Community and Transportation

An Analysis of Roundabouts as a Solution

Presentation by Per Gårder, PhD, PI

• Professor at the University of Maine
• Lives in Bangor, Maine
• Bangor roundabouts?
• Bangor and Newtownards are the 4th and 7th largest towns in Northern Ireland, with a combined population of around 80,000
  – Compare Burlington, VT: 39,000 (206,000)
• What do we know about other countries?
• What can we learn from them?

Montpelier / Montpellier, France

May 2009 blog: “Red Wine, Sun, Mountains and an Accident”

Luckily, I managed NOT to drop the bike, although he had given me a good push which catapulted me into the roundabout. Should have been warned, a few days earlier, I had a near-crash…. What happened ? The funny French put pedestrian crossings at the exit of each roundabout, so I had to stop as the car in front of me had to let a lady cross the road and the guy behind me didn’t realize there is stationary traffic on the roundabout. Roundabouts in France are tricky anyway, the French don’t seem to have understood the principle, scary sometimes
1983 to 2003, > 26,000 roundabouts built in France
Since 2003, approximately 1,000/year
90% of French roundabouts single lane, volumes < 2,000 vph

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**Boulevards:**
A Study of Safety, Behavior, and Usefulness
Allan B. Jacobs
Yordan Y. Rofé
Elizabeth S. Macdonald
UC-Berkeley, 1994

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<table>
<thead>
<tr>
<th>Intersection</th>
<th>Volume (24/7/1994)</th>
<th>Accidents Per Year</th>
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<th>Pedestrian Accidents Per Year</th>
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Place de l’etoile
Illinois: Planned for construction in 2009

Not just safety, mobility too

There are several bicycle-only roundabouts (bikeabouts) at the University of California—Davis. A couple are shown here.
Aesthetics

Swedish “ AAA” : Lemon Award
Swedish “DOT” : Safety Award

Carmel, Indiana

Two die at Carmel roundabout

Oct 1, 2007 05:59 PM EDT

Carmel - Police say two young men died early Monday morning at a roundabout in Carmel.

It happened around 3:00 am at Westfield Blvd. and 96th Street. Police found a Honda Accord in the center portion of the traffic roundabout. Police say the car crashed into the concrete retaining wall.

Fernando Hernandez-Lopez, 22, of Carmel, and Carlos Herndandez-Sanchez, 20, of Indianapolis, were pronounced dead at the scene.

The cause of the accident is still under investigation
Safety depends on road design, vehicle mix, and road-user behavior.

from England (‘flipped’) “one of the safest countries in the world”

Note: no crosswalks but… no yield signs, minimal striping

1=>2 lanes
Three ‘signs’ telling people to go counterclockwise

Also note illumination of crosswalk

Figure 6: Pedestrian deaths by different impact speed of car (SNRA)
What about rear-end?
What about angular crashes?

The boom in roundabouts—Merry-go-round
Aug 9th 2007
From The Economist print edition

• America may be sluggishly on general road-building, but it is experiencing a boom in modern roundabouts, which (for those who have not yet met them) do the job of any ordinary four-way, stop-sign or traffic-light crossroads. They are more efficient and safer ....

• Although exact statistics are hard to come by, the Insurance Institute for Highway Safety (IIHS) estimates that America has 1,000 modern-style roundabouts. Britain has 10,000, Australia 15,000 and France 20,000 1. Nowadays America is adding perhaps 150 to 250 new roundabouts a year, not counting mini-ones in suburbs....

• The arguments for roundabouts are strong. There are no costly traffic lights to build or maintain. Unless something is coming round, cars need not stop, so congestion is reduced and fuel is saved. Most important is safety. About 45% of all crashes in America occur at crossroads, often because of misjudged left turns. ... A 2001 study by the IIHS found that roundabouts have 80% fewer crashes with injuries than ordinary intersections. Other research also points to big reductions.

• So roundabouts may be a small reason why America’s roads are slowly getting safer. Last year injuries in motor-vehicle crashes were down an estimated 6%. Even so, drivers are often sceptical. "We lose far more roundabouts that could have been built, because of city councils or a trucking company," says Mr Walsh....

1 France had over 26,000 already in 2003 according to French sources. The US had over 1600 in the summer of 2007
US Roundabout Numbers?
Nationwide around 1600 in the US, March 2006. Now 2000+

States with ‘many’ modern roundabouts:
• Colorado: 200+(2008), 160+ (summer 2005)
  – 42 in City of Colorado Springs (pop 460k) by late ’07
• Maryland: 160 (November, 2008)
• Florida: 150+ (June 2006)
• Utah: 150+ (Nov 2008)
• Washington (state): 115+ (Nov. 2008)
  – The City of Kennewick: 17 roundabouts. Seattle area c. 100 + 100’s of minis
• Virginia: 64 (Nov 2008)
• Iowa: 32 (Nov 2008)
• Kansas 38 (March 2006) (22 in Kansas City area)
  +7 under construction; 23 designed; and 23 in the planning stage

Source: Typically respective DOT

But: Time Magazine September 4, 2008
You Want A Revolution?
Carmel, Ind., is driving in circles. Since 2001, the Indianapolis suburb has built 50 roundabouts, those circular alternatives to street intersections that have become a transit fixture in much of the rest of the world. Because roundabouts force cars to travel through a crossroads in a slower but more free-flowing manner—unlike traffic circles, roundabouts have no stop signals—in seven years, Carmel has seen a 78% drop in accidents involving injuries, not to mention a savings of some 24,000 gal. of gas per year per roundabout because of less car idling. “As our population densities become more like Europe’s,” says Mayor Jim Brainard, who received a climate-protection award this year from the U.S. Conference of Mayors, “roundabouts will become more popular.”

About 1,000 roundabouts have been built in 25 states, and research bears out the benefits to states like Kansas, where the new design has produced a 65% average drop in vehicular delays, according to a recent Kansas State University study. Most roundabouts are also more aesthetically pleasing and cost much less to construct than stoplight intersections. The problem is teaching Americans how to navigate them. (Folks, cars entering a roundabout yield to those already in it.) But the heightened anxiety people feel in roundabouts makes them drive more carefully and remember that intersections are dangerous places. And as Tom Vanderbilt notes in this summer’s best seller Traffic, “The system that makes us more aware of this is actually the safer one.”
Preliminary Evaluation of 14 Roundabout Installations

North Carolina

Another 15 roundabouts built on state highways and two on municipal roads in North Carolina in the three-year period 2004-2006

All 14 built as single-lane roundabouts though several with by-pass lanes

<table>
<thead>
<tr>
<th>Safety Evaluation Group</th>
<th>Traffic Engineering and Safety Systems Branch, North Carolina Department of Transportation</th>
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<tbody>
<tr>
<td>Group 1: Mainline Speed Limit As or Below 35 mph (Prior Control - Stop Sign)</td>
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<tr>
<td>Total Crashes Using None Before and After Analysis: -41% +/- 14%</td>
<td></td>
</tr>
<tr>
<td>Total Crashes Using Before and After Analysis With Traffic Adjustment: -54% +/- 11%</td>
<td></td>
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</tbody>
</table>

| Group 2: Mainline Speed Limit Above 35 mph (Prior Control - Stop Sign) |
| Total Crashes Using None Before and After Analysis: -47% +/- 15% |
| Total Crashes Using Before and After Analysis With Traffic Adjustment: -48% +/- 15% |

Also, the single location in Group 3 (with Prior Control - Signal) experienced a 74% reduction in total crashes. The preliminary results demonstrate that all three groups of roundabouts locations appear to have had a substantial reduction in the frequency of crashes from the before to the after period.

Windham, me
Maine

New and Safer Roundabout in Sanford at the Route 4/Route 109 Intersection

Gorham's New Roundabouts

Rte. 112/25

Bypass / Rte. 112

A

Rte. 114

Bypass / Rte. 112

Rte. 204

B

Rte. 114

Bypass / Rte. 112

C
Letters to the Editor

Traffic circles pay off

The Maine Department of Transportation and Dana Wardwell of the Bangor Public Works Department deserve our thanks for the recently completed traffic circle connecting Maine, Vermont and Texas Avenues.

Traffic circles keep cars moving while calming speeds. They also reduce emissions produced by braking to and accelerating from a dead stop at a red light, and they all but eliminate the useless emissions produced by traffic at a standstill waiting for lights to change or gaps between long lines of cars to open.

Having lived and driven extensively in England where traffic circles are much more numerous than intersection lights, I find it remarkable how much more efficiently and safely traffic moves there. And, let's face it, there is nothing more irritating than having to stop every few hundred yards to wait in line for the next traffic light to turn green, and nothing more dangerous than trying to make a left turn across busy roads. Traffic circles solve these problems.

Cliff Guthrie
Bangor
Traffic-calming circles

Seattle, Washington has 400+ minis, at a cost of approximately $6,000 each => 1.94 to 0.18 collisions/year per intersection, Area wide (block): about 67% improvement

Clearwater, Florida

South Portland, Maine, Mid 1990's
Austin, Texas

La Jolla Blvd, San Diego (Bird Rock Neighborhood): Access management (medians) and roundabouts (5) in a series. RBT photo from week of Dec 8, 2008. Before shot from April 2006. Considered by local residents and businesses an outstanding success. Design and construction was a combination of local developers, Michael Wallwork and City of San Diego. About 22,000 AADT. -Philip Demosthenes

After—the median is continuous. Pedestrian crossings at the roundabouts which are at each block. Five roundabouts in 3,400 feet, approx. 600’ between them. Note: No U-turn sign in before situation.
The Magic Roundabout, Swindon, UK

Colchester Ring

First minis installed at a four-arm roundabout crossroads at Colchester in 1972

Ulster, NY.
600 ft => 200 ft diameter
Palmas, Tocantins, Brazil

(Palmas (lit. Palm trees) is the capital of the Brazilian state of Tocantins. It was founded in 1990. In 2008, the city had 184,010 inhabitants. It has an area of 2475 km$^2$. Distance between roundabouts in grid, 500-700 meters.

Use Google Maps or Earth and go to Palmas, Tocantins, Brazil. What you see here is just a small part of the roundabout city.
Dubai, 2009

small \quad bigger \quad biggest

Note: no striping
Long Beach, California

The flared entries of modern roundabouts give them a high capacity in a compact space. At this multilane entry, a vanes island between the second and third lanes deflects the trajectories of vehicles in the outer lanes.
Auburn Mall, Maine. North roundabout, March 2008

Biddeford, Maine, March 2008
Note right-turn only lane. First concern: some people go straight from that lane => sideswipes. Second concern: what does solid line mean? Prioritywise? See next slide.
Sidewalks? Pedestrians...

What about setbacks?

Left turn delay from minor roadways (avg. 20sec)

Speed of traffic on Wilson Street (avg. 75km/h in a 50km/h zone)

Traffic growth (at the time 9700 ADT on major, 5677 ADT on minor)

Safety: 31 crashes 1988-2002, 10 injuries, 10 angle collisions last 5 years before reconstruction

http://www.roundabouts.ca/orc_webcam.htm
50 mph approach, don't use signals
Estimates of safety effect for groups of conversions

<table>
<thead>
<tr>
<th>Jurisdiction/Control Before/ # of lanes</th>
<th>Urban/Rural</th>
<th>Single/Or Multi-Lane</th>
<th>Number Of conversions</th>
<th>Crash Severity</th>
<th>Count of Crashes in Period after conversion</th>
<th>Crashes expected in after period without conversion (standard deviation)</th>
<th>Index of effectiveness (standard deviation) and percent reduction in crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL/Signalized</td>
<td>Urban</td>
<td>Single</td>
<td>3</td>
<td>ALL</td>
<td>106.7(10.5)</td>
<td>0.68(0.16)</td>
<td>72%</td>
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<td></td>
<td></td>
<td>2 multi</td>
<td></td>
<td>Injury</td>
<td>12.0 (2.3)</td>
<td>0.32(0.17)</td>
<td>58%</td>
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<td>Maryland/Unsignalized</td>
<td>Rural</td>
<td>All</td>
<td>5</td>
<td>ALL</td>
<td>105.2(18.4)</td>
<td>0.42(0.07)</td>
<td>59%</td>
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<tr>
<td></td>
<td></td>
<td>Single</td>
<td></td>
<td>Injury</td>
<td>29.9(4.7)</td>
<td>0.16(0.09)</td>
<td>82%</td>
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<tr>
<td>Other Unsignalized (excluding Colorado)</td>
<td>Urban</td>
<td>All</td>
<td>9</td>
<td>ALL</td>
<td>112.6(10.2)</td>
<td>0.39(0.07)</td>
<td>81%</td>
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<td></td>
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<td>Single</td>
<td></td>
<td>Injury</td>
<td>16.6(2.6)</td>
<td>0.23(0.12)</td>
<td>77%</td>
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<tr>
<td>Colorado/Unsignalized</td>
<td>Urban</td>
<td>All</td>
<td>7</td>
<td>ALL</td>
<td>153.8(12.4)</td>
<td>0.85(0.10)</td>
<td>15%</td>
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<tr>
<td>Colorado/Signalized</td>
<td>Urban</td>
<td>Multi</td>
<td>2</td>
<td>ALL</td>
<td>101.9 (9.9)</td>
<td>0.69(0.10)</td>
<td>40%</td>
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Privacy
Raw data before & after analysis
‘all’ U.S. roundabouts in 1999

<table>
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<tr>
<th></th>
<th>Before</th>
<th>After</th>
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<tr>
<td>Total</td>
<td>345</td>
<td>185</td>
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<td>Injury crashes (incl. possible)</td>
<td>121</td>
<td>22</td>
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<tr>
<td>Definite injury</td>
<td>62</td>
<td>14</td>
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<tr>
<td>Incapacitating injury crashes</td>
<td>27</td>
<td>3</td>
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<tr>
<td>Fatal crashes</td>
<td>3 (2 in cars, 1 bicyclist)</td>
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Before 272 million vehicles entered
After 307 million vehicles.

Crash rates (per million entering vehicles)

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<th>Injury crashes includ. possible injury</th>
<th>Injury crashes excluding possible injury</th>
<th>Incapacitating injury crashes</th>
<th>Fatal crashes</th>
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<td>Before</td>
<td>1.27</td>
<td>0.44</td>
<td>0.228</td>
<td>0.0993</td>
<td>0.011</td>
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<td>After = roundabout</td>
<td>0.60</td>
<td>0.07</td>
<td>0.046</td>
<td>0.0098</td>
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### International Comparison

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<th>Country</th>
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<td>Australia</td>
<td>high volume</td>
<td>0.80</td>
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<td>rural</td>
<td>0.20</td>
<td>0.11</td>
<td>0.04</td>
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<td>Denmark</td>
<td>urban</td>
<td>0.18</td>
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<tr>
<td>Norway</td>
<td>3-leg*</td>
<td></td>
<td>0.03</td>
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<tr>
<td>Norway</td>
<td>4-leg*</td>
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<td>0.05</td>
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<tr>
<td>Sweden</td>
<td>50 km/h, low volume**</td>
<td>0.35</td>
<td>0.14</td>
<td>0.03</td>
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<td>50 km/h, high volume**</td>
<td>0.64</td>
<td>0.14</td>
<td>0.09</td>
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<td>Sweden</td>
<td>70 km/h, low volume**</td>
<td>0.37</td>
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<tr>
<td>Sweden</td>
<td>70 km/h, high volume**</td>
<td>0.67</td>
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<td>The U.K.</td>
<td>30–40 mph, small</td>
<td>0.37</td>
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<td>50–70 mph, small</td>
<td>0.29</td>
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<td>30–40 mph conventional</td>
<td>0.21</td>
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<td>50–70 mph conventional</td>
<td>0.29</td>
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</table>
Approach lanes: 4.5 meters wide
Exit lanes are 5.5 meters wide
Circulating lane: 5 meters wide.
Central island: 7-meter diameter
Truck apron: 21 x 23 meters.
Raised 40 mm (60 mm) with a 1:1 bevel

**Design speed** around 29 km/h (18 mph)
Acceptable range?
25 to 37 km/h (16 to 23 mph)
40 km/h (25 mph) at entry (no apron encroachment)
29 km/h (18 mph) circulating
43 km/h (27 mph) when exiting

Northbound left turn 26 km/h (16 mph).
*Southbound* direction, entry 43 km/h (27 mph)
Circulating speed for through traffic 30 km/h (19 mph)
Exiting speed 40 km/h (25 mph). Right turn 26 km/h (16 mph)
Rt. 237 eastbound: 40 km/h (25 mph) at entry
Through traffic circulating: 29 km/h (18 mph)
and an exit speed above 40 km/h (25 mph).
Right-turning vehicles: 40 km/h (25 mph).

Westbound traffic: theoretical entry speed >100 km/h (60 mph)
Straight: 31 km/h (19 mph) while circulating
Right turn: 56 km/h (35 mph).
Left turn, circulating speed 23 km/h (14 mph)

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<tr>
<th>Year</th>
<th>No. of months</th>
<th>No. of fatal crashes</th>
<th>Incapacitating crashes</th>
<th>Non-incapacitating crashes</th>
<th>Possible injury crashes</th>
<th>Property damage only</th>
<th>Sum</th>
<th>Crashes per year</th>
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<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>R</td>
<td>SUM</td>
<td>54</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td>3.11*</td>
</tr>
</tbody>
</table>

*All three 1997 crashes occurred within a few months of reconstruction. Excluding 1997 gives 2.75 crashes per year

What happened later?
Crash numbers up a bit, but not a significant difference…
14 crashes in 54 months => 0.62 per million entering vehicles.

Poisson distribution => 5% chance < 0.40 and 5% risk > 0.95

<table>
<thead>
<tr>
<th>All</th>
<th>Injury crashes including possible injury</th>
<th>Injury crashes excluding possible injury</th>
<th>Incapacitating Injury crashes</th>
<th>Fatal crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gorham</td>
<td>0.62 (0.40-0.95)</td>
<td>0.09 (0.04-0.27)</td>
<td>0.00 (0.00-0.23)</td>
<td>0.00 (0.00-0.23)</td>
</tr>
<tr>
<td>All roundabouts</td>
<td>0.60</td>
<td>0.07</td>
<td>0.046 (0.0098)</td>
<td>0.000 (0.00-0.23)</td>
</tr>
</tbody>
</table>

Signalized, Maine: 0.8 crashes per million entering vehicles

VTI model: flow => crash rate: 0.51 = 12 crashes/54 months with 0.13 injuries/crash, i.e. 1.5 injured persons over this time. Observed no real injuries but three possible injuries

TRL model: 0.55 injury crashes per year => 2.5/54 months. One serious injury every thirteen years. One fatality every 422 years.

1 2009 analysis shows that there has been one serious injury so far, in 11 years
Splitter island in westbound direction projected forward leads to the edge of the center island rather than to the edge of the truck apron.

Kansas study

“Only Clearwater's first roundabout was proposed by ‘government.’ All the following 14 roundabouts were proposed by citizens who went on to garner very strong citizen support. City staff did zero (-0-) selling for those 14 roundabouts. Thirteen of the 14 roundabout proposals came out of citizen charrettes sponsored by the City. For Clearwater, citizen charrettes = roundabouts = success. Clearwater retained Dan Burden of Walkable Communities as the charrette provider. If you're getting nowhere with your current approach to achieving consensus, you might want to consider trying citizen charrettes lead by a very good provider. -Ken”

(Ken Sides, PE, City of Clearwater)

Little Falls
Construction cost: $169,554
Total cost: $259,682
Gas consumption
Air Quality

Emissions from a stopped vehicle are approximately 4.5 times greater than a vehicle moving at 5 mph

June 2006: A roundabout interchange completed in NY, at Exit 12, I-87 (south of Saratoga Springs) accompanied by three more along Rt-67

Travel time along the Route 67 corridor in Malta has been reduced
Safety problem at one location, Intersection between Routes 9 & 67
First four months, see =>

GREEN BAY (WFRV News August 2009) - Ahead of the upcoming Highway 41 expansion project through Winnebago and Brown counties, the Wisconsin Department of Transportation is beginning an educational push on roundabouts. The Highway 41 project will contain 44 multi-lane roundabout intersections: 28 in Brown County and 16 in Winnebago County. "They're going to be placed at the ramp terminals, the on and off ramps, and also at some of the nearby intersections that feed traffic into the system," said Kris Schuller, Communications Director for the DOT's Highway 41 Expansion Project. "It's just a safer way to move traffic."
Double laner with standard (excellent) striping

Or Turbo striping

From: TURBO CIRCUITS: A WELL-TRIED CONCEPT IN A NEW GUISE
L.G.H. Fortuin and P.J. Carton
Board of Economy and Transport
Province of South Holland
Clearwater Beach Roundabout

From TURBO CIRCUITS:
A WELL-TRIED CONCEPT IN A NEW GUISE
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P.J. Carton
Board of Economy and Transport
Province of South Holland

Designed for ADT of 39,500 on Causeway Boulevard.

On Friday, March 3, 2000, 58,456 vehicles passed through the roundabout. And 4,309 pedestrians used the intersection that same day (12-hr count)

6 months before, 262 = 524 per year. 18 months after, 3 crashes = 2 per year. Reduction = 522 per year. Percent reduction = 99.6%
Keene Sentinel's  The Keene Roundabouts Are Finished
By Donna Moxley, Tuesday, October 9, 2007.

Keene residents are driving around in circles a lot lately.
After years of debate over the best way to solve the city’s traffic problems, two roundabouts have finally opened to traffic there. **And even the critics at least seem satisfied with how they’re working.**

The last full day of paving at the new roundabout on Route 101, Route 10 and Winchester Street signaled the end of a decade-old struggle.

…the turning from, say, the Keene bypass onto Route 10 is now a breeze. “Everybody’s very satisfied with it. It was a difficult project but the group came through, they built it fast.” That’s Ron Smalloff, one of the state engineers on the project. His roundabout was nearly done almost a year ahead of schedule – but it was a long time coming. And during that time, it could easily have become a highway overpass with huge, trumpet-shaped exit lanes. But a group called Concerned Cheshire Citizens fought that plan. They argued that it encroached on wetlands. And with the help of lawsuit filed by the Conservation Law Foundation, the group won. That victory led to this cheaper, more circular plan. Bob King is a founding board member of Concerned Cheshire Citizens. He says: “Boy at one point they had 11 lanes across in one location and … just a huge, huge plan, and it was an expensive plan, it was a 66 million dollar plan.” King said he’s happy with the result of his group’s fight. “It seems to be working very well and it’s passing traffic smoothly and it’s safe and it looks good and came in at a price many millions less than the huge overpass and single-point diamond interchange that the DOT had planned.”

Few deny that the intersection is working – not even Randy Filiault, a city councillor who openly opposed its construction.

“Even the Keene, N.H., Bypass Expansion fight (Ourston, Crown, Garder and myself have all at one time or another been a part of this one, all on behalf of the Concerned Cheshire Citizens group) has a resistant NHDOT ready to build one roundabout as a sop to opponents of the bypass expansion.” Tony Redington
Keene - NH 101 at Winchester Street
Too many crashes!

Also watch
http://www.youtube.com/watch?v=X8ofykWqpXk&feature=channel_page
Rotondes

Figure 39 Typical Scandinavian Roundabout

Redrawn by Per Garder
(Virginia) HOUSE JOINT RESOLUTION NO. 594

Encouraging the Department of Transportation to construct more roundabouts instead of signalized intersections.

Agreed to by the House of Delegates, February 1, 2003
Agreed to by the Senate, February 13, 2003

WHEREAS, modern roundabouts are designed to control traffic flow at intersections without the use of stop signs or traffic signals; and
WHEREAS, in recent years, there has been growing interest in their potential benefits and an increase in roundabout construction; and
WHEREAS, studies have shown that construction of modern roundabouts instead of signalized intersections result in much needed improvements in motorists’ safety and reductions in motor vehicle crashes and injuries; and
WHEREAS, though relatively uncommon in Virginia, modern roundabouts have been and are used extensively and successfully in other states and in foreign countries; and
WHEREAS, California, Colorado, Florida, Maine, Maryland, Michigan, Nevada, South Carolina, Vermont, and Washington are among the states where modern roundabouts are being used; and
WHEREAS, an eight-state study of 24 intersections changed from stop signs and traffic signals to modern roundabouts between 1992 and 1997 revealed a 39 percent reduction in crashes for the converted intersections; and
WHEREAS, widespread construction of roundabouts can produce substantial reductions in crash losses associated with motor vehicles on roads; now, therefore, be it
RESOLVED by the House of Delegates, the Senate concurring, That the Department of Transportation be encouraged to construct more roundabouts instead of signalized intersections; and, be it
RESOLVED FURTHER, That the Clerk of the House of Delegates transmit a copy of this resolution to the Commonwealth Transportation Commissioner, requesting that the Commissioner further disseminate copies of this resolution to his constituents so that they may be apprised of the sense of the General Assembly of Virginia in this matter.
Virginia DOT’s web page entitled "Roundabout Policy Revisions" 2008:
It states "When the analysis shows that a Roundabout is a feasible alternative, it should be considered the Department's preferred alternative due to the proven substantial safety and operational benefits."
(http://www.virginiadot.org/info/faq-roundabouts.asp)

Similar resolutions:
September 2007: City of Ottawa