

Considering Conspicuity for North Carolina Department of Transportation Light Trucks

RP2020-33 Close Out Meeting

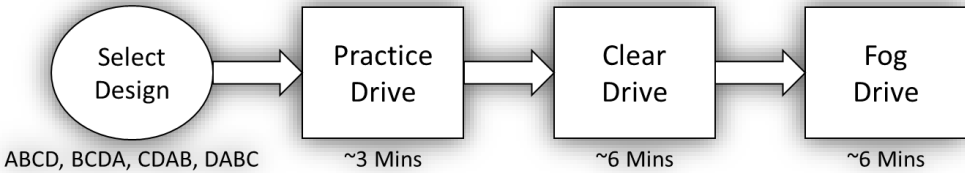
October 12, 2022



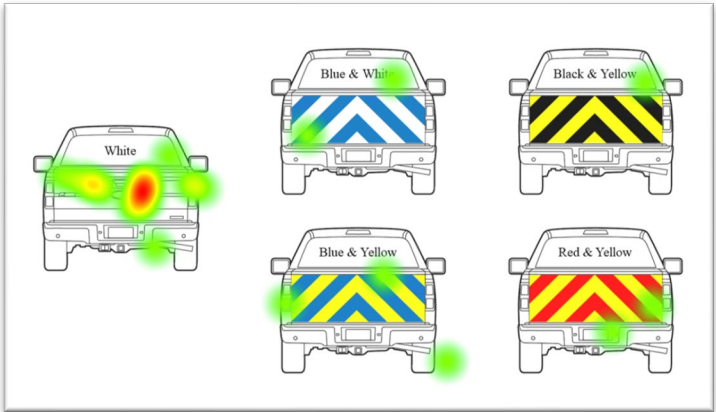
Overview



Background



Experiment



Results



Conclusion



A 2014 guideline update changed the color requirement for state service vehicles.



Concerns about brand recognition of stock-colored trucks has risen.

Battenberg

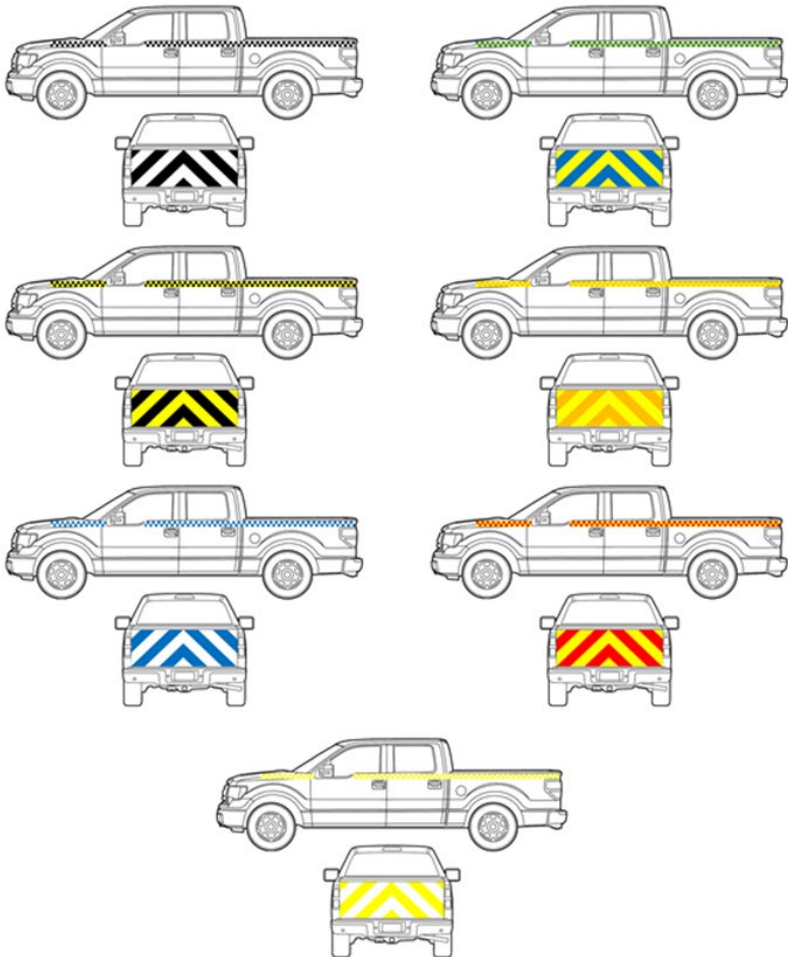


Chevron



To address concerns about the speed and accuracy with which NCDOT vehicles are identified, this project focused evaluating driver response to the proposed color combinations

Please rank the following chevron patterns. Place them in order with the one you prefer most at the top and the one you prefer least at the bottom.



Survey Responses Ranking Color Combinations

Rank	Black & White	Black & Yellow	Blue & White	Blue & Yellow	Orange & Yellow	Red & Yellow	Yellow & White
1	25	26	72	30	5	44	2
2	20	56	34	48	15	24	6
3	11	70	23	45	22	23	10
4	20	25	28	41	46	29	15
5	16	14	28	18	65	24	37
6	26	9	14	13	41	35	64
7	85	3	4	8	9	24	69
Average	4.97	2.92	2.82	3.20	4.53	3.82	5.69

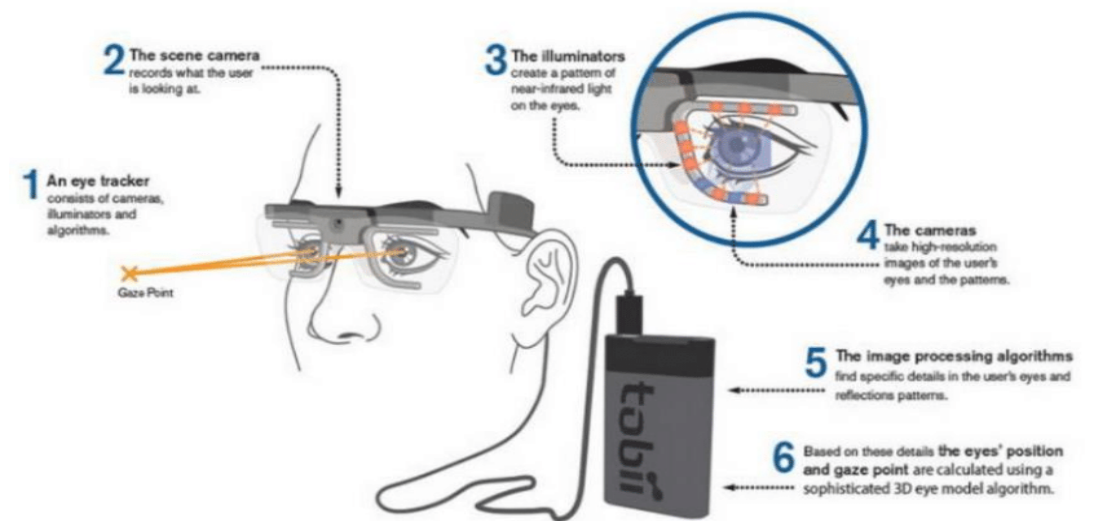
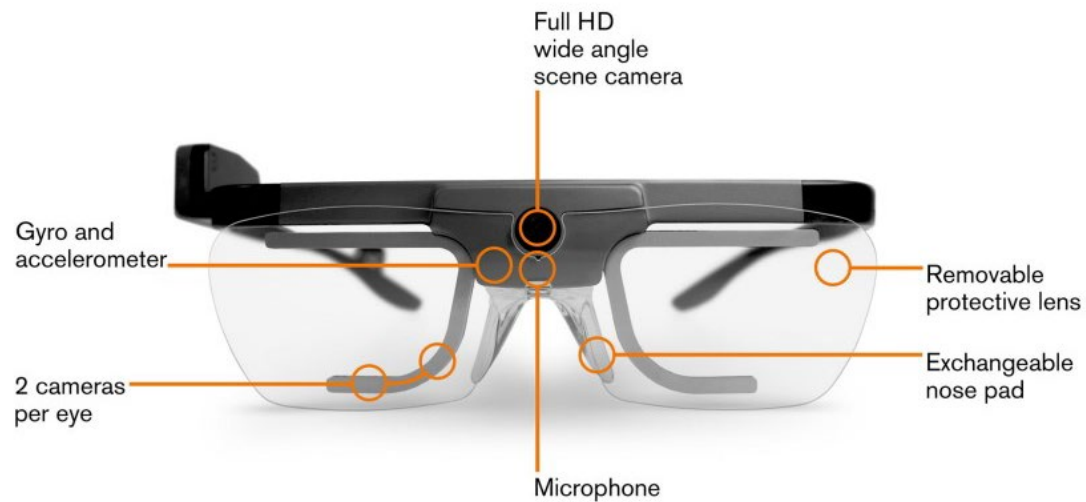
Study details

- 40 total subjects recruited from in and round the Greenville, NC area.
- 6 subjects were excluded from the data analysis due poor recording quality.
- 19 male and 15 female participants were included in the analysis.
- Average age of subjects included in analysis is 44.5 years.
- For participants that reported the information, the average length of time they held a valid license was greater that ~25 years.
- Participants were compensated with a \$25 Amazon gift card for their participation in the study.

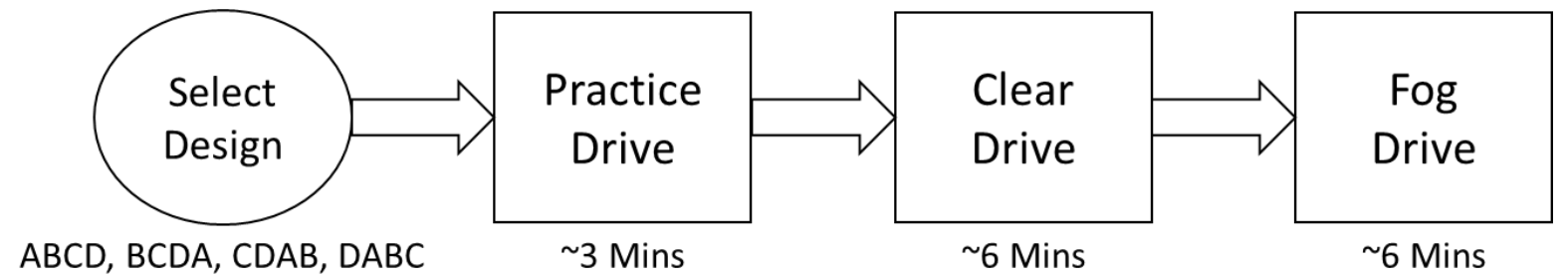


Simulator Experiment

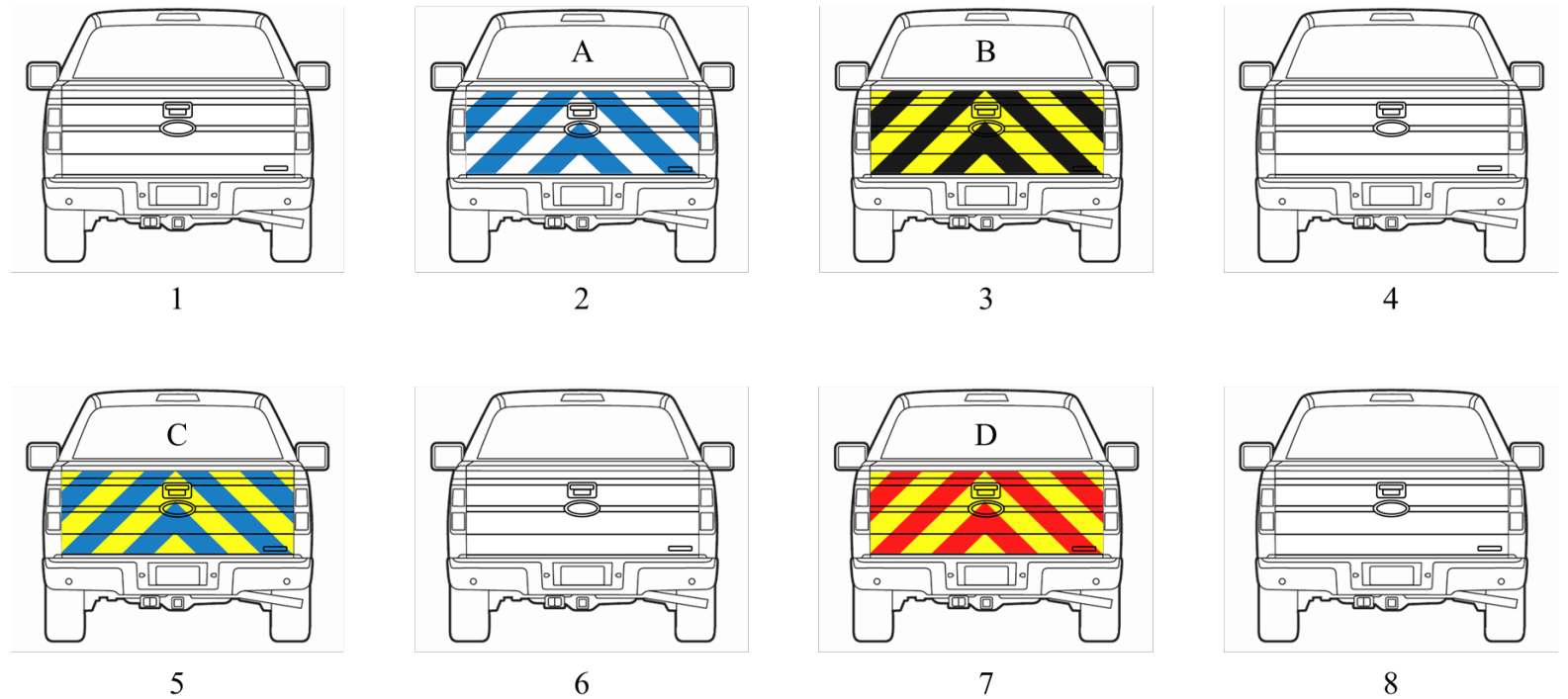
STISIM
DRIVE®



Experimental Design Order



Example Vehicle Presentation (ABCD Order)



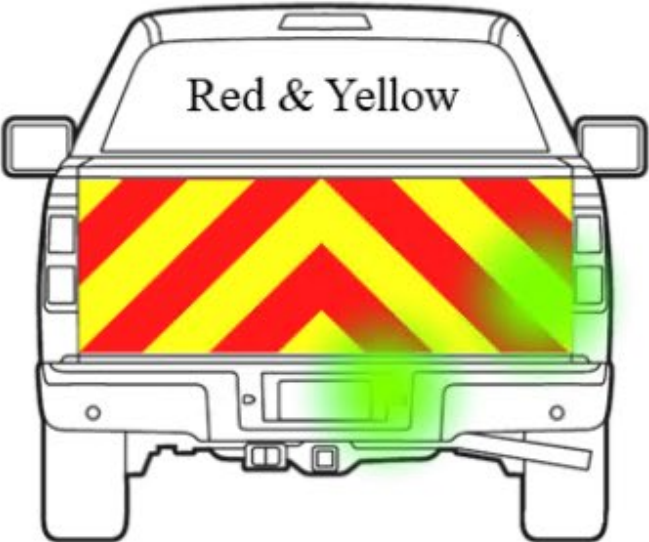
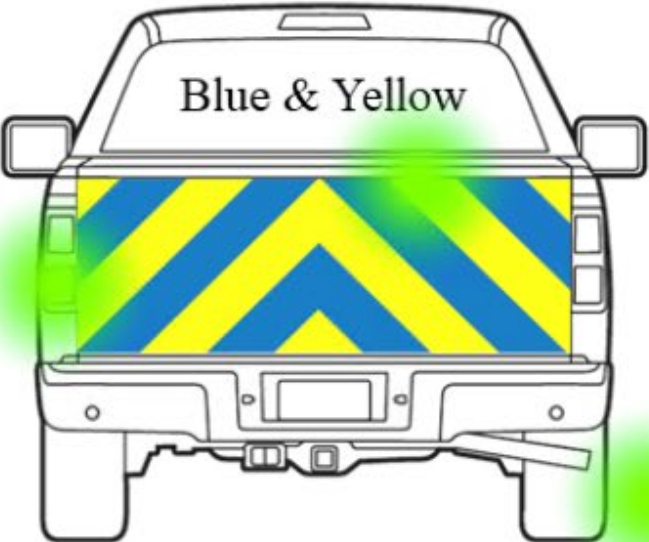
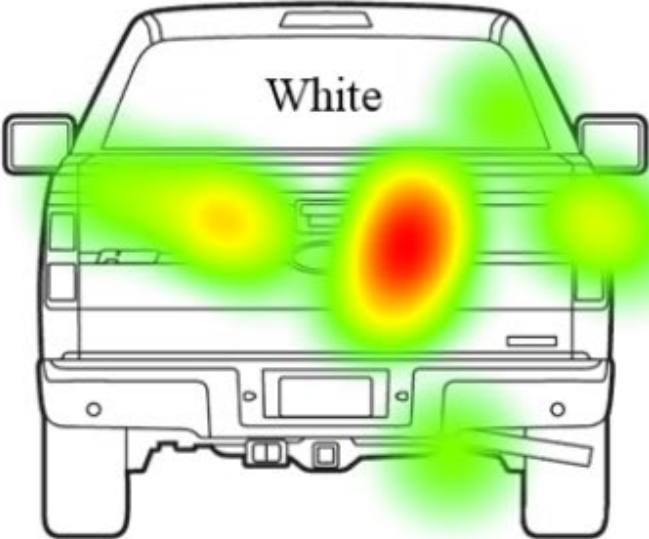
Virtual Reality Experiment



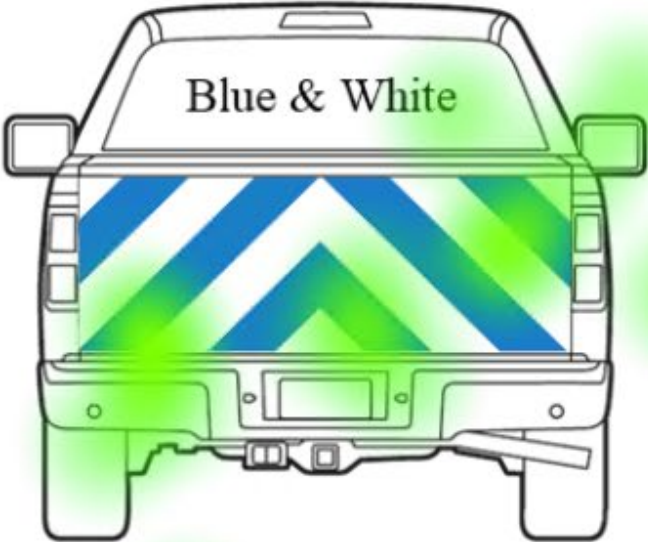
Yellow Chevron



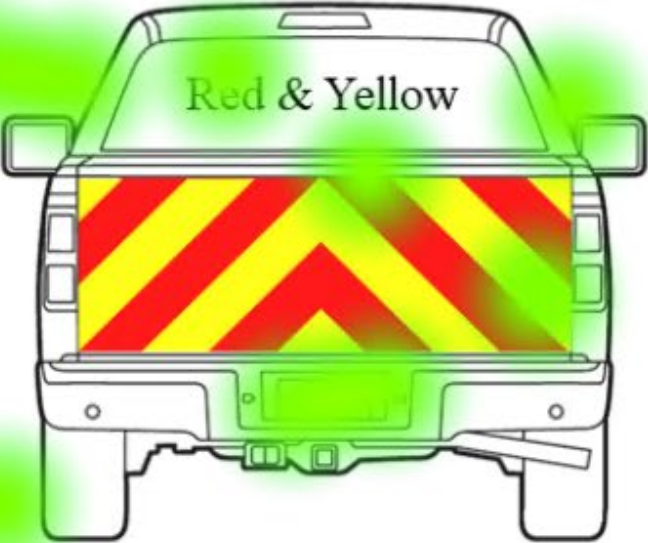
Single Participant Clear Condition



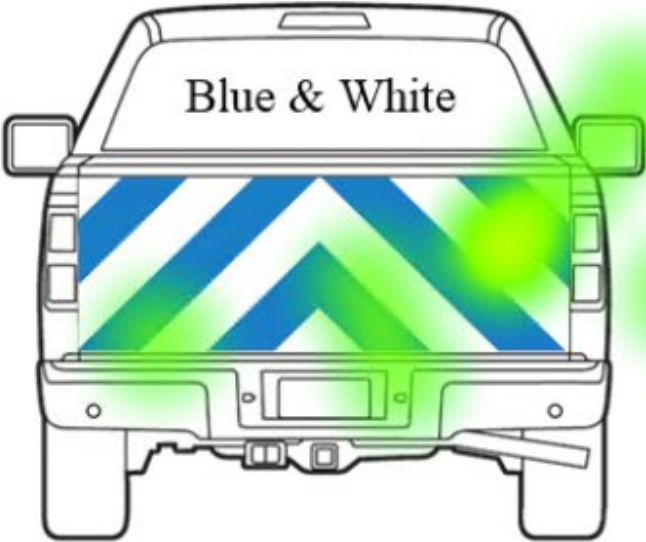
Single Participant Fog Condition



Multiple Participants Clear Condition



Multiple Participants Fog Condition



Fixation Count is the number of times the subject focuses on the target

Count of Subjects Who Fixated At Least Once	<i>Blue & White</i>	<i>Black & Yellow</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>	<i>First White</i>
<i>Clear</i>	9	12	11	12	19
<i>Fog</i>	12	9	10	12	16
<i>Total</i>	21	21	21	24	35

Total Fixation Count	<i>Blue & White</i>	<i>Black & Yellow</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>	<i>First White</i>	<i>Total White</i>
<i>Clear</i>	18	18	17	17	58	116
<i>Fog</i>	14	18	16	16	26	79
<i>Total</i>	32	36	33	33	84	195

Fixation Duration is a measure of the amount of time subjects spend focused on the target.

Average Time to First Fixation in Milliseconds

	<i>Blue & White</i>	<i>Black & Yellow</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>	<i>First White</i>	<i>Total White</i>
<i>Mean Clear</i>	841.00	1947.67	1795.64	958.08	1396.58	1488.51
<i>Mean Fog</i>	1667.42	1496.89	701.10	1260.67	1669.38	1631.83
<i>Mean Overall</i>	1313.24	1754.48	1274.43	1109.38	1521.29	1553.28

Average Fixation Duration in Milliseconds

	<i>Blue & White</i>	<i>Black & Yellow</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>	<i>First White</i>	<i>Total White</i>
<i>Mean Clear</i>	288.67	257.92	236.18	162.25	208.37	196.35
<i>Mean Fog</i>	239.58	237.44	198.30	190.83	268.13	217.68
<i>Mean Overall</i>	260.62	249.14	218.14	176.54	235.69	205.99

Count of Subjects Who Fixated At Least Once (VR)

	<i>Blue & White</i>	<i>Black & Yellow</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>
<i>Clear</i>	8	11	11	10
<i>Fog</i>	13	16	15	13
<i>Total</i>	21	27	26	23

Average Fixation Duration in Milliseconds (VR)

	<i>Black & Yellow</i>	<i>Blue & White</i>	<i>Blue & Yellow</i>	<i>Red & Yellow</i>
<i>Mean Clear</i>	334.71	483.15	279.31	305.53
<i>Mean Fog</i>	259.86	401.22	542.17	204.18
<i>Mean Overall</i>	288.37	434.60	430.96	248.24

Conclusion

- Vehicle simulators have been used in a variety of scenarios to study and ultimately gain a better understanding of driver behavior in a safe environment.
- This study investigated differences in how drivers respond to different potential color combinations for high visibility vehicle markings.
- The results from this study found that, in general, there were no statistically significant differences in the performance of the different color combinations on the metrics of interest.
- The blue & white pattern was found to have a slightly longer average fixation duration than some other patterns, indicating that it held the attention of driver for a longer period of time.
- Based on these results, there does not appear to be a substantial difference in the conspicuity of the tested color combinations.
- Further investigation is required to establish the best practices for the NCDOT fleet of light trucks.

Acknowledgements

- Morgan McDonald
- Alec Ducharme
- Meagan Denny
- Avery Vose
- Jonathan Echerd
- Dr. Anne Dickerson

