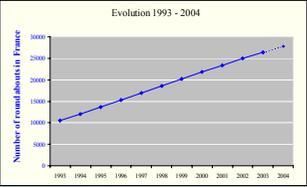
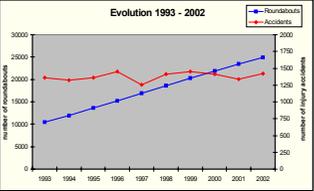
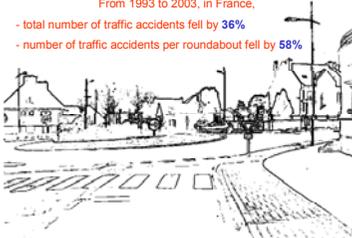
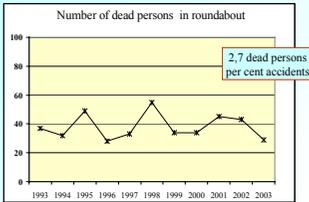
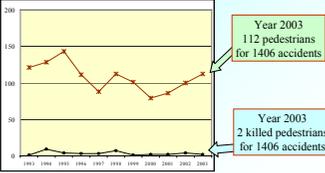


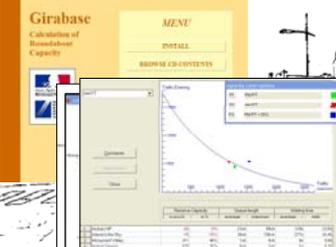
Diapos		Commentaire de base
	 	<p>I shall speak to you of roundabouts in France, about safety and some new uses of these intersections</p>
<p>Every year, more than 1000 new roundabouts in FRANCE</p> 		<p>In nineteen ninety-four, I counted a little more that twelve thousand roundabouts in France. And fifteen hundred has been built during the year. France goes on doing more than one thousand of new roundabouts every year. Today, we can be sure that the number is superior to twenty-five thousands ... perhaps half of all the world.</p>
		<p>That are some examples of varied roundabouts Rural modern roundabout</p>
		<p>High traffic national road</p>

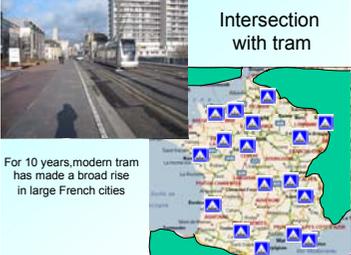
Diapos		Commentaire de base
		Suburban roundabout
		In tourist seaside town
		Other urban example
		Central island is sometime the work of architects

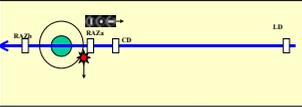
Diapos		Commentaire de base
		Mini roundabout
		Double mini roundabout
		Triple roundabout
		Special roundabout for exceptional transport of sailing boat

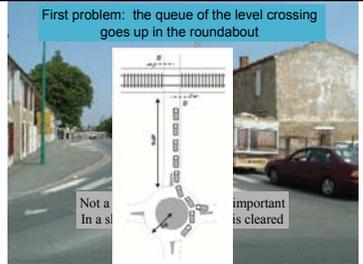
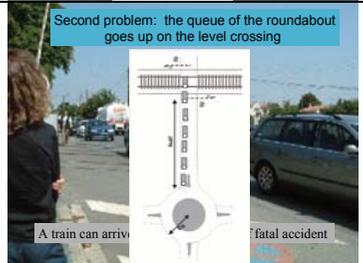
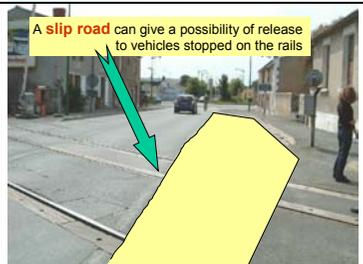
Diapos		Commentaire de base
		<p>Double roundabout in countryside interchange</p>
		<p>Double roundabout in suburban interchange</p>
		<p>This is actually no finish</p>
<p>More roundabouts, but less accidents by roundabout</p> 	 	<p>Number of roundabouts is increasing. Normally, number of accidents on roundabout should grow too.</p> <p>If we count injury accidents since nineteen ninety-three, we can see that they have been about the same ones for ten years.</p> <p>How can we explain that ?</p>

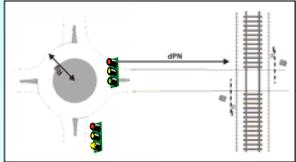
Diapos		Commentaire de base												
<p>From 1993 to 2003, in France, - total number of traffic accidents fell by 36% - number of traffic accidents per roundabout fell by 58%</p> 		<p>In eleven years, total of injury accidents in France decreased by thirty-six percent During the same time, the number of injury accident on roundabouts decreased by fifty-eight percent.</p>												
<p>FATAL ACCIDENTS</p> 		<p>About forty fatal accidents every year</p> <p>Recently, we have known a spectacular global fall of fatal accident. I don't know the effects on roundabouts</p>												
<p>PEDESTRIAN ACCIDENTS</p> 	  	<p>The number of pedestrians in roundabout accident is very limited : about seven to eight percent</p> <p>And the fatal accidents of pedestrian are exceptional</p>												
<p>Roundabouts and elderly drivers Part of elderly drivers in accidents</p> <table border="1" data-bbox="203 1102 512 1187"> <thead> <tr> <th>age</th> <th>Roundabouts</th> <th>Other intersections</th> </tr> </thead> <tbody> <tr> <td>66-75 years</td> <td>5,46%</td> <td>7,74%</td> </tr> <tr> <td>> 75 years</td> <td>4,14%</td> <td>5,71%</td> </tr> <tr> <td>For a total of drivers</td> <td>1209</td> <td>14337</td> </tr> </tbody> </table> <p><small>Ref: 1999-2003 - Bretagne + Pays de la Loire</small></p>	age	Roundabouts	Other intersections	66-75 years	5,46%	7,74%	> 75 years	4,14%	5,71%	For a total of drivers	1209	14337		<p>A specific statistic about elderly drivers : the part of drivers 66 years old and more is thirty percent lower than in other intersections.</p>
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> 75 years	4,14%	5,71%												
For a total of drivers	1209	14337												

Diapos		Commentaire de base
<p>New guidelines has been published in 1998 and 1999</p>  <p>in english</p> <p>http://catalogue.setra.equipement.gouv.fr/2_prod/telechargement.shtml</p>	<p>🔗</p> <p>🔗</p> <p>🔗</p>	<p>To help to make better installations, we published two guides</p> <ul style="list-style-type: none"> - one for interurban junction, - the over for urban junction <p>That explain perhaps safety results of roundabouts</p> <p>You can download the English translation of "Interurban junction design"</p>
 <p>Sales Office http://www.certu.fr</p>	<p>🔗</p>	<p>GIRABASE is the French software for calculation of roundabout capacity</p> <p>The fourth version is available in English as from July in CERTU</p> <p>I developed the first version in 1986. Now , there are more than five hundred users in France and some other countries</p>
	<p>🔗</p> <p>🔗</p> <p>🔗</p> <p>🔗</p> <p>🔗</p> <p>🔗</p>	<p>Useful data are :</p> <ul style="list-style-type: none"> Description of area Geometric design with safety advice Traffic <p>Results are :</p> <ul style="list-style-type: none"> capacity reserve with queue length and queuing delay And also recommendations in the event of too low capacity And capacity curve to compare different level of traffic
<p>New use of roundabouts and studies :</p> <ul style="list-style-type: none"> - intersection with tram - near railway level crossing - with traffic signals 	<p>🔗</p>	<p>The second part of my report is the use of roundabouts with trams</p>

Diapos		Commentaire de base
<p>Intersection with tram</p>  <p>For 10 years, modern tram has made a broad rise in large French cities</p>		<p>A lot of French cities chose to introduce modern tramways to reduce the proportion of cars in the town. Nantes, Grenoble, Strasbourg, Lyon, Montpellier, Bordeaux ...</p> <p>One problem is the management of intersections with cars.</p>
<p>NANTES Ligne 3 - 1999-2004</p>  <p>● Roundabout</p>	   	<p>Let us see the evolution in Nantes The first line was open in nineteen eighty-six. All intersections are with traffic signals The second line was in ninety-two – ninety three. First roundabouts appeared in the south part. In the north part, they are the majority On the new lines, it's the same Now, I count fifty-two roundabouts with tram</p>
<p>They are modern roundabouts with yield to the entries</p>  <p>Advantages of roundabouts for tramway intersections :</p> <ul style="list-style-type: none"> - better safety - possibility of U-turn - easier management of traffic lights 	 	<p>These roundabouts are modern roundabouts with priority of traffic in the circle Advantages are - a better safety for all users (also the pedestrians)</p> <ul style="list-style-type: none"> - U-turn - Management of traffic lights more easy
<p>When a tram arrive, traffic is stopped by red lights and priority is given to the tram</p>  <p>Flashing red signal are used on the ring to stop cars</p>  <p>This specific signal is used for trams</p>	  	<p>When a tram arrives, traffic is stopped by red light and priority is given to tram The organization of the signals changed during years. After different tests, we hope to have obtained the best solution for simplicity, the safety and the respect of the signals Now we use only red flashing signals on the ring A specific signal has been adopted for trams</p>

Diapos		Commentaire de base
		<p>That is an example on a recent installation We can see the two flashing signals just before the tram arriving (five seconds minimum)</p>
<p>4 detections order the signals</p>  <p>LD : (80 - 140m) = red for cars and "green" for tram CD : (5 - 10m) = confirmation and safety RAZa : (5m after) = red for tram RAZb : (after roundabout) = black for car</p>		<p>They are four detections</p> <ul style="list-style-type: none"> - LD long distance, eighty meters ore more before the intersection. It give red for cars, then the green for tram - CD short distance, just before tram signal, is used in different special situations, such as failure of the first - RAZa, just after tram signal, said that tram is enter, and give the red for an other tram - RAZb, after the intersection, give the green (or black) for cars
<p>Roundabouts close to railway level crossing</p>  <p>More and more of roundabouts, therefore more often close to level crossings</p>		<p>Recently, a new problem appeared : roundabouts close to railway level crossing. Designers project more and more often roundabout for intersection, sometimes near the level crossings.</p>
<p>The French National Railway Company is anxious</p>  <p>Road Directory and Railway Company manage a working group to plan a guideline with solutions</p> <p>Two various problems are studied ...</p>		<p>The SNCF (French National Railway Company) is anxious because there are risks of crashes between cars and trains We are studying this, with the aim of producing a guide of recommendations and of proposing solutions. There are two various problems</p>

Diapos		Commentaire de base
<p>First problem: the queue of the level crossing goes up in the roundabout</p>  <p>Not a In a s important is cleared</p>	<p>☞ ☞ ☞</p>	<p>That is the first : when the level crossing is close the queue goes up in the roundabout and blocks other entries. It's not a safety problem. We are sure that one entry is free, so all will become normal when the level crossing is open.</p>
<p>Second problem: the queue of the roundabout goes up on the level crossing</p>  <p>A train can arriv fatal accident</p>	<p>☞ ☞ ☞</p>	<p>The second is : the queue of the roundabout goes up on the level crossing It's an important safety problem. A train can arrive at high speed, up to a hundred and sixty kilometres hour. (they is no level crossing with TGV)</p>
<p>Solutions are either preventive, or curative, static or dynamic</p> <p>Various complementary signals are tested to avoid the stop on railways</p> 	<p>☞</p>	<p>We have selected different solutions. They can be preventive, to prevent that a car stops on the rails or curative, to give off a car stopped on the rails, before the arrival of a train. They can be static, with only road signs or dynamic, with detections and light signals Here are some examples of preventive solutions</p>
<p>A slip road can give a possibility of release to vehicles stopped on the rails</p> 	<p>☞ ☞ ☞</p>	<p>One curative and static solution : The slip road can give a possibility of release for a car stopped on the railway The length and the width of the slip road must be well adapted</p>

Diapos		Commentaire de base
<p>Other curatives solutions used traffic signal At entry of roundabout Or in the ring of (large) roundabout</p> 	<p>☞ ☞ ☞</p>	<p>The other curatives solutions use traffic signals, For little roundabouts, with the preceding entry</p> <p>And for large roundabouts, in the circulatory carriageway</p>
<p>We propose a formula to calculate the time of release of the level crossing</p> $t(s) = 7 + \pi * (R_g - L_a / 2) / 20 + dPN / 4,05 + IPN / 2,78$ <p>To validate the various parameters, the reaction times were timed on a lot of roundabouts</p> <p>Publication of a guideline in 2005</p>	<p>☞ ☞ ☞</p>	<p>It's necessary to know how long time is necessary to release the level crossing, So we have timed the delay between the detection of a train and the effects for the cars stopped in various places in the queue.</p> <p>My paper gives details of times We hope to publish a technical guide next year</p>
<p>A other subject of research : roundabouts with permanent traffic signals</p>  <p>Publication in 2006</p> <p>Guideline for area of utilization, design, planning, road signs ...</p>	<p>☞ ☞ ☞ ☞</p>	<p>We are also studying controlled roundabouts Advantage compared to traffic signals intersection are... Advantages compared to roundabouts are...</p> <p>A publication perhaps at end of this year ?</p>
 <p>ROUNDAOUBTS IN FRANCE Safety and New Uses</p> <p>Bernard GUICHET bernard.guichet@equipement.gouv.fr</p>		