

Motorcycle Mentorship Module 25

Dynamics of Stopping





Warning: Incorrect or inaccurate information could lead to tragic results on the road. If a question arises that is not covered in the guide and you don't know the answer from your own experience and training, simply state, "That is a great question, I'll get back to you with the answer."

Your Service Safety Center will help with these types of questions should they arise. Their numbers are as follows:

US Army Driving Directorate: **334.255.3039**

USMC Safety Division: **703.604.4459**

US Navy Shore Safety: **757.444.3520 x7165**

US Air Force Safety Center: **505.846.0728**

USCG Safety Division: **202.475.5206**



Preface

About: The Defense Safety Oversight Council (DSOC) Motorcycle Mentorship Modules are a set of thirty six (36) facilitation modules designed for the purpose of increasing rider knowledge on various aspects of riding and providing additional capability for self-policing within peer groups. The modules are intended as a mechanism to further decrease motorcycle related mishaps and fatalities within Department of Defense (DoD) by encouraging riders to talk, live, and think about the topic.

Using the Module: The module content enclosed is intended as a facilitation guide to assist you with discussing the topic. However, it is still critical to use your skills and talent to engage participants and develop “buy-in” on this subject from your group. To maximize this, motivate and moderate your participants, control the accuracy of participant feedback, and be mindful of their time.

Page	Section
2	Facilitation Guide – A brief overview on conducting a facilitated discussion of a topic
3	Module Overview – This section provides the facilitator a synopsis of the topic, learning objectives, and the suggested environment, props, and handouts for conducting the module
4	Module Discussion Introduction – This section provides guidance to the facilitator in opening up the discussion and getting participants talking about the topic and their relevant experiences
5	Discussion Areas – This section provides various discussion topics, sample facilitation questions, and factual information for the facilitator to lead the discussion
10	Wrap-Up – This section provides guidance to the facilitator on wrapping up the topic discussion
11	Feedback Form – A feedback form to be given to all participants for their feedback on the module discussion
12	Resources – Additional resources and definitions to assist the facilitator in preparing for and conducting the topic facilitation
N/A	Handouts – Figures, pictures, diagrams, etc. to assist the facilitator to better demonstrate a topic idea

Facilitation Guide for DSOC Mentorship Modules

It is recommended that this Mentorship Module be conducted in a facilitation style. Using the information provided in this Mentorship Module, you, as the facilitator, will lead a discussion on the subject. *You should not be conducting a lecture!* The facilitator's role is to help with how the discussion is proceeding. Participants will have much more "buy in" and connectivity with the information if they have input. One of your roles as the facilitator is to control the accuracy of the input and control the time. From the Mentorship Module, generate questions which will lead to group discussion. The more you let the group participate, the more success you will have.

Competencies of a Facilitator:

- Prepare prior to the event
- Make sure everyone gets a chance to participate and help members to express themselves
- Ask rather than tell
- Honor the group, display respect for the members, and acknowledge participant contributions
- Ask for others' opinions
- Listen without interrupting
- Demonstrate professionalism and integrity

The key characteristic distinguishing facilitation from other types of leadership, like scripted training, is that the outcomes are never predetermined in a facilitative setting. Although the background information provided with this Module remains the same, the result will depend on the participants, the knowledge and experience they bring, and the information that they feel they need to take away. The group uses the activities provided by the facilitator to unlock expertise, ensure thorough discussion, stay focused and reach decisions that are better than those any individual could come up with alone.

At the beginning of each Mentorship Event, discuss why the participants are there and what they will receive as a result of participating. Adults have limited time and they want to know "What's in it for me?" A facilitator should make training fun. Encourage humor and laughter in your Mentorship Event.

Principles of Adult Learning:

- Adult Learners want material that is relevant to them. "What's in it for me?" "What will I get out of this that will make a difference to me?"
- Adult Learners come to training events with varying amounts of experience. They like to share their experiences. If you have minimal or no motorcycle experience, you can still draw from your group.
- Even if you have motorcycle experience, you should draw from your group because people tend to remember what "they" said longer than what you said. Information that they "own" is more valuable to them.
- Facilitators are not always subject matter experts; nor do they need to be. Facilitators may draw on the existing knowledge of the participants and the information provided in these Modules.

Section I: Module Overview

Time Frame: One 30-40 minute facilitator-led discussion

Level of Prior Knowledge: Participants should be able to operate a motorcycle at a novice level or be familiar with motorcycle operations.

Synopsis: Many motorcyclists do not know how to proficiently stop a motorcycle. In order to attain a deeper understanding of the dynamics of stopping a motorcycle, core concepts need to be discussed. Specifically, the three components of total stopping distance are covered. The rider is introduced to stopping techniques such as brake modulation, correcting skids caused by over-application of brakes, scanning for potential hazards, and creating safety buffers. Additionally, there are discussions regarding the importance of rider actions after stopping and the techniques for quickly moving from the stop point.

Learning Objectives:

- Riders will identify the three parts of total stopping distance: perception, reaction and braking.
- Riders will understand and explain the need to properly modulate both brakes and to smoothly transfer weight to load the front tire.
- Riders will identify corrective action and recovery from a locked wheel skid caused by improper brake application.
- Riders will demonstrate understanding of downshifting, scanning and maximizing time and space while stopping.
- Riders will explain the need to scan, use of proper protective rider gear, and looking for escape routes while stopped.
- Riders will explore the relationship between motorcycle mechanical condition, tire wear, and stopping potential.

Suggested Environment/Props/Handouts:

Any comfortable environment, such as classroom, conference room, auditorium, or stadium seating, is appropriate.

Props/Handouts: none

Section II: Module Discussion

Introduction: Facilitate discussion: What are the three components of total stopping distance?
Perception, Reaction and braking distances

Facilitation Questions:

- What is meant by ‘Perception’ distance?
- How can we reduce our perception distance?
- How far do you scan down the road and why?
- How can we increase our safety margins?
- Can we improve our ability to ‘perceive’? If so, how?
- Is there anything else we should consider with regard to perception?

Perception distance is the distance traveled from the time a rider sees something until the rider actually recognizes what it is (i.e. from the time the danger is seen until the time it is recognized). Riders can reduce perception distance by being attentive, keeping their head and eyes up, and aggressively scanning far enough ahead to identify factors that could lead to problems. Scanning at least twelve seconds ahead is recommended. The more time and attention one devotes to scanning distance, the greater the margin of safety. Riders can also improve their perception by practicing the same forward scanning in their cars - actively searching for potential hazards and practicing “what if?” What if that child walking on the sidewalk decides to dart into the street? What if that car at the intersection decides to turn right on red directly in front of me?

Facilitation Questions:

- What is meant by Reaction distance?
- How can we reduce our reaction distance?
- Does our ability to react change over the course of our lives? If so, how?
- What else can affect our ability to react?

Reaction distance is the distance you travel from when the problem is perceived until an action is taken (i.e., from the time you see the danger until the time you actually start to apply the brakes). Riders can reduce reaction distance by anticipating potential hazards and being prepared to respond. For example, the greatest potential for conflict between a motorcyclist and other vehicles is at intersections. Specifically, the oncoming driver violates the motorcyclist’s right of way by turning left in front of them. Covering the brakes as you approach an intersection can save you precious distance that could mean the difference between stopping safely and slamming into the oncoming car. In fact, a one second delay in reaction time while traveling at 40 mph will eat up about 60 feet of critical road space – just about the same distance it takes to stop from that speed!

Facilitation Questions:

- What is meant by Braking distance?
- How can we reduce our braking distance?
- In addition to our physical abilities, what else can affect braking distance?

Braking distance is the distance traveled from when the brakes are applied until you come to a safe stop. Riders can reduce their braking distance by maintaining their motorcycles properly. Make sure tires are within their service life and properly inflated. Regularly check the suspension and brake components and change brake fluid in accordance with the owner's manual. Being well acquainted with your motorcycle owner's manual and service manual will help guide you. Most importantly, the greatest improvements in braking distance come from practicing. Participating in a training venue or safety course is a great way to improve braking skills.

Suggested Discussion Areas:

Discussion Area 1: Different Types of Braking Systems

Facilitation Questions:

- What are the three variations to standard braking systems?
- How are the systems different?
- What type of braking system does your motorcycle have?
- Which braking system do you prefer?

Facilitator Facts:

Traction Availability and Transference: During normal riding (static or during constant speed) traction forces are distributed between the front and rear tires. As you brake, the weight shifts forward to make the front brake more powerful. Managing traction becomes very important when slowing or turning.

A motorcycle has one of the three different types of braking systems:

- 1. Independently-Controlled Braking Systems:** The traditional or independently-controlled system is most common. One lever controls the front brake and, on modern motorcycles, a foot pedal controls the rear brake. This braking system design is very common and requires significant practice to achieve maximum braking mastery.
- 2. Linked:** This braking system is less common and is somewhat similar to the independently controlled braking systems. Applying pressure to one brake system (front or back) will also apply some braking pressure to the other braking system. This system has two controls, similar to the independent braking system, but the brakes are not fully independent of each control.
- 3. Anti-lock Braking Systems (ABS):** Most anti-lock braking systems are electro-mechanical in design. Electronic sensors monitor the motorcycles wheels for rotation and mechanically modulates the brakes systems to prevent wheel lock up. This system is operator friendly and assists the rider with achieving maximum braking in a straight line. The system provides less

effective skid control when the motorcycle is leaned over during a turn. The ABS system is highly reliable on high, limited, and low traction surfaces (while the motorcycle is mostly up right). Practice and experience with ABS is necessary for riders unfamiliar with ABS quick stopping potential.

Motorcycles without anti-lock braking systems will require the operator to adjust and modulate braking pressure to the front and rear brakes—as traction availability shifts to the front tire. During hard braking, many riders may unintentionally under apply front brake pressure and over apply rear brake pressure during the shifting of frictional limits. This dynamic condition (weight shift and traction transference) requires significant and regular braking practice when operating a motorcycle with independent controls. **Linked brakes** compensate, somewhat, for typical over and under application of brakes but still requires significant and regular practice to master maximum braking. **ABS** technology accommodates less developed braking-skill for maximum braking performance but, ABS is not available on all motorcycles.

Discussion Area 2: Using Both Brakes: Threshold Braking and Traction Management

Facilitation Questions:

- What is Threshold Braking?
- Which brake do you use when stopping? Why?
- Are the front and rear brakes equally powerful? Why (or why not)?
- What is the relationship between the front brake and the rear brake and the amount of pressure that can be applied when stopping?

Facilitator Facts:

Threshold Braking is utilizing both brakes to their maximum capacity without skidding (i.e. braking to the threshold of the absolute limit of traction without exceeding that limit).

Use both brakes to stop: Motorcycles have a front and rear brake. For optimum braking performance, both brakes must be used simultaneously. Although both brakes are used in unison, the front brake is the workhorse providing at least 70% of the stopping power. It is vital that you become comfortable with using the front brake, learning to trust its efficiency. Motorcycle crash data reveal that when faced with an emergency stop, most riders underuse the front brake and overuse the rear.

To bring a motorcycle to a complete stop, squeeze the front brake lever as you press down on the rear brake pedal. The amount of force you use will depend on how quickly you need to stop. As you are applying both brakes, squeeze the clutch lever in and press down repeatedly on the gearshift lever until the bike is in the appropriate gear for your speed. The ultimate goal is to be in first gear immediately prior to stopping.

While most stops will require less than full braking force, it is important to develop the habit of using both brakes at all stops. This will help in the event of an emergency. If you have to avoid a hazard and stop the motorcycle quickly, muscle memory will ensure you use both brakes.

Proper brake modulation for weight transfer: As stated earlier, the front brake is the workhorse when it comes to stopping the motorcycle. The reason for this is because the weight of the motorcycle and the operator shift forward and transfers onto the front tire during deceleration. This weight transfer (force)

pushes the front tire and the roadway together to produce friction, allowing the motorcycle to slow and stop. Applying the front brake gradually, in a smooth progression, will properly load the front tire. Apply the front brake too aggressively and the front wheel has the potential to lock because the weight of the motorcycle and the rider has not had a chance to shift forward and transfer onto the front tire. Thus, it is critical to have a refined touch when applying the front brake. Remember to squeeze the front brake lever; do not grab it!

Weight Transfer: Based on the above, you may have already surmised that the rear end of the motorcycle becomes lighter under deceleration because the weight shifts forward. The lack of weight on the rear tire means that there is less friction between the tire and the roadway. Less friction means less traction or grip and less potential to slow and stop the motorcycle effectively. Note that the rear wheel now has the potential to lock up just as the front wheel did when it was not bearing enough load. It is, therefore, critical to have a refined feel for the rear brake pedal. By all means use the rear brake, but use it judiciously. Do not stomp on the rear brake pedal. Press down on it gently keeping in mind that you might have to release some of the pressure as the weight shifts forward and unloads the rear tire.

Discussion Area 3: Over-Application of Brakes

Facilitation Questions:

- What causes the front wheel to lock up and skid?
- What should you do in the event of a front wheel lock up? Why?
- What causes the rear wheel to lock up and skid?
- What should you do in the event of a rear wheel lock up? Why?

Facilitator Facts:

Front wheel lock up (skid): If the front brake is applied too quickly (front brake grab) the front tire loses grip and skids. The loss of control is complete and immediate. Crashes can happen very quickly under this condition. If the front tire starts to skid, immediately release the front brake lever so the front tire can regain traction and resume rolling. Then reapply the front brake using the appropriate pressure and technique, squeezing the front brake lever progressively as the weight transfers onto the front tire.

Rear wheel lock up (skid): If too much rear brake is applied during the weight transfer to the front, the rear tire loses grip and skids. In the event of a rear wheel lock up, it is recommended that you keep the rear wheel locked until the motorcycle comes to a complete stop. You can accomplish this by keeping pressure on the rear brake pedal. Note that if the rear wheel locks under hard braking at higher speeds, the back end of the motorcycle might begin to weave, or “fish tail.” Fish tailing is when the rear wheel slides out and becomes substantially out of line with the front wheel. If the rear brake is released when the bike is out of alignment, the motorcycle's rear tire regains traction and snaps back in line. The danger in releasing the rear brake is that the realignment can be violent. In fact, the snap back can be so violent that it throws the rider off of the motorcycle. This is known as a “high side” crash.

Discussion Area 4: Other Considerations When Stopping

Facilitation Questions:

- What are some other considerations when stopping a motorcycle?
- Is downshifting to first part of each and every stop? Why (or why not)?
- How serious are crashes from behind?
- What should a rider do once stopped?
- Can you think of other things?

Facilitator Facts:

Although oncoming traffic poses the greatest risk to a motorcyclist, the traffic behind is also threatening. Although only 3% of motorcycle crashes come from behind, those crashes carry a high risk of death or serious injury. Downshifting, scanning, and maximizing time and space while coming to a stop can mitigate that threat.

Downshifting: As the rider approaches the stop, it is important to downshift and ultimately be in first gear when completely stopped. Depending upon the circumstance, the rider can keep the clutch squeezed and keep pressing down on the gear shift lever until first gear is reached or shift down one gear at a time and ease the clutch lever through the friction zone after each press. The latter will cause an effect similar to applying the brakes. This effect is called engine brake. Whichever method the rider chooses, the important thing to remember is to be in first gear when reaching the stop point.

Motorcycle and brake system condition: The overall condition of the motorcycle, to include the entire braking system, has a significant factor in total stopping (braking) potential. A properly maintained motorcycle, with serviceable tires, brake pads and rotors, brake shoes and drums, and properly adjusted actuators (levers and hydraulic systems) will provide the most stopping and braking potential for skilled riders; however, a skilled rider is not able to stop at the rider's full ability if the motorcycle and braking systems are not maintained within design specifications. Combining an underdeveloped rider with a poorly maintained motorcycle is a hazardous crash formula.

Scanning: Riders should have a 360 degree awareness of traffic at all times. In order to survive on the street, know what is in front of you, to the sides of you and behind you. Traffic to the rear becomes more threatening when coming to a stop. Rear end crashes may become more commonplace as motor vehicle operators become more distracted. To mitigate the risk of a rear end hit, scan your mirrors to check that the traffic from behind is also coming to a stop.

Maximize Time and Space: When coming to a stop make sure you place yourself in a position that will create as much time and space as possible between you and your fellow roadway users. Place yourself where you can see and be seen. Just as important, leave yourself an "out." That is, have an escape route in case the vehicle behind you does not stop. For example, if you are following the vehicle in front of you too closely (not maximizing your time and space) and the car behind you is not slowing down, you are trapped. You have no place to go. Not only can you get hit from behind, but there is a good chance you will get plowed into the car you are following too closely. Be wary of getting "sandwiched" when coming to a stop. Utilize area to the right or left of the stopped vehicle in front of you.

Discussion Area 5: After the Stop:

Facilitation Questions:

- What do you do when stopped at a traffic light waiting to proceed?
- How do you feel while waiting for the light to change?
- What are you thinking?
- Where is your focus?
- What *should* you do while waiting at a traffic light?

Facilitator Facts:

Many riders have a false sense of security when they are stopped. Once stopped, at a traffic light they often relax and let their guard down. Perhaps because they are not moving, they feel safe. It is not uncommon to see a rider sitting at a traffic light in neutral, remove their hands from the bars, be lost in thought, smoke, pull out their cell phone and generally do everything else but pay attention to the traffic that is swirling around them. Avoid being lulled into a false sense of security. A rider stopped in traffic is a stationary target.

Continue to scan: Once stopped, it is imperative that you continue to scan your surroundings. In particular, know what is behind you or what is approaching you from behind. Distracted drivers are a top cause of traffic mishaps and many motor vehicle operators are so distracted they simply do not see the red light or stop sign; or the motorcyclist. Always stay on high alert!

Be in first gear: Make sure you are in first gear, have your hands on the handle bars and be ready to move out just in case that distracted driver approaching you from behind fails to see you and the red light. Never shift to neutral while stopped in traffic. Be ready to go!

Escape Route: Be sure to leave yourself an out once you are stopped. Again, if that worker who pulled an “all nighter” is not slowing down and is about to ram you from behind, you need to have an escape route. Maximizing your time and space does not apply only when you are moving. You also need to create time and space between you and other traffic when stopped. Do not box yourself in; always have a clear path to escape.

Wrap-Up:

Brief or discuss the following:

- Ask participants how they will apply what they've discussed here today.
- Has it made a difference in how they look at different aspect of motorcycling?
- Which techniques do they think will help the most in their day-to-day riding?

Through knowledge, understanding and practice, riders of all types and skill levels can become more proficient at stopping their motorcycles. The motorcyclist's total stopping distance is dependent on her ability to perceive, react and use the front brake lever and rear brake pedal with sensitivity and finesse. The refined handling of these controls will give the motorcycle exactly what it needs to perform optimally. Lastly and perhaps most importantly, is the need to have a plan while stopping and stopped. Scanning, proper gear selection and maximizing time and space are all necessary for street survival.

Distribute copies of the DSOC Motorcycle Mentorship Module Evaluation form to all participants and request that they deliver or mail the completed form to the Command or Command Safety Office for processing.

Remind everyone to ride safe, and see you at the next Mentorship Meeting.

DSOC Motorcycle Mentorship Feedback Form

Presenter Name:

Date:

Topic/Title:

Unit Number:

Please review each statement below and check the response that closely matches your experience in the Mentorship Module today:

1. Please rate the presenter's performance:

Prepared
 Not Prepared
 Engaging
 Not Engaging
 Led Discussion
 Lectured

Comments:

2. I was given opportunities to participate in the module's discussion

Never
 Only Once
 2-4 Times
 Many Times Throughout Discussion

Comments:

3. With regard to my personal riding experiences, this discussion was:

Relevant
 Not Relevant
 Interesting
 Not Interesting

Comments:

4. This discussion topic has provided me with specific learning points that I can use to be a safer, better informed rider

None
 One Idea or Fact
 2-4 Learning Points
 5 or More

Comments:

5. I would be interested in participating in other Motorcycle Mentorship Module discussion topics

Never Again
 Willing to Try Another Module
 Would Like to Do Modules Regularly

Comments:

Thank you for your participation. Please make note of any other suggestions or comments below (continue on the back if needed):

Deliver or mail this completed form to the Command or Command Safety Office for processing. Please do not return this form directly to the Module Presenter.

Resources

Continued Reading:

Duckett, Beth; Madrid, Ofelia; and Hurtado, Allison. “Driver who hit group of motorcyclists in north Phoenix has several violations.” *The Arizona Republic*, 27 Mar. 2010.
<http://tinyurl.com/czqtasf>

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Ienatsch, Nick (2003). *Sport Riding Techniques: How To Develop Real World Skills for Speed, Safety, and Confidence on the Street and Track*. Phoenix, AZ: David Bull Publishing

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Parks, Lee (2003). *Total Control – High Performance Street Riding Techniques*. St. Paul, MN: Motorbooks International

Pridmore, Reg (2004). *Smooth Riding The Pridmore Way*. Center Conway, NH: Whitehorse Press

Definitions: (As defined for purposes of this module.)

Control: Ability to direct or manage vehicle

Falling: Move downward, drop, or come down suddenly from an upright position

Friction: Resistance encountered by an object moving relative to another object with which it is in contact

Hydraulic: Force driven by fluid (hydraulic braking system)

Lever: Hand lever associated with braking system

Linkage: Interconnected mechanical or electrical connections to transmit or trigger motion

Pedal: Foot pedal associated with braking system (not associated with car accelerator)

Pneumatic: Use of compressed air or gas

Threshold braking: Applying the maximum potential of your braking system and tires.

Thrown: Sent forth through the air (undesirably and uncontrolled)

Traction: Adhesive friction between road surface and tire.

Slip/Skid: Loss of traction

Systems: Interrelated parts and materials organizing a complex whole (braking system)





ACKNOWLEDGMENTS

This module was developed collaboratively through the Defense Safety Oversight Council's (DSOC) Private Motor Vehicle Accident Reduction Task Force (PMV TF), Service Safety Centers, Line Leaders, Military Riders, National Safety Council, and the Motorcycle Safety Foundation. The DSOC wishes to recognize the organizations and the Service Men and Women who made this Motorcycle Mentoring Module possible.

Some of the principal contributors to this effort include the following:

Mr. Joseph J. Angello, Jr., DSOC Executive Secretary
Major General Margaret Woodward, USAF, PMV TF Chair
Colonel John "Odie" Slocum, USAF, PMV TF Vice-Chair
Major Alejandro Ramos, USAF, PMV TF Executive Secretary
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Captain Richard D. Jones, US Naval Safety Center
Mr. Walter Beckman, US Army Ground Driving Task Force
Mr. Peter Hill, HQMC SD, PMV-2 Working Group Chair
Mr. John Waltman, HQMC SD
Mr. Dave Kerrick, US Naval Safety Center
Mr. Don Borkowski, US Naval Safety Center
Mr. Bill Parsons, USAF Safety Center
Mr. Mark Erpelding, USAF Safety Center
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Mr. Dale Wisnieski, USCG Traffic and Recreational Safety
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Ms. Debra Ann Ferris, National Safety Council
Dr. Ray Ochs, Motorcycle Safety Foundation
Ms. Karen F. Nelson, Concurrent Technologies Corp.
Mr. Robert A. Gardiner, Concurrent Technologies Corp.
Mr. Steve Kurtiak, Global Support Services
Mr. Zack Sionakides, Cape Fox Professional Services

