To:

The Secretary
Senate Regional and Rural Affairs and Transport
Parliament House
Canberra ACT 2600

From:

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Cont . . .

The REVA all-electric car:

‘*fuel* for thought . . . ‘

This proposal is submitted to the Senate Committee Inquiry into Australia’s future oil supply and alternative transport fuels under the terms of reference:

‘ . . . **ALTERNATIVE TRANSPORT FUELS**.’

- The REVA all-electric car was designed in the United States and is manufactured in India.
- It is entirely emission free and runs on batteries.
- Designed for city and suburban motoring, it can comfortably carry two adults and has a top speed of 65 kph with a range of 80 kilometres on a fully charged battery.
- Connecting the vehicle to a standard electricity power point carries out recharging.

- The REVA takes six hours to fully charge at a cost of approximately 60 cents.

- The REVA has already been certified for use in the UK as a Heavy Quadricycle.

- Several hundred REVAs are now being driven on British roads and boast a strong safety record (**see LSV/Quadricycle Accident Analysis** P 4-19)

- The REVA has also been certified for use on roads in all EU countries, Japan and India.

- The REVA has been banned for use on Australian roads by the Department of Transport and Regional Services (DoTARS) on the grounds of 'passenger safety' until the vehicle has passed a full crash testing program costing approx $300,000.

- The Australian distributors of the REVA, the Solar Shop Pty Ltd, wish to present the vehicle before the Inquiry to demonstrate its fitness to be driven on Australian roads.

- The Solar Shop requests that the Minister for Local Government Territories and Roads, Hon Jim Lloyd, be urged to immediately introduce a Heavy Quadricycle category in order for the REVA to be legally driven on Australian roads.

- The Solar Shop asks the Inquiry to question DoTARS management, among them Mr Peter Robertson, about why they keep referring to the REVA as a 'golf buggy' and why DoTARS staff have stated that 'it will take 12 months for the REVA to be certified for Australian roads – if EVER (Roger Payne, DoTARS).'

- The Solar Shop invites the Senate Committee to Adelaide for each member to personally inspect and drive the REVA.

Cont . . .

Feel Good Cars

LSV/QUADRICYCLE ACCIDENT ANALYSIS BASED ON FRENCH ON-ROAD STATISTICS 1995-2000

Relative and comparative road safety of the Low Speed Electric Vehicle (LSV) in Europe and North America

Prepared by :

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Director Engineering & Certification
Feel Good Cars Inc.

Wednesday, May 08, 2002

INTRODUCTION AND PRELIMINARY NOTES:

This paper will discuss in detail the relative and comparative road safety of the Low Speed Electric Vehicle (LSV) in Europe and North America.

The LSV/Quadricycle (Low Speed Vehicle) category is a new concept in North America. In June 1998 the LSV officially became a new class of motor vehicle at the federal level in the U.S., and in September of 2000 in Canada.

Globally, an LSV/Quad is a 4-wheel motor vehicle with less power and a much lower maximum speed than the common passenger car. An analogy can be made with the 2-wheel segment: A moped is a 2-wheel motor vehicle that has less power and a lower maximum speed than the common motorcycle.

The following accident statistics referenced in tables I to VIII were obtained from the AFQUAD (Association Européenne des Fabricants de Quadricycles) and from the Direction de la Sécurité routière de France.

The quadricycle category in France is 20 years old. The fleet in France in the year 2000 is estimated at 140,000 vehicles. 35,000 new quadricycles are sold each year in Europe.

The LSV in North America is an emerging market but sales may ramp up very aggressively in the next few years as people realize the benefits related to the use of these small environmentally-friendly low-speed vehicles; forecasts are around 30,000 units for 2003 in the U.S.A.

A Quadricycle in Europe is technically similar to a North American LSV. LSVs and Quads have a similar mass, top speed, are close in size, and possess similar safety features. No crash requirements are required for both types of vehicles. Most LSV/Quads can easily meet certification/homologation requirements according to European AND North American standards because of a high level of regulatory compatibility between both markets. Refer to **Annex I** for an inventory of LSV/Quads available to date in Europe and in North America.

In France, there are 25 million passenger cars, 1.5 million mopeds and 1 million motorcycles. All numbers were "downsized" and leveled to a fleet of 100,000 vehicles for each category, so accidents, deaths and injuries refer to a 100,000-vehicle fleet comparison for each category.

These accident statistics show the safety performance of the low speed 4-wheel vehicles (LSV/Quadricycle) compared to high-speed four-wheel vehicles (passenger cars), low speed two-wheel vehicles (mopeds) and high-speed two-wheel vehicles (motorcycles).

Since the LSV fleet in North America is just establishing itself and accident statistics have not yet been compiled, the available French data has been interpreted to reflect the recent LSV market in North America and to assess the safety potential of LSV's in this growing market.

As of Wednesday, May 08, 2002, the LSV/quadricycle has the following status at the international level:

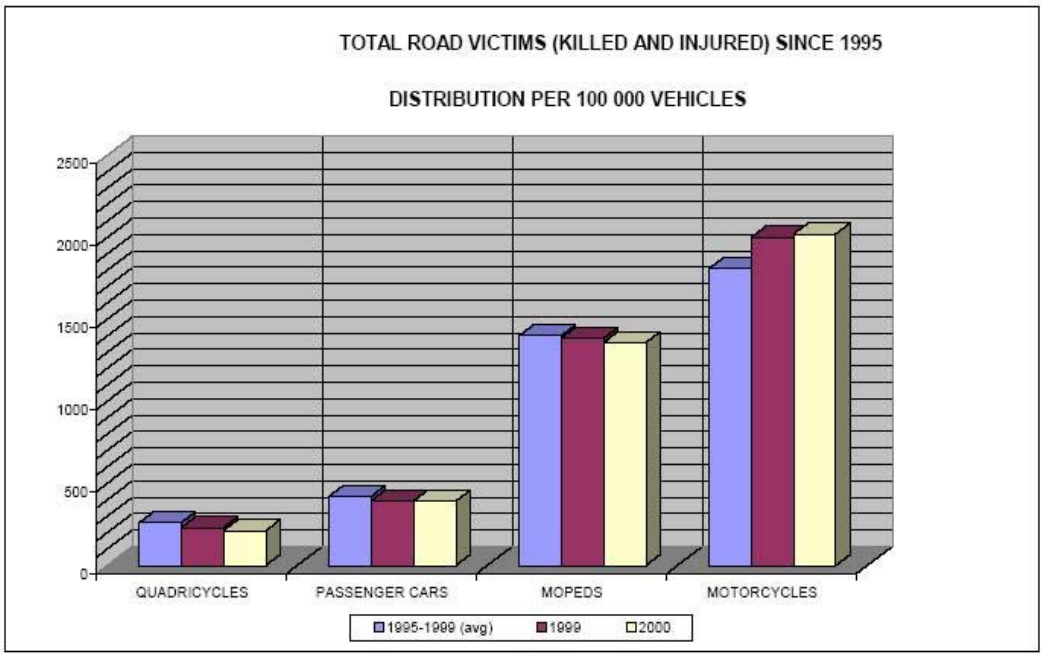
- Since August 1997 the Quadricycle category has been harmonized through the 16 EC countries: Major manufacturers are Aixam, Microcar, Ligier
- This motor vehicle class also exists in Japan/Asia (45 and 60 km/h category): Motorized 4-wheel bicycle class I & II. Most are doorless, four-wheel LSVs like the Mitsuoka MC-1 and Q-Car.
- The LSV category is harmonized between Transport Canada (September 2000) and NHTSA (June 1998) : Federal level
- So far, 37 U.S. states have legislated the LSV category.
- No legislation has been enacted on this low speed four-wheel category in any of the ten Provinces in Canada. BC and QC are discussing legislation concerning this motor vehicle category in their individual provincial regulations.

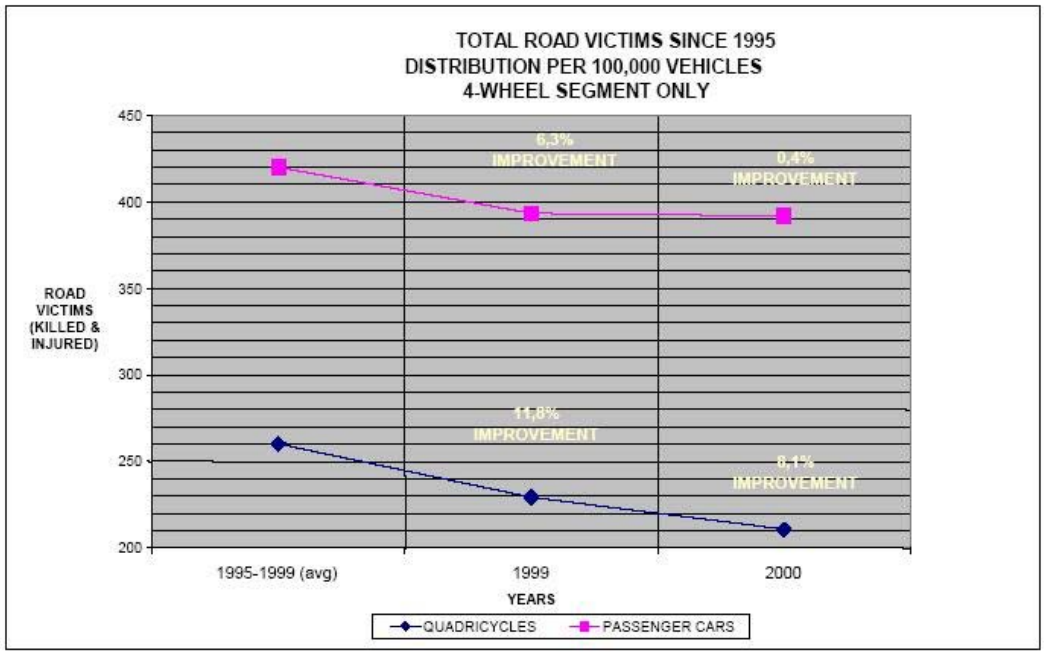
TABLE I

ROAD VICTIMS (KILLED AND INJURED) IN FRANCE
DISTRIBUTION PER 100 000 VEHICLES SINCE 1995

	KILLED & INJURED PER 100 000 VEHICLES				
	1995-1999 (avg)	1999	2000	Improvement 95/99 (avg) - 99	Improvement 1999-2000
QUADRICYCLES	260	229,3	210,7	11,8%	8,1%
PASSENGER CARS	420	393,5	391,9	6,3%	0,4%
MOPEDS	1400	1384,0	1359,1	1,1%	1,8%
MOTORCYCLES	1810	1999,7	2019,7	-10,5%	-1,0%

CONCLUSION: QUADS ARE BETTER THAN PASSENGER CARS IN TERMS OF NUMBER OF KILLED AND INJURED PEOPLE AND SHOW THE BEST SAFETY PROGRESS SINCE 1995





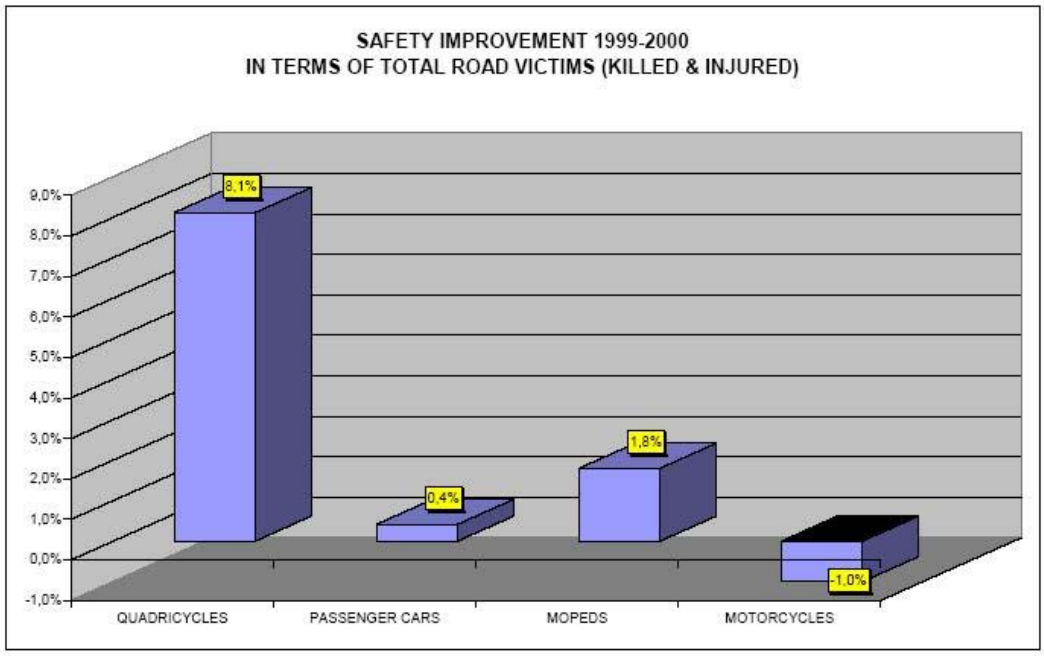


TABLE II

ROAD VICTIMS (KILLED AND INJURED) IN FRANCE
DISTRIBUTION PER 100,000 VEHICLES
YEAR 2000

	KILLED & INJURED PER 100 000 VEHICLES	HI-SPEED VS LOW SPEED EFFECT	
QUADRICYCLES	210,7	100,0%	(Datum 4 wheeler)
PASSENGER CARS	391,9	**186,0%**	
MOPEDS	1359,1	100,0%	(Datum 2 wheeler)
MOTORCYCLES	2019,7	148,6%	

CONCLUSION: QUADS ARE BETTER THAN PASSENGER CARS IN TERMS OF LOWER NUMBER OF KILLED & INJURED PEOPLE

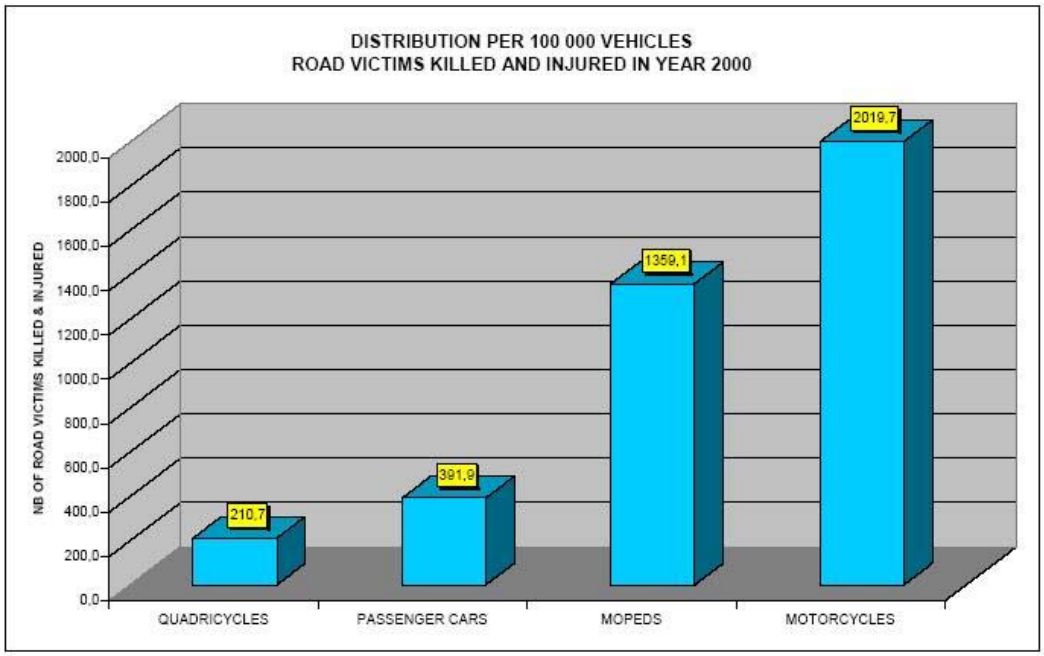


TABLE III

ROAD VICTIMS (INJURED ONLY) IN FRANCE
DISTRIBUTION PER 100,000 VEHICLES
YEAR 2000

	INJURED PER 100 000 VEHICLES	HI-SPEED VS LOW SPEED EFFECT	
QUADRICYCLES	192,1	100,0%	(Datum 4 wheeler)
PASSENGER CARS	371,8	**193,5%**	
MOPEDS	1330,4	100,0%	(Datum 2 wheeler)
MOTORCYCLES	1931,1	145,1%	

CONCLUSION: QUADS ARE BETTER THAN PASSENGER CARS IN TERMS OF THE NUMBER OF INJURED PEOPLE

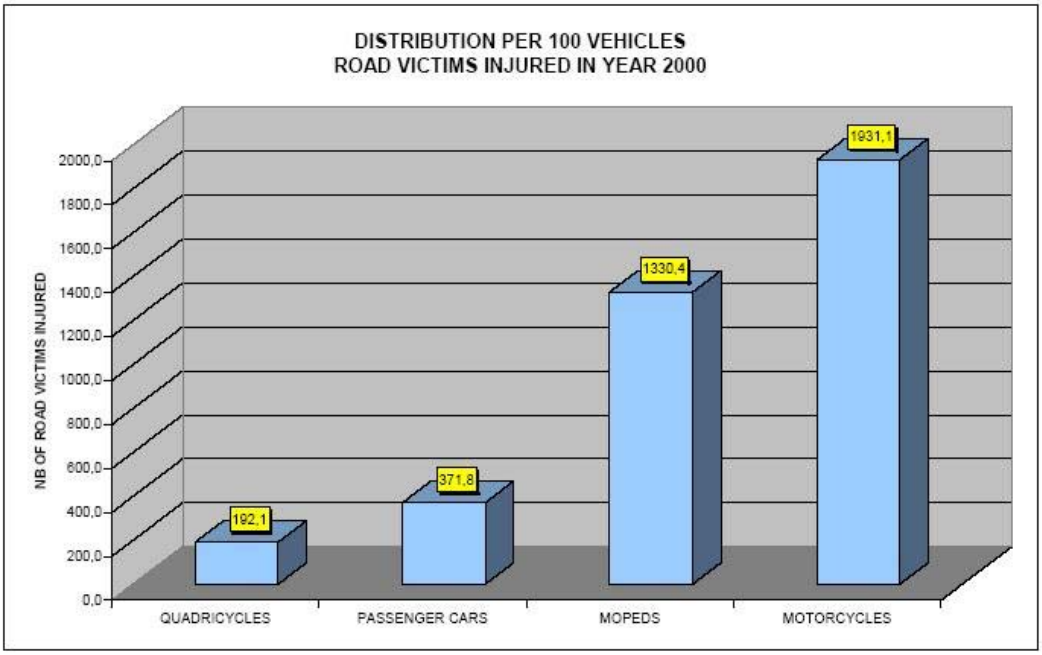


TABLE IV

ROAD VICTIMS (KILLED ONLY)
DISTRIBUTION PER 100,000 VEHICLES
YEAR 2000

	VICTIMS PER 100 000 VEHICLES	HI-SPEED VS LOW SPEED EFFECT	
QUADRICYCLES	18,6	100,0%	(Datum 4 wheeler)
PASSENGER CARS	20,0	107,5%	
MOPEDS	28,7	100,0%	(Datum 2 wheeler)
MOTORCYCLES	88,6	308,7%	

CONCLUSION: QUADS ARE BETTER THAN PASSENGER CARS IN TERMS OF # OF PEOPLE KILLED

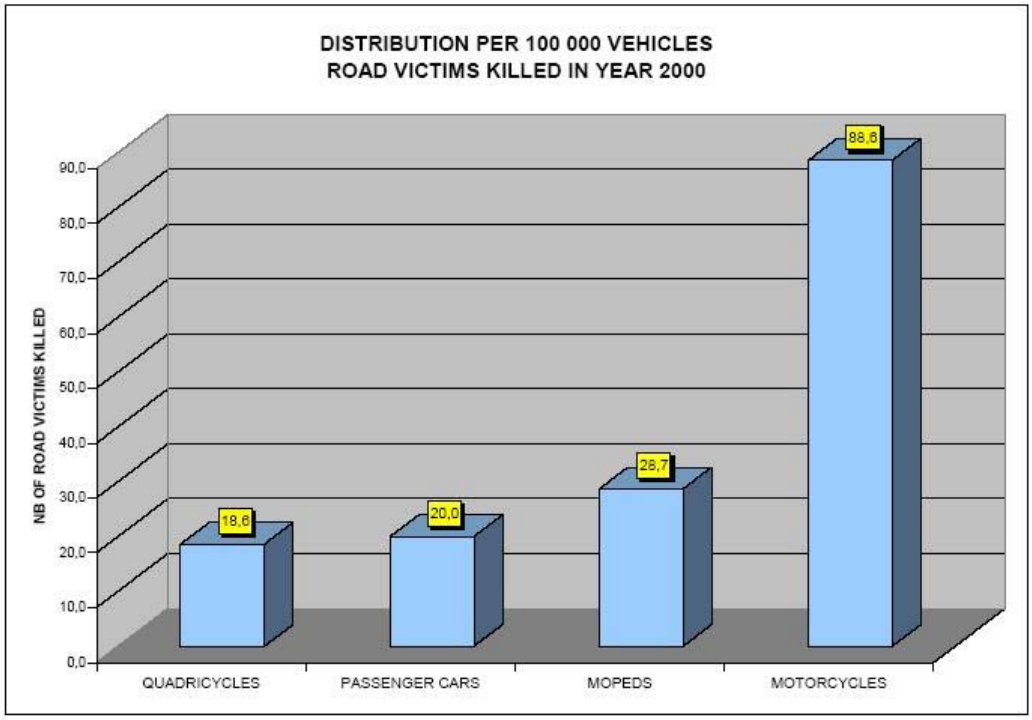
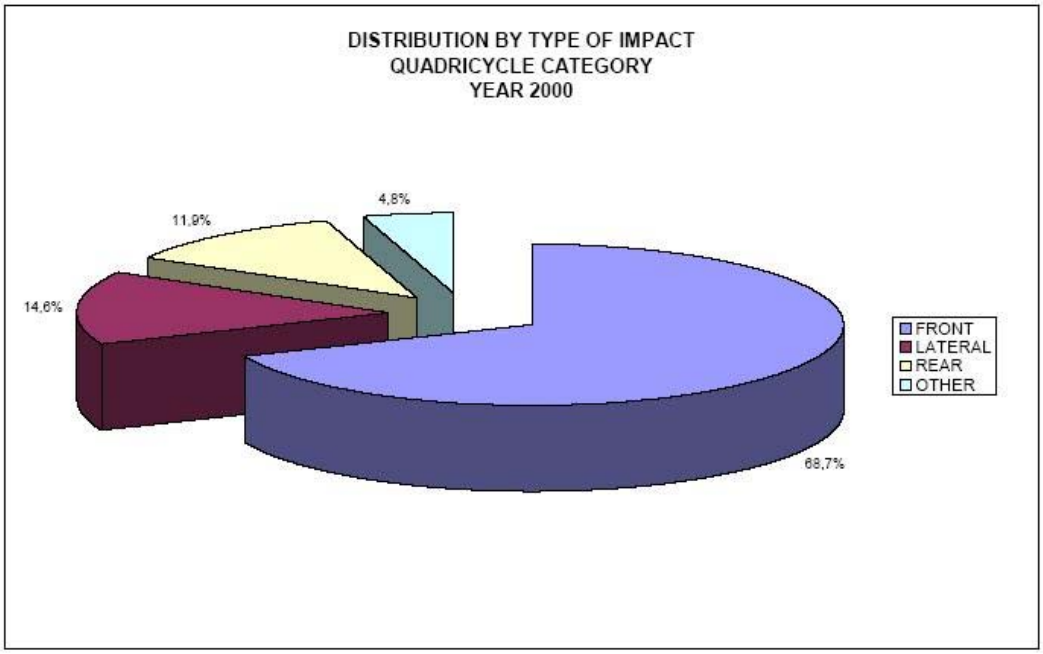


TABLE V

DISTRIBUTION BY TYPE OF IMPACT FOR QUADRICYCLES
YEAR 2000

FRONT	68,7%
LATERAL	14,6%
REAR	11,9%
OTHER	4,8%

CONCLUSION: WITH THE NUMBERS ABOVE IT IS UNDERSTANDABLE THAT SINCE 1997, THE QUADRICYCLE INDUSTRY HAS INVESTED THEIR EFFORTS IN FRONTAL CRASHWORTHINESS. TECHNOLOGICAL PROGRESS IS EXPECTED IN TERMS OF SIDE AND REAR IMPACT PROTECTION IN THE NEXT FEW YEARS.



MICROCAR FRONTAL IMPACT TEST

AIXAM FRONTAL IMPACT TEST

TABLE VI

MOST FREQUENT ACCIDENT CAUSE
YEAR 2000

EXCESSIVE SPEED	15,0%
ALCOHOL	14,0%
YIELD REFUSAL	13,0%
STOP	12,0%
DIRECTION CHANGE	10,0%
DRIVING ERROR	9,0%
RIGHT PRIORITY ERROR	6,0%
RED LIGHT	4,0%
WRONG SIDE OF THE ROAD	2,0%
LEFT DRIFT	1,0%

CONCLUSION: 42% OF ACCIDENT CAUSES ARE PARTICULAR TO FRANCE (AS OPPOSED TO USA DRIVING AND LICENSING SITUATIONS)
1) SPEED EXCEEDING POSTED LIMIT ("UNLOCKED" QUADS CAN GO UP TO 70 KM/H)
2) QUADRICYCLE USED AS AN ALTERNATIVE WHEN DRIVING LICENSE WAS LOST BECAUSE OF ALCOHOL
3) MOST YIELD CONDITIONS ARE IN "ROUNDABOUTS" AND ON HIGHWAYS

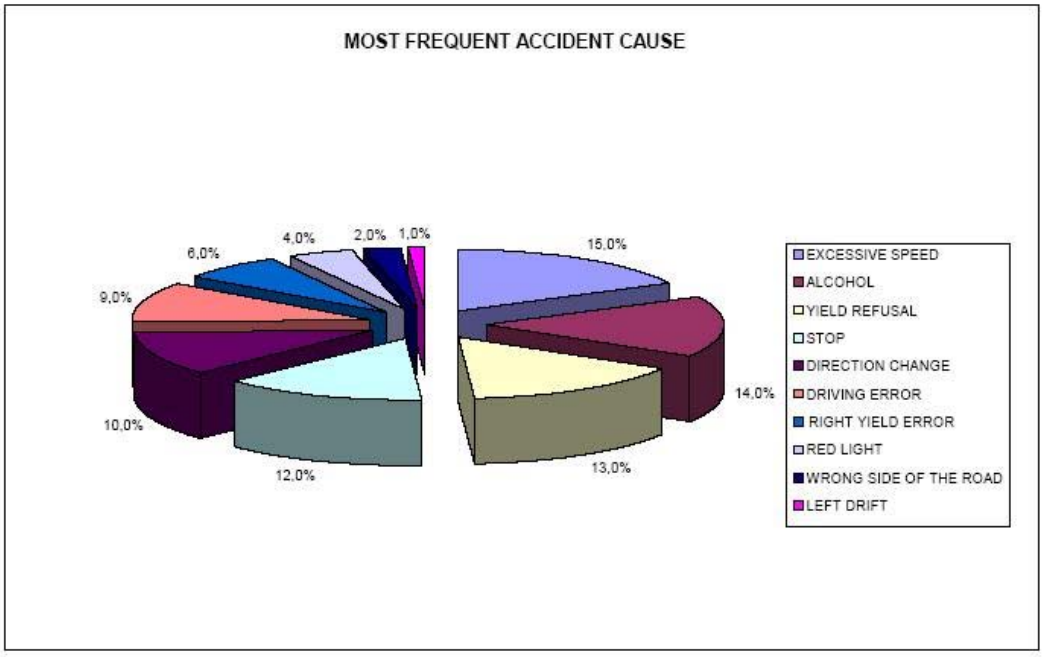


TABLE VII

ACCIDENT DISTRIBUTION ACCORDING TO THE TIME OF DAY

	QUADS	PASS. CAR	MOPEDS	MOTORCYCLES
DAY	78%	66%	70%	73%
NIGHT	22%	34%	30%	27%

NOTE: QUADRICYCLES HAVE THE SMALLEST NIGHT ACCIDENT RATE OF ALL CATEGORIES
QUADS NORMALLY HAVE HI-BEAM/LOW-BEAM AUTOMOTIVE LIGHTING SYSTEM

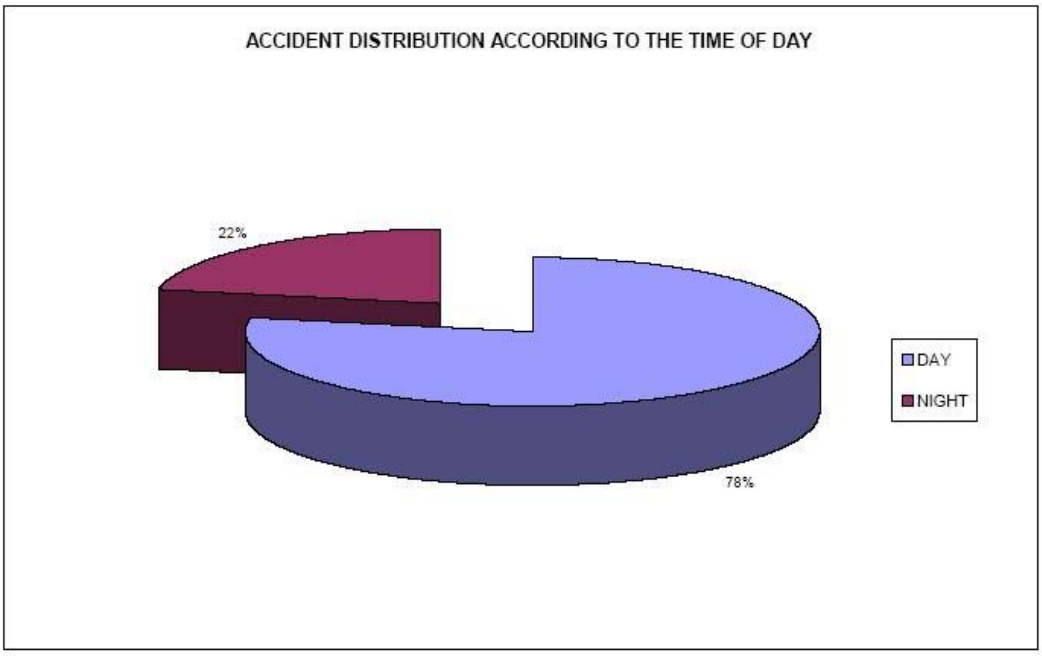
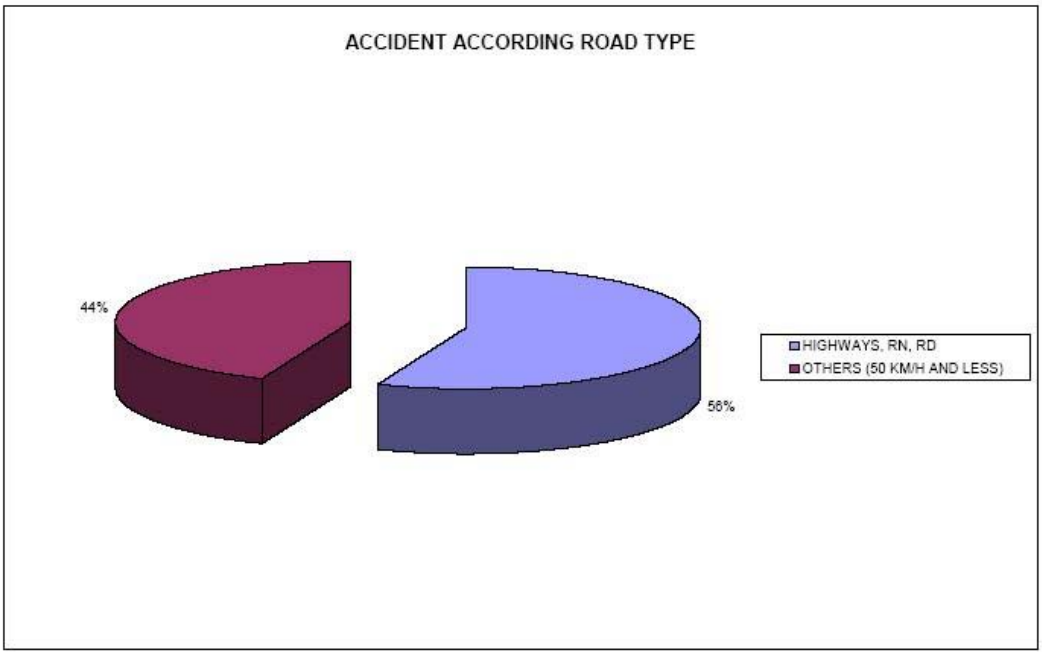


TABLE VIII

ACCIDENT DISTRIBUTION ACCORDING TO ROAD TYPE

HIGHWAYS, RN, RD	56%
OTHERS (50 KM/H AND LESS)	44%

CONCLUSION: 56% OF ACCIDENTS WOULD BE AVOIDED IF QUADS WERE LIMITED TO ROADS WITH SPEED LIMITS OF 50 KM/H OR LESS. IT IS REASONABLE TO EXTRAPOLATE THAT MOST ACCIDENTS CAUSING DEATH AND INJURIES OCCUR ON HI-SPEED ROADS THEREFORE, LIMITING QUADS TO ROADS WITH SPEED LIMITS OF 50 KM/H OR LESS WOULD HAVE A DRASTIC POSITIVE EFFECT IN THE REDUCTION OF QUAD DEATHS AND INJURIES



Comments regarding these statistics:

1) The quadricycle market has been a French specialty for the last 20 years. The quadricycle market extended beyond France in 1998 to other EC countries. This was due to the fact that EC countries harmonized the Quadricycle legislation (this resulted in a 100% increase in total sales of Quadricycles since 1997). While the Quadricycle market is relatively new in the other EC countries, the quadricycle fleet in France is well established with 140,000 vehicles on the road in 2000.

2) The global harmonization at the EC level in 1997 (Bruxelles, DG3) was made only after a careful examination of accident statistics. The Quadricycle has been, since 1997, an official motor vehicle class for all EC Member States. Any Quadricycle homologated according to Directive 92/61/EC can be imported, sold, registered and operated on public roads in any of the 17 EC countries (available for about 400million people). In 2003, statistics at the EC level will be available. Please note that there exists a similar class in Japan and in some Asian countries. These Asiatic doorless low speed vehicles are mainly electric or gas powered one-seater vehicles intended for dense and congested urban environments.

3) Generally, Quadricycles are manufactured from FRP, ABS and aluminum and use very simple mechanical components, and therefore they have a longer life than conventional cars. As Quadricycles have been on the road in France for the past 20 years, the French Quadricycle fleet is quite old. As of 2002, only about 40% of the quadricycle fleet should be considered "modern" vehicles.

4) Introduction of voluntary front crash worthiness requirements was generalized among the Quadricycle manufacturers in 1997. Therefore only about 40% of the French quadricycle fleet is modern and certified "crash worthy".

5) The Passenger Car fleet is made up of predominately newer vehicles. More than 80%-85% of the Passenger Car fleet was manufactured in the last 10 years and therefore meet advanced crash worthiness standards.

6) The quadricycle segment is the class of motor vehicles experiencing the most significant progress in terms of safety improvement year to year. Between 1999-2000 the Quadricycle segment increased 8.1% in overall safety, while the passenger car only increased by 0.4%. In fact, the safety progression of passenger cars is similar to mopeds (1.8%) and motorcycles (-1%). These figures clearly demonstrate a threshold of technical safety progress in the passenger car and 2-wheel vehicle fleets. By contrast, the Quadricycle segment is increasing dramatically in safety innovation as newer, safer, tested Quadricycles continue to enter the market. We expect to see the safety standards of the Quadricycle fleet to continue this upward trend as new vehicles replace aged, less-crashworthy Quadricycles.

7) The highest cause of accidents in 2000 is due to speeding (15%). The second highest cause of accidents is alcohol (14%). The third highest cause of accidents is "failure to yield" (13%).

   Although it is "illegal" in Europe, the average "real-world" speed that Quadricycles operate at is approximately 70 km/h (owners "unlock" the transmission to allow the vehicles to travel at speeds over the regulated 45 km/h). Some vehicles, in the 15 kW quadricycle category (10% of Quadricycles), even travel at speeds up to 100 km/h! Since Quadricycles do not require a driver's license in France, they become an alternative for drivers who have lost their license for alcohol related infraction. "Failure to yield" accidents generally occur in "roundabouts" which are common intersections in France, but not in America.

8) In 2000, 68.7% of all accidents were frontal crashes, 14.6% were side impacts, and 11.9% were rear crashes. These percentages encouraged Quadricycle manufacturers to generalize in 1997 voluntary front crash testing of their vehicles and implement design improvements to their vehicles to meet front

crash standards. These voluntary crash requirements will eventually be implemented as official 92/61/EC safety standards (Official Journal of the European Community, No L 225/72).

9) Only 22% of quadricycle accidents occur at night. Quadricycle manufacturers generally use efficient automotive lighting systems in their vehicles. Poor quality lighting systems could result in higher accident rate during the night when visibility is limited.

10) 56% of accidents occur on highways, national roads (RN) and department roads (RD), which have a posted speed limit of 90 km/h. Limiting Quadricycles to roads with a posted limit of not more than 50 km/h would result in a drastic decrease in injuries and fatalities. Please note that LSVs in North America are electrically limited to 25 mph (max motor RPM) and are only permitted to operate on roads with a posted speed limit of 35 mph or less. It is reasonable to believe that most accidents causing death and injuries occur in catastrophic high-speed road conditions. Limiting quads to travel on 30-35 mph roads, like in America, would have a drastically beneficial effect on Quad's death and injuries statistics.

11) A moped and a motorcycle are quite similar in terms of design. The main difference is POWER and SPEED. The effect of decreasing speed in this class of two-wheel motor vehicles is dramatically clear: Low speed is an effective crash avoidance feature. In 2000, there were 45.1% more injuries and 208.7% more fatalities due to higher speed and higher power in the two-wheel segment. **This results in a 48.6% increase when injuries and fatalities are combined.**

12) The low speed effect is also noticeable in the 4-wheel segment. In 2000, there were 93.5% more injuries and 7.5% more fatalities due to higher speed and higher power in the 4-wheel segment. **This results in an 86% increase when injuries and fatalities are combined.**

This low-power/low-speed safety phenomenon correlates with efforts to keep vehicles at reasonable speeds on our roads (Quebec's safety slogan is "*Speeding Kills*"- "La vitesse tue"). What is interesting with LSVs is that since it is virtually impossible to drive aggressively and recklessly at excessive speeds; the problem of speeding, and therefore resulting death and injuries caused by speeding is mitigated.

Again, these statistics are derived from an older Quadricycle fleet of which only 40% of vehicles are modern and crashworthy. We can expect, in the next few years, that Quadricycles will meet ALL crash worthiness requirements normally established for passenger cars (refer to www.aixam.com).

Therefore, this "low speed effect" will be even more accentuated over the coming years. Quadricycles will continue to experience major technological progress, while passenger cars will remain at virtually the same technical level in terms of crashworthiness. Crash worthy fleet proportions could rise by a factor of 100% (40% to 80%) for quadricycles while the rise for passenger cars could hardly be more than 20% (80% to 100%).

COMPARISON OF FRENCH EXPERIENCES AND DATA RELATED TO U.S. LSV DRIVING "REALITIES"

ITEM	DESCRIPTION	FRANCE - QUADS	AMERICA - LSVs	EFFECT ON SAFETY
1)	Driver license requirement	Quads are license free-vehicles accessible from 16 to ??? year-old people	LSVs drivers need a valid driver's license to operate LSVs on public roads	Means that American drivers have more driving skills, more driving practice with "real cars" and more driving "sharpness" Minimum strength, vision and hearing capabilities are assured by MTO registration office for driving "hi-speed" passenger vehicles.
2)	Speed capabilities of LSV/QUADS	Max speed (by design) of 45 km/h = light quads (90% of quad fleet). The majority of these light quads are "unlocked" by their owner so "real life" max speed is around 70 km/h. The Heavy Quad category max speed is limited by physics (15 kW) up to 100 km/h (10% of quad fleet)	Max speed by design of 40 km/h only	LSV refers to NEV's that are electric. No CVT, just a single ratio gearbox directly matched with the electric motor running at max RPM at 40 km/h. NEV's cannot be simply "unlocked" Design speed = "real life" speed. Modifications are complex and costly High level of knowledge in electricity and mechanical engineering is required to increase speed
3)	Road limitations	Quads are allowed everywhere (except on highways) These include City (50 km/h) and departmental roads up to 90 km/h. 56% of accidents occur on roads with a posted limit in excess of 50 km/h and these accidents are the most catastrophic	Operational laws limit LSVs to roads with posted limits less than 35 mph (State laws).	LSVs will be used at much lower speeds and will share the road with slower traffic. Maximum posted limit of 35 mph rather than 90 km/h. The limit in Canada would even be lower than in the US States: 50 km/h (31 mph)
4)	Size and Mass differences between French & American vehicles ("Bigger American car" issue) **Consideration of mass alone is a meaningless comparison** The difference of the operating speed of the LSV/QUAD + the actual speed has to be taken in account. Doubling the mass of an incoming object gives twice the impact energy, but doubling its speed gives FOUR times the impact energy.	Mass-market cars are smaller than American cars but they travel faster - posted limit up to 90 km/h. Quads are all gas/diesel powered. Max. mass by law is 350 kg (light quads) and 400 kg (quads)	Mass-market cars are bigger but they travel slower. We know that speed is the key factor in energy calculation: In the MV2/2 equation, doubling the mass will only give TWICE the energy, while doubling the speed will give FOUR times the energy. LSVs refer to NEV's that are electric. Because of batteries, LSV mass, with an average of 600 kg are heavier than quads (40% heavier) and American cars are bigger then French cars, but LSVs are also bigger than "French LSVs", so the LSVs in the USA are also following the trend of the "bigger American car" phenomenon	American LSVs are heavier than quads, and are operated at much lower speeds and mixed with much slower mass-market cars. The added danger argument of the "bigger American car" can be seriously debated. Also, with a judicious positioning of batteries in the front compartment, an electric LSV would have a better "ramming" effect on deformable objects than lighter ICE powered Quads and consequently would use the deformation energy of other cars or objects to their benefit.

5)	Recent Technical progress in the crash worthiness of Quads.	Quads last for many years since they are very simply constructed and made from FRP and ABS. So, Quad statistics are based on many older vehicles in the fleet. Although the safety statistics are positive, they do not yet fully represent the real benefits in safety brought by modern, recent quads (1997 and +). We have to understand that current quads in France are the result of a 20-year evolution. Modern quads (40% of in-use vehicles) are not yet integrated into the consumer fleet the way modern passenger cars are (80%). Please note that the next 2003 generation of quads of the main quad manufacturers (78% of current sales) will meet ALL safety requirements applicable to passenger cars. It will take a few years to see the benefits on the consumer fleet.	LSV/NEV market is just emerging. Crash-worthy NEV technology is available now, not in 20 years. We will not have to go through the same slow technical progress experienced in France. In a few short years, North American NEV's could quickly benefit from this French expertise.	Technological "jump" for NEV's is available for North America. Fatalities and Injury statistics could be positively influenced since it is an emerging market. We will see a faster rise of a safer consumer fleet since technological progress is available **NOW**. Quads are a recent phenomenon in Germany and Sweden. Statistics from these countries will refer to a much more modern quad fleet. Common sense tells that injuries/fatalities statistics in these emerging markets could be even better than what we have in France: A safer, newer Quad fleet.
6)	Driver Vulnerability	66% of quad users are 60 years and older. Osteoporosis is more present for driver of this class of motor vehicle, resulting in more injuries	LSV/NEV's, especially those operated in urban environments, attract EVERYONE. In America, they are now marketed as a "cool" youthful product, while In France they are associated with elderly people. Healthier, stronger drivers will be prevalent in America.	Overall health and strength (including reflexes and reaction capabilities) is greater in North American LSV/NEV users. This will result in less injuries and fatalities and increased accident avoidance.
7)	Driving attitude	Culturally, French drivers, like most of EC drivers have a more "Latin"& "sporty" attitude behind the steering wheel	Americans generally adopt a more "reserved" driving attitude	This should beneficial for the integration of LSVs in "calmer" surrounding traffic (neighborhoods, slower, congested urban core driving). Moreover, as LSVs are electric, studies show that electric propulsion has a "calming" effect on the driver. It is very difficult to drive aggressively in a 40 km/h vehicle with smooth, electronically controlled acceleration!

Extract from NHTSA's CFR 49 571.500, the final rulemaking document, supports the fact that quads are driving at approximately twice the speed of LSVs and that they *are not nearly so restricted by law as LSVs*.

(…) As for the two classes of voiturettes in Europe, the agency has learned that the European Union (EU) issued a directive last year harmonizing laws in EU for mopeds, auto-cycles, motorcycles and motorized tricycles and quadricycles ("voiturettes") with respect to tires, lighting, signaling, mirrors, fuel tanks, seat belts, and belt anchorages, washers, wipers, and demisters. Under the directive, a voiturette approved in one European country is automatically marketable in all 14 other member states.

(…) **voiturettes can travel at approximately twice the speed of LSVs** and have a much longer operating range. **Further, their operating environment is not nearly so restricted by law as that of LSVs**.

Feel Good Cars

ANNEX I
INVENTORY OF WELL KNOWN LSV'S AND QUADRICYCLES

NORTH AMERICAN LSV'S






GEM
LIDO
THINK NEIGHBOR
FEEL GOOD CARS ZENN
DYNASTY MOTORCARS IT
(ALL 100% ELECTRIC)

EUROPEAN QUADRICYCLES






AIXAM MAC & 300, 400, 500
MICROCAR NEWSTREET & VIRGO
LIGIER BE-UP & NOVA
(ALL DIESEL OR GAS POWERED)

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The Solar Shop thanks you for taking the time to read this important submission.

Yours faithfully,

Adrian Ferraretto
Managing Director
Solar Shop