


# INSTRUCTOR'S LESSON PLAN

## Snowmobile Safety – Reaction Time

Page 1 of 6

<b>SUBJECT</b> <b>Snowmobile Safety</b>		<b>INSTRUCTOR</b>
<b>TITLE OF LESSON</b> <b>Speed - Reaction Time and Stopping Distance</b> ***Third of Three in the Speed Lesson Plan Series		<b>DATE OF INSTRUCTION</b>
<b>TIME PERIOD (TOTAL)</b> <b>20 minutes</b>		<b>PLACE</b>
<b>TRAINING AIDS</b> 1. Lesson Plan 2. Annual Fatal Crash Synopsis Report 3. Reaction Time Table and Stopping Distance Formula 4. ATV and/or Snowmobile Student Manual	<b>TYPE OF LESSON</b> <input type="checkbox"/> E.D.O.C. <input checked="" type="checkbox"/> LECTURE <input checked="" type="checkbox"/> DISCUSSION <input type="checkbox"/> PRACTICAL	
<b>OBJECTIVE(S)</b> ✓ Discuss Reaction Time ✓ Discuss Stopping Distance ✓ Discuss How Speeds Effect Reaction Time and Stopping Distance ✓ Discuss Headlight Effectiveness ✓ Discuss How to Set a Safe Personal Speed Limit (This lesson meets the WI DNR Safety Education standards.)		
<b>INSTRUCTOR REFERENCE</b> ATV & Snowmobile Safety Student Manual ATV & Snowmobile Regulations Lesson Plan		
<b>STUDENT REFERENCE</b> ATV & Snowmobile Student Manual ATV & Snowmobile Regulations		

TIME	LESSON OUTLINE	AID CUES
<b>0:00</b> 	<p>Your ability to avoid a collision is based on 2 things – <b>REACTION TIME</b> and <b>STOPPING DISTANCE</b></p> <p><b>REACTION TIME is the time it takes to see something and start the braking/avoidance process.</b></p> <p>There are 4 stages in the process of REACTION:  <b>Step 1 – CONSCIOUS AWARENESS THAT</b></p>	<p>Student Manual</p> <p>Refer to Chart</p>

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Page 2 of 6

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<div> <div></div> <div>7:00</div> <div></div> </div>	<p><b>SOMETHING IS PRESENT.</b></p> <ul style="list-style-type: none"> <li>• The stimulus may be within field of view for some time before it is detected.</li> <li>• There may be a significant delay between presentation of the stimulus, and its being detected because of size and its contrast with background.</li> </ul> <p><b>Step 2 – IDENTIFICATION</b></p> <ul style="list-style-type: none"> <li>• Sufficient information is acquired about the stimulus to be able to reach a decision.</li> </ul> <p><b>Step 3 – DECISION</b></p> <ul style="list-style-type: none"> <li>• The operator must decide what to do about it.</li> </ul> <p><b>Step 4 – RESPONSE</b></p> <ul style="list-style-type: none"> <li>• Brain and muscle carry out the required action. (slow, brake, stop, steer around...etc)</li> </ul> <p><b><u>How long does it take to React?</u></b></p> <ul style="list-style-type: none"> <li>• About 1 to 3 seconds for the average person.</li> <li>• Practicing Reaction can improve Reaction Time.</li> <li>• Reaction Time will never be zero seconds.</li> <li>• It just takes time for those four things to happen.</li> </ul> <p><b>BOTTOM LINE: SPEED and OPERATOR ALERTNESS</b> are the most important factors for the distance traveled during Reaction Time.</p> <p>There is nothing you can do to speed up your reaction time once you have it down to the minimum.</p> <p><b><u>However, there are a lot of things that can slow it down.</u></b></p> <p><b><u>FACTORS THAT SLOW REACTION TIME:</u></b></p> <p><b>1. Factors/substances that slow your brain down.</b>  ALCOHOL/DRUGS    FATIGUE    TRAIL HYPNOSIS  COLD MEDICINES    OTHERS??</p> <p><b>2. Factors that influence how well you can see an object and begin the reaction process.</b></p>	<p>Ask Students for examples.</p> <p>Personal Experience</p> <p>Ask Students for possible decisions.</p> <p>Refer to Chart</p> <p>Ask Students what they have learned about how speed affects reaction time.</p> <p>Ask Students for other factors.</p>

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Page 3 of 6

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<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> <div style="width: 1px; height: 100%; background-color: black; position: relative;"> <div style="position: absolute; top: 0; left: -5px;">↓</div> <div style="position: absolute; bottom: 0; left: -5px;">↓</div> </div> <div style="margin-top: 10px;">12:00</div> </div> </div>	<p><b><u>POOR VISIBILITY FACTORS</u></b></p> <p>DAY or NIGHT                      OVERCAST or CLEAR</p> <p>SNOWING.....FOGGY        RAIN</p> <p>HILLS                      CURVES        TREES</p> <p>COLOR OF OBJECT (blend in or contrast with background)</p> <p>SNOW or DUST kicked up by other machines</p> <p>WINDSHIELD DIRTY</p> <p>HELMET SHIELD DIRTY, SCRATCHED or FOGGED</p> <p>HELMETS can limit side to side visibility.</p> <p><b><u>HEADLIGHTS</u></b></p> <ul style="list-style-type: none"> <li>➤ Effective for about 200 - 250 feet maximum.</li> <li>➤ Less effective depending on terrain &amp; weather.</li> <li>➤ Overdriving headlights at approximately 45 mph.</li> <li>➤ One of the factors so many crashes happen at night.</li> </ul> <p><b>3. Factors unique to the individual rider</b></p> <p><b><u>LACK of EXPERIENCE</u></b></p> <ul style="list-style-type: none"> <li>• New to Sport</li> <li>• New or Unfamiliar ATV or Snowmobile</li> <li>• No or Little Ability to recognize hazards</li> </ul> <p>Ice Heaves      Open Water              Snow Covered Obstacles</p> <p>Trail Conditions      Blind Corners/Hills      Animals</p> <p><b><u>LACK of SIZE &amp; STRENGTH</u></b></p> <ul style="list-style-type: none"> <li>• Difficulty Controlling ATV//Snowmobile</li> <li>• Important to fit ATV/Snowmobile to size of Operator</li> </ul> <p><b><u>After You React You Have to Stop</u></b></p> <p><b>BRAKING and STOPPING DISTANCE FACTORS</b></p> <p><u>Speed</u> – The faster you are going the greater the distance needed before you can brake to a stop.</p> <p><b><u>Trail Factors</u></b></p> <p>Ice    Snow    Dirt    Gravel    Grass    Pavement</p> <p>Mud    Water    Up Hill    Down Hill</p>	<p>Ask Students for other factors.</p> <p>Show Students 200 feet.</p> <p>Colored headlights are not legal.</p> <p>Ask Students for other factors.</p> <p>Refer to Chart</p> <p>Ask Students for other factors</p>

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Page 4 of 6

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<div style="position: relative; height: 600px;"> <div style="position: absolute; top: 0; left: 50%; transform: translate(-50%, -50%);">↓</div> <div style="position: absolute; bottom: 0; left: 50%; transform: translate(-50%, 50%);">20:00</div> </div>	<p><u>Mechanical Factors</u></p> <p>Vehicle      Brakes      Tire Condition      Track/Ski</p> <p><u>Operator Factors</u></p> <p>Size      Strength      Ability/Experience</p> <p><b>All the above have an effect on your stopping distance.</b></p> <p><b>Putting Reaction Time and Stopping Distance together.</b></p> <p>AS SPEED INCREASES</p> <ul style="list-style-type: none"> <li>• Distance traveled for reaction time increases.</li> <li>• Stopping distances increases.</li> <li>• Your Personal Safe Speed Limit considers</li> </ul> <p>Trail Conditions    Various Factors    Ability    Speed</p> <p>Reaction Time    Stopping Distance    AT ALL TIMES</p> <p><b>Use the Three Second Rule when driving</b></p> <ul style="list-style-type: none"> <li>• Leading or Following</li> <li>• Day or Night</li> </ul> <p><b>NIGHT TIME DRIVING – Why Slow Down</b></p> <ul style="list-style-type: none"> <li>• Only see what is in headlight – Nothing to sides of trail</li> <li>• Deer/Animals moving around</li> <li>• Tendency for Trail Hypnosis or Tunnel Vision</li> <li>• Tend to follow too closely</li> <li>• Tend to Over Drive Headlights</li> </ul> <p><b>TRAIL RIDE LEADERS MUST RIDE/LEAD AT THE SPEED OF THE LEAST EXPERIENCED DRIVER.</b></p> <p><b>SAFE &amp; RESPONSIBLE DRIVERS ARE CONSTANTLY ALERT TO THEIR PERSONAL SAFE SPEED LIMIT.</b></p>	<p>STUDS – effective on ice, but no difference on packed trails.</p> <p>Refer to chart</p> <p>Synopsis of fatal crashes from Annual Report</p> <p>Instructor/Student Personal Experiences</p> <p>Pushing the safety envelope (almost losing control)</p> <p>Refer to Chart</p> <p>Ask Students for other factors.</p> <p>Headlights provide only about 200' visibility, so a speed of 50 mph exceeds reaction time and stopping distance required.</p>

# INSTRUCTOR'S LESSON PLAN

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Page 5 of 6

### SPEED – REACTION TIME – BRAKING & STOPPING DISTANCE

#### TESTING STOPPING DISTANCE

Tests were done at various speeds with four (4) different snowmobiles. The surface used for the tests was a frozen lake, but it was covered with compacted snow, very similar to a groomed trail. The results of the tests were plugged into a formula that gave a skid factor of .39. This is to say that using this factor in a formula along with the speed of the snowmobile makes it possible to predict how far the machine will travel once the brakes are applied. If you are traveling at 50 mph, the snowmobile will skid to a stop in 213 feet (see formula below). It should be noted that studded tracks do not reduce this distance by any appreciable amount. In the tests, the locked track gave the shortest stopping distances.

$$\text{Distance} = \frac{50^2}{30 \times .39} \quad 213.6 \text{ feet} = \frac{2500}{11.7}$$

#### FACTORING IN REACTION TIME

The Driver Perception Response Time cites research done on reaction times. Times for this process to happen can range from 0.6 seconds to 3.2 seconds or more, depending on the number of choices to select from and the alertness of the test subjects. If you add alcohol, drugs, fatigue, cold, or age to these tests; the time will increase well above 3 seconds. The times are based on the 85 percentile of the population in the study.

#### NIGHT TIME DRIVING

Keep in mind the distance that the headlights will illuminate an object. A car will illuminate a contrasting object at about 300 feet on high beam, 250 feet on low beam. In a car, the headlight is around 29 inches above the ground and the operator's eye level is about 48 inches above the ground. The next point to consider is that a snowmobile does not have headlights like a car. The headlight is not 29 inches above the ground, and the operator's eye level may or may not be 48 inches above the ground. Thus, the distance illuminated by the headlight is less than the 250 to 300 feet for cars.

MPH	FEET/SEC	How far you'll go with these REACTION TIMES					BRAKING DISTANCE	TOTAL STOPPING DISTANCE AT 1.5 SEC REACTION TIME PLUS BRAKING DISTANCE
		.75 SEC.	1 SEC.	1.5 SEC.	2 SEC.	3 SEC.		
20	29.33	22	29	44	59	88	34'	78'
30	44.0	33	44	66	88	132	77'	143'
40	58.67	44	59	88	117	176	137'	205'
50	73.33	55	73	110	147	220	213'	323'
60	88.0	66	88	132	176	264	308'	440'
70	102.67	77	103	154	205	308	418'	572'
80	117.33	88	117	176	235	352	547'	723'
90	132.0	99	132	198	264	396	692'	890'
100	146.67	110	147	220	293.34	440	855'	1,075'

**Yellow** – ALERT! Approaching over driving headlight threshold.

**Red** – WARNING! Over driving headlights.

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Page 6 of 6

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Dark Gray – WARNING! Over driving headlights.