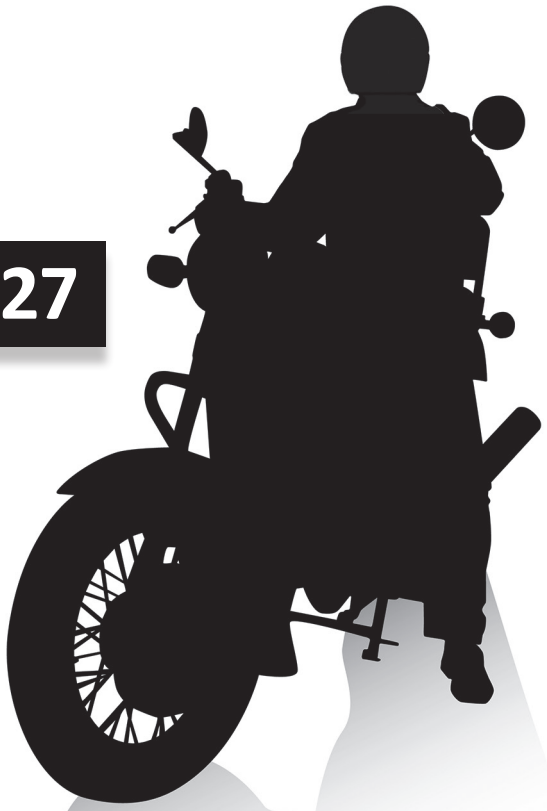
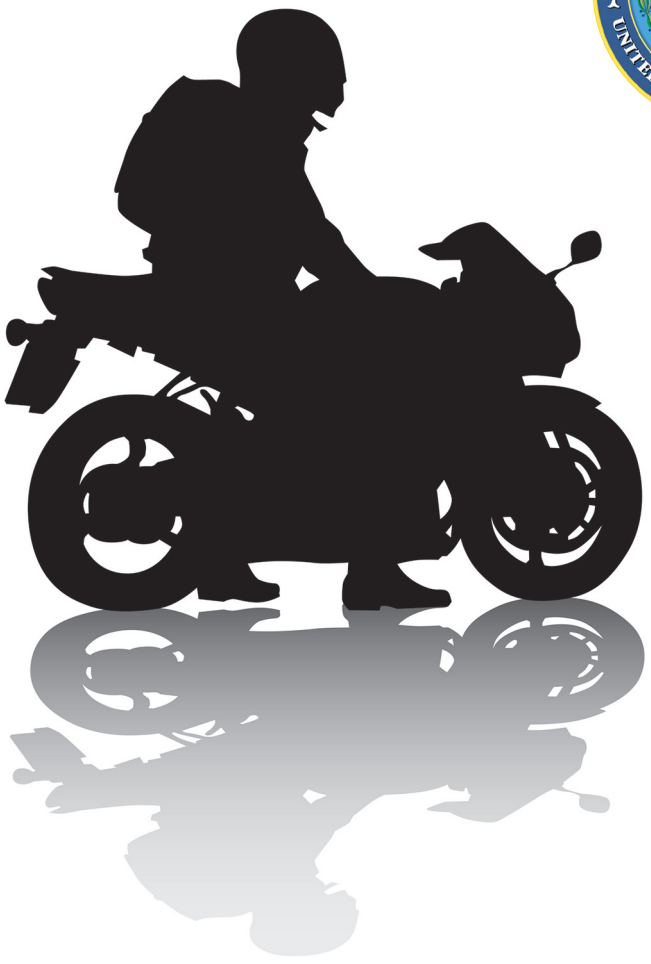
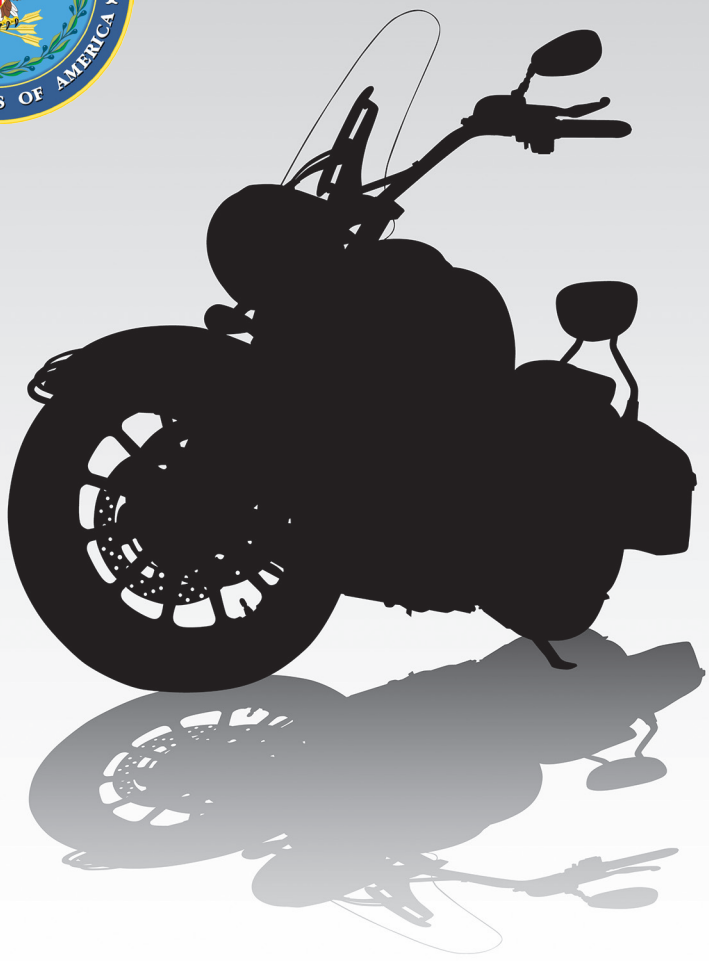
DSOC
Defense Safety Oversight Council

Motorcycle Mentorship Module 27

Emergency Braking







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.

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 20-60 minute facilitator-led discussion

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

Synopsis: The essentials of highly developed braking skills are based on the operator's knowledge of braking systems, understanding of braking physics, and awareness of individual motorcycle performance envelopes. Research suggests that attending and developing a safety attitude or ethos, within the operator, may significantly reduce the undesirable behaviors that result in crashes because "… individuals often search for and select information that confirms beliefs and attitudes…" (Bohner, Wanke, 2002). This module is intended to define the elements of emergency braking, differences in brake system designs, and the concept of emergency braking.

Learning Objectives:

- Introduction to basic knowledge and participant recognition of braking systems and fundamental concepts of braking physics.
- Define maximum braking and purpose of maximum braking. Describes or recalls different braking systems.
- Participant explains the relationship between motorcycle stability and braking. Recalls related variables and conditions of braking system potential.
- Recollection of facts.
- Participant comprehends presented facts and knowledge—participant may offer alternative perspectives, contribute or supplement accurate statements regarding terms, facts, sequential events, and may share experiential knowledge.

Suggested Environment/Props/Handouts:

Handout 1 – Traction

Additional handouts and presentation ideas are available at Service Branch Safety Centers, the National Highway Traffic Safety Administration (NHTSA) and other traffic safety related web sites. Safety center developed Combat Wallets, i.e. Army Combat Readiness/Safety Center Surviving Riding and the Naval Safety Center Surviving Riding, are great materials as handouts or supplemental learning materials.

Section II: Module Discussion

Introduction: Facilitate discussion: What is maximum or emergency braking?

Definition: Maximum or emergency braking is defined as the intentional and controlled stopping of the motorcycle, by the operator, within the shortest distance and time possible. Maximum braking, also known as threshold braking, is described as applying the maximum braking forces without locking the wheels or causing the tires to skid. Maximum braking requires significant practice, in a safe area, and is considered a highly perishable skill. Most motorcycle operators do not practice maximum braking to a highly-developed and refined skill that is instinctive or ingrained in muscle memory. The real goal during maximum braking: Stopping when the operator needs to stop and stopping where the operator must stop to avoid a crash.

Open discussions with participant-focused activities and introductions. Activities should encourage participant interaction and develop camaraderie and peer-relatedness. Ask for and encourage participant sharing of experiences related to the module topic.

Sample questions may include:

- ➤ Has anyone ever had a crash due to improper braking in an emergency situation? Can you tell us what happened or what you think happened? What did you learn from that situation?
- ➤ Have you ever seen a motorcycle crash due to improper braking in an emergency situation? What do you think happened? Did you learn anything from what another person's misfortune?
- ➤ What situations put a rider into "emergency braking mode"?
- ➤ What things do riders typically do wrong?
- ➤ How can you avoid having to make emergency stops?

Suggested Discussion Areas:

Discussion Area 1: Different Types of Braking Systems

Facilitation Questions:

- What type of braking system does your motorcycle have?
- How are braking systems different?
- What braking system do you prefer?

1. **Independently-Controlled Braking Systems:** The independently-controlled system is most common. One lever controls the front brake and *typically* 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 limits the over pressurization of the braking 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.

Discussion Area 2: Physics and Dynamics of Maximum or Hard Braking

Facilitation Questions:

- What happens to the bike when brakes are applied?
- What factors influence your bike's potential to stop or stop quickly?
- What factors can you control to improve your bike's braking potential?

1. **Traction Availability and Transference:** During normal riding (static or during constant speed) traction forces are equally distributed between the front and rear tires. As you brake, the weight shifts forward to make the front brake more valuable.

   Motorcycles with **independent brake 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 transference of frictional forces. 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 (**threshold) braking**.

ABS technology accommodates less developed braking-skill for maximum braking performance; but, ABS is not available on all motorcycles.

2. **Tire pressure:** Improperly inflated tires (under and over pressurized) can adversely affect braking distances and stopping performance. It's important to maintain the motorcycle manufacturer's recommended tire pressure (found in the motorcycle manual or on the frame, not on the tire).

3. **Tire compound type and age:** Tire compounds can increase traction with softer compounds but, even the softest compounds may become hard with time or exposure to the environment or some chemicals.

Discussion Area 3: Over-Application of Brakes

Facilitation Questions:

- What might happen if you over-apply your brakes?
- What happens if you "grab" your front brake or stomp on your rear brake?
- What are some important considerations when applying brakes?
- What about in different situations, or with different braking systems?

Front Tire: Front tire lock ups can easily and quickly induce a crash—learn to avoid locking or skidding the front tire. The operator should brake hard enough to reach maximum braking without locking the tires.

Rear Tire: Locking the rear tire, unintentionally, is less catastrophic and somewhat manageable during skidding; however, the operator should practice maximum braking without locking any wheel.

While Leaning in a Turn: Tractional forces are consuming available friction at a higher rate as a motorcycle is leaned over and applying braking forces—less braking application is required to prevent a braking-induced crash. Many who crash their motorcycles, by over-applying their brakes while leaned over, rationalize poor riding skills as "laying down the motorcycle to avoid a crash". We encourage the general riding public to acknowledge "laying the motorcycle down" is a crash—intentional or not; and experts agree that many crashes are avoidable.

ABS: This system is considered, by some, as a technology that should become a standard motorcycle feature. **ABS technology** demands less of the operator's skill during maximum braking. Typically ABS will not out-perform a highly skilled motorcyclist during maximum braking efforts with a traditional brake system; however, **ABS technology** will allow a novice or less developed motorcyclists to achieve maximum braking performance in many different road conditions with under developed braking skills or limited practice.

Discussion Area 4: Maximum Braking During Reduced Traction Conditions

Facilitation Questions:

- What considerations are there when riding on slippery or reduced traction roadways?

ABS: ABS technology is very adaptive to reduced traction conditions and remains very effective. ABS technology allows riders to brake heavily and with less precision while on oil, water, sand, and other conditions that reduce tire and road traction. ABS technology does not prevent a fall-over in reduced traction conditions i.e. ABS will not prevent your motorcycle from sliding sideways while on ice.

Non-ABS requires the operator to have familiarity and highly developed skills while braking in reduced traction conditions. Practice and braking skill development requires an initial and continued investment in creating and maintain maximum braking skills.

Wrap-Up:

Brief or discuss the following:

In Good Conditions: Practicing one's initial braking skills is best done with a qualified instructor, mentor, or professional. Suitable training and skill development venues are often designed and include paved areas free from debris, sand, and other traction reducing elements. Recommended maximum braking practice and courses should start slowly and less aggressively then gradually and incrementally develops increased braking performance. It is important to remember, practicing maximum braking has risks similar to riding a motorcycle on a public roadway. A closed parking lot or closed circuit training area does not remove the potential for injury—practice areas only reduce the potential. Practice opportunities should include braking clinics, training courses, and professionally developed or designed practice sessions. This module is not intended as a skill development practice guide.

In Reduced Traction Conditions: We do not recommend intentionally creating conditions of reduced traction during self-practice.

Off-road: Enrolling and attending an off-highway motorcycle course (dirt-bike riding) is a great opportunity to practice braking and operating motorcycles on reduced traction surfaces. The skills learned, operating a dirt-bike while off-highway, transfer to on-road riding.

Suggested Wrap-Up Discussion:

Ask participants how they would apply the knowledge they gained from this discussion to their ride home or their next ride with friends. What opinions or preconceptions about braking have changed?

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:

Bohner, G., Wanke, M. (2002). *Attitudes and Attitude Change*. East Sussex, UK: Psychology Press

Code, Keith (1983). *A Twist of the Wrist* (Vol. I.) Glendale, CA: California Superbike School, Inc.

Code, Keith (1993). *A Twist of the Wrist* (Vol. II.) Glendale, CA: California Superbike School, Inc.

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

Motorcycle Safety Foundation, (2005). *The Motorcycle Safety Foundation's Guide to Motorcycling Excellence,* 2nd Edition. Irvine CA: Whitehorse Press

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

RAND Corp. (2010). *Understanding and Reducing Off-Duty Vehicle Crashes Among Military Personnel* (DSOC Contract W74V8H-06-C-0002). Arlington VA: RAND Corp.

Spiegel, B. (2010). *The Upper Half of the Motorcycle*. Stuttgart, Germany: 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.

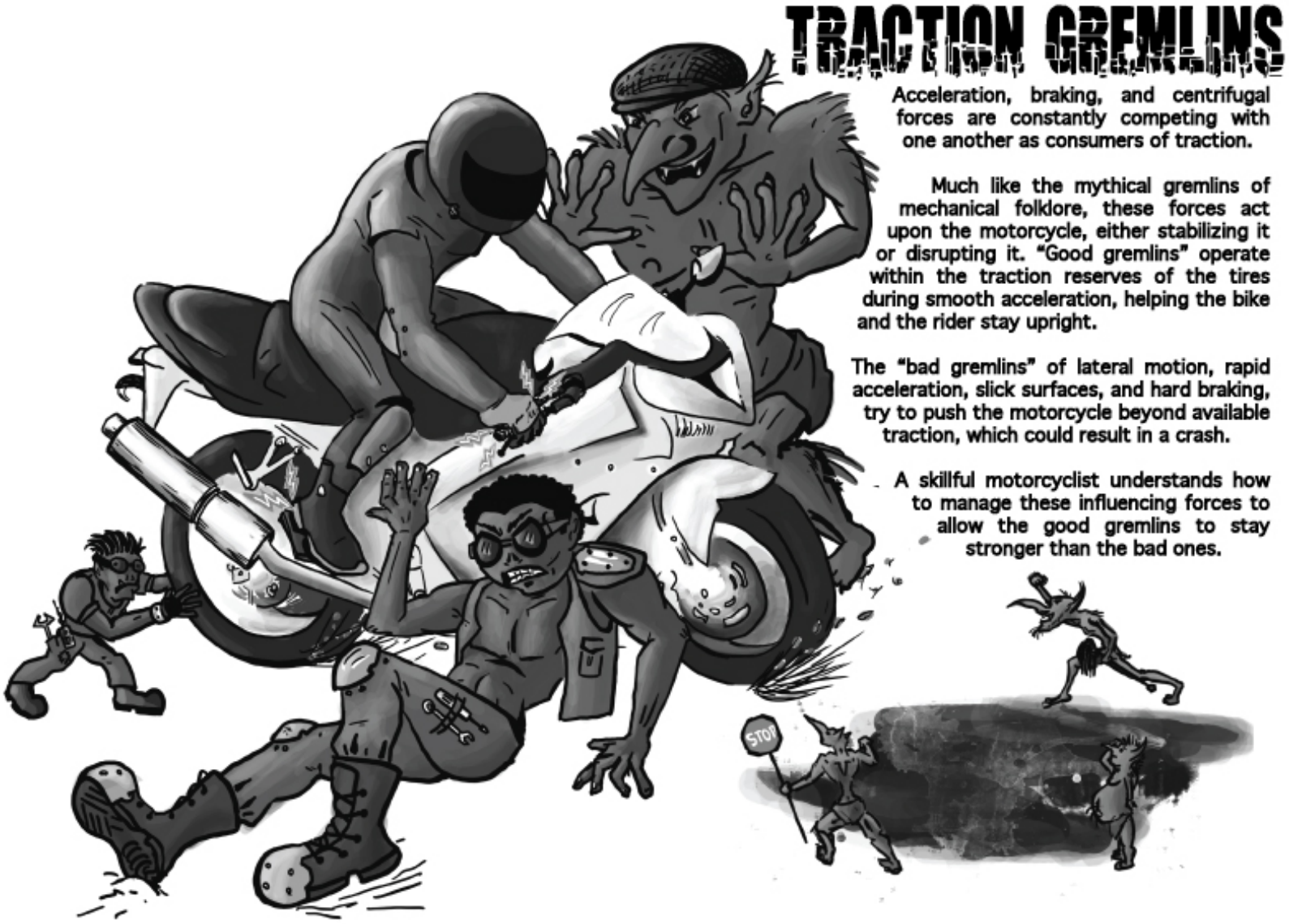
Thrown: Sent forth through the air (undesirably and uncontrolled)

Traction: Adhesive friction between road surface and tire.

Slip/Skid: Loss of traction

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

Handout 1 – Traction



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
Mr. Jerry Aslinger, DSOC Program Manager

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
Mr. William Walkowiak, USAF Safety Center
Mr. Arthur Albert, USAF Safety Center
Mr. Dale Wisnieski, USCG Traffic and Recreational Safety
Ms. Wendy Medley, US Joint Bases Subject Matter Expert
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

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THE RIGHT SKILLS>THE RIGHT TRAINING>THE RIGHT ATTITUDE

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