



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



DOT HS 811 789

June 2013

Prioritized Recommendations Of the National Agenda for Motorcycle Safety

Final Report

DISCLAIMER

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade names, manufacturers' names, or specific products are mentioned, it is because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prioritized Recommendations of the National Agenda for Motorcycle Safety

Introduction.....	1
Methods.....	2
Setting Priorities.....	5

Appendices

Appendix A: NAMS Recommendations and Classification.....	A-1
Appendix B: Methods.....	B-1
Appendix C: NAMS Recommendation Tables.....	C-1
Table C-1 NAMS Recommendations in Priority Order	C-4
Table C-2 NAMS Recommendations in Priority Order by Organization Type	C-4
Table C-3 NAMS Recommendations by Subject Area	C-10
Table C-4 NAMS Recommendations by NAMS Number	C-13
Table C-5 Highest Priority Recommendations by Organization	C-16
Appendix D: Detailed Discussion of Each NAMS RecommendationD-1	
Introduction and Terminology	D-3
10 Motorcyclists.....	D-5
11 Alcohol and Other Drugs	D-6
12 Helmets and Clothing	D-12
13 Training.....	D-24
14 Education and Information	D-35
15 Behavior and skills.....	D-44
16 Licensing.....	D-49
20 Motorcycles.....	D-58
30 Other Drivers and Vehicles.....	D-68
40 Highway and Environment	D-79
50 EMS	D-88
60 Management and Data	D-92
Appendix E: References	E-1

Prioritized Recommendations of the National Agenda for Motorcycle Safety

Introduction

The National Agenda for Motorcycle Safety (NAMS) is a comprehensive plan to improve United States motorcycle safety in the 21st century. The NAMS was developed by a technical working group of experts representing all constituencies involved in motorcycle safety, led by the National Highway Traffic Safety Administration and the Motorcycle Safety Foundation (MSF), and published in November 2000 (NHTSA, 2000). The 82 individual NAMS recommendations address the full range of topics and strategies relevant to motorcycle safety: human, vehicle, environmental, and social factors to prevent crashes, reduce injuries in crashes, and care for people injured in crashes. The technical working group prioritized the 82 recommendations into three groups: urgent (4 recommendations), essential (56), and necessary (22). The NAMS is available at www.nhtsa.gov/people/injury/pedbimot/motorcycle/00-NHT-212-motorcycle/index.html.

On September 11, 2007, the National Transportation Safety Board (NTSB) held a public meeting on motorcycle safety. Following the meeting, NTSB issued two recommendations to NHTSA:

H-07-35: Reprioritize the NAMS recommendations based on objective criteria, including known safety outcomes.

H-07-36: Following completion of the reprioritization of the NAMS requested in Safety Recommendation H-07-35, implement an action plan for States and others, such as Federal agencies, manufacturers, insurers, and rider groups, to carry out those high-priority recommendations.

This document prioritizes NTSB's Safety Recommendation H-07-35. It contains two sections. The Methods section defines three important characteristics of each recommendation, describes how the recommendations are classified according to each of these characteristics, and outlines the overall method used in establishing priorities. The Priorities section lists the highest priority recommendations.

Five Appendices provide details. Appendix A lists the 82 recommendations in their original NAMS order and gives each recommendation's classification. Appendix B describes in detail the methods used in setting priorities. Appendix C provides several tables of all recommendations and priorities. Appendix D describes how each recommendation's priority was established and provides other relevant information. Appendix E lists references.

Methods

Three Important Ways of Classifying the NAMS Recommendations

The 82 NAMS recommendations differ in three important characteristics, each of which affects how they can be prioritized based on objective criteria and how the high-priority recommendations can form the basis for an action plan. Each recommendation advocates an action. The three characteristics are:

- I. Who takes the action?
- II. What type of action is it?
- III. Who or what does the action ultimately affect and how does it affect them?

I. Who takes the action?

The NAMS recommendations are addressed to States, municipalities, rider groups, Federal agencies, motorcycle manufacturers, and insurance companies. These are aggregated into three large groups, called Organization Types.

- A. States, municipalities, and rider groups. These organizations operate in the field to train, educate, and license motorcyclists; to enact and enforce laws affecting motorcyclists; and to build and maintain the highway infrastructure on which motorcyclists ride. Their actions affect all motorcyclists directly and daily.
- B. Motorcycle and other vehicle manufacturers and insurers. They influence motorcyclists directly, through motorcycle design and performance characteristics, and less directly, through the provisions, cost structure, and incentives of motorcycle rider insurance policies and through the design of other vehicles.
- C. Federal Government. Federal agencies, primarily NHTSA, conduct research, develop programs and guidance, provide information, and establish regulations. They serve as the major support structure for many of the actions of organizations in the other two groups.

This classification does not affect the recommendations' priorities but certainly affects how the recommendations are implemented and may affect the action plan structure.

Some recommendations apply to more than one Organization Type. They have been assigned to the type that has the major responsibility.

II. What type of action is it?

Again there are three large groups, called Activity Types.

- P. Programs: Activities directly affecting individual motorcyclists, the motorcycles they ride, the roads they ride on, or the other vehicles or drivers on these roads (these are called "direct programs") or activities affecting some intermediary (such as law enforcement) that in turn will directly affect motorcyclists, motorcycles, etc. ("indirect programs").
- R. Research: Activities to study some issue or to develop or evaluate a program.

X. Management and support: Activities to improve and provide data, encourage partnerships, include motorcyclist considerations in various traffic safety activities, provide funding, and the like.

This classification is critical. Program activities in theory can be evaluated for their “known safety outcomes” – their effect on crashes, injuries, or fatalities. Unfortunately, many of the programs in the NAMS recommendations have not been evaluated, or evaluated well. Research, management, and support activities, on the other hand, do not have a direct effect on safety outcomes. To account for this difference, different prioritization strategies are necessary for each of these three types.

Table 1 shows that most programs are State, local, and advocate activities; research is almost completely a Federal activity; and management and support activities are shared.

Table 1. NAMS Recommendations by Organization Type and Activity Type

Organization Type	Activity Type			Total
	Programs	Research	Mgmt, support	
A State, local, advocates	31	0	10	41
B Mfrs, insurers	6	2	1	9
C Federal	3.5	22.5	6	32
Total	40.5	24.5	17	82

[Recommendation #35 was divided into two parts.]

III. Who or what does the action ultimately affect and how does it affect them?

The classification is more detailed, into several subject area types and subtypes. The few recommendations applying to more than one area are assigned to the area where they will have the largest effect.

This classification helps in prioritizing both the program activities that lack good evaluation evidence and also the research, management, and support recommendations. There is some research evidence on the effect of each subject area type on motorcycle safety outcomes (for example, on the role of alcohol, or of other vehicles). There also is some research evidence on the role or potential effect of specific topics within each area type (to continue the example, on the actual or potential effect of motorcyclist education in reducing alcohol-impaired riding). These latter two classifications, by activity and subject area, guide the prioritization.

Table 2 shows how the 82 NAMS recommendations are distributed across subject area and activity type classifications. Table 2 also outlines how the NAMS recommendations are numerically categorized into six major subject areas and referenced throughout this document (e.g., recommendations associated with road signs can be found in Subject Area 40, Highway and Environment, or more specifically Subject Area 41, Signage for Hazards).

Appendix A lists all 82 NAMS recommendations, in NAMS order, and gives each recommendation’s original NAMS priority and its area, activity, and organization type.

Table 2. NAMS Recommendations by Subject Area and Activity Type

Subject Area	Activity Type			Subtotal	Total
	Programs	Research	Mgmt		
10 Motorcyclists					41
11 Alcohol and Other Drugs				5	
11.1 Enforcement	1				
11.2 Communications	1	1	1		
11.3 Research		1			
12 Helmets and Clothing				7	
12.1 Helmets	3.5*	0.5*			
12.2 Clothing	1	1			
12.3 Conspicuity	1				
13 Training				9	
13.1 Current Training	1	2			
13.2 Improve Training	1	4			
13.3 Incentives for Training	1				
14 Education and Information				8	
14.1 Specific Knowledge	5				
14.2 Methods	2		1		
15 Behavior and Skills		4		4	
16 Licensing				8	
16.1 Increase Licensing	5				
16.2 Improve Licensing	1	2			
20 Motorcycles					8
21 Brakes	1	1		2	
22 Tires	1			1	
23 Lighting			1	1	
24 Conspicuity	1			1	
25 Design		1		1	
26 Modifications		1		1	
27 Technology		1		1	
30 Other Drivers and Vehicles					9
31 Other Drivers	4	1	1	6	
32 Other Vehicles	1	2		3	
40 Highway and Environment					8
41 Signage for Hazards	2			2	
42 Improve Roadway Conditions	2			2	
43 General	2	1	1	4	
50 EMS					3
50 EMS Curricula and Training	3			3	
60 Management and Data					13
61 Data			4	4	
62 Include Motorcycles			6	6	
63 Research and Funding		1	2	3	
Total	40.5	24.5	17		82

*Recommendation #35 was divided into two parts.

Setting Priorities

The model priority strategy applies to recommendations for programs that address problems of known size and that have good research evidence on their effectiveness. For each of these, two quantities can be estimated:

1) Problem Area size. Programs attempt to affect motorcyclists, motorcycles, roads, other vehicles, or other drivers. If the program were completely effective – if it completely changed behavior, or modified all motorcycles, etc. – how many fatalities would be prevented?

2) Effect size. Based on direct or indirect evidence, how large an effect is the program likely to have?

Multiply these two quantities to estimate the recommendation's overall impact on safety outcomes. For example, if alcohol causes 30 percent of fatal motorcycle crashes (in the sense that the crashes would not have occurred if the motorcycle riders had been sober) and if a specific alcohol program is estimated to reduce alcohol-impaired motorcycling by 20 percent, then a recommendation to implement this program nationwide would have a $30\% \times 20\% = 6\%$ impact on fatalities.

Fatalities are used instead of injuries or crashes as the problem size measure for several reasons. With very few exceptions, recommendations will have similar relative effects on fatal and non-fatal injury crashes and their outcomes. Data on fatal crashes and their characteristics, from FARS, is far better than data on non-fatal crashes. Finally, most motorcycle crashes produce some injuries, so there is little difference between injury and non-injury crashes.

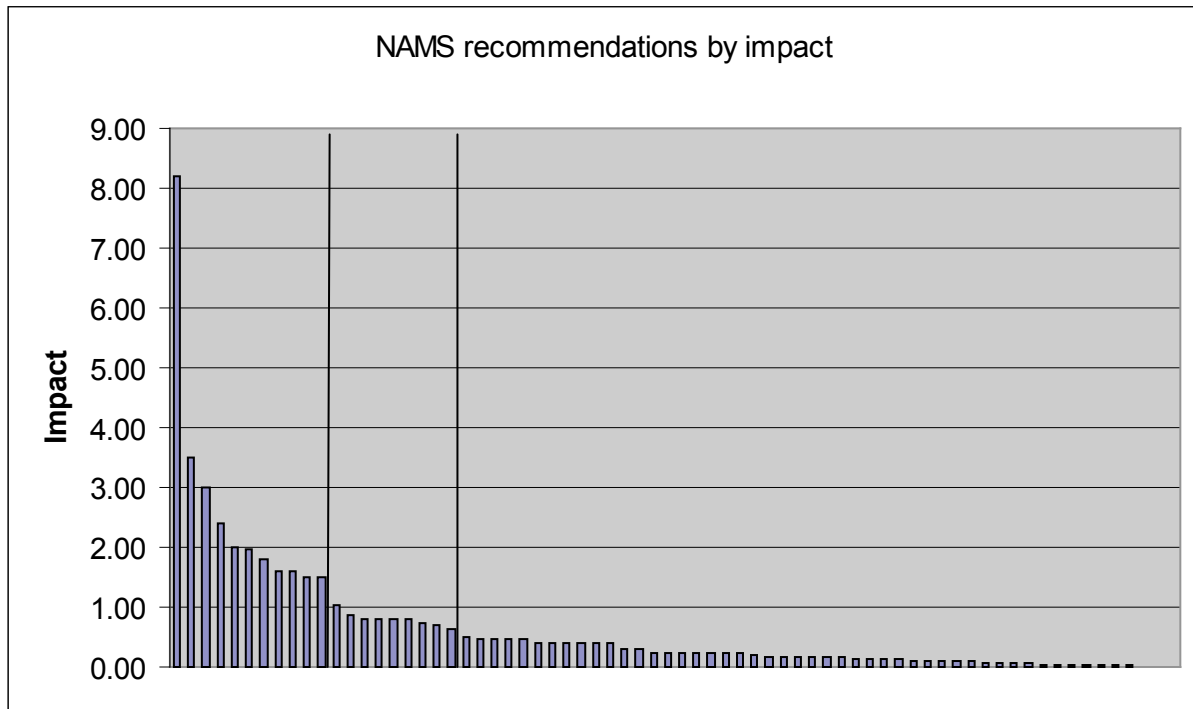
Effectiveness is estimated for programs without good research evidence by weighing the available evidence that the program would produce some change and that the change would reduce motorcyclist crashes and fatalities.

Effectiveness is estimated for research recommendations by combining somewhat subjective assessments of the likelihood that the proposed research will be successful in answering the research question, that the results will provide useful information, that the information will lead to a program that can be implemented, and that the program will reduce crashes and fatalities.

Many management and support recommendations are so general that their effect cannot be estimated directly. When possible, the effect is estimated as with research recommendations by combining somewhat subjective assessments of the likelihood that the management recommendation will be successful in accomplishing what is proposed, that the result will lead to program changes, and that the program changes will reduce crashes and injuries.

Across the 69 recommendations for which impacts can be estimated, impact sizes range from 8.21 (for recommendation # 31, Use effective strategies to increase use of FMVSS 218 compliant helmets) to essentially zero. Figure 1 illustrates the distribution of impacts.

Figure 1. NAMS Recommendations by Impact



Eleven recommendations have impacts of 1.50 and above, with #31 by far the highest. Another 9 have impacts from 0.64 to 1.05. The rest all have impacts below 0.50. These three groups are separated by vertical lines in Figure 1. Tables C-1 to C-4 in Appendix C give the problem size, effect, and impact of each recommendation.

Next, three implementation issues are considered: costs, time, and any obstacles to implementation. Each is estimated in broad categories – low, medium, and high – in a subjective manner, following the model of *Countermeasures That Work* (NHTSA, 2009a).

Overall priorities are then assigned by considering each of the four criteria: impact, cost, time, and obstacles. The final prioritization attempts to balance these four criteria, with the full understanding that this balance is subjective. Others may start with the same information and produce different overall priorities.

Nine management and support recommendations for which effect sizes cannot be estimated are prioritized separately and quite subjectively. Three recommendations are not assigned priorities.

Overall, 12 recommendations are classified priority 1, 29 are priority 2, 39 are priority 3, and 3 are not prioritized. Priorities follow the impact rankings closely: All recommendations with an impact of 1.50 or higher are priority 1, and are assigned to priority 1A, with the exception of recommendation #56. This produces 10 “top priority 1A” recommendations. The two remaining priority 1 recommendations (#1 and #3) are so general that they cannot be acted upon directly but only through other, more specific recommendations included within them. They are assigned to priority 1B as a reminder that they state important overall principles.

The 29 priority 2 recommendations have been subdivided by impact. The 10 with impacts above 0.64 are priority 2A; the 14 with impacts 0.16 to 0.50 are 2B; and the remaining 5 are priority 2C. Finally, 39 recommendations are priority 3 while three recommendations were not assigned a priority, for a total of 83 (recommendation #35 was divided into two parts).

Appendix B describes these prioritization methods in greater detail. Appendix D discusses each recommendation in turn and explains how its problem size, effect, impact, cost, time, obstacles, and priority are determined.

Priorities

Table 3 summarizes the 22 highest priority recommendations – priority 1 and 2A – by organization. See Appendix C for the complete priorities for all recommendations, tabulated in several ways.

States, Municipalities, Rider Groups: The 10 highest priority recommendations cover the critical issues of impaired riding (#28 and #29), helmets (#31 and #33), motorcyclist conspicuity (#61), training (#9 and #57), licensing (#11 and #17), and involvement of police and judges in motorcycle issues (#45). Most are program recommendations that can be implemented fairly quickly.

Manufacturers and Insurers: The 2 highest priority recommendations both involve improvements in motorcycle brakes (#55 and #56). None of the highest priority recommendations is directed to insurers.

Federal: The 10 highest priority recommendations cover impaired riding (#27), helmets (#35.1 and #35.2), crash avoidance attitudes, skills, training, and technology (#7, #21, #22, and #25), licensing (#20), and 2 general recommendations supporting research and funding (#1 and #3). Most involve research that requires both time and funding.

These 22 recommendations form a comprehensive high-priority agenda for improving motorcycle safety in the years ahead.

Table 3. High-Priority NAMS Recommendations by Organization

No.	National Agenda for Motorcycle Safety Recommendations	Area	Type	Impact	Impact Rank	Priority	Cost	Time	Ease	Overall
						Impact				
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	8.21	1	1	1	1	3	1A
45	Educate police and judges on motorcycle safety issues	62	X	1.60	8	1	1	2	1	1A
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	1.50	10	1	2	2	1	1A
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	1.05	12	1	2	2	2	2A
9	Provide training to all who need or seek it	13.1	P	0.80	14	2	3	3	2	2A
57	Provide additional education/training on proper braking techniques	13.2	P	0.80	14	2	3	3	3	2A
11	Merge rider education/training and licensing into one-stop operations	16.1	P	0.80	14	2	1	2	3	2A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	0.80	14	2	1	2	3	2A
61	Encourage motorcyclists to increase conspicuity	12.3	P	0.75	18	2	2	2	1	2A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	0.68	19	2	2	2	1	2A

	Manufacturers, Insurers									
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	3.00	3	1	2	3	2	1A
56	Use research information to implement other braking-related countermeasures	21	P	1.50	10	1	2	3	2	2A
	Federal									
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	3.50	2	1	3	3	2	1A
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	2.40	4	1	3	3	2	1A
21	Identify critical crash avoidance skills	15	R	2.00	5	1	3	3	1	1A
35.2	Revise FMVSS 218 - improve performance	12.1	R	1.96	6	1	3	3	3	1A
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	1.80	7	1	3	3	2	1A
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	1.60	8	1	3	3	3	1A
1	Government and industry research studies, both comprehensive and specific	63	R	N/A	N/A	N/A	3	3	3	1B
3	Build academic and funding capacity for motorcycle safety research	63	X	N/A	N/A	N/A	3	3	3	1B
35.1	Revise FMVSS 218 - labels	12.1	P	0.87	13	2	1	3	2	2A
20	Develop & evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	0.64	20	2	2	3	2	2A

Table 3: Key

Area: see Subject Area classification in Table 2.

Type: P = Programs; R = Research; X = Management and Support

Impact: measured as a percentage of motorcyclist fatalities

Impact rank: from 1 (highest) to 69 (lowest), with 13 unranked recommendations (N/A)

Priority - Impact, Cost, Time, Ease, Overall: 3-point scale, with 1 = best and 3 = worst.

Priorities 1 and 2 have been further divided into parts with A = highest and C = lowest

Prioritized Recommendations of the National Agenda for Motorcycle Safety

Appendix A NAMS Recommendations and Classifications

No.	National Agenda for Motorcycle Safety Recommendation	Subject Area	Type	Org.
1	Government and industry research studies, both comprehensive and specific	63	R	C
2	Develop uniform crash and EMS reports	61	X	C
3	Build academic and funding capacity for motorcycle safety research	63	X	C
4	Motorcycle safety information clearinghouse	14.2	X	C
5	Research-based safety information for media and for rider education and training	14.2	P	C
6	Methods and media for information distribution: PSAs, ads in enthusiast media, etc.	14.2	P	A
7	Study motorcyclists' attitudes, behavior, effect on crash involvement	15	R	C
8	Develop programs to reduce dangerous behavior and reinforce safe behavior	15	R	C
9	Provide training to all who need or seek it	13.1	P	A
10	Study effectiveness and impact of rider education/training	13.1	R	C
11	Merge rider education/training and licensing into one-stop operations	16.1	P	A
12	Increase State use of motorcycle program assessments	62	X	A
13	Establish benchmarks for education/training effectiveness and motorcycle program operations	13.1	R	C
14	Study effectiveness of on-street training	13.2	R	C
15	Research to assure that licensing tests measure crash avoidance skills, behaviors	16.2	R	C
16	Identify and remove barriers to obtaining motorcycle endorsement	16.1	P	A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	A
18	Enforce penalties for improperly licensed motorcyclists	16.1	P	A
19	Train license examiners in motorcycle issues	16.2	P	A
20	Develop and evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	C
21	Identify critical crash avoidance skills	15	R	C
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	C
23	Evaluate effectiveness of education/training in developing crash avoidance skills	13.2	R	C
24	Evaluate need for simulator training in motorcycle skills	13.2	R	C
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	C
26	Study alcohol, drug, and medication effects on motorcyclists' skills	11.3	R	C
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	C
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	A
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	A
30	Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD)	11.2	X	A
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	A
32	Educate motorcyclists on protective equipment with information source, forum for information exchange	12.2	P	A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	A
34	Use effective strategies to ensure all helmets meet FMVSS 218	12.1	P	A
35.1	Revise FMVSS 218 - labels	12.1	P	C
35.2	Revise FMVSS 218 – improve performance	12.1	R	C

No.	National Agenda for Motorcycle Safety Recommendation	Subject Area	Type	Org.
36	Study protective equipment benefit, consider standards if warranted	12.2	R	C
37	Educate other motorists to be more conscious of motorcycles	31	P	A
38	Educate motorcyclists that they may not be seen; provide defensive strategies	14.1	P	A
39	Include information on motorcyclists in driver manuals and licensing tests	31	P	A
40	Require motorcyclist awareness class for motorists guilty of violating cycle right-of-way	31	P	A
41	Devote adequate funding to develop and implement motorcyclist awareness info	31	X	A
42	Insurance policies should not be valid for improperly licensed operators	16.1	P	B
43	Collect, analyze, distribute motorcycle-specific loss data from insurers	61	X	B
44	Develop guidelines for insurers for premium reductions for education/training and licensing	13.3	P	B
45	Educate police and judges on motorcycle safety issues	62	X	A
46	Include police in State motorcycle program assessments	62	X	A
47	Develop and implement standard motorcycle crash data collection and reporting	61	X	C
48	Include motorcycle crash procedures in basic crash investigation training	61	X	A
49	Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge	31	P	A
50	Educate traffic safety organizations on motorcycle safety issues	62	X	A
51	Raise importance, increase funds for motorcycle programs in State highway safety offices	63	X	A
52	Integrate motorcycle safety representatives into traffic safety activities	62	X	A
53	Study how current motorcycle designs affect crashes and injury causation	25	R	B
54	Improve tires and wheels to reduce puncture flats	22	P	B
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	B
56	Use research information to implement other braking-related countermeasures	21	P	B
57	Provide additional education/training on proper braking techniques	13.2	P	A
58	Study the role of vehicle motorcycle modifications in crashes	26	R	C
59	Educate riders how modifications and loads affect motorcycle operating characteristics	14.1	P	A
60	Study why motorists don't see motorcycles; develop and implement countermeasures	31	R	C
61	Encourage motorcyclists to increase conspicuity	12.3	P	A
62	Encourage manufacturers to increase conspicuity of apparel and parts	24	P	B
63	Reconsider State requirements prohibiting conspicuity modifications	23	X	A
64	Study effects of automobile daytime running lights on motorcycle safety	32	R	C
65	Study safety implications of lane splitting	15	R	C
66	Educate motorcyclists on lane use strategies, including HOV lanes	14.1	P	A
67	Identify and prioritize roadway hazards to motorcyclists	43	R	C
68	Revise design, construction, maintenance standards to include motorcyclist needs	43	P	A
69	Create working group to recommend changes to highway standards for motorcycle needs	43	X	C
70	Post hazard warnings for motorcyclists	41	P	A

No.	National Agenda for Motorcycle Safety Recommendation	Subject Area	Type	Org.
71	Revise MUTCD for better signage for hazardous road or construction conditions	41	P	C
72	Educate motorcyclists about common roadway hazards	14.1	P	A
73	Remove slippery sealants and road surface repair substances	42	P	A
74	Educate road design and maintenance staff about conditions hazardous to motorcyclists	43	P	A
75	Reduce roadway debris	42	P	A
76	Educate motorcyclists how to overcome hazards presented by other vehicles' designs	14.1	P	A
77	Emphasize motorcycle safety in other vehicle design	32	P	B
78	Study how other vehicle designs affect motorcycle safety	32	R	C
79	Include motorcyclist component in EMS training	50	P	A
80	Include motorcyclist component in first aid/bystander training	50	P	A
81	Use EMS Agenda for Future to promote motorcycle safety	50	P	C
82	Include motorcycles in ITS design and development	62	X	C

**Prioritized Recommendations of the
National Agenda for Motorcycle Safety**

**Appendix B
Methods**

Appendix B: Methods

Methods

Three Important Ways of Classifying the NAMS Recommendations

The 82 NAMS recommendations differ in three important characteristics, each of which affects how they can be prioritized based on objective criteria and how the high-priority recommendations can form the basis for an action plan. Each recommendation advocates an action. The three characteristics are:

- I. Who takes the action?
- II. What type of action is it?
- III. Who or what does the action ultimately affect and how does it affect them?

I. Who takes the action? The NAMS recommendations are addressed to States, municipalities, rider groups, Federal agencies, motorcycle manufacturers, and insurance companies. These are aggregated into three large groups, called Organization Types.

- A. States, municipalities, and rider groups. These organizations operate in the field to train, educate, and license motorcyclists; to enact and enforce laws affecting motorcyclists; and to build and maintain the highway infrastructure on which motorcyclists ride. Their actions affect all motorcyclists directly and daily.
- B. Motorcycle and other vehicle manufacturers and insurers. They influence motorcyclists directly, through motorcycle design and performance characteristics, and less directly, through the provisions, cost structure, and incentives of motorcycle rider insurance policies and through the design of other vehicles.
- C. Federal Government. Federal agencies, primarily NHTSA, conduct research, develop programs, provide information, and establish regulations. They serve as the major support structure for many of the actions of organizations in the other two groups.

This classification does not affect the recommendations' priorities but certainly affects how the recommendations are implemented and may affect the action plan structure. There may well be separate action plans for each organization type.

Some recommendations apply to more than one organization type. They have been assigned to the type that has the major responsibility.

II. What type of action is it? Again there are three large groups, called Activity Types.

- P. Programs: Activities directly affecting individual motorcyclists, the motorcycles they ride, the roads they ride on, or the other vehicles or drivers on these roads (these are called "direct programs") or activities affecting some intermediary (such as law enforcement) that in turn will directly affect motorcyclists, motorcycles, etc. ("indirect programs").
- R. Research: Activities to study some issue or to develop or evaluate a program.
- X. Management and support: Activities to improve and provide data, encourage partnerships, include motorcyclist considerations in various traffic safety activities, provide funding, and the like.

This classification is critical. Program activities in theory can be evaluated for their "known safety outcomes" – their effect on crashes, injuries, or fatalities. Unfortunately, many of the

Appendix B: Methods

program activities in the NAMS recommendations have not been evaluated, or evaluated well. Research, management, and support activities, on the other hand, do not have a direct effect on safety outcomes. To account for this difference, different prioritization strategies are necessary for each of these three types.

It is not surprising that different activities are conducted by different organizations. Table B-1 shows that most programs are State, local, and advocate activities; research is almost completely a Federal activity; and management and support activities are shared.

Table B-1. NAMS Recommendations by Organization Type and Activity Type

Organization Type	Activity Type			Total
	Programs	Research	Mgmt. Support	
A State, local, advocates	31	0	10	41
B Mfrs, insurers	6	2	1	9
C Federal	3.5	22.5	6	32
Total	40.5	24.5	17	82

[Recommendation #35 was divided into two parts.]

III. Who or what does the action ultimately affect and how does it affect them? The classification here is more detailed, into several subject area types and subtypes. The few recommendations applying to more than one subject area have been assigned to the area where they would have the largest effect.

This classification helps in prioritizing both the program activities that lack good evaluation evidence and also the research, management, and support recommendations. There is some research evidence on the effect of each subject area type on motorcycle safety outcomes (for example, on the role of alcohol, or of other vehicles). There also is some research evidence on the role or potential effect of specific topics within each area type (to continue the example, on the actual or potential effect of motorcyclist education in reducing alcohol-impaired riding). These latter two classifications, by Activity and subject area, guide the prioritization.

Table B-2 shows how the 82 NAMS recommendations are distributed across subject area and Activity Type classifications. Table B-2 also outlines how the NAMS recommendations are numerically categorized into six major subject areas and referenced throughout this document by subject area (e.g., recommendations associated with operator licensing can be found in Subject Area 10, Motorcyclists, or more specifically Subject Area 16, Licensing).

Numerical Categorization of NAMS Recommendations by Subject Area:

- Subject Area 10 – Motorcyclists
- Subject Area 20 – Motorcycles
- Subject Area 30 – Other Drivers and Vehicles
- Subject Area 40 – Highway and Environment
- Subject Area 50 – Emergency Medical Services (EMS)
- Subject Area 60 – Management and Data

Appendix B: Methods

Table B-2. NAMS Recommendations by Subject Area and Activity Type

Subject Area	Activity Type			Subtotal	Total
	Programs	Research	Mgmt		
10 Motorcyclists					41
11 Alcohol and Other Drugs				5	
11.1 Enforcement	1				
11.2 Communications	1	1	1		
11.3 Research		1			
12 Helmets and Clothing				7	
12.1 Helmets	3.5*	0.5*			
12.2 Clothing	1	1			
12.3 Conspicuity	1				
13 Training				9	
13.1 Current Training	1	2			
13.2 Improve Training	1	4			
13.3 Incentives for Training	1				
14 Education and Information				8	
14.1 Specific Knowledge	5				
14.2 Methods	2		1		
15 Behavior and Skills		4		4	
16 Licensing				8	
16.1 Increase Licensing	5				
16.2 Improve Licensing	1	2			
20 Motorcycles					8
21 Brakes	1	1		2	
22 Tires	1			1	
23 Lighting			1	1	
24 Conspicuity	1			1	
25 Design		1		1	
26 Modifications		1		1	
27 Technology		1		1	
30 Other Drivers and Vehicles					9
31 Other Drivers	4	1	1	6	
32 Other Vehicles	1	2		3	
40 Highway and Environment					8
41 Signage for Hazards	2			2	
42 Improve Roadway Conditions	2			2	
43 General	2	1	1	4	
50 EMS					3
50 EMS Curricula and Training	3			3	
60 Management and Data					13
61 Data			4	4	
62 Include Motorcycles			6	6	
63 Research and Funding		1	2	3	
Total	40.5	24.5	17		82

* Recommendation #35 was divided into two parts.

Appendix B: Methods

Setting Priorities: Model Strategy

The model priority strategy applies to recommendations for programs that address a problem of known size and that have good research evidence on their effectiveness. For each of these, two quantities can be estimated:

(1) Problem area size. Programs attempt to improve the safety of motorcyclists, motorcycles, roads, other vehicles, or other drivers. If the program were completely effective – if it completely changed behavior, or modified all motorcycles, etc. – how many crashes, injuries, or fatalities would be prevented?

(2) Effect size. Based on direct or indirect evidence, how large an effect is the program likely to have?

Multiply these two quantities to estimate the recommendation's overall impact on safety outcomes. For example, if alcohol causes 30 percent of fatal motorcycle crashes (in the sense that the crash would not have occurred if the motorcycle rider had been sober) and if a specific alcohol program is estimated to reduce alcohol-impaired motorcycling by 20 percent, then a recommendation to implement this program nationwide would have a $30\% \times 20\% = 6\%$ impact on fatalities.

Next, three implementation issues are considered: costs, time, and any obstacles to implementation. Each of these is estimated in broad categories in a subjective manner, following the model of *Countermeasures That Work* (NHTSA, 2009a). Overall priorities then are assigned by considering each of the four criteria: impact, cost, time, and obstacles. The highest priority would be assigned to a recommendation with large impact, low cost, short time to implement, and no obstacles. But it is not obvious how to prioritize two recommendations, one with a larger impact but higher cost and longer time and the other with a smaller impact, lower cost, and shorter time. The final prioritization attempts to balance these four criteria, with the full understanding that this balance is subjective. Others may start with the same information and produce different overall priorities.

Setting Priorities: Detailed Strategy

Few recommendations fit the model criteria described above: programs that address a problem of known size, that have good research evidence on their effectiveness, and for which the implementation cost, time, and obstacles can be estimated reliably. The modifications of this strategy used for other recommendations follow.

Program recommendations are assigned an effect size in several ways, depending on the available evidence.

(1) There is evidence of the specific program's effect on motorcyclist crashes, injuries, or fatalities. Example: NAMS recommendation #9, provide training to all who need or seek it: several studies evaluate this directly (though study design and quality may temper the conclusions).

Appendix B: Methods

(2) If there is no direct evidence of the program’s effect on motorcyclists, but there is evidence of the program’s effect on reducing crashes, injuries, or fatalities on other non-motorcycle motor vehicle operators; then, evaluate the evidence that the program may produce the effect. Example: recommendation #33, communicate helmet use benefits and work toward greater voluntary use of FMVSS helmets. There is extensive evidence that FMVSS-compliant helmet use reduces injuries and fatalities in a crash. The effect size is estimated by considering the evidence of how better communication of helmet use benefits and related strategies might increase the voluntary use of FMVSS-compliant helmets.

(3) If there is no direct evidence of the program’s effect, then evaluate the basis for believing that the effect sought would reduce motorcyclist crashes and injuries; then evaluate the evidence that the program would produce the effect. Example: recommendation #19, train license examiners in motorcycle issues. There’s no direct evidence on the extent to which license examiners lack appropriate training, nor is there any direct evidence that better-trained license examiners would have an effect on rider skill levels or crashes. So the effect size is estimated indirectly, through the likely effects of all three stages: of the need for better-trained license examiners, of the effects of license examiners on rider skills, and of the effects of improved rider skill levels on crashes.

Effect sizes are estimated in these manners for program recommendations. A “likely” effect – the best estimate, based on available evidence – is used in developing the priorities. The likely effect is then combined with the problem size estimate to produce an overall estimate of the recommendation’s impact. Upper and lower bounds for the effect size also are given but are not used in estimating the impact.

For indirect programs, effect size is estimated in two steps: first, the effect of the program on the intermediary, and then the effect of the intermediary on motorcyclists, motorcycles, etc.

Research recommendations do not have a direct and objective safety outcome effect. So, indirect and less objective methods must be used to estimate effect size. The fundamental strategy is to combine a subjective assessment of the likelihood that the proposed research will be successful in answering the research question and providing useful information with a second subjective assessment of the likelihood that the information will lead to a program that can be implemented. These are combined with the objective problem size data to estimate the recommendation’s impact. The recommendation’s cost, time, and obstacles (each of these for both the research and subsequent implementation) are estimated as before. It is worth noting again that most research recommendations are directed to the Federal Government, with only two to motorcycle manufacturers and none to States, municipalities, or rider groups. So the use of somewhat different and less objective prioritization methods for research and program recommendations should not cause confusion. It is also worth noting that most research recommendations cost more and take longer to produce an effect on motorcyclist crashes and casualties than program recommendations.

Appendix B: Methods

Management and support recommendations are even less suited to objective prioritization. Some defy objective prioritization completely. For example, recommendation #2, develop uniform crash and EMS reports, seeks to improve motorcycle crash data, which in turn may improve research and evaluation activities, which in turn may help develop improved programs, which eventually may have an effect on safety outcomes. This recommendation cuts across all activity types and has the potential to affect all motorcycle crashes and casualties, but its effect size cannot be estimated. Other management and support recommendations are directed to quite specific activities, for example recommendation #69, create a working group to recommend changes to highway standards for motorcycle needs. Here the problem size can be estimated fairly well: the proportion of motorcycle crashes and casualties that might be prevented or reduced by highway changes. Effect size is another matter: it is impossible to estimate the potential effect of such a working group on highway standards, or the effect of unknown changes in highway standards on crashes and casualties.

The strategy for management and support recommendations is similar to the strategy for research recommendations. When possible, a subjective assessment of the likelihood that the recommendation will be successful in accomplishing what is proposed is combined with a second subjective assessment of the likelihood that the result will lead to program changes to estimate the recommendation's impact. The recommendation's cost, time, and obstacles are estimated as before. There are 11 management and data recommendations whose impact cannot be estimated, consisting of most recommendations in Subject Areas 62 (data), 63 (include motorcycles and motorcyclists in various activities), and 64 (funding). These are prioritized separately and quite subjectively.

Factors Used in Establishing Priorities

Problem Size

The problem size of each recommendation is measured by the percent of motorcycle fatalities that the recommendation may affect. For example, the problem size of a recommendation that seeks to reduce the number of alcohol-impaired motorcycle riders is estimated to be 30 percent, the proportion of fatally injured motorcyclists for whom alcohol impairment is estimated to have caused or contributed to their crash (see Area 11, Alcohol). Across the recommendations, problem sizes range from 0.5 to 100 percent.

Fatalities are used instead of injuries or crashes as the problem size measure for several reasons. Fatal crashes generate more overall social concern than non-fatal crashes. With very few exceptions, recommendations will have similar relative effects on fatal and non-fatal injury crashes and their outcomes. Data on fatal crashes and their characteristics, from FARS, are far better than data on non-fatal crashes. Finally, most motorcycle crashes produce some injuries, so there is little difference between injury and non-injury crashes.

In 2008, 5,290 motorcyclists died in traffic crashes and about 96,000 were injured, or a little over 18 injuries for each fatality (NHTSA, 2009c, Table 1). So, in round numbers, a problem size of 10 percent affects about 500 fatalities and about 10,000 non-fatally injured motorcyclists each

Appendix B: Methods

year; a problem size of 1 percent affects about 50 fatalities and 1,000 non-fatally injured motorcyclists.

Effect Size

The effect size of a recommendation is the percent of the potentially affected fatalities that the recommendation is estimated to reduce. A default of 0.1 percent is used for recommendations with no discernable effect. While effect sizes can reach 50 percent, most are less than 5 percent and many are less than 2 percent. Effect sizes typically assume that the recommendation is implemented uniformly, thoroughly, and well, with sufficient financial and staff resources and, if appropriate, vigorous and effective publicity.

Impact

The impact of a recommendation is the product of its problem size and its effect size. Impact also is measured as the percent of total motorcyclist fatalities that the recommendation is estimated to reduce. As with its problem size, a recommendation's impact can be translated into fatalities and injuries: in round numbers, an impact of 1 percent would reduce fatalities by about 50 and injuries by about 1,000 annually. Impacts range from 0.01 to 8.21 across the 70 recommendations for which they can be estimated. Stated in terms of fatalities, recommendation impacts range from 0.5 fatalities to 434 fatalities annually.

Cost and Time

Cost and time estimates for the recommendations use the same general classifications as *Countermeasures That Work* (NHTSA, 2009a). Both are estimated on a 3-point scale, with 1 the best (lowest cost, shortest time) and 3 the worst.

Cost:

- 1: Low – can be implemented with current staff, perhaps with training; limited costs for equipment, facilities, and publicity
- 2: Medium – requires some additional staff time, equipment, facilities, publicity, and/or funding
- 3: High – requires extensive new facilities, staff, equipment, publicity, or funding, or makes heavy demands on current resources

These definitions take into account the resources available to the organizations to which the recommendation is addressed.

Time:

- 1: Short – three months or less
- 2: Medium – more than three months but less than one year
- 3: Long – more than one year

These estimates do not include the time required to enact legislation or establish policies.

Appendix B: Methods

Obstacles

This category attempts to estimate any obstacles to accomplishing the recommendation other than cost or time. It also is estimated on a 3-point scale.

- 1: Low – straight-forward; no apparent obstacles
- 2: Medium – moderate obstacles
3. High – substantial obstacles

In the discussions of individual recommendations, only obstacles rated medium or high are mentioned.

**Prioritized Recommendations of the
National Agenda for Motorcycle Safety**

**Appendix C
NAMS Recommendation Tables**

Appendix C: NAMS Recommendation Tables

NAMS Recommendation Tables

Appendix C tabulates the problem size, effect size, impact, cost, time, obstacles, and overall priorities of the 82 NAMS recommendations in several ways. Table C-1 provides this information for all recommendations listed in their overall priority order, and by impact within each priority group. The remaining tables provide the same information sorted in different ways:

Table C-2: by priority order within each organization type; by impact within priorities;

Table C-3: by subject area; and

Table C-4: by NAMS number.

Table C-4 also includes the original NAMS priorities, coded U = Urgent (4 recommendations), E = essential (56), and N = necessary (22).

Table C-5 summarizes the top priority recommendations – priority 1 and 2A – by organization: 12 recommendations for States, municipalities, and rider groups; 2 for manufacturers, and 10 for Federal agencies.

In each table, the information on each NAMS recommendation is contained in a single row. The columns provide the following information on each recommendation. Due to space constraints, not all tables contain all fields.

No: Number in NAMS, from 1 to 82.

Recommendation: Short description of the recommendation. See Appendix D for full texts.

Area: Subject area, as summarized in Table B-2, Appendix B.

Type: Activity type, as described on p. B-1, Appendix B.

Org: Organization type, as described on p. B-1, Appendix B.

Problem Size: Problem size, as described on p. B-6, Appendix B.

Effect: Effect size, as described on p. B-6, Appendix B.

Impact: Impact size, as described on p. B-6, Appendix B.

Impact rank: Overall ranking of all recommendations by impact, from 1 (highest) to 69 (lowest). Recommendations with the same impact all have the same rank.

Impact rank in org: Ranking of all recommendations by impact within each organization type.

Priorities: see discussion on p. B-2 and following, Appendix B.

Impact: 3-point classification, from 1 (highest) to 3 (lowest); see p. B-6.

Cost: 3-point classification, from 1 (lowest) to 3 (highest); see p. B-7.

Time: 3-point classification, from 1 (lowest) to 3 (highest); see p. B-7.

Ease: 3-point classification of obstacles, from 1 (low) to 3 (high); see p. B-7.

Overall: 3-point classification of overall priority, from 1 (highest) to 3 (lowest); priority 1 is further subdivided, from 1A (highest) to 1B (lowest); priority 2 is subdivided, from 2A (highest) to 2C (lowest).

Measures that cannot be calculated are coded N/A. Note that all numerical scales are coded with 1 as the best grade: high effect is coded 1, as is low time.

Table C-1. NAMS Recommendations in Priority Order

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
Priority 1														
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	A	57	14.4	8.21	1	1	1	1	1	3	1A
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	C	35	10	3.50	2	1	1	3	3	2	1A
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	B	60	5	3.00	3	1	1	2	3	2	1A
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	C	80	3	2.40	4	2	1	3	3	2	1A
21	Identify critical crash avoidance skills	15	R	C	50	4	2.00	5	3	1	3	3	1	1A
35.2	Revise FMVSS 218 - improve performance	12.1	R	C	49	4	1.96	6	4	1	3	3	3	1A
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	C	90	2	1.80	7	5	1	3	3	2	1A
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	C	80	2	1.60	8	6	1	3	3	3	1A
45	Educate police and judges on motorcycle safety issues	62	X	A	80	2	1.60	8	2	1	1	2	1	1A
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	A	30	5	1.50	10	3	1	2	2	1	1A
1	Government and industry research studies, both comprehensive and specific	63	R	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
3	Build academic and funding capacity for motorcycle safety research	63	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
Priority 2														
56	Use research information to implement other braking-related countermeasures	21	P	B	60	2.5	1.50	10	2	1	2	3	2	2A
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	A	35	3	1.05	12	4	2	2	2	2	2A
35.1	Revise FMVSS 218 - labels	12.1	P	C	5	18.5	0.87	13	7	2	1	3	2	2A
9	Provide training to all who need or seek it	13.1	P	A	80	1	0.80	14	5	2	3	3	2	2A
57	Provide additional education/training on proper braking techniques	13.2	P	A	80	1	0.80	14	5	2	3	3	3	2A
11	Merge rider education/training and licensing into one-stop operations	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
61	Encourage motorcyclists to increase conspicuity	12.3	P	A	25	3	0.75	18	9	2	2	2	1	2A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	A	57	1.2	0.68	19	10	2	2	2	1	2A
20	Develop and evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	C	80	0.8	0.64	20	8	2	2	3	2	2A
62	Encourage manufacturers to increase conspicuity of apparel and parts	24	P	B	25	2	0.50	21	3	2	1	2	1	2B
70	Post hazard warnings for motorcyclists	41	P	A	6	8	0.48	22	11	2	2	2	2	2B
68	Revise design, construction, maintenance standards to include motorcyclist needs	43	P	A	6	8	0.48	22	11	2	1	3	1	2B
74	Educate road design and maintenance staff about conditions hazardous to motorcyclists	43	P	A	6	8	0.48	22	11	2	1	2	2	2B
67	Identify and prioritize roadway hazards to motorcyclists	43	R	C	6	8	0.48	22	9	2	2	2	1	2B
44	Develop guidelines for insurers for premium reductions for education/training and licensing	13.3	P	B	80	0.5	0.40	26	4	2	2	2	2	2B
37	Educate other drivers to be more conscious of motorcycles	31	P	A	50	0.8	0.40	26	14	2	2	2	3	2B
30	Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD)	11.2	X	A	30	1	0.30	32	17	2	1	2	2	2B

Table C-1. NAMS Recommendations in Priority Order

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
80	Include motorcyclist component in first aid/bystander training	50	P	A	20	1.5	0.30	33	18	2	2	2	2	2B
39	Include information on motorcyclists in driver manuals and licensing tests	31	P	A	50	0.5	0.25	34	19	2	1	3	3	2B
19	Train license examiners in motorcycle issues	16.2	P	A	80	0.3	0.24	36	20	2	2	2	2	2B
71	Revise MUTCD for better signage for hazardous road or construction conditions	41	P	C	6	4	0.24	36	13	2	1	3	1	2B
69	Create working group to recommend changes to highway standards for motorcycle needs	43	X	C	6	4	0.24	36	13	2	1	1	2	2B
10	Study effectiveness and impact of rider education/training	13.1	R	C	80	0.2	0.16	43	16	3	3	3	2	2B
79	Include motorcyclist component in EMS training	50	P	A	20	0.7	0.14	48	25	3	1	1	1	2C
48	Include motorcycle crash procedures in basic crash investigation training	61	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
12	Increase State use of motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
52	Integrate motorcycle safety representatives into traffic safety activities	62	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
82	Include motorcycles in ITS design and development	62	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	2C
Priority 3														
23	Evaluate effectiveness of education/training in developing crash avoidance skills	13.2	R	C	80	0.5	0.40	26	10	2	3	3	1	3
66	Educate riders on lane use strategies, including HOV lanes	14.1	P	A	80	0.5	0.40	26	14	2	2	2	1	3
8	Develop programs to reduce dangerous behavior and reinforce safe behavior	15	R	C	80	0.5	0.40	26	10	2	3	3	1	3
41	Devote adequate funding to develop and implement motorcyclist awareness info	31	X	A	50	0.8	0.40	26	14	2	2	2	3	3
60	Study why drivers don't see motorcycles; develop and implement countermeasures	31	R	C	25	1	0.25	34	12	2	3	3	3	3
73	Remove slippery sealants and road surface repair substances	42	P	A	6	4	0.24	36	20	2	3	3	3	3
75	Reduce roadway debris	42	P	A	6	4	0.24	36	20	2	3	1	2	3
15	Research to assure that licensing tests measure crash avoidance skills, behaviors	16.2	R	C	80	0.25	0.20	41	15	3	3	3	1	3
72	Educate riders about common roadway hazards	14.1	P	A	6	3	0.18	42	23	3	2	2	1	3
13	Establish benchmarks for education/training effectiveness and motorcycle program operations	13.1	R	C	80	0.2	0.16	43	16	3	2	3	1	3
14	Study effectiveness of on-street training	13.2	R	C	80	0.2	0.16	43	16	3	1	2	2	3
6	Methods and media for information distribution: PSAs, ads in enthusiast media, etc.	14.2	P	A	80	0.2	0.16	43	24	3	2	2	1	3
4	Motorcycle safety information clearinghouse	14.2	X	C	80	0.2	0.16	43	16	3	2	2	1	3
16	Identify and remove barriers to obtaining motorcycle endorsement	16.1	P	A	26	0.5	0.13	48	25	3	2	2	2	3
38	Educate riders that they may not be seen; provide defensive strategies	14.1	P	A	25	0.5	0.13	48	25	3	2	2	1	3
54	Improve tires and wheels to reduce puncture flats	22	P	B	1	25	0.13	48	5	3	2	3	1	3
53	Study how current motorcycle designs affect crashes and injury causation	25	R	B	50	0.2	0.10	52	6	3	3	3	1	3
63	Reconsider State requirements prohibiting conspicuity modifications	23	X	A	25	0.375	0.09	53	28	3	2	3	3	3
34	Use effective strategies to ensure all helmets meet FMVSS 218	12.1	P	A	5	1.9	0.09	53	28	3	2	2	3	3
32	Educate motorcyclists on protective clothing with information source, forum for information exchange	12.2	P	A	58	0.15	0.09	53	28	3	1	2	1	3

Table C-1. NAMS Recommendations in Priority Order

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
36	Study protective clothing benefit, consider standards if warranted	12.2	R	C	58	0.15	0.09	53	20	3	3	3	2	3
24	Evaluate need for simulator training in motorcycle skills	13.2	R	C	80	0.1	0.08	57	21	3	3	3	2	3
76	Educate riders how to overcome hazards presented by other vehicles' designs	14.1	P	A	80	0.1	0.08	57	31	3	2	2	1	3
18	Enforce penalties for improperly licensed riders	16.1	P	A	26	0.3	0.08	57	31	3	1	1	1	3
42	Insurance policies should not be valid for improperly licensed riders	16.1	P	B	26	0.2	0.05	60	7	3	1	3	2	3
58	Study the role of vehicle motorcycle modifications in crashes	26	R	C	25	0.2	0.05	60	22	3	3	3	2	3
77	Emphasize motorcycle safety in other vehicle design	32	P	B	50	0.1	0.05	60	7	3	3	3	3	3
78	Study how other vehicle designs affect motorcycle safety	32	R	C	50	0.1	0.05	60	22	3	3	3	2	3
26	Study alcohol, drug, and medication effects on riders' skills	11.3	R	C	35	0.1	0.04	64	24	3	3	3	2	3
59	Educate riders how modifications and loads affect motorcycle operating characteristics	14.1	P	A	25	0.1	0.03	65	33	3	2	2	1	3
64	Study effects of automobile daytime running lights on motorcycle safety	32	R	C	25	0.1	0.03	65	25	3	3	3	3	3
81	Use EMS Agenda for Future to promote motorcycle safety	50	P	C	20	0.1	0.02	67	26	3	1	1	1	3
65	Study safety implications of lane splitting	15	R	C	3	0.2	0.01	68	27	3	3	3	1	3
40	Require motorcyclist awareness class for drivers guilty of violating cycle right-of-way	31	P	A	0	3	0.00	69	34	3	3	3	3	3
49	Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge	31	P	A	0	3	0.00	69	34	3	2	2	2	3
2	Develop uniform crash and EMS reports	61	X	C	100	N/A	N/A	N/A	N/A	N/A	1	3	3	3
47	Develop and implement standard motorcycle crash data collection and reporting	61	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	3
46	Include police in State motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	1	2	1	3
50	Educate traffic safety organizations on motorcycle safety issues	62	X	A	100	N/A	N/A	N/A	N/A	N/A	1	1	1	3
Not Prioritized														
51	Raise importance, increase funds for motorcycle programs in State highway safety offices	63	X	A	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Research-based safety information for media and for rider education and training	14.2	P	C	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
43	Collect, analyze, distribute motorcycle-specific loss data from insurers	61	X	B	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C1: Twelve recommendations are classified priority 1; 29 are priority 2; 39 are priority 3; and 3 are not prioritized. Priorities follow the impact rankings closely: all recommendations with an impact of 1.50 or higher are priority 1, and are assigned to priority 1A, with the exception of recommendation #56. This produces 10 “top priority 1A” recommendations. The two remaining priority 1 recommendations #1 and #3 are so general that they cannot be acted upon directly but only through other more specific recommendations included within them. They are assigned to priority 1B as a reminder that they state important overall principles. The 29 priority 2 recommendations have been subdivided similarly. The 10 with impacts above 0.64 are priority 2A, the 14 with impacts 0.16 to 0.50 are 2B, and the remaining 5 are priority 2C. Most if not all of the priority 2C recommendations should be done as a matter of course. Further information on each recommendation is provided in Appendix D.

Table C-2. NAMS Recommendations in Priority Order within Organization Type

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
States, Municipalities, Rider Groups														
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	A	57	14.4	8.21	1	1	1	1	1	3	1A
45	Educate police and judges on motorcycle safety issues	62	X	A	80	2	1.60	8	2	1	1	2	1	1A
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	A	30	5	1.50	10	3	1	2	2	1	1A
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	A	35	3	1.05	12	4	2	2	2	2	2A
9	Provide training to all who need or seek it	13.1	P	A	80	1	0.80	14	5	2	3	3	2	2A
57	Provide additional education/training on proper braking techniques	13.2	P	A	80	1	0.80	14	5	2	3	3	3	2A
11	Merge rider education/training and licensing into one-stop operations	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
61	Encourage motorcyclists to increase conspicuity	12.3	P	A	25	3	0.75	18	9	2	2	2	1	2A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	A	57	1.2	0.68	19	10	2	2	2	1	2A
70	Post hazard warnings for motorcyclists	41	P	A	6	8	0.48	22	11	2	2	2	2	2B
68	Revise design, construction, maintenance standards to include motorcyclist needs	43	P	A	6	8	0.48	22	11	2	1	3	1	2B
74	Educate road design and maintenance staff about conditions hazardous to motorcyclists	43	P	A	6	8	0.48	22	11	2	1	2	2	2B
37	Educate other drivers to be more conscious of motorcycles	31	P	A	50	0.8	0.40	26	14	2	2	2	3	2B
30	Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD)	11.2	X	A	30	1	0.30	32	17	2	1	2	2	2B
80	Include motorcyclist component in first aid/bystander training	50	P	A	20	1.5	0.30	33	18	2	2	2	2	2B
39	Include information on motorcyclists in driver manuals and licensing tests	31	P	A	50	0.5	0.25	34	19	2	1	3	3	2B
19	Train license examiners in motorcycle issues	16.2	P	A	80	0.3	0.24	36	20	2	2	2	2	2B
79	Include motorcyclist component in EMS training	50	P	A	20	0.7	0.14	48	25	3	1	1	1	2C
48	Include motorcycle crash procedures in basic crash investigation training	61	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
12	Increase State use of motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
52	Integrate motorcycle safety representatives into traffic safety activities	62	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
66	Educate riders on lane use strategies, including HOV lanes	14.1	P	A	80	0.5	0.40	26	14	2	2	2	1	3
41	Devote adequate funding to develop and implement motorcyclist awareness info	31	X	A	50	0.8	0.40	26	14	2	2	2	3	3
73	Remove slippery sealants and road surface repair substances	42	P	A	6	4	0.24	36	20	2	3	3	3	3
75	Reduce roadway debris	42	P	A	6	4	0.24	36	20	2	3	1	2	3
72	Educate riders about common roadway hazards	14.1	P	A	6	3	0.18	42	23	3	2	2	1	3
6	Methods and media for information distribution: PSAs, ads in enthusiast media, etc.	14.2	P	A	80	0.2	0.16	43	24	3	2	2	1	3
16	Identify and remove barriers to obtaining motorcycle endorsement	16.1	P	A	26	0.5	0.13	48	25	3	2	2	2	3
38	Educate riders that they may not be seen; provide defensive strategies	14.1	P	A	25	0.5	0.13	48	25	3	2	2	1	3
63	Reconsider State requirements prohibiting conspicuity modifications	23	X	A	25	0.375	0.09	53	28	3	2	3	3	3
34	Use effective strategies to ensure all helmets meet FMVSS 218	12.1	P	A	5	1.9	0.09	53	28	3	2	2	3	3

Table C-2. NAMS Recommendations in Priority Order within Organization Type

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
32	Educate motorcyclists on protective clothing with information source, forum for information exchange	12.2	P	A	58	0.15	0.09	53	28	3	1	2	1	3
76	Educate riders how to overcome hazards presented by other vehicles' designs	14.1	P	A	80	0.1	0.08	57	31	3	2	2	1	3
18	Enforce penalties for improperly licensed riders	16.1	P	A	26	0.3	0.08	57	31	3	1	1	1	3
59	Educate riders how modifications and loads affect motorcycle operating characteristics	14.1	P	A	25	0.1	0.03	65	33	3	2	2	1	3
40	Require motorcyclist awareness class for drivers guilty of violating cycle right-of-way	31	P	A	0	3	0.00	69	34	3	3	3	3	3
49	Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge	31	P	A	0	3	0.00	69	34	3	2	2	2	3
46	Include police in State motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	1	2	1	3
50	Educate traffic safety organizations on motorcycle safety issues	62	X	A	100	N/A	N/A	N/A	N/A	N/A	1	1	1	3
51	Raise importance, increase funds for motorcycle programs in State highway safety offices	63	X	A	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manufacturers, Insurers														
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	B	60	5	3.00	3	1	1	2	3	2	1A
56	Use research information to implement other braking-related countermeasures	21	P	B	60	2.5	1.50	10	2	1	2	3	2	2A
62	Encourage manufacturers to increase conspicuity of apparel and parts	24	P	B	25	2	0.50	21	3	2	1	2	1	2B
44	Develop guidelines for insurers for premium reductions for education/training and licensing	13.3	P	B	80	0.5	0.40	26	4	2	2	2	2	2B
54	Improve tires and wheels to reduce puncture flats	22	P	B	1	25	0.13	48	5	3	2	3	1	3
53	Study how current motorcycle designs affect crashes and injury causation	25	R	B	50	0.2	0.10	52	6	3	3	3	1	3
42	Insurance policies should not be valid for improperly licensed riders	16.1	P	B	26	0.2	0.05	60	7	3	1	3	2	3
77	Emphasize motorcycle safety in other vehicle design	32	P	B	50	0.1	0.05	60	7	3	3	3	3	3
43	Collect, analyze, distribute motorcycle-specific loss data from insurers	61	X	B	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Federal														
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	C	35	10	3.50	2	1	1	3	3	2	1A
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	C	80	3	2.40	4	2	1	3	3	2	1A
21	Identify critical crash avoidance skills	15	R	C	50	4	2.00	5	3	1	3	3	1	1A
35.2	Revise FMVSS 218 - improve performance	12.1	R	C	49	4	1.96	6	4	1	3	3	3	1A
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	C	90	2	1.80	7	5	1	3	3	2	1A
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	C	80	2	1.60	8	6	1	3	3	3	1A
1	Government and industry research studies, both comprehensive and specific	63	R	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
3	Build academic and funding capacity for motorcycle safety research	63	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
35.1	Revise FMVSS 218 - labels	12.1	P	C	5	18.5	0.87	13	7	2	1	3	2	2A
20	Develop & evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	C	80	0.8	0.64	20	8	2	2	3	2	2A
67	Identify and prioritize roadway hazards to motorcyclists	43	R	C	6	8	0.48	22	9	2	2	2	1	2B

Table C-2. NAMS Recommendations in Priority Order within Organization Type

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
71	Revise MUTCD for better signage for hazardous road or construction conditions	41	P	C	6	4	0.24	36	13	2	1	3	1	2B
69	Create working group to recommend changes to highway standards for motorcycle needs	43	X	C	6	4	0.24	36	13	2	1	1	2	2B
10	Study effectiveness and impact of rider education/training	13.1	R	C	80	0.2	0.16	43	16	3	3	3	2	2B
82	Include motorcycles in ITS design and development	62	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	2C
23	Evaluate effectiveness of education/training in developing crash avoidance skills	13.2	R	C	80	0.5	0.40	26	10	2	3	3	1	3
8	Develop programs to reduce dangerous behavior and reinforce safe behavior	15	R	C	80	0.5	0.40	26	10	2	3	3	1	3
60	Study why drivers don't see motorcycles; develop and implement countermeasures	31	R	C	25	1	0.25	34	12	2	3	3	3	3
15	Research to assure that licensing tests measure crash avoidance skills, behaviors	16.2	R	C	80	0.25	0.20	41	15	3	3	3	1	3
13	Establish benchmarks for education/training effectiveness and motorcycle program operations	13.1	R	C	80	0.2	0.16	43	16	3	2	3	1	3
14	Study effectiveness of on-street training	13.2	R	C	80	0.2	0.16	43	16	3	1	2	2	3
4	Motorcycle safety information clearinghouse	14.2	X	C	80	0.2	0.16	43	16	3	2	2	1	3
36	Study protective clothing benefit, consider standards if warranted	12.2	R	C	58	0.15	0.09	53	20	3	3	3	2	3
24	Evaluate need for simulator training in motorcycle skills	13.2	R	C	80	0.1	0.08	57	21	3	3	3	2	3
58	Study the role of vehicle motorcycle modifications in crashes	26	R	C	25	0.2	0.05	60	22	3	3	3	2	3
78	Study how other vehicle designs affect motorcycle safety	32	R	C	50	0.1	0.05	60	22	3	3	3	2	3
26	Study alcohol, drug, and medication effects on riders' skills	11.3	R	C	35	0.1	0.04	64	24	3	3	3	2	3
64	Study effects of automobile daytime running lights on motorcycle safety	32	R	C	25	0.1	0.03	65	25	3	3	3	3	3
81	Use EMS Agenda for Future to promote motorcycle safety	50	P	C	20	0.1	0.02	67	26	3	1	1	1	3
65	Study safety implications of lane splitting	15	R	C	3	0.2	0.01	68	27	3	3	3	1	3
2	Develop uniform crash and EMS reports	61	X	C	100	N/A	N/A	N/A	N/A	N/A	1	3	3	3
47	Develop and implement standard motorcycle crash data collection and reporting	61	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	3
5	Research-based safety information for media and for rider education and training	14.2	P	C	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-3. NAMS Recommendations by Subject Area

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
Alcohol and Other Drugs														
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	A	30	5	1.50	10	3	1	2	2	1	1A
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	C	35	10	3.50	2	1	1	3	3	2	1A
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	A	35	3	1.05	12	4	2	2	2	2	2A
30	Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD)	11.2	X	A	30	1	0.30	32	17	2	1	2	2	2B
26	Study alcohol, drug, and medication effects on riders' skills	11.3	R	C	35	0.1	0.04	64	24	3	3	3	2	3
Helmets and Clothing														
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	A	57	14.4	8.21	1	1	1	1	1	3	1A
35.2	Revise FMVSS 218 - improve performance	12.1	R	C	49	4	1.96	6	4	1	3	3	3	1A
35.1	Revise FMVSS 218 - labels	12.1	P	C	5	18.5	0.87	13	7	2	1	3	2	2A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	A	57	1.2	0.68	19	10	2	2	2	1	2A
34	Use effective strategies to ensure all helmets meet FMVSS 218	12.1	P	A	5	1.9	0.09	53	28	3	2	2	3	3
32	Educate motorcyclists on protective clothing with information source, forum for information exchange	12.2	P	A	58	0.15	0.09	53	28	3	1	2	1	3
36	Study protective clothing benefit, consider standards if warranted	12.2	R	C	58	0.15	0.09	53	20	3	3	3	2	3
61	Encourage motorcyclists to increase conspicuity	12.3	P	A	25	3	0.75	18	9	2	2	2	1	2A
Training														
9	Provide training to all who need or seek it	13.1	P	A	80	1	0.80	14	5	2	3	3	2	2A
10	Study effectiveness and impact of rider education/training	13.1	R	C	80	0.2	0.16	43	16	3	3	3	2	2B
13	Establish benchmarks for education/training effectiveness and motorcycle program operations	13.1	R	C	80	0.2	0.16	43	16	3	2	3	1	3
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	C	80	2	1.60	8	6	1	3	3	3	1A
57	Provide additional education/training on proper braking techniques	13.2	P	A	80	1	0.80	14	5	2	3	3	3	2A
23	Evaluate effectiveness of education/training in developing crash avoidance skills	13.2	R	C	80	0.5	0.40	26	10	2	3	3	1	3
14	Study effectiveness of on-street training	13.2	R	C	80	0.2	0.16	43	16	3	1	2	2	3
24	Evaluate need for simulator training in motorcycle skills	13.2	R	C	80	0.1	0.08	57	21	3	3	3	2	3
44	Develop guidelines for insurers for premium reductions for education/training and licensing	13.3	P	B	80	0.5	0.40	26	4	2	2	2	2	2B
Education and Information														
66	Educate riders on lane use strategies, including HOV lanes	14.1	P	A	80	0.5	0.40	26	14	2	2	2	1	3
72	Educate riders about common roadway hazards	14.1	P	A	6	3	0.18	42	23	3	2	2	1	3
38	Educate riders that they may not be seen; provide defensive strategies	14.1	P	A	25	0.5	0.13	48	25	3	2	2	1	3
76	Educate riders how to overcome hazards presented by other vehicles' designs	14.1	P	A	80	0.1	0.08	57	31	3	2	2	1	3
59	Educate riders how modifications and loads affect motorcycle operating characteristics	14.1	P	A	25	0.1	0.03	65	33	3	2	2	1	3
6	Methods and media for information distribution: PSAs, ads in enthusiast media, etc.	14.2	P	A	80	0.2	0.16	43	24	3	2	2	1	3

Table C-3. NAMS Recommendations by Subject Area

4 Motorcycle safety information clearinghouse		14.2	X	C	80	0.2	0.16	43	16	3	2	2	1	3
No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
5	Research-based safety information for media and for rider education and training	14.2	P	C	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Behavior and Skills														
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	C	80	3	2.40	4	2	1	3	3	2	1A
21	Identify critical crash avoidance skills	15	R	C	50	4	2.00	5	3	1	3	3	1	1A
8	Develop programs to reduce dangerous behavior and reinforce safe behavior	15	R	C	80	0.5	0.40	26	10	2	3	3	1	3
65	Study safety implications of lane splitting	15	R	C	3	0.2	0.01	68	27	3	3	3	1	3
Licensing														
11	Merge rider education/training and licensing into one-stop operations	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	A	80	1	0.80	14	5	2	1	2	3	2A
16	Identify and remove barriers to obtaining motorcycle endorsement	16.1	P	A	26	0.5	0.13	48	25	3	2	2	2	3
18	Enforce penalties for improperly licensed riders	16.1	P	A	26	0.3	0.08	57	31	3	1	1	1	3
42	Insurance policies should not be valid for improperly licensed riders	16.1	P	B	26	0.2	0.05	60	7	3	1	3	2	3
20	Develop & evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	C	80	0.8	0.64	20	8	2	2	3	2	2A
19	Train license examiners in motorcycle issues	16.2	P	A	80	0.3	0.24	36	20	2	2	2	2	2B
15	Research to assure that licensing tests measure crash avoidance skills, behaviors	16.2	R	C	80	0.25	0.20	41	15	3	3	3	1	3
Motorcycles														
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	B	60	5	3.00	3	1	1	2	3	2	1A
56	Use research information to implement other braking-related countermeasures	21	P	B	60	2.5	1.50	10	2	1	2	3	2	2A
54	Improve tires and wheels to reduce puncture flats	22	P	B	1	25	0.13	48	5	3	2	3	1	3
63	Reconsider State requirements prohibiting conspicuity modifications	23	X	A	25	0.375	0.09	53	28	3	2	3	3	3
62	Encourage manufacturers to increase conspicuity of apparel and parts	24	P	B	25	2	0.50	21	3	2	1	2	1	2B
53	Study how current motorcycle designs affect crashes and injury causation	25	R	B	50	0.2	0.10	52	6	3	3	3	1	3
58	Study the role of vehicle motorcycle modifications in crashes	26	R	C	25	0.2	0.05	60	22	3	3	3	2	3
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	C	90	2	1.80	7	5	1	3	3	2	1A
Other Drivers and Vehicles														
37	Educate other drivers to be more conscious of motorcycles	31	P	A	50	0.8	0.40	26	14	2	2	2	3	2B
39	Include information on motorcyclists in driver manuals and licensing tests	31	P	A	50	0.5	0.25	34	19	2	1	3	3	2B
41	Devote adequate funding to develop and implement motorcyclist awareness info	31	X	A	50	0.8	0.40	26	14	2	2	2	3	3
60	Study why drivers don't see motorcycles; develop and implement countermeasures	31	R	C	25	1	0.25	34	12	2	3	3	3	3
40	Require motorcyclist awareness class for drivers guilty of violating cycle right-of-way	31	P	A	0	3	0.00	69	34	3	3	3	3	3
49	Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge	31	P	A	0	3	0.00	69	34	3	2	2	2	3
77	Emphasize motorcycle safety in other vehicle design	32	P	B	50	0.1	0.05	60	7	3	3	3	3	3
78	Study how other vehicle designs affect motorcycle safety	32	R	C	50	0.1	0.05	60	22	3	3	3	2	3

Table C-3. NAMS Recommendations by Subject Area

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Impact rank in org	Priority				
										Impact	Cost	Time	Ease	Overall
64	Study effects of automobile daytime running lights on motorcycle safety	32	R	C	25	0.1	0.03	65	25	3	3	3	3	3
	Highway and Environment													
70	Post hazard warnings for motorcyclists	41	P	A	6	8	0.48	22	11	2	2	2	2	2B
71	Revise MUTCD for better signage for hazardous road or construction conditions	41	P	C	6	4	0.24	36	13	2	1	3	1	2B
73	Remove slippery sealants and road surface repair substances	42	P	A	6	4	0.24	36	20	2	3	3	3	3
75	Reduce roadway debris	42	P	A	6	4	0.24	36	20	2	3	1	2	3
68	Revise design, construction, maintenance standards to include motorcyclist needs	43	P	A	6	8	0.48	22	11	2	1	3	1	2B
74	Educate road design and maintenance staff about conditions hazardous to motorcyclists	43	P	A	6	8	0.48	22	11	2	1	2	2	2B
67	Identify and prioritize roadway hazards to motorcyclists	43	R	C	6	8	0.48	22	9	2	2	2	1	2B
69	Create working group to recommend changes to highway standards for motorcycle needs	43	X	C	6	4	0.24	36	13	2	1	1	2	2B
	EMS													
80	Include motorcyclist component in first aid/bystander training	50	P	A	20	1.5	0.30	33	18	2	2	2	2	2B
79	Include motorcyclist component in EMS training	50	P	A	20	0.7	0.14	48	25	3	1	1	1	2C
81	Use EMS Agenda for Future to promote motorcycle safety	50	P	C	20	0.1	0.02	67	26	3	1	1	1	3
	Management and Data													
48	Include motorcycle crash procedures in basic crash investigation training	61	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
2	Develop uniform crash and EMS reports	61	X	C	100	N/A	N/A	N/A	N/A	N/A	1	3	3	3
47	Develop and implement standard motorcycle crash data collection and reporting	61	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	3
43	Collect, analyze, distribute motorcycle-specific loss data from insurers	61	X	B	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
45	Educate police and judges on motorcycle safety issues	62	X	A	80	2	1.60	8	2	1	1	2	1	1A
12	Increase State use of motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
52	Integrate motorcycle safety representatives into traffic safety activities	62	X	A	100	N/A	N/A	N/A	N/A	N/A	2	2	2	2C
82	Include motorcycles in ITS design and development	62	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	2C
46	Include police in State motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	N/A	1	2	1	3
50	Educate traffic safety organizations on motorcycle safety issues	62	X	A	100	N/A	N/A	N/A	N/A	N/A	1	1	1	3
1	Government and industry research studies, both comprehensive and specific	63	R	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
3	Build academic and funding capacity for motorcycle safety research	63	X	C	100	N/A	N/A	N/A	N/A	N/A	3	3	3	1B
51	Raise importance, increase funds for motorcycle programs in State highway safety offices	63	X	A	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-4. NAMS Recommendations by NAMS Number

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Priority					NAMS priority
									Impact	Cost	Time	Ease	Overall	
1	Government and industry research studies, both comprehensive and specific	63	R	C	100	N/A	N/A	N/A	N/A	3	3	3	1B	U
2	Develop uniform crash and EMS reports	61	X	C	100	N/A	N/A	N/A	N/A	1	3	3	3	E
3	Build academic and funding capacity for motorcycle safety research	63	X	C	100	N/A	N/A	N/A	N/A	3	3	3	1B	E
4	Motorcycle safety information clearinghouse	14.2	X	C	80	0.2	0.16	43	3	2	2	1	3	N
5	Research-based safety information for media and for rider education and training	14.2	P	C	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N
6	Methods and media for information distribution: PSAs, ads in enthusiast media, etc.	14.2	P	A	80	0.2	0.16	43	3	2	2	1	3	N
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	C	80	3	2.40	4	1	3	3	2	1A	E
8	Develop programs to reduce dangerous behavior and reinforce safe behavior	15	R	C	80	0.5	0.40	26	2	3	3	1	3	E
9	Provide training to all who need or seek it	13.1	P	A	80	1	0.80	14	2	3	3	2	2A	E
10	Study effectiveness and impact of rider education/training	13.1	R	C	80	0.2	0.16	43	3	3	3	2	2B	E
11	Merge rider education/training and licensing into one-stop operations	16.1	P	A	80	1	0.80	14	2	1	2	3	2A	E
12	Increase State use of motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	2	2	2	2C	N
13	Establish benchmarks for education/training effectiveness and motorcycle program operations	13.1	R	C	80	0.2	0.16	43	3	2	3	1	3	N
14	Study effectiveness of on-street training	13.2	R	C	80	0.2	0.16	43	3	1	2	2	3	N
15	Research to assure that licensing tests measure crash avoidance skills, behaviors	16.2	R	C	80	0.25	0.20	41	3	3	3	1	3	E
16	Identify and remove barriers to obtaining motorcycle endorsement	16.1	P	A	26	0.5	0.13	48	3	2	2	2	3	E
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	A	80	1	0.80	14	2	1	2	3	2A	E
18	Enforce penalties for improperly licensed riders	16.1	P	A	26	0.3	0.08	57	3	1	1	1	3	E
19	Train license examiners in motorcycle issues	16.2	P	A	80	0.3	0.24	36	2	2	2	2	2B	E
20	Develop and evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	C	80	0.8	0.64	20	2	2	3	2	2A	N
21	Identify critical crash avoidance skills	15	R	C	50	4	2.00	5	1	3	3	1	1A	E
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	C	80	2	1.60	8	1	3	3	3	1A	E
23	Evaluate effectiveness of education/training in developing crash avoidance skills	13.2	R	C	80	0.5	0.40	26	2	3	3	1	3	E
24	Evaluate need for simulator training in motorcycle skills	13.2	R	C	80	0.1	0.08	57	3	3	3	2	3	N
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	C	90	2	1.80	7	1	3	3	2	1A	N
26	Study alcohol, drug, and medication effects on riders' skills	11.3	R	C	35	0.1	0.04	64	3	3	3	2	3	E
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	C	35	10	3.50	2	1	3	3	2	1A	E
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	A	35	3	1.05	12	2	2	2	2	2A	U
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	A	30	5	1.50	10	1	2	2	1	1A	E
30	Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD)	11.2	X	A	30	1	0.30	32	2	1	2	2	2B	E
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	A	57	14.4	8.21	1	1	1	1	3	1A	U
32	Educate motorcyclists on protective clothing with information source, forum for information exchange	12.2	P	A	58	0.15	0.09	53	3	1	2	1	3	E
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	A	57	1.2	0.68	19	2	2	2	1	2A	E

Table C-4. NAMS Recommendations by NAMS Number

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Priority					NAMS priority
									Impact	Cost	Time	Ease	Overall	
34	Use effective strategies to ensure all helmets meet FMVSS 218	12.1	P	A	5	1.9	0.09	53	3	2	2	3	3	E
35.1	Revise FMVSS 218 - labels	12.1	P	C	5	18.5	0.87	13	2	1	3	2	2A	E
35.2	Revise FMVSS 218 - improve performance	12.1	R	C	49	4	1.96	6	1	3	3	3	1A	E
36	Study protective clothing benefit, consider standards if warranted	12.2	R	C	58	0.15	0.09	53	3	3	3	2	3	N
37	Educate other drivers to be more conscious of motorcycles	31	P	A	50	0.8	0.40	26	2	2	2	3	2B	U
38	Educate riders that they may not be seen; provide defensive strategies	14.1	P	A	25	0.5	0.13	48	3	2	2	1	3	E
39	Include information on motorcyclists in driver manuals and licensing tests	31	P	A	50	0.5	0.25	34	2	1	3	3	2B	E
40	Require motorcyclist awareness class for drivers guilty of violating cycle right-of-way	31	P	A	0	3	0.00	69	3	3	3	3	3	E
41	Devote adequate funding to develop and implement motorcyclist awareness info	31	X	A	50	0.8	0.40	26	2	2	2	3	3	E
42	Insurance policies should not be valid for improperly licensed riders	16.1	P	B	26	0.2	0.05	60	3	1	3	2	3	E
43	Collect, analyze, distribute motorcycle-specific loss data from insurers	61	X	B	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N
44	Develop guidelines for insurers for premium reductions for education/training and licensing	13.3	P	B	80	0.5	0.40	26	2	2	2	2	2B	N
45	Educate police and judges on motorcycle safety issues	62	X	A	80	2	1.60	8	1	1	2	1	1A	E
46	Include police in State motorcycle program assessments	62	X	A	80	N/A	N/A	N/A	N/A	1	2	1	3	E
47	Develop and implement standard motorcycle crash data collection and reporting	61	X	C	100	N/A	N/A	N/A	N/A	3	3	3	3	E
48	Include motorcycle crash procedures in basic crash investigation training	61	X	A	100	N/A	N/A	N/A	N/A	2	2	2	2C	E
49	Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge	31	P	A	0	3	0.00	69	3	2	2	2	3	E
50	Educate traffic safety organizations on motorcycle safety issues	62	X	A	100	N/A	N/A	N/A	N/A	1	1	1	3	E
51	Raise importance, increase funds for motorcycle programs in State highway safety offices	63	X	A	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E
52	Integrate motorcycle safety representatives into traffic safety activities	62	X	A	100	N/A	N/A	N/A	N/A	2	2	2	2C	E
53	Study how current motorcycle designs affect crashes and injury causation	25	R	B	50	0.2	0.10	52	3	3	3	1	3	E
54	Improve tires and wheels to reduce puncture flats	22	P	B	1	25	0.13	48	3	2	3	1	3	E
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	B	60	5	3.00	3	1	2	3	2	1A	E
56	Use research information to implement other braking-related countermeasures	21	P	B	60	2.5	1.50	10	1	2	3	2	2A	N
57	Provide additional education/training on proper braking techniques	13.2	P	A	80	1	0.80	14	2	3	3	3	2A	N
58	Study the role of vehicle motorcycle modifications in crashes	26	R	C	25	0.2	0.05	60	3	3	3	2	3	N
59	Educate riders how modifications and loads affect motorcycle operating characteristics	14.1	P	A	25	0.1	0.03	65	3	2	2	1	3	N
60	Study why drivers don't see motorcycles; develop and implement countermeasures	31	R	C	25	1	0.25	34	2	3	3	3	3	E
61	Encourage motorcyclists to increase conspicuity	12.3	P	A	25	3	0.75	18	2	2	2	1	2A	E
62	Encourage manufacturers to increase conspicuity of apparel and parts	24	P	B	25	2	0.50	21	2	1	2	1	2B	E
63	Reconsider State requirements prohibiting conspicuity modifications	23	X	A	25	0.375	0.09	53	3	2	3	3	3	E
64	Study effects of automobile daytime running lights on motorcycle safety	32	R	C	25	0.1	0.03	65	3	3	3	3	3	N
65	Study safety implications of lane splitting	15	R	C	3	0.2	0.01	68	3	3	3	1	3	E

Table C-4. NAMS Recommendations by NAMS Number

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Org	Size	Effect	Impact	Impact rank	Priority					NAMS priority
									Impact	Cost	Time	Ease	Overall	
66	Educate riders on lane use strategies, including HOV lanes	14.1	P	A	80	0.5	0.40	26	2	2	2	1	3	N
67	Identify and prioritize roadway hazards to motorcyclists	43	R	C	6	8	0.48	22	2	2	2	1	2B	E
68	Revise design, construction, maintenance standards to include motorcyclist needs	43	P	A	6	8	0.48	22	2	1	3	1	2B	E
69	Create working group to recommend changes to highway standards for motorcycle needs	43	X	C	6	4	0.24	36	2	1	1	2	2B	E
70	Post hazard warnings for motorcyclists	41	P	A	6	8	0.48	22	2	2	2	2	2B	E
71	Revise MUTCD for better signage for hazardous road or construction conditions	41	P	C	6	4	0.24	36	2	1	3	1	2B	E
72	Educate riders about common roadway hazards	14.1	P	A	6	3	0.18	42	3	2	2	1	3	E
73	Remove slippery sealants and road surface repair substances	42	P	A	6	4	0.24	36	2	3	3	3	3	E
74	Educate road design and maintenance staff about conditions hazardous to motorcyclists	43	P	A	6	8	0.48	22	2	1	2	2	2B	E
75	Reduce roadway debris	42	P	A	6	4	0.24	36	2	3	1	2	3	N
76	Educate riders how to overcome hazards presented by other vehicles' designs	14.1	P	A	80	0.1	0.08	57	3	2	2	1	3	E
77	Emphasize motorcycle safety in other vehicle design	32	P	B	50	0.1	0.05	60	3	3	3	3	3	N
78	Study how other vehicle designs affect motorcycle safety	32	R	C	50	0.1	0.05	60	3	3	3	2	3	N
79	Include motorcyclist component in EMS training	50	P	A	20	0.7	0.14	48	3	1	1	1	2C	E
80	Include motorcyclist component in first aid/bystander training	50	P	A	20	1.5	0.30	33	2	2	2	2	2B	E
81	Use EMS Agenda for Future to promote motorcycle safety	50	P	C	20	0.1	0.02	67	3	1	1	1	3	N
82	Include motorcycles in ITS design and development	62	X	C	100	N/A	N/A	N/A	N/A	3	3	3	2C	E

Table C-5. Highest Priority Recommendations, by Organization

No.	National Agenda for Motorcycle Safety Recommendation	Area	Type	Impact	Impact rank	Priority				
						Impact	Cost	Time	Ease	Overall
States, Municipalities, Rider Groups										
31	Use effective strategies to increase use of FMVSS 218-compliant helmets	12.1	P	8.21	1	1	1	1	3	1A
45	Educate police and judges on motorcycle safety issues	62	X	1.60	8	1	1	2	1	1A
29	Educate police on alcohol-related behavior of motorcyclists	11.1	P	1.50	10	1	2	2	1	1A
28	Discourage mixing alcohol or other drugs with motorcycling	11.2	P	1.05	12	1	2	2	2	2A
9	Provide training to all who need or seek it	13.1	P	0.80	14	2	3	3	2	2A
57	Provide additional education/training on proper braking techniques	13.2	P	0.80	14	2	3	3	3	2A
11	Merge rider education/training and licensing into one-stop operations	16.1	P	0.80	14	2	1	2	3	2A
17	States issue motorcycle endorsements immediately upon course completion	16.1	P	0.80	14	2	1	2	3	2A
61	Encourage motorcyclists to increase conspicuity	12.3	P	0.75	18	2	2	2	1	2A
33	Communicate helmet use benefits, work toward greater voluntary use of FMVSS helmets	12.1	P	0.68	19	2	2	2	1	2A
Manufacturers, Insurers										
55	Study effectiveness of linked and antilock brakes; if positive, use more widely	21	R	3.00	3	1	2	3	2	1A
56	Use research information to implement other braking-related countermeasures	21	P	1.50	10	1	2	3	2	2A
Federal										
27	Study motorcyclists' alcohol, drug, and medication use patterns	11.2	R	3.50	2	1	3	3	2	1A
7	Study riders' attitudes, behavior, effect on crash involvement	15	R	2.40	4	1	3	3	2	1A
21	Identify critical crash avoidance skills	15	R	2.00	5	1	3	3	1	1A
35.2	Revise FMVSS 218 - improve performance	12.1	R	1.96	6	1	3	3	3	1A
25	Evaluate crash avoidance technology (e.g., pre-crash warning systems)	27	R	1.80	7	1	3	3	2	1A
22	Develop training, licensing, technology measures to address crash avoidance problems	13.2	R	1.60	8	1	3	3	3	1A
1	Government and industry research studies, both comprehensive and specific	63	R	N/A	N/A	N/A	3	3	3	1B
3	Build academic and funding capacity for motorcycle safety research	63	X	N/A	N/A	N/A	3	3	3	1B
35.1	Revise FMVSS 218 - labels	12.1	P	0.87	13	2	1	3	2	2A
20	Develop & evaluate enhanced motorcycling model using graduated licensing concepts	16.2	R	0.64	20	2	2	3	2	2A

Table C-5 summarizes the top priority recommendations – priority 1 and 2A – by organization: 10 recommendations for States, municipalities, and rider groups; 2 for manufacturers; and 10 for Federal agencies.

**Prioritized Recommendations of the
National Agenda for Motorcycle Safety**

**Appendix D
Detailed Discussion of Each NAMS Recommendation**

Appendix D: Detailed Discussion of Each NAMS Recommendation

NAMS Recommendations: Detailed Discussion

Detailed discussions of each of the 82 NAMS recommendations follow. They are arranged by subject area, as listed in Tables B-2 and C-3. Each subject area and subarea begins with a brief overall discussion including its problem size. Then each of the recommendation in the area or subarea is discussed in approximately one page. Each discussion follows the same format, illustrated below with information from recommendation #29, the first recommendation discussed.

11.1 Enforcement

[Subject Area number and name, from Table B-2]

#29 Educate police on alcohol-related behavior of motorcyclists

[NAMS recommendation number and short title, as used in Tables]

Full recommendation: Educate law enforcement about unique alcohol-related behavior of motorcyclists.

[Full text of recommendation from NAMS]

Type: P program

[Recommendation Type]

Organization: A States, municipalities, rider groups

[Recommendation organization]

Problem Size: 30%

[problem size estimate, in percent of fatalities]

Effect: 5% Range: 1-20%

[effect size estimate: likely and range, in percent]

Impact: 1.50

[impact estimate: size x likely effect]

Impact priority: high

Rank: 10

Rank in org: 3

[impact priority on 3-point scale, from 1 = high to 3 = low; rank out of all 70 prioritized recommendations; rank within all recommendations addressed to this organization; ties in rank all coded with the highest rank of those tied]

Cost: medium

Time: medium

Obstacles: low

[cost, time, and obstacle estimates, on 3-point scale, from 1 = high, best to 3 = low, worst]

Overall priority: high

[overall priority estimate, combining impact, cost, time, and obstacles, on 3-point scale]

Discussion

[discussion of relevant points]

The discussion intends only to capture major points. It cites references as appropriate; but, is not intended to be complete. Key references are cited as follows: NAMS (NHTSA, 2000), NAMS

Appendix D: Detailed Discussion of Each NAMS Recommendation

Implementation Guide (NHTSA, 2006), CMTW (NHTSA, 2009a), Hurt report (Hurt, Ouellet, & Thom, 1981), and NCHRP (Potts et al., 2008).

Terminology

This report uses current NHTSA terminology. A motorcycle rider is the operator; a passenger is any other person on the motorcycle. The term motorcyclist includes both rider and passenger.

Clothing includes everything a motorcyclist wears except a helmet. Apparel includes both clothing and helmets.

The target population for a recommendation is expressed as a percentage reduction in motorcyclist fatalities.

Appendix D: Detailed Discussion of Each NAMS Recommendation

10 Motorcyclists

Half of all NAMS recommendations – 41 of the 82 – address motorcyclists, both riders and passengers. These recommendations are grouped into six areas:

- 11 alcohol and other drugs
- 12 helmets and clothing
- 13 training
- 14 education and information
- 15 behavior and skills
- 16 licensing

Each area is introduced separately.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11 Alcohol and Other Drugs

Five NAMS recommendations address alcohol and other drug use by riders.

In 2008, 36 percent of motorcycle operators in fatal crashes had a positive blood alcohol concentration (BAC) and 29 percent had a BAC over the legal limit of .08 grams per deciliter (NHTSA, 2009c). Assuming that alcohol caused or contributed to almost all the fatalities involving motorcycle operators with BACs over .08, in the sense that the fatality would not have occurred had the operator been sober, and caused or contributed to perhaps one-fourth of the fatalities with a lower alcohol level, the problem size for alcohol is estimated to be 30 percent.

NHTSA's Roadside Survey provides an estimate of the prevalence of alcohol-impaired and drugged motorcyclists and other drivers (Lacey et al., 2009a, 2009b, & 2009c); however there are no other national estimates of the presence of drugs other than alcohol in motorcycle crashes (CMTW 5.2.2). A few small studies have found quite high levels of impairing drugs, especially marijuana, in specific locations and at specific times, but they cannot be generalized. For the purpose of this report, we estimate that another 5 percent of motorcycle fatalities involve other drugs not used together with alcohol.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11.1 Enforcement

#29 Educate police on alcohol-related behavior of motorcyclists.

Full recommendation: Educate law enforcement about unique alcohol-related behavior of motorcyclists.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 30%
Effect: 5% Range: 1-20%
Impact: 1.50
Impact priority: high
Rank: 10
Rank in org: 3
Cost: medium
Time: medium
Obstacles: low

Overall priority: high

Discussion

The full NAMS discussion of this recommendation is broader than the title suggests: it includes “working with law enforcement to enforce current laws and helping them recognize motorcyclists’ alcohol/substance abuse behavior.” Sustained, high-visibility enforcement of impaired-driving (DWI) laws can reduce alcohol-impaired driving by as much as 20 percent (CMTW, Sec. 1.2.1). If interpreted as sustained, high-visibility DWI enforcement that will reach motorcyclists, the recommendation is identical to countermeasure 5.2.2 (Alcohol-impaired motorcyclists: detection and sanction) from CMTW, which in turn is a combination of CMTW countermeasures 1.2.1 (checkpoints) and 1.2.2 (saturation patrols) directed to all alcohol-impaired drivers. It could be implemented in various ways. All require that officers be trained to detect alcohol-impaired motorcyclists (the short version of the NAMS recommendation). This training itself has low cost and time but likely will have little effect. Greater effects may be expected if motorcyclists are included in regular high-visibility DWI enforcement activities; greater yet if some of these activities are conducted at times and places where DWI motorcyclists pose problems. Both options add cost and time. See Strategy 1.2 of the NAMS Implementation Guide for additional discussion, examples of enforcement practices, and resources. The recommendation’s overall high priority arises from its high impact (when implementing both training and high-visibility enforcement) and moderate cost and time.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11.2 Communications

#28 Discourage mixing alcohol or other drugs with motorcycling.

Full recommendation: Continue to discourage mixing alcohol or other drugs with motorcycling.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 35%
Effect: 3% Range: 1-13%
Impact: 1.05
Impact priority: medium
Rank: 12
Rank in org: 4
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

The NAMS recommendation states a goal but does not provide a strategy for achieving the goal. If “discourage” is interpreted as passive communications of well-known facts regarding alcohol impairment then the recommendation is inexpensive, easy, quick to implement, and likely will have no effect. See CMTW 5.2.1 and NAMS Implementation Guide 1.1 for discussion, as well as the discussion of communication program effectiveness in Area 14.

A more effective strategy combines several things. First, it begins with serious research on motorcyclist culture, the role of alcohol and drugs in this culture, and potential intervention methods; see recommendation #27 in Area 11.2. Then it develops effective communications policies, most likely in cooperation with national, State, and local rider groups. As shown by the rider group activities and policies regarding alcohol documented in NAMS Implementation Guide 1.4, some of this work does not need to wait for additional research. The upper effect estimate of 13 percent is taken from CDC’s synthesis of the most effective DWI communication campaigns (CMTW, 1.5.5); the likely effect of 3 percent discounts this but still assumes a vigorous, well-funded effort with the full cooperation of rider groups; obtaining this cooperation is the potential obstacle.

The recommendation’s overall medium priority follows directly from its medium ranking on all factors except impact, where it ranks at the bottom of the high category. While the goal certainly is high priority, as noted in the original NAMS prioritization, the methods of this strategy used to date have not been effective in achieving this goal.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11.2 Communications

#30 Encourage partnerships with other alcohol/traffic safety groups (MADD, SADD).

Full recommendation: Encourage partnerships with groups already involved in alcohol/substance abuse issues related to motor vehicle crashes, e.g., Mothers Against Drunk Driving (MADD), Students Against Destructive Decisions (SADD).

Type: X management and support
Organization: A States, municipalities, rider groups

Problem Size: 30%
Effect: 1% Range: 0.1-3%
Impact: 0.30
Impact priority: medium
Rank: 32
Rank in org: 17
Cost: low
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

MADD has substantial influence on alcohol and traffic safety issues and programs. A successful partnership that focused some of this influence on alcohol and drug issues of motorcyclists potentially could aid both enforcement and communications. However, MADD's membership, priorities, and programs derive from its concern with the victims, often innocent victims, of drunk driving. Alcohol-impaired motorcyclists seldom injure other innocent parties, so MADD may not wish to devote substantial time or resources to motorcycle issues. SADD is considerably smaller than MADD, with correspondingly fewer resources and impact. The effect and overall priority estimates are influenced by the important role alcohol plays in motorcycle crashes.

This recommendation is assigned to States, municipalities, and rider groups because such partnerships will have the most effect on enforcement and communication programs at State and local levels. National partnerships also may help, so manufacturers, insurers, and Federal agencies also have a role to play.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11.2 Communications

#27 Study motorcyclists' alcohol, drug, and medication use patterns.

Full recommendation: Study the alcohol, drug and other substance use patterns of motorcyclists.

Type: R research

Organization: C Federal

Problem Size: 35%

Effect: 10% Range: 1-30%

Impact: 3.50

Impact priority: high

Rank: 2

Rank in org: 1

Cost: high

Time: high

Obstacles: medium

Overall priority: high

Discussion

It is common knowledge that motorcyclists differ from other drivers in important respects. So far, this knowledge has been used primarily to make excuses for why some countermeasures have less effect for motorcyclists than for other drivers rather than for developing strategies and countermeasures tailored to these differences. This recommendation is interpreted broadly as research into motorcyclist culture, the role of alcohol and drugs in this culture and their relation to riding, and potential countermeasures. This is basic research, requiring substantial funding and time, likely conducted in cooperation with motorcycle advocates and organizations. It is also risky research, which may not have a high likelihood of finding effective strategies or countermeasures. But it is important research if motorcycle safety communications and programs are to make more than incremental progress; see recommendation #28 in Area 11.2. Its high overall priority reflects this importance.

Appendix D: Detailed Discussion of Each NAMS Recommendation

11.3 Research

#26 Study alcohol, drug, and medication effects on motorcyclists' skills.

Full recommendation: Study how alcohol, drugs and other substances, including over-the-counter medications, can affect a motorcyclist's operating skills.

Type: R research
Organization: C Federal

Problem Size: 35%
Effect: 0.1% Range: 1-30%
Impact: 0.04
Impact priority: low
Rank: 64
Rank in org: 24
Cost: high
Time: high
Obstacles: medium

Overall priority: low

Discussion

Since NAMS appeared in 2000, NHTSA conducted and published a study of alcohol effects on motorcycling skills (Creaser et al., 2007). At the alcohol levels used, the study observed definite but modest effects on performance measured on a test track.

The effects of alcohol on tasks related to driving in general have been studied extensively. There is no reason to believe that alcohol's effects on motorcycling would be any less; indeed, they likely are greater. While other drugs, both legal and illegal, have been studied far less extensively, the same conclusion holds. With high cost and low value, this recommendation is a very high priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12 Helmets and Clothing

Helmets and clothing can prevent or reduce injury in a crash and can improve motorcyclists' conspicuity. Four NAMS recommendations address helmets in their protective role. One of these – #35, revising FMVSS 218 – can be interpreted in two quite different ways, so it has been separated into two components, 35.1 and 35.2. Two recommendations address clothing as protection and one addresses conspicuity of both helmets and clothing.

Problem size estimates for helmets are documented well:

helmet use: 58 percent for motorcyclist fatalities (both FMVSS-compliant and non-compliant)

FMVSS-compliant helmet use: 49 percent

non-compliant helmet use: 9 percent

In 2008, 59 percent of fatally injured motorcycle riders (operators), 49 percent of fatally injured passengers, and 58 percent of fatally injured motorcyclists overall were helmeted (NHTSA, 2009c, p. 6; NHTSA, 2009b, Table 92). This data, from FARS, does not distinguish helmets that comply with FMVSS 218 (DOT-compliant helmets) from those that do not.

In 2008, 3,025 motorcyclist fatalities, or 57 percent, occurred in the 30 States that did not have helmet laws covering all motorcyclists (“universal coverage” laws). (NHTSA, 2009b, Table 111).

In 2009, observed helmet use was 76 percent, of which 67 percent were DOT-compliant helmets and 9 percent were non-compliant (Pickrell & Ye, 2009). Thus about $9/76 = 12\%$ of observed helmets were non-compliant. If the same ratio holds for helmets worn by fatally injured motorcyclists, then about 49 percent wore compliant helmets and about 9 percent non-compliant helmets.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.1 Helmets

#31 Use effective strategies to increase use of FMVSS 218-compliant helmets.

Full recommendation: Use effective strategies to increase use of FMVSS 218-compliant helmets.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 57%
Effect: 14.4% Range: 1-20%
Impact: 8.21
Impact priority: high
Rank: 1
Rank in org: 1
Cost: low
Time: low
Obstacles: high

Overall priority: high

Discussion

The effectiveness of motorcycle helmets in reducing head injury and the probability of fatality in a crash has been documented extensively. NHTSA currently estimates that helmets reduce fatalities in a crash by 37 percent for riders and 41 percent for passengers (NHTSA, 2009c). This recommendation is to use “effective strategies” to increase helmet use. There is only one strategy with proven effectiveness: helmet use laws covering all motorcyclists (see CMTW 5.1.1; NCHRP 11.1E1). Other strategies to increase helmet use through voluntary methods are discussed in recommendation #33.

The population affected by this recommendation consists of the 57 percent of motorcyclist fatalities that occurred in the 30 States that do not have helmet laws covering all motorcyclists.

Helmet use among fatally injured motorcycle riders, including both FMVSS-compliant and non-compliant helmets, was 82 percent in States with universal helmet laws and 39 percent in States without universal laws (NHTSA, 2009c, Table 2). In universal law States, observed helmet use was 97 percent, of which 86 percent were FMVSS-compliant and 11 percent were not; in States without universal helmet laws, observed use was 63 percent with 55 percent compliant and 8 percent not (Pickrell & Ye, 2009). Apply these proportions to the fatality data: about 73 percent of motorcyclist fatalities in universal law States wore compliant helmets compared to about 34 percent in the remaining States.

This recommendation, if successful, would enact universal helmet laws in the 30 States that do not have them. This in turn would increase the use of FMVSS-compliant helmets for

Appendix D: Detailed Discussion of Each NAMS Recommendation

motorcyclists involved in potentially fatal crashes from about 34 percent to about 73 percent, thus affecting 39 percent of the fatalities in these States. Helmets are 37 percent effective in preventing fatalities in these crashes, so the effect of this recommendation is $37\% \times 39\% = 14.4\%$. Applying this to the population size of 57 percent would produce the likely impact of 8.2, the highest of all 82 NAMS recommendations. The potential impact could be even greater if all States had universal helmet laws, then the consistent nationwide policy might increase use above the current levels in helmet law States.

The main obstacle to enacting universal helmet laws is strong, well-coordinated, and highly political opposition. See discussions and references in CMTW countermeasure 5.1.1 and NCHRP strategy 11.1E1. The likely effect above assumes that effective strategies to overcome this opposition are developed and implemented. If they are not, this recommendation will have little or no effect.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.1 Helmets

#33 Communicate helmet use benefits, work toward greater voluntary use of FMVSS-compliant helmets

Full recommendation: Find ways to more effectively communicate the benefits of helmet use and work toward making voluntary use of FMVSS 218-compliant helmets more widely accepted.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 57%
Effect: 1.2% Range: 0.1-2.4%
Impact: 0.68
Impact priority: medium
Rank: 19
Rank in org: 10
Cost: medium
Time: medium
Obstacles: low

Overall priority: medium

Discussion

With its emphasis on voluntary use of FMVSS-compliant helmets, this recommendation primarily affects the 57 percent of motorcyclist fatalities that occurred in the 30 States that do not have helmet laws covering all motorcyclists.

In these States, voluntary measures to increase helmet use potentially could affect the 61 percent of fatally injured motorcyclists who were unhelmeted. If all wore FMVSS-compliant helmets, the effect of this recommendation would be 37% helmet effectiveness x 61% unhelmeted = 22.6% and the impact would be 22.6% x 57% = 12.9. However, any effect remotely approaching this is highly unlikely. The facts about and benefits of helmets have been known for 60 years and have been communicated frequently to motorcyclists (NCHRP 11.1E1, CMTW 5.1.2). There is no evidence that communication programs have had any effect on voluntary helmet use. The communications would be stand-alone, not tied to an enforcement or other program. Thus voluntary helmet use communications would lack several characteristics of effective campaigns (see the discussion in Area 14). At best, communications working with motorcycle groups and based on solid research may convert 10 percent of the non-users, which would give an effect of 37% x 6.1% = 2.3%. Half of this is more likely, for an effect of 1.2 percent and an impact of 1.2% x 57% = 0.68.

Appendix D: Detailed Discussion of Each NAMS Recommendation

Cost and time for a well-researched and vigorously implemented campaign are medium to high. If a communications campaign is to succeed it must have the enthusiastic support of rider groups, which may pose an obstacle. The overall priority of medium reflects these rankings.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.1 Helmets

#34 Use effective strategies to ensure all helmets meet FMVSS 218

Full recommendation: Use effective strategies to ensure all helmets in use meet FMVSS 218.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 4.7%
Effect: 1.9% Range: 1-3.7%
Impact: 0.09
Impact priority: low
Rank: 53
Rank in org: 28
Cost: medium
Time: medium
Obstacles: high

Overall priority: low

Discussion

As noted in the introduction to Area 12, observed helmet use in 2009 was 67 percent for FMVSS-compliant helmets and 9 percent for non-compliant (also referred to as “fake” or “novelty”) helmets. Thus almost one-eighth of all helmets in use were non-compliant. Their use is greater in universal law States, where 11 percent of all motorcyclists wore non-compliant helmets compared to 8 percent in other States (Pickrell & Ye, 2009). It is likely that many non-compliant helmets are worn in law States to avoid being cited for helmet law violations. This suggests the effective strategy to reduce their use: Enforce the provisions of State helmet laws that require FMVSS-compliant helmets. (Federal law already requires all motorcycle helmets sold in the United States to meet FMVSS 218, but in practice enforcement depends on State helmet use laws.) The problem size is thus the fatally injured motorcyclists with non-compliant helmets in universal law States: 43 percent of all fatalities occurred in law States x 11% wearing non-compliant helmets = 4.7%, or 5 percent in round numbers.

Non-compliant helmets offer no discernable protection. Thus if all of these fatally injured motorcyclists had worn compliant helmets, about 37 percent would have survived, and the effect would be 37 percent. However, effective enforcement is difficult at best. Officers must first identify non-compliant helmets and issue citations. Identification is quite straightforward, but proving to a judge that a helmet is non-compliant is quite another matter. A compliant helmet is identified by a DOT sticker. Counterfeit DOT stickers are readily available and frequently used. Without a more permanent identification method (see recommendation #35.1), citations for non-compliant helmets may not be upheld in court; if not, then officers will not issue them. At best, an enforcement campaign may increase compliant helmet use by 10 percent, leading to an effect of 3.7 percent. The more likely effect is a 5-percent increase, or a 1.9-percent effect.

Appendix D: Detailed Discussion of Each NAMS Recommendation

An alternate interpretation of this strategy is to communicate the benefits of compliant helmets. This is part of recommendation #33 in this area and is not considered here.

A serious enforcement campaign would require law enforcement resources that can be used more effectively for other activities. The recommendation's overall low priority takes into account its low impact and substantial obstacles unless non-compliant helmets can be identified easily and reliably (see recommendation #35.1 immediately following).

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.1 Helmets

#35.1 Revise FMVSS 218: labels

Full recommendation: Revise FMVSS 218.

Type: P program
Organization: C Federal

Problem Size: 4.77
Effect: 18.5% Range: 12-24%
Impact: 0.87
Impact priority: medium
Rank: 13
Rank in org: 7
Cost: low
Time: high
Obstacles: medium

Overall priority: medium

Discussion

Recommendation #35, revise FMVSS 218, has two distinct strategies: Improve labeling so that FMVSS-compliant helmets are easily and permanently identified, and improve helmet performance to increase effectiveness in preventing injury in a crash. These are considered separately: #35.1 discusses labeling and #35.2 discusses performance.

At present, an FMVSS-compliant helmet is identified by a DOT sticker affixed to the inside of the helmet. Counterfeit DOT stickers are readily available and frequently used. Without a more permanent identification method, citations for non-compliant helmets may not be upheld in court; if not, then officers will not issue them, so enforcing State laws requiring compliant helmets is difficult (see recommendation #34 in this area).

NHTSA has issued an NPRM to improve helmet-labeling requirements (Docket No. NHTSA-2008-0157). Permanent, easily understood, and counterfeit-resistant labels might reduce the use of non-compliant helmets in universal law States by 50 percent. As with recommendation #34, the problem size estimate are the fatally injured motorcyclists with non-compliant helmets in universal law States: 4.7 percent. If half of these were to use compliant helmets, the effect would be $50\% \times 37\% \text{ helmet effectiveness} = 18.5\%$.

This recommendation assumes a permanent, easily understood, and counterfeit-resistant labeling system. It is uncertain whether such a system can be devised. The overall medium priority reflects its impact if successful.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.1 Helmets

#35.2 Revise FMVSS 218: improve performance

Full recommendation: Revise FMVSS 218.

Type: R research

Organization: C Federal

Problem Size: 49%

Effect: 4% Range: 3-5%

Impact: 1.96

Impact priority: high

Rank: 6

Rank in org: 4

Cost: high

Time: high

Obstacles: high

Overall priority: high

Discussion

Recommendation #35, revise FMVSS 218, has two distinct strategies: improve labeling so that FMVSS-compliant helmets are easily and permanently identified and improve helmet performance to increase effectiveness in preventing injury in crashes. These are considered separately: #35.1 discusses labeling and #35.2 discusses performance.

This recommendation is to conduct research with a goal of improving helmet performance. If successful, the improved helmets developed under this recommendation would affect the 49 percent of fatalities who wore FMVSS-compliant helmets. The amount to which helmet performance would improve is pure speculation: perhaps the current 37-percent effectiveness would increase 3 to 5 percentage points, to 40 to 42 percent.

The research called for likely will be long and expensive. It is unknown whether research will find methods to improve helmet performance. If it does, then rulemaking will be required to implement these improvements. The recommendation's overall high priority begins with the observation that helmets are the single most effective strategy to reduce motorcyclist fatalities and assumes that some improvements in current standards can be found.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.2 Clothing

#32 Educate motorcyclists on protective clothing with information source, forum for information exchange

Full recommendation: Educate motorcyclists about the value of protective apparel by providing an information source on related research and a forum for the exchange of information.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 58%
Effect: 0.15% Range: 0.1-0.2%
Impact: 0.09
Impact priority: low
Rank: 53
Rank in org: 28
Cost: low
Time: medium
Obstacles: low

Overall priority: low

Discussion

Protective clothing other than helmets will prevent or reduce abrasions and other minor injuries in virtually all motorcycle crashes. Protective clothing's value in more serious injuries has not been evaluated (NCHRP 11.1E2, CMTW 5.4.1). The problem size for potentially fatal crashes can be estimated as the 58 percent of motorcyclist fatalities that do not involve head injury (Subramanian, 2007). Armor-quality clothing is needed to affect life-threatening torso injuries. While the European Union has established testing standards for such clothing, the United States has not (NCHRP 11.1E2).

This recommendation calls for education through an information source and forum. It suffers from the same weaknesses as other communication strategies: it is largely passive, does not present new information, and is not based on sound behavioral change principles (see communication program effectiveness in Area 14.). In addition, it faces the substantial obstacle of "effecting change in a long-established culture. Riders may be very reluctant to put aside the traditional attire in favor of protective clothing" (NCHRP 11.1E2). The effect of this recommendation consequently is likely to be minimal and its overall priority is low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.2 Clothing

#36 Study protective clothing benefit, consider standards if warranted

Full recommendation: Conduct research regarding protective apparel effectiveness, and consider development or adoption of existing standards, if research justifies.

Type: R research
Organization: C Federal

Problem Size: 58%
Effect: 0.15% Range: 0.1-0.2%
Impact: 0.09
Impact priority: low
Rank: 53
Rank in org: 20
Cost: high
Time: high
Obstacles: medium

Overall priority: low

Discussion

As noted in the immediately preceding companion recommendation #32, protective clothing other than helmets will prevent or reduce abrasions and other minor injuries in virtually all motorcycle crashes. The problem size for potentially fatal crashes can be estimated as the 58 percent of motorcyclist fatalities who do not involve head injury (Subramanian, 2007).

Protective clothing's value in more serious injuries has not been evaluated (NCHRP 11.1E2, CMTW 5.4.1). This recommendation calls for evaluating the effects of protective clothing and, if appropriate, establishing standards.

The recommendation faces substantial obstacles. First, armor-quality clothing is needed to affect life-threatening torso injuries (NCHRP 11.1E2). The tradeoffs between the clothing's cost, weight, comfort, and protection are unknown – that's what the research should investigate. However, it is likely that clothing that provides any substantial reduction in fatality risk would be both expensive and far from the casual clothing preferred by many motorcyclists. Next, any standards must be established by rulemaking. While the European Union has established testing standards for such clothing, the United States has not (NCHRP 11.1E2). Finally, any standards would be voluntary both for clothing manufacturers and for motorcyclist purchasers. It is likely that as the protective value of clothing increases, the reluctance of motorcyclists to buy and wear it also increases. So the effect of this recommendation and its overall priority both are low, even assuming successful research.

Appendix D: Detailed Discussion of Each NAMS Recommendation

12.3 Conspicuity

#61 Encourage motorcyclists to increase conspicuity

Full recommendation: Encourage motorcyclists to enhance their conspicuity.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 25%
Effect: 3% Range: 0.1-10%
Impact: 0.75
Impact priority: medium
Rank: 18
Rank in org: 9
Cost: medium
Time: medium
Obstacles: low

Overall priority: medium

Discussion

Motorcyclist conspicuity in its broadest sense is an important factor in motorcycle crashes. One estimate of the problem size comes from fatal crash data. First, 47 percent of fatal motorcycle crashes involve two or more vehicles (NHTSA, 2009c); in 35 percent of these the other vehicle violated the motorcycle's right of way (Longthorne et al., 2007, Table 22); and in-depth investigations found that motorcycle conspicuity was low in 46 percent right-of-way violation crashes (Hurt, Ouellet, & Thom, 1981). This produces a problem size of $47\% \times 35\% \times 46\% = 8\%$. Direct evidence comes from a New Zealand case-control study that found a 37-percent lower risk of crashes leading to emergency room treatment, hospitalization, or death for riders wearing any reflective or fluorescent clothing (Wells et al., 2004). If the latter estimate applies to fatal crashes, then conspicuity is a causal factor in three-quarters of all multivehicle fatal motorcycle crashes, an estimate that appears high. A more likely problem size estimate is 25 percent. The proportion of motorcyclists in fatal crashes who are wearing conspicuous clothing is not known.

The recommendation uses communications to encourage motorcyclists to wear conspicuous clothing. NAMS recognizes that conspicuous clothing is not acceptable to many motorcyclists due to "social and fashion pressures": "[A]lthough sportbike riders ... have largely accepted bright colors, the larger cruiser category chooses apparel in almost nothing but inconspicuous black. Other [rider] categories often choose other hard-to-see colors such as gray, beige, and other neutral colors." NAMS also reports that more than half the helmets sold for street use are black.

Appendix D: Detailed Discussion of Each NAMS Recommendation

As with other communications recommendations, a successful campaign must overcome this resistance. It also must be researched well, implemented vigorously, funded adequately, and supported by rider groups. If so, it may convert 10 percent of riders to wearing conspicuous clothing. A 3-percent effect is more likely, leading to an impact of 0.75.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13 Training

NAMS states unequivocally that “motorcycle rider education and training comprise the centerpiece of a comprehensive motorcycle safety program.” It is no surprise that 9 individual NAMS recommendations address some aspect of training: delivering, providing incentives, evaluating, and improving training.

Problem size: estimated to be 80 percent. Training has the potential to affect all crashes in which some rider behavior precipitated or could have prevented or mitigated the crash. One estimate of the proportion of crashes satisfying this “rider behavior” criterion comes from Hurt, Ouellet, and Thom (1981), who found that rider error was a primary precipitating factor in 41 percent of crashes and a secondary factor in another 7 percent, for a total of 48 percent. This undoubtedly is too low, because rider behavior may have avoided crashes that the rider did not precipitate. Another estimate comes from FARS. First, the rider could have prevented or mitigated almost all the 53 percent of fatal crashes with no other vehicle. In multivehicle crashes, 55 percent involved some rider factor (Longthorne et al., 2007, Table 22). Together these yield 53% single-vehicle + 47% multivehicle x 55% rider factor = 79%. Again, rider behavior may have prevented or mitigated some of the remaining 21 percent. Finally, studies of other vehicle crashes find driver factors involved in about 90 percent (for a recent example, the Large-Truck Crash Causation Study found that drivers were responsible for the most critical causal factor in 87 percent of crashes, compared to 10 percent for vehicle factors and 3 percent for environmental factors [Craft, 2007]). All together, rider behavior likely is involved in 80 to 90 percent of motorcycle crashes. The lower estimate of 80 percent is used to take into account the common crash type where another vehicle turns into the path of a motorcycle: Passenger vehicle drivers failed to yield the right-of-way in 35 percent of all two-vehicle fatal motorcycle crashes (Longthorne et al., 2007, Table 22), or about 17.5 percent of all fatal crashes. Rider behavior may have little effect on these crashes.

Effect: 0.8 percent. One study (Billheimer, 1998, cited in NCHRP and NAMS as the definitive source) found a positive effect of training for the first six months. However, NAMS also states that “there is no evaluation of rider education and training effectiveness” and “it is assumed, yet unknown, that the current programs are teaching necessary skills to survive in traffic.” Other motorcycle training evaluations found that training increased crash rates (CMTW 5.3.2; Daniello et al., 2009). This parallels similar conclusions for driver education: The definitive DeKalb study found at best a small effect over the first six months (CMTW 6.2.1). Riders in their first six months probably contribute less than 4 percent of total motorcycle travel or fatalities, so even a 50-percent crash reduction during these months would produce only an overall 2-percent fatality effect; a 10-percent crash reduction is more likely, leading to an 0.8-percent effect. No evaluations of refresher or returning rider training have been conducted.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.1 Current Training

#9 Provide training to all who need or seek it

Full recommendation: Expand motorcycle safety programs to accommodate all who need or seek training.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 1% Range: 0.1-2%
Impact: 0.80
Impact priority: medium
Rank: 14
Rank in org: 5
Cost: high
Time: high
Obstacles: medium

Overall priority: medium

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Training undoubtedly is useful in teaching the skills needed to operate a motorcycle. But most crashes are caused by poor judgment, poor attitudes, or poor higher-order crash avoidance behavior (such as lack of proper search techniques), not by poor operating skills, and training for novice riders has not been effective in improving these higher-order behaviors. At best, training may reduce crashes slightly during the first few months of riding, leading to an effect of at most 1 percent and an impact of 0.80.

Training is broadly supported by motorcyclists, rider groups, manufacturers, and States. Training is expensive, requiring instructors, motorcycles, and facilities (large paved areas, or ranges, where novices can learn and practice). In States with limited riding seasons, training demand peaks abruptly at the beginning of the riding season, which strains training resources.

States should and will continue to provide training and should seek to satisfy the training needs of their residents in the spirit of this recommendation. Its overall medium priority stems from its limited impact in relation to its cost.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.1 Current Training

#10 Study effectiveness and impact of rider education/training

Full recommendation: Conduct uniform follow-up research into the effectiveness and impact of rider education and training.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.2% Range: 0.1-0.2%
Impact: 0.16
Impact priority: low
Rank: 43
Rank in org: 16
Cost: high
Time: high
Obstacles: medium

Overall priority: medium

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

As discussed in the introduction to Area 13, several evaluations of entry-level rider training have been conducted. Most, but not all, found that current training did not reduce the crash risk of novice riders. However, many of the evaluations had methodological shortcomings (Daniello et al., 2009). NHTSA has begun an evaluation of entry-level rider training which may provide more definitive results. That study may satisfy the immediate goals of this recommendation, so additional research at this time is not a high priority.

The effect and impact of this recommendation by itself are low. If current entry-level rider training is found to be effective, then there's additional evidence to support the previous recommendation #9 to provide training to all who need it, and recommendation #9 will produce the impact on motorcycle crashes and fatalities. If current entry-level training is found not to be effective, then this recommendation will encourage research to improve training, as in recommendations #22, 23, and 57. The medium priority of recommendation #10 balances the importance of providing more definitive evidence on the effects of entry-level rider training with the low effect and impact of this evidence by itself.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.1 Current Training

#13 Establish benchmarks for education/training effectiveness and motorcycle program operations

Full recommendation: Establish benchmarks for rider education and training effectiveness and program operation excellence.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.2% Range: 0.1-0.2%
Impact: 0.16
Impact priority: low
Rank: 43
Rank in org: 16
Cost: medium
Time: high
Obstacles: low

Overall priority: low

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Most training uses one of the curricula developed by the Motorcycle Safety Foundation, the *Basic RiderCourse* for novices and the *Experienced RiderCourse Suite* (NAMS Implementation Guide, Sec. 3) for more advanced riders, so training is quite standardized. NHTSA currently is establishing benchmarks for entry-level rider training. Motorcycle program operations have a benchmark in NHTSA's Motorcycle Program Guideline (www.nhtsa.dot.gov/nhtsa/whatsup/tea21/tea21programs/pages/MotorcycleSafety.htm). As a result, the immediate goals sought by this recommendation have been met. Additional efforts have a low impact and a low overall priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.2 Improve Training

#23 Evaluate effectiveness of education/training in developing crash avoidance skills

Full recommendation: Evaluate effectiveness of rider education and training in developing crash avoidance skills.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.5% Range: 0.1-2%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 10
Cost: high
Time: high
Obstacles: low

Overall priority: low

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Crash avoidance, broadly interpreted, includes everything needed to prevent crashes. Said another way, training begins with the basic skills needed to operate a motorcycle under ideal conditions and then moves on to the more sophisticated knowledge, attitudes, judgment, and skills needed to avoid crashes under the wide variety of riding conditions encountered on the road. Skills alone – for example, braking techniques – are not enough. The skills must be practiced so they become automatic when they must be applied instantly to avoid a crash. And higher-level attitudes and practices are more important yet: always searching for potentially threatening vehicles or road conditions, planning maneuvers or paths “just in case,” avoiding risky situations, obeying traffic laws, and many more. Again, knowledge is not enough: what’s needed are first the attitudes and judgment to use this knowledge and then practice, practice, and more practice so that it all becomes second nature.

Many crash avoidance skills and strategies are fairly well understood and training attempts to teach them. If training were successful, then training would reduce crash risk, and the evaluation studies show that any reductions are limited at best; see the discussion at the beginning of Area 13. So in a sense this recommendation already has been met. The recommendation is interpreted in a broader sense, as the final part of a package to study how training best can develop and improve riders’ crash avoidance skills and practices and how this training can be delivered

Appendix D: Detailed Discussion of Each NAMS Recommendation

(recommendations #7 and #21 in Area 15 and #22 in this area). The low effect and impact treat this recommendation in isolation as applied to entry-level rider training.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.2 Improve Training

#22 Develop training, licensing, technology measures to address crash avoidance problems

Full recommendation: Develop countermeasures in training, license testing, and motorcycle technology to address any current crash avoidance deficiencies.

Type: R research

Organization: C Federal

Problem Size: 80%

Effect: 2% Range: 1-30%

Impact: 1.60

Impact priority: high

Rank: 8

Rank in org: 6

Cost: high

Time: high

Obstacles: high

Overall priority: high

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

This recommendation assumes the results of recommendation #23: that current training, especially novice training, does not develop effective crash avoidance skills in the sense that training does not reduce crash risk. It seeks methods to improve upon this performance. It is interpreted as a training recommendation: License testing could serve as an incentive for training and potential motorcycle technology improvements are discussed elsewhere (recommendations #25, 55, and 56).

As noted in recommendation #23, many crash avoidance skills and strategies are fairly well understood. The difficulties are that these skills and strategies first must be practiced so extensively that they become automatic and then that motorcyclist attitudes must accept them by following safe riding practices. Training can help overcome the first of these. But novice training cannot: In a limited time, with novices who need to concentrate on basic motorcycle operation, only very rudimentary crash avoidance skills and practices can be taught and even these cannot be practiced sufficiently. This recommendation first would develop methods to teach and practice key crash avoidance skills and practices and then would develop an effective strategy for implementing them in some post-licensure format. Work toward these ends is in progress elsewhere (see for example Haworth & Mulvihill, 2005).

Note that this recommendation subsumes recommendation #57, training on braking techniques. This recommendation also is related to recommendation #21, research to identify critical crash

Appendix D: Detailed Discussion of Each NAMS Recommendation

avoidance skills, to the extent that these skills are not known well enough. It also is related to recommendation #7, research on rider attitudes and behavior related to crash involvement. Its impact and priority estimates are based on current knowledge. If research from recommendations #7 or 21 provide additional information, the impact and priority of this recommendation will rise.

Curriculum development will be challenging; effective implementation even more so. But the research is important to move beyond the common belief that current novice training is all that's needed to produce safe riders.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.2 Improve Training

#57 Provide additional education/training on proper braking techniques

Full recommendation: Provide additional training and education on proper braking and panic-braking techniques.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 1% Range: 0.1-30%
Impact: 0.80
Impact priority: medium
Rank: 14
Rank in org: 5
Cost: high
Time: high
Obstacles: high

Overall priority: medium

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Most motorcycle front and rear brakes are controlled separately. This means that proper braking is considerably more difficult for motorcycles than for four-wheel vehicles. The Hurt study found that many motorcyclists did not use their brakes effectively in crash situations. Braking techniques are included in rider training, but novice training most likely does not provide enough practice time to make these techniques become automatic, especially in panic situations (see recommendation #22).

Antilock brakes provide a technological means to improve braking performance. A recent study (Teoh, 2009) found that antilock brakes reduced the risk of a fatal crash by 28 percent. Other studies have found greater effects (see recommendation #57). A companion study found 19-percent fewer collision insurance claims for antilock-equipped than for standard motorcycles. It is reasonable to estimate that 25 percent of all fatal crashes, or about 30 percent of the 80 percent of crashes involving rider behavior, potentially could be affected by improved braking.

This recommendation is a component of recommendation #22 on overall crash avoidance training. In both recommendations, the major obstacle is to develop effective implementation in a post-licensing and post-novice training format. Its medium impact and overall priority reflect its position as a component of recommendation #22.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.2 Improve Training

#14 Study effectiveness of on-street training

Full recommendation: Explore the effectiveness of on-street training.

Type:	R	research
Organization:	C	Federal
Problem Size:	80%	
Effect:	0.2%	Range: 0.1-0.5%
Impact:	0.16	
Impact priority:	low	
Rank:	43	
Rank in org:	16	
Cost:	low	
Time:	medium	
Obstacles:	medium	

Overall priority: low

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Most training in the United States is conducted at off-street ranges rather than on streets. Each offers advantages and disadvantages. Off-street training provides a safe and controlled environment where specific maneuvers can be demonstrated and practiced. It requires a dedicated training range, which sometimes is hard to find. On-street training provides the opportunity to interact with the real-world riding environment, but in limited circumstances.

NAMS notes that on-street training is widely used in other parts of the world. Thus, comparing the two, or evaluating the benefits of training that includes both off-street and on-street components, can be done fairly quickly and easily. The motorcycle training community certainly has already considered the advantages and disadvantages of including on-street segments in current curricula, so it is unlikely that the recommended study will produce any new information or will improve current training. The recommendation's low impact and priority reflect this observation.

The MSF announced at the January 2010 TRB motorcycle committee meeting that it is developing an on-street training course. Pilot tests of that course will provide a low-cost opportunity to investigate on-street training's potential benefits. If the results are promising, the priority of this recommendation should be revisited.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.2 Improve Training

#24 Evaluate need for simulator training in motorcycle skills

Full recommendation: Evaluate the need for motorcycle simulator skills training.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.1% Range: 0.1-0.5%
Impact: 0.08
Impact priority: low
Rank: 57
Rank in org: 21
Cost: high
Time: high
Obstacles: medium

Overall priority: low

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

Simulators potentially present an opportunity for teaching and practicing motorcycle operating skills that cannot be taught and practiced on actual motorcycles. However, the keys to crash avoidance are not skills (aside perhaps from braking, which can be addressed in other ways; see recommendations #55-57) but knowledge, attitudes, and behavior (see recommendation #23). Thus simulator training is unlikely to have much effect. In addition, simulators are expensive. Even if simulators were found to provide advantages over traditional training, it is unlikely to expect that they could be incorporated as part of every novice rider's training. This recommendation consequently has low priority. It should be noted that a simulator developed by Honda is becoming available. Experience with this simulator may change the cost, time, obstacles, effect, impact, and priority estimates for this recommendation.

Appendix D: Detailed Discussion of Each NAMS Recommendation

13.3 Incentives for Training

#44 Develop guidelines for insurers for premium reductions for education/training and licensing

Full recommendation: Develop guidelines for insurers to tie approved training, licensing, and safe-riding practices to premium reductions.

Type: P program
Organization: B manufacturers, insurers

Problem Size: 80%
Effect: 0.5% Range: 0.1-1%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 4
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

As discussed in the introduction to Area 13, Training, the problem size is estimated to be 80 percent.

This recommendation is best considered as an incentive for training. It is unlikely that insurers would consider an incentive for proper licensing because riders are legally required to do this (even though some do not). And it is difficult to see how “safe-riding practices” could be defined and measured in a manner worthy of consideration by insurers.

Some insurers offer a premium reduction for motorcyclists who satisfactorily complete various training courses and some States require some premium reduction (NAMS, Appendix J). These reductions are similar to the reductions some insurers provide for driver education. It is unclear whether a premium reduction provides an incentive for training. Thus an effect estimate is speculative. It has been set at 0.5 percent, half the effect of the training it seeks to encourage (see recommendation #9). Costs of the recommendation would be borne by insurers and perhaps would be passed on to all insured riders. The costs of course would depend on the premium reduction size and the demand for it. It is also unclear who would develop the recommended guidelines and whether insurers would accept them. The recommendation’s mid-range impact, cost, time, and priority all reflect these uncertainties.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14 Education and Information

Education and communication programs long have been a standard traffic safety strategy for many issues affecting motorcyclists and others. Williams (2007) provides an excellent summary of communication program types, characteristics, and effectiveness. He concludes that “most [communication] programs do not lead to a measurable reduction in crashes or injuries” and some even are counterproductive. Characteristics of ineffective programs include messages that are passive, use fear tactics, provide no new information, and/or are not based on behavioral change methods, and campaigns that are poorly planned, short-term, low-intensity, and/or stand-alone. Effective program characteristics include messages that are based on behavior change models, provide concrete actions rather than exhortations to “just don’t do it,” and/or provide new and relevant information, and campaigns that are carefully planned, long-term, high-intensity, and/or are part of broader programs such as enforcement. See also Preusser, Williams, Nichols, Tison, & Chaudhary (2008), which concludes that most generic traffic safety communications programs were ineffective. The exceptions all involved children, the most recent example being communications on the dangers of air bags combined with a recommendation that children sit in the back seat (with an observed success over 90%).

Motorcycle communications to date frequently exhibit many characteristics noted above for ineffective programs. “More of the same” will be similarly ineffective. Effective communications likely would require new information, directly affecting all motorcyclists, used in a well-researched and funded long-run campaign urging behavior change that’s easy and acceptable or that’s backed up by enforcement. Lacking any of these, communication program effectiveness likely will be low, based on previous examples. The components that can be estimated are whether the information is new, how many motorcyclists are affected by it, and whether the behavior change is easy and acceptable or is backed up by enforcement. These are used as the basis for the upper effectiveness estimates. The lower estimates generally assume “business as usual” with minimal effectiveness.

Education and information of course can be provided during formal training sessions where there is more opportunity for active learning and knowledge retention. The five specific knowledge recommendations thus can be considered part of training recommendation #22 in Area 13.2. In the following discussions they are considered as education and information recommendations separate from training.

Problem size: except as noted in the individual discussions, education and communication strategies have the potential to affect the 80 percent of fatal crashes in which some rider behavior precipitated or could have prevented or mitigated the crash.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.1 Specific Knowledge

#66 Educate riders on lane use strategies, including HOV lanes

Full recommendation: Educate motorcyclists about lane-use strategies, including HOV lane usage.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 0.5% Range: 0.1-1%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 14
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

Effective lane position is fundamental to safe on-road riding. Lane position affects how well riders see the roadway and traffic, how well other road users see them (see recommendation #38), and the motorcycle's operation in turns and curves.

Lane positioning is taught in rider training courses. Additional information on lane positioning in these courses may well be useful (see recommendation #22 in Area 13.2). Education and communication efforts on lane positioning outside of formal courses may present some new information to some riders, but likely not much. As a stand-alone program, this recommendation is likely to have at most a modest impact. To achieve this much will require an intensive and well-financed campaign which will divert resources from more pressing needs.

HOV (high-occupancy vehicle) lanes are found in some major metropolitan areas. They have two forms: a separate roadway, often in the center median of a divided highway, with periodic entrances and exits, and a separate lane, usually the left-hand lane, of a divided highway that's separated from other lanes only by markings. Many HOV lanes allow motorcycles to use them. The separate-roadway HOV lanes may provide a less congested and safer environment for motorcycles. The separate-lane HOVs may not, if traffic enters and exits erratically. Regardless, riders in areas with HOV lanes probably are well aware that they can use these lanes so that additional education is not needed.

The overall priority of this recommendation is low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.1 Specific Knowledge

#72 Educate riders about common roadway hazards

Full recommendation: Educate motorcyclists about the hazards created by common roadway defects and maintenance methods. Emphasize riding skills required to negotiate these hazards through education and training.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 6%
Effect: 3% Range: 0.1-5%
Impact: 0.18
Impact priority: low
Rank: 42
Rank in org: 23
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

The problem size is estimated to be 6 percent, the estimate of the contribution of roadway features to motorcycle fatal crashes (see Area 40).

Many roadway features and conditions can be hazardous to motorcycles – see NCHRP 11.1A for detailed discussion. Most riders with even a small amount of on-road experience recognize and can cope with some of these: potholes, irregularities, debris, poor or non-existent shoulders. Less common features may not be recognized or understood: steel mesh bridges, road surface treatments. So education and information on these may present new information. That would increase the potential effectiveness of an education and communication campaign (see Area 14). However, the information on any less common feature won't be relevant to all riders, thus reducing a campaign's potential effect. As with other stand-alone education recommendations, it has a low impact and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.1 Specific Knowledge

#38 Educate riders that they may not be seen; provide defensive strategies

Full recommendation: Remind motorcyclists that they may be overlooked and provide defensive strategies for overcoming this situation.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 25%
Effect: 0.5% Range: 0.1-1%
Impact: 0.13
Impact priority: low
Rank: 48
Rank in org: 25
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

This recommendation addresses motorcyclist conspicuity in its broadest sense. As discussed in recommendation #61 in Area 12.3, the problem size is estimated to be 25 percent.

Riding strategies to make motorcycles on the road more visible should be a standard part of an overall plan to enhance conspicuity – see also recommendations #61 and 62 on apparel and equipment. Information and basic strategies to address this issue, such as proper lane use (see recommendation #66 in this section) are included in rider training courses. It is safe to say that any rider with any formal training or any rider with some on-road experience understands the basic issue, though perhaps not all relevant riding strategies for addressing it. So the recommended education and communications have few of the characteristics of successful programs (see Area 14). As a stand-alone program, this recommendation has at best a 1-percent effect and a low impact and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.1 Specific Knowledge

#76 Educate riders how to overcome hazards presented by other vehicle designs

Full recommendation: Educate motorcyclists about strategies to overcome the challenges that the designs of other vehicles create in the traffic environment.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 0.1% Range: 0.1-0.2%
Impact: 0.08
Impact priority: low
Rank: 57
Rank in org: 31
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

The hazards referred to in the recommendation include tall vehicles, which obscure the rider's view of the road and other drivers' view of the motorcycle; other vehicles' blind spots; and features of other vehicles that may increase a motorcyclist's injuries in a crash. The most relevant appear to be those that limit or block the view of other drivers or motorcyclists. Strategies to help other drivers see the motorcycle are covered under the conspicuity recommendations #38 and 66 in this section. Strategies to help the motorcyclist see other traffic and the environment are covered under the lane use recommendation #66. By itself, this recommendation has negligible effect and low impact and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.1 Specific Knowledge

#59 Educate riders how modifications and loads affect motorcycle operating characteristics

Full recommendation: Educate users about how modifications and loads can change the operating characteristics of their motorcycles.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 25%
Effect: 0.1% Range: 0.1-0.2%
Impact: 0.03
Impact priority: low
Rank: 65
Rank in org: 33
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

The problem size estimate is a generous 25 percent, as discussed in recommendation #58 in Area 26.

This recommendation uses an ineffective strategy to address an issue of unknown but likely small size. To the extent that modifications and loads change operating characteristics, the changes will vary with the specific modification or load. Thus, aside from a general message that modifications and loads may change operating characteristics (a message that all riders likely know already), useful information may need to be tailored to several specific situations. This dilutes the effect of this recommendation even further. It has a very low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.2 Methods

#6 Methods and media for information distribution: PSAs, ads in enthusiast media, etc.

Full recommendation: Explore public service announcements, advertising in enthusiast and near-enthusiast media, and any other viable avenues for distributing safety information.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 0.2% Range: 0.1-0.4%
Impact: 0.16
Impact priority: low
Rank: 43
Rank in org: 24
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

This recommendation seeks to convey information to motorcyclists through effective communication methods. These methods should be integral to any traffic safety education and communication campaign. To that extent this recommendation should have a high priority. However, the recommendation's effect is limited by the effect of the information it seeks to convey. As discussed generally in Area 14 and more specifically in the recommendations of Area 14.1, many motorcycle safety topics are unlikely to be conveyed effectively through even the best communications methods. This recommendation should be considered a standard part of any communications campaign, but as a stand-alone recommendation it has low impact and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.2 Methods

#5 Research-based safety information for media and for rider education and training

Full recommendation: Develop research-based safety information that can be used easily by the consumer media and in rider education and training systems.

Type: P program
Organization: C Federal

Problem Size: 80%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Overall rank:
Rank in org:
Cost: N/A
Time: N/A
Obstacles: N/A

Overall priority: N/A

Discussion

NAMS, pg. 13, states the general conclusion that “there is often misinformation passed around among motorcyclists.” If so, there are two potential explanations: that solid, research-based information is not available, or that it is not communicated effectively to motorcyclists. This recommendation addresses the first reason; recommendations #6 and 4 address the second.

On some motorcycle safety issues, such as helmets, there is extensive research and information. On other issues, there is little or no research. Thus the action to satisfy this recommendation is to conduct research in areas where it is needed. As a general statement this is included as recommendation #1 in Area 63. In specific areas it is covered by other research recommendations such as #27 in Area 11.2, #36 in Area 12.2, and 55 in Area 21. Consequently, the effect, impact, and priority are not estimated for this recommendation.

Appendix D: Detailed Discussion of Each NAMS Recommendation

14.2 Methods

#4 Motorcycle safety information clearinghouse

Full recommendation: Create a clearinghouse to distribute current, practical information about motorcycle safety based on recent research.

Type: X management, support
Organization: C Federal

Problem Size: 80%
Effect: 0.2% Range: 0.1-1%
Impact: 0.16
Impact priority: low
Rank: 43
Rank in org: 16
Cost: medium
Time: medium
Obstacles: low

Overall priority: low

Discussion

The recommendation seeks to create a single source for motorcycle safety information. Several organizations including NHTSA, MSF, SMSA, and several rider groups and motorcycle manufacturers currently provide this information through their Web sites. Riders easily can obtain the information they need. Media also can obtain information from one or more sources.

Given the differing views and strong positions of these organizations, it is unlikely that information provided by any one would be universally recognized as authoritative. The same differences suggest that a clearinghouse involving information from several of them would be difficult to operate. As a result, there appears to be little to be gained by efforts to establish a single clearinghouse. Even if a clearinghouse could be established, its impact would be limited by the factors discussed in Area 14. Consequently, this recommendation has a low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

15 Behavior and Skills

Four NAMS recommendations address general or specific rider behavior on the road together with associated knowledge and attitudes. These recommendations all involve research. Results from the research can be implemented through the training, education, and information recommendations of Areas 13 and 14 or perhaps through other methods.

Problem size: except as noted in the individual discussions, the rider behavior recommendations have the potential to affect the estimated 80 percent of fatal crashes in which some rider behavior precipitated or could have prevented or mitigated the crash.

Appendix D: Detailed Discussion of Each NAMS Recommendation

15 Behavior and Skills

#7 Study riders' attitudes, behavior, effect on crash involvement

Full recommendation: Study factors that affect and shape motorcyclists' attitudes and behavior and how they affect crash involvement.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 3% Range: 1-10%
Impact: 2.40
Impact priority: high
Rank: 4
Rank in org: 2
Cost: high
Time: high
Obstacles: medium

Overall priority: high

Discussion

This recommendation is key to the cluster of recommendations dealing with crash avoidance, which in turn is the key to reducing crashes. Recommendations #21-23 in Areas 15 and 13.2 deal with crash avoidance skills and implicitly assume that improved skills alone will reduce crashes. Recommendation #23 has been interpreted more broadly, to include attitudes and behaviors; that means it requires the results of this research to be effective. This research may not yield anything useful – rider attitudes and behaviors may not be amenable to change. But the research is necessary. Its high effect, impact, and priority reflect this necessity.

Appendix D: Detailed Discussion of Each NAMS Recommendation

15 Behavior and Skills

#21 Identify critical crash avoidance skills

Full recommendation: Conduct research to determine which rider crash avoidance skills are most important.

Type: R research
Organization: C Federal

Problem Size: 50%
Effect: 4% Range: 2-10%
Impact: 2.00
Impact priority: high
Rank: 5
Rank in org: 3
Cost: high
Time: high
Obstacles: low

Overall priority: high

Discussion

This recommendation's 50-percent problem size estimate is lower than the 80 percent estimated for recommendation #7, research into attitudes and behavior that affect crash involvement, because specific skills are less important than overall attitudes and behavior.

This recommendation should be considered together with other recommendations on crash avoidance. Recommendations #22 and 23 (in Area 13.2) to evaluate and improve crash avoidance training presume that the important crash avoidance skills are known. This research is important to the extent that they are not known well enough. This recommendation forms a logical pair with the previous recommendation #7 on crash avoidance attitudes and behaviors. Its high priority assumes that the results of this research can provide useful new information that in turn will improve training by focusing attention on the most critical crash avoidance skills. The crash causation study to be conducted over the next several years should provide useful background information on crash characteristics to guide the research.

Appendix D: Detailed Discussion of Each NAMS Recommendation

15 Behavior and Skills

#8 Develop programs to reduce dangerous behavior and reinforce safe behavior

Full recommendation: Using information about how motorcyclists form attitudes about safety issues, create programs that reduce dangerous behavior and reinforce safe behavior.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.5% Range: 0.1-2%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 10
Cost: high
Time: high
Obstacles: low

Overall priority: low

Discussion

This recommendation seeks to implement the results of recommendation #7 in this area on rider attitudes and behaviors into programs. Recommendation #22 in Area 13.2 already incorporates these results into training. That leaves communication programs, broadly defined. As opposed to the recommendations in Area 13, which communicate specific information related to specific behaviors, this recommendation attempts to change general attitudes and behaviors. It is far from clear how this can be accomplished outside of the controlled training environment (and it is very difficult even there). While the recommendation's goal certainly is high priority, its low effect, impact, and priority derive from the lack of effective means to accomplish this goal.

Appendix D: Detailed Discussion of Each NAMS Recommendation

15 Behavior and Skills

#65 Study safety implications of lane splitting

Full recommendation: Study the safety implications of lane splitting.

Type: R research
Organization: C Federal

Problem Size: 3%
Effect: 0.2% Range: 0.1-0.5%
Impact: 0.01
Impact priority: low
Rank: 68
Rank in org: 27
Cost: high
Time: high
Obstacles: low

Overall priority: low

Discussion

Lane-splitting refers to traveling between lanes of slow-moving or stopped vehicles on a multi-lane road. It is permitted in California but is practiced more commonly in other countries (NAMS).

About 25 percent of fatal single-vehicle motorcycle crashes occur on multi-lane roads (Shankar, 2001, Table 14) and the proportion for multivehicle crashes is similar. It is likely that at most 10 percent of these crashes occur in situations where lane splitting was or could be used, to give a problem size estimate of 3 percent.

Lane-splitting is a specific lane use technique (see recommendation #66 in Area 14.1), which is illegal in most States. Research may be useful to determine whether it increases or decreases safety for all road users. However, in view of its low effect and impact, it has substantially lower priority than other research recommendations.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16 Licensing

Eight NAMS recommendations address rider licensing. The first five seek to increase the proportion of riders who are properly licensed (who have a motorcycle endorsement). In 2008, 25 percent of the riders in fatal crashes were not properly licensed (NHTSA, 2009c). The other three seek to improve licensing practices.

In theory, riders can pass the licensing tests and receive their motorcycle endorsement only if they demonstrate that they are competent to operate a motorcycle safely. In practice, as with automobile licensing, motorcycle licensing tests are far less demanding than this. They serve as a very low-level screen that prevents complete incompetents from receiving licenses. So the true value of licensing may be to encourage training, especially if training and licensing are closely linked (recommendations #11 and 17). There is no research that compares crash rates of properly and improperly licensed riders.

The problem size of recommendations that link licensing with training or that seek to improve licensing is 80 percent, which is the percentage of fatal crashes in which some rider behavior precipitated or could have prevented or mitigated the crash. The problem size of recommendations to increase proper licensing without a tie to training is 26 percent, the proportion of riders in fatal crashes who were not properly licensed.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.1 Increase Licensing

#11 Merge rider education/training and licensing into one-stop operations

Full recommendation: Merge rider education and training and licensing functions to form one-stop operations.

Type: P program research
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 1% Range: 0.1-2%
Impact: 0.80
Impact priority: medium
Rank: 14
Rank in org: 5
Cost: low
Time: medium
Obstacles: high

Overall priority: medium

Discussion

As discussed in Area 16, the problem size is estimated to be 80 percent.

The effect of this recommendation would be to award the motorcycle endorsement immediately upon successful completion of a basic training course, without separate trips to the licensing agency for written or operator tests: see recommendation #17 immediately following. Recommendations #11 and 17 should be considered together, with #11 providing the overall administrative framework and #17 the specific action.

At least two States, Maryland and Pennsylvania, already do this (NAMS Implementation Guide 3.4). The general principle that separate licensing tests are not needed for training graduates is well-established: As of 2007, at least 46 States waived the licensing skills test and at least 16 waived the knowledge test for training course graduates (Hanchulak & Robinson, 2009, Table B-18).

The recommendation likely would encourage more riders to become properly licensed, would save one or two trips to the licensing agency for training course graduates who become licensed, and would reduce the demand for licensing tests. Its effect on crashes, though, is at best the same as the effect of training (see recommendation #9 in Area 13.1). There may be obstacles to combining or coordinating State training and licensing functions. So its overall impact and priority is medium. Its administrative advantages and potential cost savings to States may increase this priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.1 Increase Licensing

#17 States issue motorcycle endorsements immediately upon course completion

Full recommendation: Develop and implement programs to allow all State motorcycle safety programs to issue motorcycle endorsements immediately upon successful completion of rider training courses.

Type: P program research
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 1% Range: 0.1-2%
Impact: 0.80
Impact priority: medium
Rank: 14
Rank in org: 5
Cost: low
Time: medium
Obstacles: high

Overall priority: medium

Discussion

As discussed in Area 16, the problem size is estimated to be 80 percent.

This recommendation should be considered together with the previous recommendation #11, where #11 provides an administrative framework and #17 the specific action.

At least two States already do this (NAMS Implementation Guide 3.4). The general principle that separate licensing tests are not needed for training graduates is well-established: As of 2007, at least 46 States waived the licensing skills test and at least 16 waived the knowledge test for training course graduates (Hanchulak & Robinson, 2009, Table B-18).

The recommendation likely would encourage more riders to become properly licensed, would save one or two trips to the licensing agency for training course graduates who become licensed, and would reduce the demand for licensing tests. Its effect on crashes, though, is at best the same as the effect of training (see recommendation #9 in Area 13.1). There may be obstacles to combining or coordinating State training and licensing functions. So its overall impact and priority is medium. Its administrative advantages and potential cost savings to States may increase this priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.1 Increase Licensing

#16 Identify and remove barriers to obtaining a motorcycle endorsement

Full recommendation: Identify and remove barriers to obtaining a motorcycle endorsement.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 26%
Effect: 0.5% Range: 0.1-1%
Impact: 0.13
Impact priority: low
Rank: 48
Rank in org: 25
Cost: medium
Time: medium
Obstacles: medium

Overall priority: low

Discussion

As discussed in Area 16, the problem size is estimated to be 26 percent.

Barriers to licensing include limited and inconvenient licensing test hours, which sometimes require appointments weeks or months in advance, and licensing systems in some States that provide no incentive to become fully licensed because learner's permits may be renewed indefinitely (NAMS Implementation Guide 4.1). Actions to remove these barriers should be a matter of good licensing department administration regardless of their impact on safety. Recommendation #11 in this area provides one way to do address this recommendation.

By itself, with no tie to training, this recommendation is unlikely to have much effect on safety. Consequently its impact and priority both are low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.1 Increase Licensing

#18 Enforce penalties for improperly licensed riders

Full recommendation: Enforce penalties for operating a motorcycle without a proper endorsement.

Type: P program research
Organization: A States, municipalities, rider groups

Problem Size: 26%
Effect: 0.3% Range: 0.1-1%
Impact: 0.08
Impact priority: low
Rank: 57
Rank in org: 31
Cost: low
Time: low
Obstacles: low

Overall priority: low

Discussion

As discussed in Area 16, the problem size is estimated to be 26 percent.

This recommendation merely requests law enforcement to cite improperly licensed riders when the lack of a proper license is discovered in the course of other activities, such as stopping a rider for some traffic violation. So it is inexpensive and easy. If practiced consistently and advertised widely it may encourage more riders to become properly licensed. But by itself, with no tie to training, it is unlikely to have much effect on safety, and its impact is low. It should be considered despite this low priority because of its low cost and low obstacles and because it merely requests law enforcement officers to enforce the law.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.1 Increase Licensing

#42 Insurance policies should not be valid for improperly licensed riders

Full recommendation: Insurers should write policies that stipulate that coverage or certain portions of coverage are not valid if the owner permits an unlicensed or improperly licensed operator to use the motorcycle.

Type: P program research
Organization: B manufacturers, insurers

Problem Size: 26%
Effect: 0.2% Range: 0.1-1%
Impact: 0.05
Impact priority: low
Rank: 60
Rank in org: 7
Cost: low
Time: high
Obstacles: medium

Overall priority: low

Discussion

As discussed in Area 16, the problem size is estimated to be 26 percent.

This recommendation seeks to provide an incentive for riders to become properly licensed. Some insurers have such provisions in their motorcycle policies but others do not (NAMS). It is unclear whether or how much such insurance provisions would increase proper licensure. Thus an effect estimate is speculative. It has been set at 0.2 percent, about half the effect of licensure incentives tied to training (recommendations #11 and 17 in this area). Costs of the recommendation are minimal; obstacles depend on insurer practices and State insurance law. The recommendation's overall low priority reflects its low impact.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.2 Improve Licensing

#19 Train license examiners in motorcycle issues

Full recommendation: Encourage States and jurisdictions to provide motorcycle specific training to license examiners administering testing for motorcyclists.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 0.3% Range: 0.1-1%
Impact: 0.24
Impact priority: medium
Rank: 36
Rank in org: 20
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

As discussed in Area 16, the problem size is estimated to be 80 percent.

As with recommendation #16 in Area 16.1, this recommendation should be a matter of good licensing department administration regardless of its impact on safety. Most States have designated motorcycle license examiners but the extent of their training or experience is uncertain (Hanchulak & Robinson, 2009, Table B-15). So the extent of the problem addressed – license examiners without proper motorcycle-specific training – is equally uncertain. The recommendation’s impact on safety also is unclear. So its impact estimate, on the low side of medium, is speculative. Its overall medium priority stems from this impact and from its administrative good sense.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.2 Improve Licensing

#20 Develop and evaluate enhanced licensing model using graduated licensing concepts

Full recommendation: Develop an enhanced motorcycle licensing model using appropriate GDL concepts and evaluate its effectiveness.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.8% Range: 0.5-1.0%
Impact: 0.64
Impact priority: medium
Rank: 20
Rank in org: 8
Cost: medium
Time: high
Obstacles: medium

Overall priority: medium

Discussion

As discussed in Area 16, the problem size is estimated to be 80 percent.

Graduated driver licensing (GDL) is a three-phase system for beginning automobile drivers, consisting of a learner's permit, an intermediate license, and a full license. A learner's permit allows driving only while supervised by a fully licensed driver. An intermediate license allows unsupervised driving under certain restrictions, typically including limits on driving at night or with teenage passengers. GDL's effectiveness in reducing crashes has been documented extensively. See CMTW 6.1.1 for discussion.

While GDL does not transfer seamlessly to motorcycles – for example, the supervision requirement must be modified – it has the potential for similar benefits, by requiring beginning riders to obtain experience in relatively safer conditions. GDL for automobile drivers reduces crashes by at least 20 percent in the first year of driving (Shope, 2007); if GDL for riders can do the same, it may have an effect of 0.8 percent.

At least 7 States use some form of GDL for riders (CMTW 5.3.1; (Hanchulak & Robinson, 2009, Appendix C). Evaluations in New Zealand and evidence from Quebec suggest that GDL can reduce crashes and injuries. NHTSA and AAMVA have developed a model GDL system for riders (Hanchulak & Robinson, 2009). The demonstrated benefits of GDL for novice automobile drivers suggest that this recommendation should be actively considered and tested, especially if the research can cooperate with ongoing rider GDL work in other countries. Its overall medium priority follows from these considerations.

Appendix D: Detailed Discussion of Each NAMS Recommendation

16.2 Improve Licensing

#15 Research to assure that licensing tests measure crash avoidance skills, behaviors

Full recommendation: Commission studies to ensure that licensing tests measure skills and behaviors required for crash avoidance.

Type: R research
Organization: C Federal

Problem Size: 80%
Effect: 0.25% Range: 0.1-1%
Impact: 0.20
Impact priority: low
Rank: 41
Rank in org: 15
Cost: high
Time: high
Obstacles: low

Overall priority: low

Discussion

As discussed in Area 16, the problem size is estimated to be 80 percent.

This recommendation's premise is that licensing tests can be improved so that they more accurately assess a rider's ability to operate a motorcycle safely. In a sense, it is parallel to recommendation #17 in Area 16.1 that licenses should be issued following satisfactory completion of training. However, it is uncertain whether licensing leads to the safe operation of a motor vehicle. Licensing tests measure skills and knowledge at a single point in time, but the safe operation of a motor vehicle depends more on attitudes and behaviors demonstrated over a much longer period of time. This recommendation consequently has low priority on the research agenda.

Appendix D: Detailed Discussion of Each NAMS Recommendation

20 Motorcycles

Eight NAMS recommendations address various features of motorcycles: brakes, tires, lighting, conspicuity, modifications, and general design and technology. All are directed primarily to motorcycle manufacturers except #63 on State requirements. The problem sizes vary substantially so are discussed in each recommendation.

Appendix D: Detailed Discussion of Each NAMS Recommendation

21 Brakes

#55 Study effectiveness of linked and antilock brakes; if positive, use more widely

Full recommendation: Study the effectiveness of linked and antilock braking in the field. If these technologies prove valuable, deploy them more widely.

Type: R research
Organization: B manufacturers, insurers

Problem Size: 60%
Effect: 5% Range: 1-42%
Impact: 3.00
Impact priority: high
Rank: 3
Rank in org: 1
Cost: medium
Time: high
Obstacles: medium

Overall priority: high

Discussion

The problem size is estimated to be 60 percent, the proportion of crashes in which brakes were used in the Hurt, Ouellet, and Thom study (1981).

The recommendation first calls for research and then, if these braking technologies prove valuable, for implementation. The first research has appeared. Teoh (2009) analyzed data from the United States and found that antilock brakes reduced the risk of a fatal crash by 28 percent. A companion study found 19-percent fewer collision insurance claims for antilock-equipped than for standard motorcycles. Rizzi et al. (2009) analyzed Swedish data and found that antilock brakes reduced severe and fatal crashes by 48 percent. Roll, Hoffman, and König (2009) used detailed analyses of 51 motorcycle crashes to conclude that antilock brakes would have provided benefits in almost all.

These results, while impressive, must be qualified: the sample size of antilock brake motorcycles was small so the statistical significance is weak; antilock brakes were optional equipment, so the riders who purchased them may not be representative of all motorcyclists (in particular, they may be safer riders in general). Still, it is reasonable to estimate that if all motorcycles had antilock brakes, then fatal crashes might be reduced by as much as 25 percent, or by 42 percent of the fatal crashes involving motorcycle braking. So this recommendation will be restricted to antilock brakes, with linked brakes treated in recommendation #56.

While additional research will be useful to confirm these conclusions, the major effect of this recommendation should be to encourage manufacturers to offer antilock brakes more widely, so

Appendix D: Detailed Discussion of Each NAMS Recommendation

it is classified as a program rather than a research recommendation. Some manufacturers are already moving to substantially increase their production of motorcycles with antilock brakes. Costs will be borne initially by motorcycle manufacturers and eventually by motorcycle purchasers. Over the next few years, antilock penetration of 20 percent would provide an effect of one-fifth of the 25-percent overall estimate, or 5 percent, leading to an impact of 0.60. The recommendation has an overall high priority because antilock brakes are the single most promising safety feature that could be incorporated into motorcycles.

Appendix D: Detailed Discussion of Each NAMS Recommendation

21 Brakes

#56 Use research information to implement other braking-related countermeasures

Full recommendation: Use information from research to implement other braking-related countermeasures.

Type: P program
Organization: B manufacturers, insurers

Problem Size: 60%
Effect: 2.5% Range: 1-42%
Impact: 1.50
Impact priority: high
Rank: 10
Rank in org: 2
Cost: medium
Time: high
Obstacles: medium

Overall priority: medium

Discussion

The problem size is estimated to be 60 percent, the proportion of crashes in which brakes were used in the Hurt, Ouellet, and Thom study (1981).

The only relevant braking-related technology aside from antilock brakes (recommendation #55 in this area) is linked brakes, in which a single control operates both brakes. There is no research on the effect of linked brakes on crash risk. So this recommendation is interpreted to include research and, if appropriate, field testing of linked brakes.

Linked brakes are less expensive than antilock brakes and address some of the same issues. But linked brakes likely are less effective than antilock brakes because the rider remains in complete control and may not brake optimally. Their effect is estimated at 2.5 percent, one-half of the effect of antilock brakes. It is not clear whether manufacturers would wish to expend resources on linked brake research when statistical evidence of their effectiveness is lacking. The recommendation's overall medium priority consequently is highly provisional: If ABS research continues and shows the technology to be beneficial for motorcycles, research into the effectiveness of linked braking should still continue as the two braking systems are complimentary to one another.

Appendix D: Detailed Discussion of Each NAMS Recommendation

22 Tires

#54 Improve tires and wheels to reduce puncture flats

Full recommendation: Implement the use of available tire and wheel technology and explore technology, such as run-flat tires, to reduce frequency of loss-of-control crashes caused by puncture flats.

Type: P program
Organization: B manufacturers, insurers

Problem Size: 0.5%
Effect: 25% Range: 10-50%
Impact: 0.13
Impact priority: low
Rank: 48
Rank in org: 5
Cost: medium
Time: high
Obstacles: low

Overall priority: low

Discussion

The Hurt, Ouellet, and Thom study (1981) found tires to be a contributing factor in fewer than 1 percent of crashes. So a reasonable problem size is estimated to be 0.5 percent.

Tire technology has improved substantially in the past 30 years, so tires probably contribute to even fewer crashes today than they did at the time of the Hurt study. Even if the improvements sought in this recommendation reduced crashes caused by puncture flats by as much as 25 percent, the overall impact still would be negligible. Consequently this recommendation's priority is low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

23 Lighting

#63 Reconsider State requirements prohibiting conspicuity modifications

Full recommendation: Reconsider State requirements that prohibit safe conspicuity-enhancing modifications, including safe modification to lighting systems.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 25%
Effect: 0.375% Range: 0.1-0.5%
Impact: 0.09
Impact priority: low
Rank: 53
Rank in org: 28
Cost: medium
Time: high
Obstacles: high

Overall priority: low

Discussion

Motorcyclist conspicuity was discussed in recommendation #61 in Area 12.3 dealing with motorcyclist clothing. The problem size is estimated to be 25 percent.

NAMS and NCHRP (11.1D2) discuss several motorcycle lighting strategies that may increase conspicuity: hard-wired headlights (now standard equipment on all new motorcycles); using high beams during daylight hours; auxiliary headlights, running lights, rear lights, or position lights in turn signals; headlight modulators; and flashing brake lights. The only one of these strategies regulated by State law is flashing brake lights, which are not permitted in all States (NCHRP, 11.1D2). These lights may affect the approximately 3 percent of two-vehicle fatal crashes in which the motorcycle was struck in the rear (Longthorne et al., 2007, Table 19). While the effectiveness of flashing brake lights in these crashes is not known, 25 percent likely is a generous estimate. Thus the overall effect is 50 percent two-vehicle crashes x 3% struck in the rear x 25% = .375% and the impact is 0.09. Changing State laws likely will be difficult and time-consuming. With such a low effect, the overall priority of this recommendation is low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

24 Conspicuity

#62 Encourage manufacturers to increase conspicuity of apparel and parts

Full recommendation: Encourage manufacturers to make motorcycle apparel and parts conspicuous.

Type: P program
Organization: B manufacturers, insurers

Problem Size: 25%
Effect: 2% Range: 0.1-5%
Impact: 0.50
Impact priority: medium
Rank: 21
Rank in org: 3
Cost: low
Time: medium
Obstacles: low

Overall priority: medium

Discussion

Motorcyclist conspicuity was discussed in recommendation #61 in Area 12.3 dealing with motorcyclist clothing. The problem size is estimated to be 25 percent.

While recommendation #61 in Area 12.3 attempts to encourage motorcyclists to wear conspicuous clothing, recommendation #62 addresses manufacturers of clothing, helmets, and parts; the motorcycles themselves also should be included. Manufacturers can offer and promote conspicuous products, but it is the buyers – the motorcyclists – who determine what will be purchased and used. Without buyer demand, produced by recommendation #61, recommendation #62 is unlikely to have much effect. If recommendation #61 is successful, demand for conspicuous apparel, parts, and motorcycles will increase and manufacturers will respond. The estimated 2-percent effect and .50 impact, lower than recommendation #61's 3 percent and .75, reflect this relationship. The overall medium priority recognizes that manufacturer promotion of conspicuity can help influence motorcyclists at relatively low cost.

Appendix D: Detailed Discussion of Each NAMS Recommendation

25 Motorcycle Design

#53 Study how current motorcycle designs affect crashes and injury causation

Full recommendation: Conduct research to determine how current motorcycle designs affect crashes and injury causation.

Type: R research
Organization: B manufacturers, insurers

Problem Size: 50%
Effect: 0.2% Range: 0.1-1%
Impact: 0.10
Impact priority: low
Rank: 52
Rank in org: 6
Cost: high
Time: high
Obstacles: low

Overall priority: low

Discussion

This recommendation encompasses a broad set of motorcycle design features not included in the more specific recommendations #55-56 (brakes, Area 21), 54 (tires, Area 22), 63 (lighting, Area 23), and 62 (conspicuity, Area 24). These include controls, fuel tanks, windshields, engines, and overall design. The contributions of these features to crash and injury causation have not been quantified. A problem size estimate of 50 percent probably is quite generous.

Overall motorcycle design – motorcycle type, such as cruiser, sport, touring, etc. – definitely correlates with crash rates. However, it is impossible to separate the contribution of the motorcycle type itself from the contribution of the rider and the way in which different motorcycle types are operated. Riders choose to buy and ride motorcycles of different designs, so additional information on the contribution of overall design to crashes likely would have little practical effect. Manufacturers have and will continue to improve specific components to improve their products and appeal to riders.

The motorcycle crash causation study to be conducted over the next several years may provide some information on these issues. Additional concentration on this recommendation does not appear useful. So it has a low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

26 Modifications

#58 Study the role of motorcycle modifications in crashes

Full recommendation: Study the role of modifications in current motorcycle crashes.

Type: R research
Organization: C Federal

Problem Size: 25%
Effect: 0.2% Range: 0.1-1%
Impact: 0.05
Impact priority: low
Rank: 60
Rank in org: 22
Cost: high
Time: high
Obstacles: medium

Overall priority: low

Discussion

Many motorcycles are modified in some way, but the proportion of motorcycles that are modified in a manner that may affect crashes or injuries is completely unknown. The problem size estimate of 25 percent probably overstates their potential role.

The effect of modifications on crashes or injuries similarly is unknown. It is likely, though, that these motorcycle factors are far less important than the rider factors considered in other recommendations.

The motorcycle crash causation study currently being planned may provide some information on the role of motorcycle modifications. Additional concentration on this recommendation does not appear useful. So it has a low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

27 Technology

#25 Evaluate crash avoidance technology (e.g., pre-crash warning systems)

Full recommendation: Examine technological approaches such as pre-crash warning and avoidance systems to enhance crash prevention.

Type: R research
Organization: C Federal

Problem Size: 90%
Effect: 2.0% Range: 0.1-25%
Impact: 1.80
Impact priority: high
Rank: 7
Rank in org: 5
Cost: high
Time: high
Obstacles: medium

Overall priority: high

Discussion

Crash avoidance technology has the potential to affect almost all motorcycle crashes, so the problem size is estimated to be 90 percent.

Crash avoidance technologies for four-wheel vehicles are being intensively studied, tested, and implemented. The most notable are electronic stability control (now in many production vehicles), automatic crash warning, and lane departure warning. Automatic crash warning may be applicable to motorcycles; other crash avoidance technologies may as well. This recommendation could proceed in at least two ways: First, build on existing four-wheel vehicle research to determine if the technologies can be adapted to motorcycles; second, investigate technologies appropriate to specific motorcycle issues such as stability.

This research is very long-term, very expensive, and very risky in the sense that successful and practical results are highly uncertain. The 2-percent effect estimate is a highly subjective combination of the likelihood of successful research and implementation; the true effect may be much higher or may be nil. But even a modest effect will produce a high impact. The overall high priority keeps this recommendation on the list of research priorities where it must be balanced against other less expensive and less risky research with potentially lower payoff.

Appendix D: Detailed Discussion of Each NAMS Recommendation

30 Other Drivers and Vehicles

It is well-documented that in many a motorcycle crash involving another vehicle the other driver fails to see the motorcycle (Hurt et al., NCHRP 11.1F3, CMTW 5.4.1). Two general strategies attempt to address this issue. The first, increasing the conspicuity of motorcycles and motorcyclists, is addressed in the recommendations of Areas 12.3 and 24. The second, attempting to increase other drivers' awareness of motorcycles on the road, is addressed in the six recommendations in Area 31.

Three recommendations in Area 32 address design features of other vehicles that affect motorcycles.

The problem size for most other driver and vehicle recommendations is estimated at 50 percent, the proportion of motorcycle fatal crashes that involve other vehicles.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#37 Educate other drivers to be more conscious of motorcycles

Full recommendation: Educate operators of other vehicles to be more conscious of the presence of motorcyclists.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 50%
Effect: 0.8% Range: 0.5-1.5%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 14
Cost: medium
Time: medium
Obstacles: high

Overall priority: medium

Discussion

As noted in Area 30, the problem size is estimated to be 50 percent.

The goal of this recommendation is laudable: many drivers of other vehicles have little or no experience with motorcycles, may not expect to see them on the road, and may overlook them. Many States have conducted motorcycle awareness campaigns (NAMS Implementation Guide 5.1). SAFETEA-LU provided grant funding specifically for State motorcycle awareness campaigns and rider training.

However, the effectiveness of these general awareness campaigns has not been studied. They share many characteristics of ineffective traffic safety communications programs (see Area 14): they are stand-alone efforts, with a passive message (just “be aware” rather than “take a specific action”) that is not based on a behavior change method, they provide little new information, and they do not use delivery methods that will reach many drivers. So it is unlikely that they will have much effect. Even a well-planned and generously financed campaign will overcome only the last of these obstacles. While a standard communications campaign faces few obstacles other than finding resources, there are substantial obstacles to developing and implementing one that will have any effect.

The 0.8-percent estimate probably is generous, as is the medium overall priority. The greatest value of such programs may be to keep motorcycle safety on a State’s highway safety priority list and to emphasize that other drivers contribute substantially to motorcycle crashes.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#41 Devote adequate funding to develop and implement motorcyclist awareness info

Full recommendation: Adequate funding needs to be devoted to the development and implementation of motorist awareness issues.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 50%
Effect: 0.8% Range: 0.5-1.5%
Impact: 0.40
Impact priority: medium
Rank: 26
Rank in org: 14
Cost: medium
Time: medium
Obstacles: high

Overall priority: low

Discussion

As noted in Area 30, the problem size is estimated to be 50 percent.

This recommendation seeks to provide the funds to implement recommendation #37 in this area. SAFETEA-LU in fact satisfied this recommendation when it provided grant funding specifically for State motorcycle awareness campaigns and rider training.

The recommendation's effect, impact, cost, and time are identical to #37 because the two are in effect parts of the same overall recommendation. Here, though, the overall priority is low because the recommendation must compete for State funding with many other demands, both relevant to and separate from motorcycle safety, and its relatively low impact does not help it in this competition for funds.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#39 Include information on motorcyclists in driver manuals and licensing tests

Full recommendation: Include questions regarding motorcyclists on driver license tests and include information in driving manuals.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 50%
Effect: 0.5% Range: 0.3-1%
Impact: 0.25
Impact priority: medium
Rank: 34
Rank in org: 19
Cost: low
Time: high
Obstacles: low

Overall priority: medium

Discussion

As noted in Area 30, the problem size is estimated to be 50 percent.

This recommendation addresses one specific method to educate other drivers about motorcycles (see recommendation #37 in this area). It is relatively easy to add information to driving manuals. Adding questions to driver license tests requires that other questions be dropped or used less frequently. This in turn depends on a State's evaluation of the relative importance of the questions.

The real issue is whether these actions will have any effect. The novice driver who studies driver's manuals and takes written driving tests has many things to learn regarding traffic laws and rules of the road. While speculative, it is likely novice drivers won't concentrate on generic "be aware of motorcycles" information. Specific information such as relative stopping distances for motorcycles and automobiles may be learned in preparation for the driving test and then promptly forgotten. The 0.5-percent effect may be generous. The 0.25 impact is near the bottom of the medium range. The overall medium priority results from the recommendation's low cost and relative ease, not from any expectation of much impact.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#40 Require motorcyclist awareness class for drivers guilty of violating cycle right-of-way

Full recommendation: Include the completion of a motorcyclist awareness class in sanctions against motorists found guilty of violating a motorcyclist's right-of-way.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 0.1%
Effect: 3% Range: 2-10%
Impact: 0.00
Impact priority: low
Rank: 69
Rank in org: 34
Cost: medium
Time: medium
Obstacles: medium

Overall priority: low

Discussion

This recommendation is a component of recommendation #49, and is discussed in that section.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#49 Sanction drivers contributing to motorcycle crashes to increase motorcycle knowledge

Full recommendation: Appropriate sanctions should be applied to those found guilty of contributing to motorcycle crashes. The sanctions, such as mandatory attendance at a motorcycle awareness course, would be designed to expand knowledge of motorcycle issues.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 0.1%
Effect: 3% Range: 2-10%
Impact: 0.00
Impact priority: low
Rank: 69
Rank in org: 34
Cost: medium
Time: medium
Obstacles: medium

Overall priority: low

Discussion

This recommendation addresses another specific method to educate other drivers about motorcycles (see recommendation #37 in Area 31). To estimate its problem size, this analysis begins with the approximately 100,000 motorcycle crashes involving injury each year. Approximately one-half of these involve other vehicles and drivers. A generous estimate that one-half of these drivers, or 25,000, will be found guilty of contributing to the crashes. There are approximately 200 million licensed drivers in the United States (NHTSA, 2009b), so approximately one in 8,000 licensed drivers, or slightly over 0.01 percent, would be affected by this recommendation annually. The problem size estimate consequently is the minimum 0.1 percent used for other recommendations.

This problem size estimate highlights the recommendation's weakness. Its direct result is to sanction drivers after they have demonstrated unsafe behavior, not prevent the behavior in the first place. Even if the sanctions are effective in changing these drivers' behavior – and evidence from other traffic safety areas, notably alcohol-impaired driving, suggests that they often are not – they address only a very small portion of the problem.

The recommendation also could be considered as a general deterrence action: if drivers know they will be sanctioned for contributing to motorcycle crashes, then they may be less likely to drive in a fashion that endangers motorcyclists. This applies to the sanctions applied to traffic violations and crashes overall, not to crashes involving motorcycles. As a method of increasing motorcycle issue education for other drivers, this recommendation's overall priority is low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

31 Other Drivers

#60 Study why drivers don't see motorcycles; develop and implement countermeasures

Full recommendation: Conduct research to determine why other motorists fail to see and identify motorcyclists and implement countermeasures.

Type: R research
Organization: C Federal

Problem Size: 25%
Effect: 1% Range: 0.5-2%
Impact: 0.25
Impact priority: medium
Rank: 34
Rank in org: 12
Cost: high
Time: high
Obstacles: high

Overall priority: low

Discussion

As with other recommendations dealing with conspicuity, the problem size of this recommendation is estimated to be 25 percent.

As noted in Area 30 and the discussions of recommendations #61-64 in Areas 12.3, 24, and 23, the issue of other drivers failing to see motorcyclists is important. The two general reasons for this are that motorcyclists may be more difficult to see than four-wheel vehicles and that other drivers are not expecting, or properly looking, for motorcyclists. Countermeasures to address these reasons are addressed in the recommendations of Areas 12.3 and 24 (conspicuity) and the rest of Area 31 (other driver awareness and expectations).

The research of this recommendation faces several obstacles. First, it will be difficult and expensive to conduct. Second, it may well not add much to what's already known about motorcyclist conspicuity and other driver awareness. Third, even if it does, it may not lead to effective new countermeasures. As discussed in Areas 12.3 and 24, motorcyclist conspicuity measures are being advocated but face substantial difficulties. As discussed in the other recommendations of this section, increasing driver awareness faces even more difficulties.

The effect of this recommendation is estimated at a generous 1 percent, assuming that it does in fact produce some useful results. This places it near the bottom of the medium range. The recommendation's high obstacles produce an overall low priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

32 Other Vehicles

#77 Emphasize motorcycle safety in other vehicle design

Full recommendation: Emphasize motorcycle safety issues as a consideration in the design of other vehicles.

Type: P program
Organization: B manufacturers, insurers

Problem Size: 50%
Effect: 0.1% Range: 0.1-0.1%
Impact: 0.05
Impact priority: low
Rank: 60
Rank in org: 7
Cost: high
Time: high
Obstacles: high

Overall priority: low

Discussion

As discussed in Area 30, the problem size is estimated to be 50 percent.

As noted in recommendation #78 in this area, there are four obvious ways in which other vehicle design features may affect motorcyclists as well as other road users. First, tall or wide vehicles may obscure the rider's view of the road and other drivers' view of the motorcycle. However, it is extremely unlikely that current vehicle size limits will be reduced.

Second, other vehicles' blind spots may prevent a driver from detecting a vehicle approaching from the rear. While blind spots cannot be eliminated, they are addressed in part through mirrors. Technology to alert a driver to a vehicle in a blind spot already is being investigated.

Third, spray from other vehicles on wet roads may reduce rider and driver vision. Some spray from large vehicles is unavoidable. Well-designed spray flaps can reduce it somewhat, but further improvements are unlikely.

Finally, structural features of other vehicles, such as hard surfaces or protrusions, may increase a motorcyclist's injuries in a crash. This falls under the general heading of a vehicle's aggressive characteristics that can increase injuries to people outside the vehicle in a crash (even though they may reduce injuries to the vehicle's occupants – overall vehicle weight probably is the best example). Vehicle designers do try to minimize a vehicle's aggressive characteristics but this goal must be balanced against the many other design goals (occupant safety, fuel economy, etc.).

Appendix D: Detailed Discussion of Each NAMS Recommendation

All in all, motorcycles already are considered in other vehicle designs. It is unlikely that further emphasis would yield noticeable improvements in motorcycle safety. Consequently this recommendation has a low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

32 Other Vehicles

#78 Study how other vehicle designs affect motorcycle safety

Full recommendation: Investigate how the designs of other vehicles affect motorcycle safety.

Type: R research
Organization: C Federal

Problem Size: 50%
Effect: 0.1% Range: 0.1-0.1%
Impact: 0.05
Impact priority: low
Rank: 60
Rank in org: 22
Cost: low
Time: high
Obstacles: medium

Overall priority: low

Discussion

As discussed in Area 30, the problem size is estimated to be 50 percent.

As discussed in recommendation #76 in Area 14.1, there are three obvious ways in which other vehicle design features may affect motorcyclists: Tall or wide vehicles may obscure the rider's view of the road and other drivers' view of the motorcycle, other vehicles' blind spots may prevent a driver from detecting a motorcycle approaching from the rear, and structural features of other vehicles may increase a motorcyclist's injuries in a crash. In addition, spray from other vehicles on wet roads may reduce a rider's vision. These facts appear to be generally understood and acknowledged, so it is unlikely that further study of the issues will be profitable. The challenge is to reduce these effects, if possible. Different strategies to address parts of this challenge are covered by other recommendations: through other vehicle design in #77 in this area, through other driver education and information in the recommendations of Area 31, and through rider actions in #76 and the included recommendations #38 and 66. So recommendation #78 by itself has low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

32 Other Vehicles

#64 Study effects of automobile daytime running lights on motorcycle safety

Full recommendation: Conduct research on the effect of automobile DRL on motorcycle safety.

Type: R research
Organization: C Federal

Problem Size: 25%
Effect: 0.1% Range: 0.1-0.2%
Impact: 0.03
Impact priority: low
Rank: 65
Rank in org: 25
Cost: high
Time: high
Obstacles: high

Overall priority: low

Discussion

As with other conspicuity recommendations #61-63 (Areas 12.3, 24, and 23), the problem size of this recommendation is estimated to be 25 percent.

Motorcycle riders were among the first to recognize that the use of headlights or other running lights (DRLs) during the daytime could increase vehicle conspicuity. Most motorcycles on the road have their headlights always on because most motorcycles manufactured since 1979 have this feature and because about half the States require daytime headlight use (CMTW 5.4.1, NCHRP 11.1D1). In recent years some automobiles have been equipped with DRLs. This recommendation proposes to study whether the increasing proportion of vehicles with DRLs reduces their effectiveness for motorcycles.

Current NHTSA research is investigating DRL effects and should satisfy this recommendation's immediate goals. Pending results of this research, the recommendation's effect, impact, and priority are low.

Appendix D: Detailed Discussion of Each NAMS Recommendation

40 Highway and Environment

Eight NAMS recommendations address highway and environmental features that may be hazardous to motorcyclists or more generally seek to include motorcyclist concerns in highway design, construction, and maintenance. State and local recommendations are addressed to departments of transportation; Federal recommendation to the Federal Highway Administration. Highway and environmental issues are discussed in some detail in NCHRP (11.1A).

The Hurt, Ouellet, and Thom report (1981) found some highway or environmental contributing factor in 1 percent of multivehicle motorcycle crashes and 11 percent of single-vehicle crashes . With single- and multivehicle crashes each contributing about 50 percent of motorcycle fatalities, the overall problem size for these highway and environmental recommendations is estimated at 6 percent.

Appendix D: Detailed Discussion of Each NAMS Recommendation

41 Signage for Hazards

#70 Post hazard warnings for riders

Full recommendation: Post specific warnings for motorcyclists where unavoidable hazards exist.

Type:	P	program
Organization:	A	States, municipalities, rider groups
Problem Size:	6%	
Effect:	8%	Range: 5-10%
Impact:	0.48	
Impact priority:	medium	
Rank:	22	
Rank in org:	11	
Cost:	medium	
Time:	medium	
Obstacles:	medium	
Overall priority:	medium	

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

Several permanent or temporary roadway design features may be hazardous to motorcycles. These include surface irregularities, pavement changes, and other conditions that affect traction (NCHRP 11.1A7). Appropriate signage in advance of these conditions is a matter of good overall roadway design and some States use motorcycle-specific signage for some potential hazards. The effectiveness of hazard warning signage has not been documented, so the effectiveness range of 5-10 percent and likely effect of 8 percent is speculative. This leads to a medium impact of 0.48.

States and municipalities must decide which locations would benefit from warning signs, which in turn will determine the costs of this recommendation. Its overall priority is medium.

Appendix D: Detailed Discussion of Each NAMS Recommendation

41 Signage for Hazards

#71 Revise MUTCD for better signage for hazardous road or construction conditions

Full recommendation: Revise the Manual on Uniform Traffic Control Devices so that signage better communicates roadway or construction conditions that present hazards to motorcyclists.

Type: P program
Organization: C Federal

Problem Size: 6%
Effect: 4% Range: 3-5%
Impact: 0.24
Impact priority: medium
Rank: 36
Rank in org: 13
Cost: low
Time: high
Obstacles: low

Overall priority: medium

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

MUTCD is revised periodically, most recently in 2009 (<http://mutcd.fhwa.dot.gov/>). States must adopt the 2009 National MUTCD within two years of the publishing of the Final Rule as their legal State standard for traffic control devices. The MUTCD includes word message signs relevant to motorcycle safety with standardized legends of “grooved pavement” and “metal bridge deck” and a new supplementary plaque featuring a side view of a motorcycle.

This recommendation advocates that MUTCD revisions include motorcycle considerations as a matter of course. If the 2009 MUTCD revisions adequately address the issues raised in this recommendation, no further action may be needed. If they do not, motorcycle professionals should take the initiative to raise these issues to FHWA. Conversely, FHWA should be sure to include motorcycle considerations as it moves to the next MUTCD revisions. This recommendation has a medium overall priority because of its medium impact. Nevertheless, MUTCD should include appropriate motorcycle considerations.

Appendix D: Detailed Discussion of Each NAMS Recommendation

42 Improve Roadway Conditions

#75 Reduce roadway debris

Full recommendation: Reduce roadway debris such as that resulting from uncovered loads and shorn retreads.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 6%
Effect: 4% Range: 3-5%
Impact: 0.24
Impact priority: medium
Rank: 36
Rank in org: 20
Cost: high
Time: low
Obstacles: medium

Overall priority: low

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent. Other estimates are higher: NCHRP (11.1A6) cites two studies in which traction loss contributed to over half of motorcycle crashes, though it is not clear how frequently roadway debris caused or contributed to the traction loss.

Roadway debris of many types can affect motorcycle traction. Highway departments attempt to remove major debris quickly – tire treads, dead animals, other objects on the road. Dirt, cinders, and other minor debris may persist for some time.

This recommendation imposes costs on State and local highway departments, who must allocate scarce resources to the broad range of their roadway construction, rehabilitation, and maintenance needs. It is unrealistic to expect all debris to be removed immediately, but it is also unrealistic to ignore the dangers that debris poses to riders. A potential implementation solution that attempts to strike a balance between these extremes is to involve the riding community through a street repair and maintenance hotline on which riders can report hazardous conditions (NCHRP 11.1A6).

With no reliable evidence on the effects of various debris removal strategies on motorcycle safety, the effect and impact estimates are speculative. The overall priority is low because it is unlikely that highway departments will be able to justify devoting more resources to increasing their debris removal activities for the primary benefit of riders.

Appendix D: Detailed Discussion of Each NAMS Recommendation

42 Improve Roadway Conditions

#73 Remove slippery sealants and road surface repair substances

Full recommendation: Take steps to remove slippery sealants and repair substances applied to road surfaces.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 6%
Effect: 4% Range: 3-5%
Impact: 0.24
Impact priority: medium
Rank: 36
Rank in org: 20
Cost: high
Time: high
Obstacles: high

Overall priority: low

Discussion

As noted in Area 40, the problem size estimate is estimated to be 6 percent.

This recommendation addresses semi-permanent roadway features that may reduce motorcycle traction. Examples include asphalt sealer and pavement markings.

Some sealants and markings are slippery; some undoubtedly have contributed to motorcycle crashes. But there's no evidence on the true problem size or the proportion of crashes that would be prevented if all slippery substances were removed. So the problem size and effect estimates use here are speculative. There is no design standard for traction requirements for these substances (NCHRP 11.1A3), so there's no way to judge objectively when one is "slippery" and should be removed.

Because of all these uncertainties, this recommendation probably is best considered as part of recommendations #68 and 74 in Area 43 on incorporating motorcycle considerations into regular road design and maintenance practices. By itself, it has low overall priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

43 Highway and Environment: General

#74 Educate road design and maintenance staff about conditions hazardous to riders

Full recommendation: Educate road design and maintenance personnel about conditions that pose hazards to motorcyclists.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 6%
Effect: 8% Range: 5-10%
Impact: 0.48
Impact priority: medium
Rank: 22
Rank in org: 11
Cost: low
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

This recommendation is a critical step in the process that begins by including motorcycle concerns in highway standards (recommendations #68 in Area 43 and #71 in Area 41) and concludes by taking actions to address these concerns in highway design and maintenance (#70 in Area 41 and #73 and #75 in Area 42). It is probably the most important step, because knowledgeable and sympathetic design and maintenance personnel can make things happen in both standards development and in day-to-day activities. In this sense it is high priority. Its overall medium ranking reflects the relatively modest effect and impact that highway and environmental conditions have on motorcycle safety.

Appendix D: Detailed Discussion of Each NAMS Recommendation

43 Highway and Environment: General

#67 Identify and prioritize roadway hazards to riders

Full recommendation: Identify and prioritize roadway hazards to motorcycle operation.

Type: R research
Organization: C Federal

Problem Size: 6%
Effect: 8% Range: 510%
Impact: 0.48
Impact priority: medium
Rank: 22
Rank in org: 9
Cost: medium
Time: medium
Obstacles: low

Overall priority: medium

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

This recommendation seeks to provide the science base for the recommendations in Area 40. While some hazards are obvious and require no further research (substantial pavement irregularities, unexpected debris), others are not (see recommendation #73 in Area 42 on slippery sealants).

The recommended research to identify hazards appears straightforward, requiring only time and funds. The research to prioritize them, which involves determining the frequency with which these hazards appear and their contribution to crashes, will be difficult. A good system of priorities will help highway departments spend their scarce funds effectively. This might appear to justify a high overall priority, but the relatively low likelihood that the results will prompt substantial changes in highway construction and maintenance practices or that any changes will lead to measurable reductions in motorcycle crashes reduces the priority to medium.

Appendix D: Detailed Discussion of Each NAMS Recommendation

43 Highway and Environment: General

#68 Revise design, construction, maintenance standards to include rider needs

Full recommendation: Develop and revise highway standards on all levels – Federal, State, county, and local – to reflect the needs of motorcyclists and encourage motorcycle-friendly design, construction, and maintenance procedures.

Type: P program
Organization: A States, municipalities, rider groups

Problem Size: 6%
Effect: 8% Range: 5-10%
Impact: 0.48
Impact priority: medium
Rank: 22
Rank in org: 11
Cost: low
Time: high
Obstacles: low

Overall priority: medium

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

This recommendation is parallel to (and could even be considered as including) recommendation #71 in Area 41 on MUTCD standards for signage. It advocates that highway standards should include motorcycle considerations as a matter of course. To the extent that they do not, motorcycle professionals should take the initiative to raise their concerns at all levels – Federal, State, county, and local. Conversely, the organizations responsible for establishing and revising these standards should include motorcycle considerations in all appropriate actions. As with recommendation #71, this recommendation has a medium overall priority because of its medium impact. Nevertheless, all highway standards should give motorcycles appropriate consideration in design, construction, and maintenance.

Appendix D: Detailed Discussion of Each NAMS Recommendation

43 Highway and Environment: General

#69 Create working group to recommend changes to highway standards for rider needs

Full recommendation: Create a working group to recommend changes to highway standards to increase motorcycle safety.

Type: X management, support

Organization: C Federal

Problem Size: 6%

Effect: 4% Range: 3-5%

Impact: 0.24

Impact priority: medium

Rank: 36

Rank in org: 13

Cost: low

Time: low

Obstacles: medium

Overall priority: medium

Discussion

As noted in Area 40, the problem size is estimated to be 6 percent.

This recommendation provides one potential way to implement recommendations #68 in Area 43 (revise standards) and #71 in Area 41 (revise MUTCD). Such working groups could operate at national or State levels, as needed. They could be useful both to advocate for changing standards and to work with others in researching, drafting, and implementing changes.

This is a management recommendation whose value depends on the need for changes and on whether the process used to study and revise the standards adequately includes motorcycle interests. Both are difficult to estimate. Changes to various assumptions would affect the priority of this recommendation.

Appendix D: Detailed Discussion of Each NAMS Recommendation

50 EMS

Three NAMS recommendations address Emergency Medical Services (EMS). Their overall goal is to provide the best possible attention to injured motorcyclists by first responders, whether EMS personnel, law enforcement, or bystanders.

Prompt and informed EMS care is critical in reducing the probability of fatality and the severity of injury outcomes in all serious motor vehicle crashes. These recommendations do not address this overall issue. Rather, they attempt to assure that first responders are trained and equipped to treat injured motorcyclists.

The only important way in which an injured motorcyclist at a crash scene differs from other crash victims is if the motorcyclist is wearing a helmet. Other injuries, though often serious, are covered in standard EMS and bystander care training. So the problem size of these recommendations can be estimated by the proportion of seriously or fatally injured motorcyclists who were wearing a helmet (58% for fatalities – see Area 12) and who had a serious head injury (35% – Subramanian, 2007), or about 20 percent overall.

Appendix D: Detailed Discussion of Each NAMS Recommendation

50 EMS

#79 Include motorcyclist component in EMS training

Full recommendation: Integrate a motorcyclist treatment component in emergency medical personnel training.

Type: P program
Organization: A State, municipal, rider groups

Problem Size: 20%
Effect: 0.07% Range: 0.05-1%
Impact: 0.14
Impact priority: low
Rank: 48
Rank in org: 25
Cost: low
Time: low
Obstacles: low

Overall priority: medium

Discussion

As discussed in Area 50, the problem size is estimated to be 20 percent.

The only important issue covered by this recommendation is what to do if an injured motorcyclist is wearing a helmet. Attempts to remove the helmet may exacerbate head or neck injuries. On the other hand, first responders' standard practice for any injured person is to assure that the airway is clear and the victim is breathing. A full-face helmet can hinder or prevent both actions.

The National EMS education standards, instructional guidelines, and curricula (all found at www.EMS.gov) already contain units on helmets of all sorts, including motorcycle helmets. So the only sense in which this recommendation is applicable is if the units could be improved. Anything beyond minimal improvement is unlikely.

EMS training itself is provided at the State level, and States do not always follow the national curricula or standards. This recommendation may be most useful if interpreted as advice to States to verify that motorcycle helmet issues are covered in their training. Checking would be relatively easy. Modifying training, if necessary, would be considerably more time-consuming and costly.

The impact and overall priority are intended to address State actions in assessing their EMS training.

Appendix D: Detailed Discussion of Each NAMS Recommendation

50 EMS

#80 Include motorcyclist component in first aid/bystander training

Full recommendation: Integrate a motorcyclist treatment component in first-aid/bystander training and encourage motorcyclists to obtain this training.

Type: P program
Organization: A State, municipal, rider groups

Problem Size: 20%
Effect: 1.5% Range: 1-2%
Impact: 0.30
Impact priority: medium
Rank: 33
Rank in org: 18
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

As discussed in Area 50, the problem size is estimated to be 20 percent.

As with recommendation #79 in this area, the only important issue covered by this recommendation is what to do if an injured motorcyclist is wearing a helmet. Again, national bystander training materials include advice on dealing with helmets. The advice is quite simple: bystanders should remove a motorcyclist's helmet only if the helmet is full-face and the motorcyclist is not breathing.

As with EMS training, bystander training is provided at the State level. This recommendation also may be useful if interpreted as advice to States to verify that motorcycle helmet issues are covered in their bystander training. Again, checking would be relatively easy. Modifying training, if necessary, would be considerably more time-consuming and costly.

This recommendation also is useful in encouraging motorcyclists to obtain bystander first-aid training. There's no way to estimate how many motorcyclists have bystander training or what the effect of this training on motorcyclist crash injury severity would be. The effect and impact estimates are twice those of recommendation #79 because there likely are far more motorcyclists with no bystander training than EMS professionals without training in helmet issues. The overall priority is influenced by the advice to motorcyclists to obtain bystander training but without any good estimate of how many motorcyclists might follow this advice.

Appendix D: Detailed Discussion of Each NAMS Recommendation

50 EMS

#81 Use EMS Agenda for the Future to promote motorcycle safety

Full recommendation: Identify opportunities to utilize the *EMS Agenda for the Future* to promote motorcycle safety.

Type: P program

Organization: C Federal

Problem Size: 20%

Effect: 0.1% Range: 0.1-0.2%

Impact: 0.02

Impact priority: low

Rank: 67

Rank in org: 26

Cost: low

Time: low

Obstacles: low

Overall priority: low

Discussion

This recommendation proposes to use the EMS Agenda for the Future as a vehicle to promote better EMS care overall for injured motorcyclists. The Agenda certainly promotes better EMS care for all but has little relevance to any special motorcyclist issues. The recommendation has low effect, impact, and priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

60 Management and Data

The remaining 13 NAMS recommendations address broad management and data issues. Most have the potential to affect all motorcycle crashes, so are assigned an estimated problem size of 100 percent. However, most are so broad that it is impossible to estimate a program effect. Priorities are assigned using the usual cost, time, and obstacle ratings and a subjective assessment of the recommendation's importance to motorcycle safety overall.

The recommendations are arranged in three broad areas:

- 61 data;
- 62 include motorcycle safety considerations in other activities; and
- 63 research and funding.

Appendix D: Detailed Discussion of Each NAMS Recommendation

61 Data

#2 Develop uniform crash and EMS reports

Full recommendation: To better utilize data collected by law enforcement personnel, a uniform traffic crash report for police officers should be developed and deployed. A similar format should also be developed for emergency medical services reports. This will permit meaningful comparisons among jurisdictions. All concerned parties should share the resulting information.

Type: X management, support

Organization: C Federal

Problem Size: 100%

Effect: N/A Range: N/A

Impact: N/A

Impact priority: low

Rank: N/A

Rank in org: N/A

Cost: low

Time: high

Obstacles: high

Overall priority: low

Discussion

A standard police accident report (PAR) for every traffic crash, not just those involving motorcycles, has been sought for at least 40 years. This goal has not yet been realized and in fact may never be. The national standard is in place: MMUCC, the Model Minimum Uniform Crash Criteria, now in its third edition (www.mmucc.us). But each State determines its own crash report and form; indeed, in some States different jurisdictions use different forms.

Obviously, if all States used the same crash reporting form, and if the form contained the necessary information as specified in MMUCC, then motorcycle crash data could be combined and analyzed far more easily. But in view of the efforts already expended, any additional motorcycle-specific contribution likely will have little influence.

The situation for EMS data is similar. Again, the national standard exists: the National EMS Information System, NEMSIS (www.nemsis.org). Again, each State determines what information it will collect and report. NEMSIS is working toward merging information from State EMS data systems into a national data file. States participating in this effort collect the NEMSIS National Data Elements. There is some hope that all States will join NEMSIS in the foreseeable future.

Appendix D: Detailed Discussion of Each NAMS Recommendation

This recommendation could be interpreted more broadly to advocate that MMUCC and NEMSIS include motorcycle considerations as a matter of course, in the same sense that recommendation #71 in Area 41 does for MUTCD, and that States adopt the recommended MMUCC and NEMSIS data elements. If the current MMUCC and NEMSIS data elements address motorcycle issues adequately, no further action may be needed. If they do not, motorcycle professionals should take the initiative to raise these issues to MMUCC or NEMSIS. Conversely, MMUCC and NEMSIS should be sure to include motorcycle considerations as they move to their next revisions. Unless either MMUCC or NEMSIS has substantial deficiencies regarding motorcycle issues, this recommendation has high priority in the overall traffic safety agenda but low priority as a motorcycle-specific action.

Appendix D: Detailed Discussion of Each NAMS Recommendation

61 Data

#47 Develop and implement standard motorcycle crash data collection and reporting

Full recommendation: Develop and implement standard data gathering and reporting for motorcycle crashes.

Type: X management, support
Organization: C Federal

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: high
Time: high
Obstacles: high

Overall priority: low

Discussion

The intent of this recommendation is to standardize law enforcement crash investigation and reporting (procedures for detailed crash investigation and reporting for research purposes already exist). It should be considered together with recommendations #2 (uniform crash and EMS reports) and #48 (crash investigation training) in this area.

As with recommendation #2, the goal is laudable but realizing this goal will be exceedingly difficult. Standard procedures can be developed fairly easily, starting with existing research-level procedures. But implementing them requires every State and jurisdiction to accept them and to train their personnel (recommendation #48). With the prospects for a uniform crash report dim (recommendation #2), the resources needed to pursue this recommendation can be used more effectively elsewhere.

Appendix D: Detailed Discussion of Each NAMS Recommendation

61 Data

#48 Include motorcycle crash procedures in basic crash investigation training

Full recommendation: Include motorcycle crash investigation procedures in the basic course given to crash investigators.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: low
Rank: N/A
Rank in org: N/A
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

As stated, this recommendation cannot be implemented because there is no standard basic crash investigation course. In the discussion, NAMS elaborates on the recommendation: “Motorcycle crash experts should be available as a resource for police crash investigators to aid in accurate analysis of motorcycle crashes.” This, too, is not practical, because there are far too few motorcycle crash investigators to assist with the 100,000 motorcycle crashes annually. The recommendation is perhaps best interpreted as a component of recommendation #45 in Area 62, to educate law enforcement about motorcycle issues and include motorcycles in all appropriate activities. This would include providing law enforcement crash investigators with some basic information about motorcycle crash dynamics, to address the recommendation’s intent. The recommendation’s cost, time, and obstacles cannot be evaluated without information on the extent to which this already occurs in law enforcement agencies across the country. As a conservative estimate, some additional information and training is needed, leading to medium estimates for these factors and to an overall medium priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

61 Data

#43 Collect, analyze, distribute motorcycle-specific loss data from insurers

Full recommendation: Collect, organize, analyze, and distribute motorcycle-specific loss data from insurers to better understand safety issues, and to educate riders and other motorists on motorcycling safety issues.

Type: X management, support
Organization: B manufacturers, insurers

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: N/A
Time: N/A
Obstacles: N/A

Overall priority: N/A

Discussion

The actions advocated by this recommendation already are in place. The Highway Loss Data Institute (HLDI), associated with the Insurance Institute for Highway Safety (IIHS), collects, organizes, analyzes, and reports on loss data from insurers who collectively insure more than 150 million passenger vehicles, or about 80 percent of the privately insured vehicles on the road in the United States (see www.iihs.org/about_hldi.html). Researchers use the HLDI data to analyze motorcycle issues, for example the effectiveness of antilock brakes (Teoh, 2009). No further action is needed.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#52 Integrate motorcycle safety representatives into traffic safety activities

Full recommendation: Representatives of the motorcycle safety community should be integrated into the larger highway safety community to improve cooperative efforts.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

This general recommendation seeks to increase the priority of motorcycle safety within the broad highway safety community and to include motorcycles as appropriate into larger highway safety activities (such as impaired driving publicity and enforcement campaigns). It is directed to both the motorcycle community and to the broader highway safety community. The motorcycle community (broadly defined, including individuals, rider groups, manufacturers, and others) must take the initiative to work with a wide variety of highway safety organizations and must be willing to work in a cooperative fashion in group activities, where motorcycle interests are not always top priority. Other highway safety groups must be open to motorcycle community participation.

While some of these cooperative activities already occur, many more should be explored. The costs of this recommendation come from the time needed to establish and maintain contacts and the resources that must be contributed to cooperative activities. The libertarian beliefs of some motorcycle community members may present an obstacle: such members value their independence and may not participate in cooperative activities.

This recommendation, though useful, is not critical, as reflected in its ratings.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#50 Educate traffic safety organizations on motorcycle safety issues

Full recommendation: Traffic safety organizations outside of the motorcycling community can better influence motorcycle safety issues by becoming more educated about motorcycle safety issues and adopt them where applicable.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: low
Time: low
Obstacles: low

Overall priority: low

Discussion

This recommendation is a weaker form of the previous recommendation #52: While #52 seeks motorcycle community integration into traffic safety activities and organizations generally, #50 only seeks to “educate” other organizations on motorcycle safety issues. Without active motorcycle community integration, this education is unlikely to have much effect unless the specific motorcycle issues directly affect the other organizations in important ways. And if they do, then other organizations probably need little education. Consequently, this recommendation by itself has a low priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#45 Educate police and judges on motorcycle safety issues

Full recommendation: Educate law enforcement and judicial officials about unique motorcycle safety issues and resources.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: 2% Range: 1-5%
Impact: 1.60
Impact priority: high
Rank: 8
Rank in org: 2
Cost: low
Time: medium
Obstacles: low

Overall priority: high

Discussion

This recommendation is critical to increasing the effectiveness of traffic laws affecting motorcyclists. It includes recommendation #29 in Area 11.1 (education on impaired riding) and is necessary for #34 in Area 12.1 (use of non-compliant helmets in helmet law States). It also affects general riding behavior (#8 in Area 15).

Unlike other recommendations in this section, an effect and impact can be estimated. The problem size is estimated to be 80 percent, the proportion of all motorcycle crashes involving some rider factor. The effect is estimated at 2 percent for this high problem size (contrast the 5% effect of #29 for the 30% of crashes involving alcohol) and the impact is 1.6. With no substantial barriers in cost, time, or obstacles, it has a high overall priority.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#12 Increase State use of motorcycle program assessments

Full recommendation: Increase the number of States conducting Motorcycle Safety Program Assessments.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: medium
Time: medium
Obstacles: medium

Overall priority: medium

Discussion

Motorcycle safety program assessments, organized by NHTSA and conducted by a panel of experts from other States, provide a detailed review of a State's motorcycle safety program and key recommendations for improvement. In the 14 years 1995 to 2009, 22 States conducted assessments; 5 States subsequently conducted second assessments. As of January 2010, 2 more States are scheduled for assessments in 2010.

An assessment probably is the best single step a State can take to improve its motorcycle safety program. An assessment takes several months to schedule and conduct. Its costs are moderate; the primary obstacle is determining a schedule that will accommodate both the State and the assessment team.

An assessment is high priority for any State that has not conducted one recently or that seriously wishes to improve its motorcycle safety program. The overall medium priority for this recommendation recognizes that 24 States have conducted assessments in the past 11 years.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#46 Include police in State motorcycle program assessments

Full recommendation: Encourage inclusion of law enforcement officials in Motorcycle Safety Program Assessments.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 80%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: low
Time: medium
Obstacles: low

Overall priority: low

Discussion

This recommendation complements recommendations #12, on assessments, and #45, on educating law enforcement on motorcycle safety issues, both in this area. Because law enforcement is so critical for SHSO motorcycle safety activities, it is difficult to see how an assessment can be successful without law enforcement participation on the assessment team. They should be included as a standard practice; an assessment should be conducted without law enforcement only if none are available and if someone well-informed on law enforcement issues is participating. Of course, law enforcement officers from the State always should participate by presenting information to the panel.

This recommendation has a high priority in that it should be a matter of standard practice. But for the purposes of this report it is low priority because it is already standard practice, so no new action is required.

Appendix D: Detailed Discussion of Each NAMS Recommendation

62 Include Motorcycles

#82 Include motorcycles in ITS design and development

Full recommendation: Include motorcycles in the design and development of Intelligent Transportation Systems.

Type: X management, support

Organization: C Federal

Problem Size: 100%

Effect: N/A Range: N/A

Impact: N/A

Impact priority: N/A

Rank: N/A

Rank in org: N/A

Cost: high

Time: high

Obstacles: high

Overall priority: medium`

Discussion

Intelligent Transportation Systems (ITS) describe a wide variety of information, communication, and control technologies in vehicles and in the highway infrastructure intended to improve safety and mobility (see www.itsa.org/). In its research and development, ITS often fails to consider motorcycle characteristics and needs. For example, pavement sensors to detect vehicles may not detect motorcycles (NCHRP 11.1G1). This recommendation advocates that motorcycle needs be given appropriate consideration in ITS research, development, and implementation.

This recommendation should be followed as a matter of course. ITS should consider the needs of all road users, and with over 10 percent of traffic fatalities, motorcycles certainly have earned their place at the table. ITS is a long-term effort, with uncertain benefits especially for motorcycles. But ignoring motorcycle needs early in ITS development runs the risk of introducing rather than reducing highway safety problems later on. While the recommendation is important in this sense, its likely impact is lower than the recommendations with a high priority, so its overall priority is medium.

Appendix D: Detailed Discussion of Each NAMS Recommendation

63 Research and Funding

#1 Government and industry research studies, both comprehensive and specific

Full recommendation: Immediate action should be taken by government and industry to address the critical questions in motorcycle safety through comprehensive, in-depth studies as well as studies focused on specific topics.

Type: R research
Organization: C Federal

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: high
Time: high
Obstacles: high

Overall priority: high

Discussion

Motorcycle safety research has increased considerably in the 10 years since NAMS was developed. As examples of research on critical areas from three different funders, NHTSA studied the effects of alcohol on riders (Creaser et al., 2007), IIHS studied the effectiveness of antilock brakes (Teoh, 2009), and the University of Auckland studied conspicuity effects (Wells et al., 2004). Manufacturer research is difficult to judge because it is not published in the open literature. However, the introduction of antilock brakes into production motorcycles suggests that manufacturer research is active. Finally, NHTSA completed a pilot test for a comprehensive motorcycle crash causation study and the main study will be conducted over the next several years.

Several high-priority recommendations call for research on various topics (#7 in Area 15, #22 in Area 13.2, #25 in Area 27, #27 in Area 11.2, and #55 in Area 21). This high-priority recommendation incorporates them as well as advocating for additional research as needed to address critical issues. The primary obstacle, of course, is finding adequate funding, especially in competition with critical needs throughout highway safety.

Appendix D: Detailed Discussion of Each NAMS Recommendation

63 Research and Funding

#3 Build academic and funding capacity for motorcycle safety research

Full recommendation: Mechanisms for building academic and funding capacity for ongoing and future motorcycle safety research should be explored.

Type: X management, support
Organization: C Federal

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: high
Time: high
Obstacles: high

Overall priority: high

Discussion

This recommendation implements recommendation #1 on the previous page , which calls for research. It should be considered and prioritized in this light.

The mechanisms for building funding are generally well-understood and have been used. The issue is to obtain needed funding in competition with other demands on these funding sources. This is high priority to the extent that there are unfunded research needs, from recommendation #1 and from the more specific research recommendations discussed there.

The mechanisms for building research capacity are even simpler: research capacity expands or contracts in response to available funding. Academic motorcycle research is stronger in other countries than in the United States (for example, Monash University in Australia has a strong record in motorcycle research). So this portion of the recommendation follows the first.

Appendix D: Detailed Discussion of Each NAMS Recommendation

63 Research and Funding

#51 Raise importance, increase funds for motorcycle programs in State highway safety offices

Full recommendation: Increase funding for motorcycle safety programs by elevating their importance to State highway safety offices.

Type: X management, support
Organization: A States, municipalities, rider groups

Problem Size: 100%
Effect: N/A Range: N/A
Impact: N/A
Impact priority: N/A
Rank: N/A
Rank in org: N/A
Cost: N/A
Time: N/A
Obstacles: N/A

Overall priority: N/A

Discussion

The priority of motorcycle safety in State Highway Safety Offices (SHSOs) has increased substantially in the 10 years since NAMS was developed. This occurred in response to the rapid increase in motorcycle fatalities, which have more than doubled since 1996. While unfortunate, this certainly served to attract and concentrate attention in the most effective way imaginable. So in 2009 a recommendation to raise the priority of motorcycle safety in SHSOs is no longer needed.

**Prioritized Recommendations of the
National Agenda for Motorcycle Safety**

**Appendix E
References**

Appendix E: References

References

Craft, R. (2007, July). *The Large Truck Crash Causation Study*. (Report No. FMCSA-RRA-07-017). Washington, DC: Federal Motor Carrier Safety Administration. Available at www.fmcsa.dot.gov/facts-research/research-technology/analysis/FMCSA-RRA-07-017.htm

Creaser, J. I., Ward, N. J., Rakauskas, M. E., Boer E., Shankwitz, C., & Nardi, F. (2007, December). *Effects of Alcohol on Motorcycle Riding Skills*. (Report No. DOT HS 810 877). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/HS810877.pdf

Daniello, A., Gabler, H. C., & Mehta, Y. A. (2009). *Effectiveness of Motorcycle Training and Licensing*. (Paper #09-1990). Washington, DC: Transportation Research Board 88th Annual Meeting.

Hanchulak, D., & Robinson, B. (2009, May). *Guidelines for Motorcycle Operator Licensing*. (Report No. DOT HS 811 141). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811141.pdf

Haworth, N., & Mulvihill, C. (2005). *Review of Motorcycle Licensing and Training*. (Report No. 240). Victoria, Australia: Monash University Accident Research Centre.

Hurt, H., Ouellet, J., & Thom, D. (1981, January). *Motorcycle Accident Cause Factors and Identification of Countermeasures, Volume 1: Technical Report*. (DOT HS 5 01160). Washington, DC: National Highway Traffic Safety Administration. Available at <http://isddc.dot.gov/OLPFiles/NHTSA/013695.pdf>

Lacey, J. H., Kelley-Baker, T., Furr-Holden, D., Voas, R., Moore, C., Brainard, K., Tippetts, A. S., Romano, E., Torres, P., & Berning, A. (2009a, December). *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Methodology*. (Report No. DOT HS 811 237). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/staticfiles/nti/pdf/811237.pdf

Lacey, J. H., Kelley-Baker, T., Furr-Holden, D., Voas, R., Romano, E., Torres, P., Tippetts, A. S., Ramirez, A., Brainard, K., & Berning, A. (2009b, December). *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Alcohol Results*. (Report No. DOT HS 811 248). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811248.pdf

Appendix E: References

Lacey, J. H., Kelley-Baker, T., Furr-Holden, D., Voas, R., Romano, E., Ramirez, E., Brainard, Moore, C., K., Torres, P., & Berning, A. (2009c, December). *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Drug Results*. (Report No. DOT HS 811 249). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811249.pdf

Longthorne, L., Varghese, C., & Shankar, U. (2007, September). *Fatal Two-Vehicle Motorcycle Crashes*. (Report No. DOT HS 810 834). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/810834.pdf

NHTSA (2000). *National Agenda for Motorcycle Safety*. (Report No. DOT HS 809 156). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.dot.gov/people/injury/pedbimot/motorcycle/00-NHT-212-motorcycle/index.html

NHTSA (2006, December). *National Agenda for Motorcycle Safety Implementation Guide*. (Report No. DOT HS 810 680). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/people/injury/pedbimot/motorcycle/NAMS2006/images/ImplementationGuide.pdf

NHTSA (2007, July). *The Detection of DWI Motorcyclists*. (Report No. DOT HS 807 856). Washington, DC: National Highway Traffic Safety Administration. www.nhtsa.dot.gov/people/injury/pedbimot/motorcycle/610DWIMotorcyWeb/images/4277-Motorcyclists_WEB.pdf

NHTSA (2009a). *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Fourth Edition*. (Report No. DOT HS 811 081). Washington, DC: National Highway Traffic Safety Administration. Available at http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa09028/resources/countermeasures.pdf

NHTSA (2009b). *Traffic Safety Facts 2008: Early Edition*. (Report No. DOT HS 811 170). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/811170.pdf

NHTSA (2009c). *Traffic Safety Facts, 2008 Data: Motorcycles*. (Report No. DOT HS 811 159). Washington, DC: National Highway Traffic Safety Administration. www-nrd.nhtsa.dot.gov/Pubs/811159.pdf

NHTSA. (2010). *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Fifth Edition*. (Report No. DOT HS 811 258). Washington, DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/staticfiles/nti/enforcement/pdf/Countermeasures_HS811258.pdf

Appendix E: References

- Pickrell, T. M., & Ye, T. J. (2009). *Motorcycle Helmet Use in 2009: Overall Results*. (Report No. DOT HS 811 254). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/811254.PDF
- Potts, I., Garets, S., Smith, T., Pfefer, R., Neuman, T. R., Slack, K. L., Hardy, K. K., & Nichols, J. (2008). Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Vol. 22: *A Guide for Addressing Collisions Involving Motorcycles*. (NCHRP Report 500). Washington, DC: Transportation Research Board. Available at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_500v22.pdf
- Preusser, D., Williams, A., Nichols, J., Tison, J., & Chaudhary, N. K., (2008), *Effectiveness of Behavioral Highway Safety Countermeasures*. (NCHRP Report 622). Washington, DC: Transportation Research Board. Available at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_622.pdf
- Rizzi, M., Strandroth, J., & Tingvall, C. (2009). *Effectiveness of Antilock Brake Systems on Motorcycles in Reducing Real-Life Crashes and Injuries*. *Traffic Injury Prevention* 10, 479-487.
- Roll, G., Hoffman, O., and König, J. (2009). *Effectiveness Evaluation of Antilock Brake Systems (ABS) for Motorcycles in Real-World Accident Scenarios*. 21st International Technical Conference on the Enhanced Safety of Vehicles, Stuttgart, Germany, June 15–18, 2009. Available at www-nrd.nhtsa.dot.gov/pdf/esv/esv21/09-0254.pdf
- Shankar, U. (2001). *Fatal Single Vehicle Motorcycle Crashes*. (Report No. DOT HS 809 360). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/809-360.pdf
- Shope, J. (2007). *Graduated Driver Licensing: Review of Evaluation Results Since 2002*. *Journal of Safety Research* 38, 237-244.
- Subramanian, R. (2007). *Bodily Injury Locations in Fatally Injured Motorcycle Riders*. (Report No. DOT HS 810 856). Washington, DC: National Highway Traffic Safety Administration. Available at www-nrd.nhtsa.dot.gov/Pubs/810856.pdf
- Teoh, E. (2009). *Effectiveness of Antilock Braking Systems in Reducing Fatal Motorcycle Crashes*. Arlington, VA: Insurance Institute for Highway Safety. Available at www.iihs.org/research/topics/pdf/r1110.pdf
- Wells, S., Mullin, B., Norton, R., Langkey, J., Connor, J., Jackson, R., & Lay-Yee, R.. (2004). *Motorcycle Rider Conspicuity and Crash Related Injury: Case-Control Study*. *BMJ*, doi:10.1136/bmj.37984.574757.EE. Available at www.bmj.com/content/328/7444/857.full.pdf+html?sid=058698e1-19d5-4a51-8359-79a6b4b9f24e

Appendix E: References

Williams, A. (2007). *Public Information and Education in the Promotion of Highway Safety*. (Research Results Digest 322). Washington, DC: Transportation Research Board. Available at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_322.pdf

DOT HS 811 789
June 2013



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



www.nhtsa.gov

7993-061413-v2