

## Sandy Paws' Christmas Eve Carbon Footprint Calculation

### Assumptions and Data

<u>General Data and Assumptions</u>		
Standard Conditions		
Temperature	60	°F
Pressure	14.696	psia
Density of air @ STP	0.0763	lb/ft <sup>3</sup>
<u>Travel Data and Assumptions</u>		
Sandy/Sleigh drag coefficient	1.13	dimensionless
Sandy/Sleigh aerodynamic reference area, fully loaded	57,600	ft <sup>2</sup>
Sandy/Sleigh aerodynamic reference area, empty	400	ft <sup>2</sup>
Average initial elevation at each liftoff	500	ft
<u>Continent-to-continent travel (Trips to six continents - Antarctica excluded)</u>		
No. of legs	7	(include. trip home)
Average distance / leg	8,000	miles
Cruising altitude	35,000	feet
Cruising speed	550	mph
Temperature @ altitude	-50	°F
Pressure @ altitude	3.47	psia
<u>Hub-to-hub travel within a continent (average per continent)</u>		
No. of legs	250	
Average distance / leg	850	miles
Cruising altitude	20,000	feet
Cruising speed	450	mph
Temperature @ altitude	-20	°F
Pressure @ altitude	6.76	psia
<u>Local travel within a 'hub' (average per hub)</u>		
No. of legs	75	
Average distance / leg	200	miles
Cruising altitude	5,000	feet
Cruising speed	250	mph
Temperature @ altitude	48	°F
Pressure @ altitude	12.23	psia

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	<u>Load Data and Assumptions</u>		
	Population of earth	6.71E+09	people
	Percent < 13 years old	22.5%	
	Average weight, each gift	7.95	lbs
	Empty vehicle weight (including Sandy / "Reindeer")	30	tons (excluding fuel)
	Percent of population, by continent		
	Leg 1 - Asia	60.4%	
	Leg 2 - Australia (Oceania)	0.5%	
	Leg 3 - Africa	14.5%	
	Leg 4 - Europe	10.9%	
	Leg 5 - South America	8.6%	
	Leg 6 - North America	5.1%	
	<u>Power Plant Data and Assumptions</u>		
	Thermal efficiency	26.8%	
	Fuel by-pass directly to atmosphere	6	SCF/mile
	Specific gravity, fuel (CNG)	0.63	
	Composition of fuel		
	Methane	85%	
	Ethane	15%	
	BTU content	1124	BTU/SCF