

# Promocycle Foundation

- In 1990, the publisher of Cycle Canada Magazine and Moto Journal and BMO Bank of Montreal formed a partnership to offer motorcyclists the **Affinity credit card**. This uniquely designed credit card assures that an ongoing financial contribution is made to non-profit organizations each time the card is used.

# Promocycle Foundation

- As a result, **Promocycle Foundation**, a national non-profit association was established to promote motorcycle safety. Approximately 9,000 readers of Cycle Canada and Moto Journal show their support for the Program and currently carry a Promocycle Mastercard.

# Promocycle Foundation

- No salary or compensation has been paid to anyone involved in the management of the Foundation since its creation.

# Promocycle Foundation

- Motorcycle countersteering (2001)
- Evaluation of brake reaction times on a motorcycle (2002)
- Performance evaluation for various braking systems of street motorcycles (2003)
- Task analysis for intensive braking for a motorcycle in a straight line (2004)

# Countersteering

- Being single-track vehicles, motorcycles must lean in order to counteract the inertia generated by a change of direction.
- It is therefore necessary to initiate a lateral shift of the roll axis toward the side one wishes to go.
- This shift is principally created by the rider rotating the handlebar in the direction opposite to the one desired

# Countersteering video



# Brake reaction times

- Brake reaction time (BRT) of motorcyclists was measured on a sample of 1,181 subjects, using stationary real motorcycles coupled to a computer.
- The mean BRT obtained by the group of test subjects, all classes combined, was 0.463 second.

# Brake reaction times

- When the subject waited for the signal with fingers already poised over the brake lever and foot positioned over the brake pedal, the mean measured BRT was reduced by 0.154 seconds.
- At 100 km/h, an increase of 0.154 seconds represents an increase braking distance of 4.28 metres



# Brake reaction times

- Covering the front brake all the time?
- On a deserted road?
- Unlimited visibility?

# Brake reaction times

- “Remember, most accidents occur on a straight road, in good weather, when you don’t expect anything to happen”. Dr. Harry Hurt.

# Evaluation of various systems

- Dry surface, Solo, Independent system
- Both controls .0774 G
- Front lever 0.771 G
- Rear Pedal 0.425 G

# Braking results

## Dry, both controls

- Conventional 0.774 G
- Conventional ABS 0.869 G
- Integrated 0.740 G
- Integrated ABS 0.853 G
- Conventional (passenger) 0.745 G

# Myths to forget (1)

- *Do not brake the motorcycle too hard to avoid the risk of going over the handlebars*
- No application of the front brake, no matter how hard, will project the rider over the handlebars. The greatest risk comes from locking the front wheel, which gives an immediate loss of stability and usually causes a low-side crash.

## Myths to forget (2)

- *Before starting emergency braking you must look in the mirrors to be sure you won't be rear-ended by a car, since motorcycle can stop much quicker than a car.*
- The rider must concentrate exclusively on braking since the operation requires a high level of skill. A modern car can easily generate -1 G in hard braking.

# Intensive braking of a motorcycle (1)

- If with an automobile there is little risk in stamping on the brake pedal, maximum braking of a motorcycle poses greater risks and demands greater expertise since the rider must simultaneously manage two independent braking systems in parallel.

# Intensive braking of a motorcycle (2)

- The fact that the front brake and the rear brake must be operated and modulate in a separate and optimal manner, the front by the right hand and the rear by the right foot, without causing wheel-lock underlines the difficulty the rider must face.



# Intensive braking of a motorcycle (3)

- Also, during deceleration, such as in the case of emergency braking, load is transferred progressively to the front wheel.
- The available braking force diminishes progressively on the rear wheel and increases progressively on the front wheel.

# Intensive braking of a motorcycle (4)

- Locking of the front wheel must be avoided at all cost during hard braking because it leads almost automatically to a loss of directional control and a sideways crash if it persists longer than a tenth of a second.

# Intensive braking of a motorcycle (5)

- During the operation, the rider has to manage his braking, while being subjected to a considerable deceleration force against his arms and hands, which must in large measure support his upper body.
- A simulator designed to recreate this force would have to incline the motorcycle on its front wheel at an angle of 64 degrees.

# Video

- Blainville Video

# Use of the clutch while braking

- With downshifting

-0.891 G    43.17 m

- Clutch engaged

-0.8

- Clutch  
disengaged

-0.929 G

# Clutch recommendation

- In light of these figures we recommend completely declutching during an emergency stop.

# Sport vs. Custom

- Mean stopping distance CBR929RR:
  - 41.67 m
- Mean stopping distance GL1500 Valkyrie:
  - 41.83 m

# Distance vs. time (1)

- The objective of emergency braking must be to reduce speed in the shortest distance possible, and not in the least elapse time



## Distance vs. time (2)

- Although there is a correlation between braking distance and time, it is not absolute.
- Thus the quickest stop time from 100 km/h recorded during these tests was only 2.70 seconds but covered 37.68 metres.
- The shortest stopping distance recorded was 36.95 metres in an elapsed time of 2.75 seconds.

## Distance vs. time (3)

- The difference highlights the importance of an effective start to the braking procedure at the moment when the distance traveled is greatest.

## 30 best tests (1)

- We focus on the 30 tests with the shortest stopping distance and during which riders cut the throttle, used the two brakes and pulled the clutch lever at the start of braking, instead of at the point where the motorcycle reached a standstill.

## 30 best tests (2)

- The mean braking distance (100 to 0 km/h) for these 30 best tests was 38.351 metres with a mean elapsed time of 2.929 seconds. The average deceleration was -0.971 g.

# Chronology

- Time to completely close throttle 0.0000
- Time to apply rear brake 0.0712
- Time to apply front brake 0.1567
- Time to declutch 0.2090
- Time to compress front suspension 0.3401

# DEBA Sequence (1)

- Deceleration
- Equilibrium
- Braking
- Adjustment

# DEBA Sequence (2)

- 1 Deceleration
  - Completely close the throttle
  - Apply the rear brake
- 2 Equilibrium
  - Place the bike vertical
  - Brace arms and legs
  - Straighten torso
  - Position fingers and feet

# DEBA Sequence (3)

- 3 Braking
  - Apply appropriate pressure to the front brake
  - Declutch completely
- 4 Adjustment
  - Adjust front brake
  - Adjust rear brake



# Ingrained habits

- In our opinion, the only way for a rider to achieve true proficiency in straight-line emergency braking of a motorcycle is to practice long enough and hard enough to make the procedure a matter of habit

# Braking through habit

- According to Dr. Bruce Lipton of Sanford University in California, our conscious mind can process 2,000 bits of information per second, while our subconscious can process 4,000,000,000. It's not necessarily limited to reflexes, but to deeply rooted habits of human beings.

# Hurt Report 1981

- Motorcycle riders in these accidents show significant collision avoidance problems. Most riders would over-brake and skid the rear wheel, and under-brake the front wheel greatly reducing collision avoidance deceleration.

# Hurt 1981/Maids 2004

- The median pre-crash speed was 29.8 mph (47.8 km/h). Hurt 1981
- The median traveling speed was found to be 49 km/h. Maids 2004