Factors

To standardize calculations the following conversions factors were applied:

$$\text{Cargo Revenue tonne-kilometres} = (\text{Cargo Revenue ton-miles} \times 1.609344 \times 0.91)$$

$$\text{Passenger Revenue tonne-kilometres} = (\text{Revenue passenger miles} \times 1.609344 \times 0.1)$$

Note: based on a passenger weight of 100 kg

$$\text{Cargo Available tonne-kilometres} = (\text{Cargo Available ton-miles} \times 1.609344 \times 0.91)$$

$$\text{Passenger Available tonne-kilometres} = (\text{Available seat-miles} \times 1.609344 \times 0.1)$$

Note: Based on a passenger weight of 100 kg

The emissions and carbon dioxide equivalent factors used below have been drawn from Canada's National Greenhouse Gas Inventory Report (NIR). The values are from the 1990 – 2010 NIR (Part 2), Annex 8, Table A8-11. The following formulas are applied:

$$1 \text{ litre Aviation Jet Fuel} = 2.534 \text{ kg CO}_2$$

$$1 \text{ litre Aviation Jet Fuel} = 2.556 \text{ kg CO}_2\text{e}$$

$$\text{CO}_2\text{e (grams) / RTK} = (\text{Fuel Used} \times 2.556 \times 1000) / (\text{Total Revenue tonne-kilometres})$$

$$\text{CO}_2\text{e (grams) / ATK} = (\text{Fuel Used} \times 2.556 \times 1000) / (\text{Total Available tonne-kilometres})$$

2.5 Data Results and Summary

The following table summarizes the NACC operational data for 2011 and revised historical data for the years 2005 to 2010, for comparison purposes. All data was volunteered by the four NACC member companies.

	2011	2010	2009	2008	2007	2006	2005
Cargo Revenue tonne-kilometres (millions)	1,590.27	1,615.28	1,213.16	1,385.01	1,618.52	1,417.45	1,456.44
Passenger Revenue tonne-kilometres (millions)	13,199.71	12,221.72	11,304.99	11,634.18	11,300.18	10,590.16	9,868.90
Total Revenue tonne-kilometres (millions)	14,789.97	13,837.00	12,518.14	13,019.20	12,918.69	12,007.61	11,325.34
Fuel Litres (millions)	5,525.09	5,187.70	4,818.95	5,054.31	4,997.74	4,794.00	4,544.15
Litres per 100 Revenue tonne-kilometres	37.36	37.49	38.50	38.82	38.69	39.92	40.12
Litres per Revenue tonne-kilometre	0.374	0.375	0.385	0.388	0.387	0.399	0.401

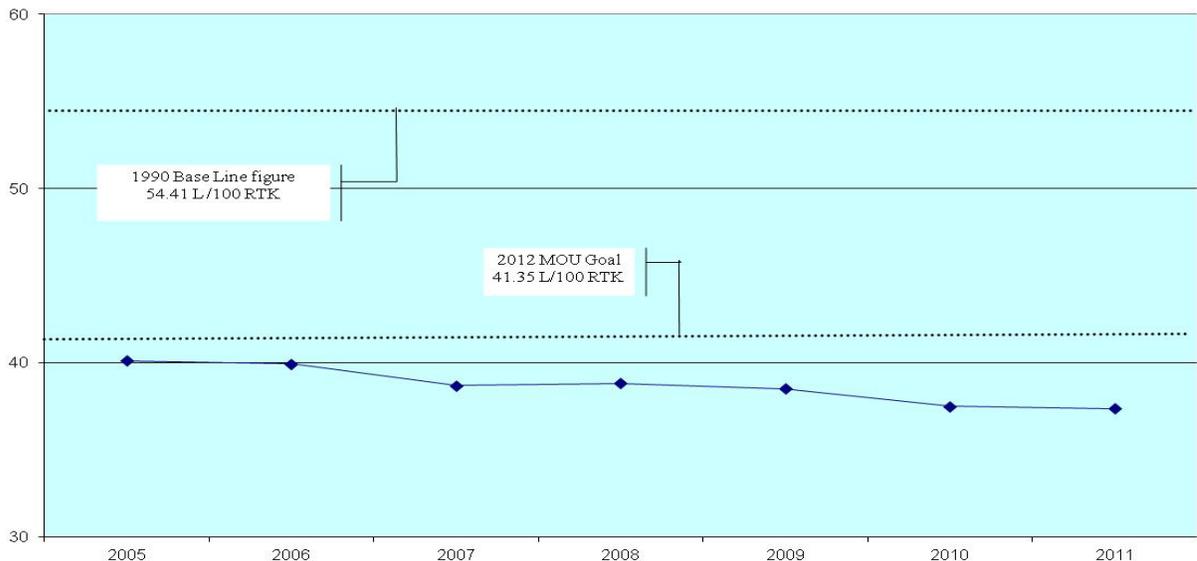
Cargo Available tonne-kilometres (millions)	6,534.28	6,246.53	5,874.89	6,103.30	5,438.18	5,203.26	4,995.29
Passenger Available-tonne kilometres (millions)	15,933.27	14,829.38	14,749.23	14,302.01	13,843.30	13,107.06	12,403.30
Total Available tonne-kilometres (millions)	22,467.55	21,075.91	20,624.12	20,405.31	19,281.48	18,310.32	17,398.58
Available tonne-kilometres per Litre	4.07	4.06	4.28	4.04	3.86	3.82	3.83
Litres per 100 Available tonne-kilometres	24.59	24.61	23.37	24.77	25.92	26.18	26.12
CO₂e emissions Tonnes (million)	14.12	13.26	12.32	12.92	12.77	12.25	11.61
CO₂e emissions gm per Revenue tonne-Kilometre	954.8	958.3	984.0	992.3	988.8	1020.5	1025.6
CO₂e emissions gm per Available tonne-Kilometre	628.6	629.1	597.2	633.1	662.5	669.2	667.6

2.6 Efficiency Improvements

This report for the NACC member airlines covers the year 2011 and contains revised data for the years 2005 through 2010 inclusive. The data shows the following:

- The 2011 achieved efficiency of 37.36 litres per 100 revenue tonne-kilometres (L/100 RTK) was an improvement of 0.4% over the achieved efficiency in 2010.
- Under the MOU, a cumulative reduction of 6.6% was targeted for the period 2005 through 2011. The data indicates that the efficiency improvement in litres per 100 revenue tonne-kilometres for the period was 6.9% or an average of 1.15% per year.
- The 2011 achieved efficiency of 37.36 litres per 100 revenue tonne-kilometres exceeded the 2012 target of 41.35 set out in the MOU by 9.7%.
- The 2011 achieved efficiency of 37.36 litres per 100 revenue tonne-kilometres was a 31.3% improvement compared to the 1990 baseline, for an average improvement of 1.5% per year.
- Over the period 2005 to 2011 the total, combined passenger and cargo, revenue tonne-kilometres (RTK) grew by 30.59% while the total fuel consumption for the period rose by only 21.59%.
- The efficiency gains over the period 2005 through 2011, measured in litres per 100 revenue tonne-kilometres, resulted in a saving of 1.34 billion litres of fuel or a reduction of 3.42 mega tonnes of CO₂-equivalent (CO₂e).

HISTORICAL REVIEW 2005 - 2011
Litres per 100 Revenue Tonne-Kilometres



3. Activities Supporting the MOU

3.1 Activities Undertaken by the NACC

The NACC and its member carriers are committed to delivering environmentally responsible air travel and working to continually reduce the industry's environmental impact and aggressively curtail its emissions. To demonstrate to Canadians that the NACC airlines are committed to finding cost-effective solutions for better environmental performance, the association has a standing Environment Subcommittee. Through this committee, the member carriers are working towards:

- developing a principled industry position on environmental issues;
- informing governments and the public on significant environmental improvements made by the airlines;
- demonstrating the airline industry's commitment to the environment.

The committee also ensures that its carriers have a forum to jointly address mutually applicable issues. One important issue was the commitment, support and participation of its member airlines with regard to the MOU. The NACC made available the resources to facilitate the generation of this report and ensured that all of its members participated in the data gathering. It also ensures that the Environmental Subcommittee has engaged in dialogue with Transport Canada and Environment Canada.

In 2009, the NACC launched its association web site, which outlines its commitment to reducing its environmental impact. In October 2011, the NACC released a report entitled *Improving Aviation Efficiency and Reducing Emissions: A NACC Framework*, as part of its continued efforts to improve aviation efficiency and its environmental impact. The report is found on the NACC web site.

The NACC has promoted its members' participation in the MOU and will continue to do so with Canada's Action Plan.

3.2 Activities Undertaken by NACC Members

Certain NACC members are also members of other industry associations such as the International Air Transportation Association (IATA), Airlines for America (A4A), and the Regional Airline Association (RAA). Participation in the environmental committees of these other industry associations allows respective NACC carriers to keep abreast of environmental issues internationally and in the United States of America. It also allows them to participate in international forums such as those for alternative fuels and in the

ICAO Committee for Aviation Environmental Protection (CAEP) and its various working groups and task groups.

NACC members continue to invest in their respective fleet renewal programs, which will continue to introduce new, more efficient aircraft into their fleets. The carriers also continue to institute policies, procedures, programs and projects that impact their operations by either improving efficiency or reducing fuel burn and hence reducing CO₂ emissions. The ongoing benefits fall into the following categories:

- Aircraft modifications and maintenance
- Aircraft operation
- Cargo and baggage operations
- In flight/catering

A summary list of activities undertaken and previously reported in MOU reports is provided below. Because of the collective nature of the reporting, these activities are not attributed to specific airlines.

3.3 Aircraft Modifications and Maintenance

Various physical modifications were made that will have an effect on the overall carbon footprint of the operator and included:

- Ozone Scrubbers: One member company completed the installation of Ozone Scrubbers on an aircraft fleet, which eliminated flight level restrictions and allows the aircraft to fly at higher, more optimum altitudes, thus reducing fuel burn and providing ongoing benefits.
- Engine modification: One member company is currently installing EP (Enhanced Performance) kits on one of its engine types to improve fuel efficiency.
- Aircraft drag: As part of their regular aircraft maintenance programs, member companies inspect aircraft structures to identify and minimize aerodynamic drag to improve fuel efficiency. One company initiated a project to study the modification of NACA (National Advisory Committee for Aeronautics) fuel vents to reduce drag.
- Aircraft tires: Two member companies have installed lighter-weight tires on certain models of their aircraft, providing ongoing benefits.

- Engine washing: All member companies have instituted programs for the regular internal washing of engines to improve engine performance, resulting in better fuel efficiency characteristics of the engine. This can provide ongoing fuel efficiency benefits of up to 1.2 per cent.

3.4 Aircraft Operation

Some NACC member companies made changes in the areas of training, flight planning/aircraft dispatch and aircraft operating procedures in order to reduce fuel consumption and therefore emissions. Implemented changes or processes continue to provide ongoing benefits. Some of these changes and ongoing activities include:

Training

- Presenting and explaining Cost Index (the optimization of time cost and fuel cost) in recurrent training classes.
- Development and implementation of a fuel conservation training program for pilots and key personnel involved in aircraft operations.
- Providing additional fuel guidance to dispatch personnel based on historical operations.

Flight Planning/Aircraft Dispatch

- Flight planning systems have been purchased, introduced or refined to increase efficiency and reduce fuel costs through improved calculations of taxi, holding and contingency fuel and optimization of flight profiles, aircraft speed and cost index.
- Continued focus on No Alternate IFR (Instrument Flight Rules) planning (NAIFR) as allowed by regulations, which reduces the amount of excess fuel carried, is an ongoing day-to-day activity.
- The refinement (removal and/or adjustment) of all fuel burn factors imbedded in the flight plan BURN calculation.
- The implementation of an additional descent profile on an aircraft fleet, which allows the flight planning system to select the optimum speed based on ambient conditions (weight/temp).
- Dispatch route optimization is an ongoing day-to-day activity.
- The development and implementation of Required Navigation Performance and Area Navigation (RNP RNAV) departures and approaches.
- Continuing work with Nav Canada on Airspace Redesign Projects.

- Implementation of Smart Operational Empty Weight Management (removing unnecessary equipment from the aircraft to reduce weight).
- Creating a Fuel Efficiency Key Performance Indicator in combination with Aircraft Performance Monitoring Program.
- Refinement and implementation of aircraft climb power settings, which enables the aircraft to climb faster to cruise altitude, reducing overall fuel consumption.
- The continual refinement of aircraft cruise speeds to optimize fuel burn.
- The optimization of aircraft descent speeds to minimize fuel consumption while accommodating air traffic control requirements.
- Improved loading procedures for cargo and passengers to improve Centre of Gravity (CG).
- The institution of a program that greatly improves the accuracy of determining aircraft weight and including actual weighing of aircraft as required during regular maintenance checks.
- Refining the calculation for determining the amount of alternate fuel carried for close-in alternate airports to ensure it reflects actual flight distance. This ensures aircraft do not carry fuel exceeding the regulatory requirement.
- The refinement of Cost Index to determine the most economical speed for each route/city pair is ongoing. This determines the most economical speed for operation of the aircraft, taking into account the cost of time versus the cost of fuel for each route operated.
- Initiatives to improve payload planning have been completed.
- Processes for conducting internal Fuel Audit to regularly examine all areas of the operation have been implemented to verify effectiveness of fuel saving policies and procedures.
- A process to provide more accurate taxi fuel to allow for improved flight planning has been implemented and updating of data is ongoing.
- Processes to more accurately determine the zero fuel weight for aircraft have been implemented and more accurately determine the true weight of the aircraft, including passengers and cargo, with a higher level of accuracy over previous methodology.
- A process has been implemented to optimize the location of the centre of gravity (CG), through a better distribution of passengers in the cabin whenever the load factor is below 90-95%. CG location has a direct influence on fuel burn during the climb and descent portions of the flight.
- A process has been implemented to reduce gate arrival delays. This will reduce the amount of time arriving aircraft are held off gate, thereby reducing fuel burn.
- The use of ground-based power and air conditioning wherever possible to reduce APU usage.

Aircraft Operating Procedures

All of the following aircraft operating procedures have been incorporated into various members' standard operating procedures.

- Employing single engine taxi-in and taxi-out procedures when conditions permit.
- Limiting APU usage on ground to 10 minutes on arrival and 20 minutes before departure at North American and European destinations.
- Reducing fuel consumption during the first 3000 feet of climb by using ICAO's NADP2 take-off climb procedure.
- Utilizing Econ climb profile, which reduces fuel burn by accelerating to en-route climb speed as soon as flap retraction is complete.
- Utilizing idle reverse and braking on landing rather than selecting maximum reverse thrust.
- Whenever possible, use of only one air conditioning pack during operation of the APU on the ground to reduce fuel burn.
- Introduction of a reduced APU operations procedure aimed at cutting fuel consumption and per-hour lease costs.
- Utilizing ground power units wherever possible to reduce APU usage.

3.5 Cargo and Baggage Operations

- One member completed the replacement of wooden skids with lighter composite skids. Previously it had switched from aluminum-constructed cargo containers to ultra light Kevlar containers. The member has also developed and instituted a program to maximize the number of bags per baggage container, thus reducing the number of baggage containers carried per flight. All of these activities provide ongoing benefits through weight reductions.
- Another member also initiated a project to switch from aluminum-constructed cargo containers to ultra light Kevlar containers.
- One member modified its loading procedures to optimize the use of bulk holds on its aircraft.

3.6 In-flight/Catering

NACC member companies continue to study and implement changes to their In-flight/catering services in order to reduce the overall weight of the aircraft, thus reducing fuel consumption and providing ongoing benefits. The following are some of the changes made or projects initiated by a least one member carrier:

- Optimizing the amount of potable water carried on their flights. Historical usage data per route was analyzed and now water carriage requirements are based on specific routes.
- Optimizing the carriage of service items on board the aircraft. Weight savings are achieved by reducing return catering, matching catering provisioning with actual requirements and eliminating/minimizing items such as headsets, amount of ice, magazines, newspapers and substituting lighter-weight products wherever possible.
- Removing the ovens from the aft galley of one single-aisle aircraft fleet as well as infrequently used trash compactors from one wide-body aircraft fleet.
- Initiating a project to study replacing existing galley carts with new lighter-weight units.
- Conducting periodic audits to monitor the usage of all catering items and make adjustments to avoid carrying excess quantities.

4. Conclusion

The 2011 data and the historical data for the years 2005 through 2011 inclusive demonstrate the commitment of NACC members to achieving the targets of the June 29, 2005 MOU. For the period 2005 through 2011, the carriers achieved an efficiency improvement in Litres/100 RTK of 6.9% or an average of 1.15% per year. In 2011 they achieved a 31.3% improvement compared to the 1990 baseline, for an average improvement of 1.5% per year, and they exceeded the MOU target for 2012 by 9.7%. Over the period 2005 through 2011, the revenue tonne-kilometres for the carriers grew by 30.59% while their total fuel consumption rose by only 21.59%. The efficiency gains over the period 2005 through 2011 resulted in a saving of 1.34 billion litres of fuel or a reduction of 3.42 mega tonnes of CO₂-equivalent.

The NACC members have demonstrated their commitment to ensuring the continuous improvement of their operating efficiency in order to reduce the emissions of GHG from their flights worldwide. The fuel efficiency improvements have come through investment in fleet renewal programs and the institution of policies and procedures that impact operations, improving efficiency and reducing fuel burn.

The NACC fully supports and is a proud signatory to Canada's Action Plan to Reduce Greenhouse Gas Emissions from Aviation, which was developed with the Government of Canada and the Canadian aviation industry. The Action Plan was released on June 4, 2012 and sets an ambitious goal to reduce GHG emissions from both domestic and international operations, which is expected to contribute to global efforts to minimize aviation's carbon footprint.