Field Study on the Efficacy of the New Restart Provision for Hours of Service: Final Report

The Federal Motor Carrier Safety Administration (FMCSA) sponsored a naturalistic field study to examine the efficacy of the restart provision under the Hours of Service of Drivers Final Rule, published on December 27, 2011, with a compliance date of July 1, 2013. Under this new rule, if commercial motor vehicle (CMV) drivers choose to use a provision allowing "restart" of the 60 or 70 hour duty-cycle limit, they are required to include at least two nighttime periods (from 1 a.m. until 5 a.m., based on the home terminal time zone if the restart takes place in a time zone that differs from the driver's home terminal) in their restart breaks in order to have sufficient time for sleep recuperation.

STUDY OVERVIEW

In the field study conducted as part of this project prior to the compliance date of the new restart rule, researchers measured CMV drivers' sleep and fatigue through two consecutive duty cycles and the intervening restart breaks. A duty cycle ended when the driver had a period of at least 34 consecutive off-duty hours. Participating drivers had a valid CMV driver's license, were fit for duty by regulatory standards, were actively employed with a carrier or as an independent contractor, and were representative of drivers affected by the maximum on-duty time regulation. During the study, drivers managed their duty and driving schedules and performed their tasks as they normally would have done; no experimental intervention changed their schedules or behaviors.

A total of 106 CMV drivers (100 men, 6 women; ages 24−69) completed the study. Their commercial driving experience ranged from less than a year to more than 39 years with a mean of 12.4 years of driving experience.

In each of the two duty cycles measured during the study, a driver could fall into one of the two following study conditions relevant to the new restart rule:

- **Restart break with one nighttime period**—the driver's restart break preceding the duty cycle contained one nighttime period.
- **Restart break with two or more nighttime periods—**the driver's restart break preceding the duty cycle contained two or more nighttime periods.

The study compared 24-hour patterns of duty and driving, sleep, and fatigue between these two conditions. Table 1 presents key findings from the study.

Table 1. Key findings from the naturalistic field study.

Outcome Measure	Significant Difference between Conditions	Drivers with One Nighttime Period in Restart (Compared to Drivers with Two or More Nighttime Periods in Restart)
Lapses of attention	Yes	Exhibited more lapses of attention, especially at night, during duty cycles.
Subjective sleepiness	Yes	Reported greater sleepiness, especially toward the end of their duty periods, during duty cycles.
Lane deviation	Yes	Showed increased lane deviation (i.e., more variability in lateral lane position) at night and in the morning and afternoon (but not in the evening) during duty cycles.
Sleep	Yes	Sleep occurred predominantly during the day during duty cycles.
On duty	Yes	Time spent on duty occurred predominantly at night.
Driving	Yes	Time spent driving was greater and occurred more typically at night.

DUTY, DRIVING, AND SLEEP PATTERNS

Following a restart break with one nighttime period, a driver was likely to be on duty and driving primarily at night. Drivers' duty logs revealed that time spent driving was distributed more or less evenly across the hours of the day when the preceding restart break contained two or more nighttime periods. When the preceding restart break contained one nighttime period, the drivers usually drove at night.

Sleeping generally occurred during the day in duty cycles preceded by a restart break with one nighttime period. During duty cycles, drivers averaged 6.2 hours of sleep per 24 hours when the preceding restart break contained two or more nighttime periods, and slept 6.0 hours per 24 hours when the preceding restart break contained one nighttime period.

In both conditions, drivers predominantly slept at night during restart breaks. Drivers' 24-hour sleep profiles were substantially different during restart breaks than during duty cycles. During restart breaks, drivers obtained an average of 8.9 hours of sleep per 24 hours when the break contained two or more nighttime periods, and 8.8 hours of sleep per 24 hours when the break contained one nighttime period.

FATIGUE MEASUREMENTS

Attention lapses on the Psychomotor Vigilance Test (PVT) were significantly greater during duty cycles when the preceding restart break contained one nighttime period. The study measured fatigue using the number of lapses of attention on a 3-minute PVT administered via a smartphone. The PVT was performed three times per day. Attention lapses were defined as reaction times greater than 355 milliseconds. The overall difference during duty cycles between the two conditions was 0.4 lapses of attention per 3-minute PVT, but at night the magnitude of the difference went up to 0.8 lapses.

Attention lapses increase crash risk. To better understand this difference between the two conditions, consider that when driving at a speed of 60 mph, a 355 millisecond attention lapse involves traveling a distance of more than 30 feet. As a driver experiences more attention lapses, the average duration of those lapses increases. During attention lapses, a CMV driver may miss important roadside cues or be less able to maintain a stable lane position. Crashes can occur when attention lapses and their consequences align, and drivers are unable to take the corrective actions to avoid a crash.

At least two nighttime periods during restart breaks help mitigate fatigue. During restart breaks, there were 1.3 more attention lapses per 3-minute PVT when the drivers' break contained one nighttime period versus two or more nighttime periods. These data points support the findings that drivers were unable to recuperate sufficiently during restart breaks with one nighttime period. Conversely, drivers showed less fatigue during duty cycles and during restart breaks when they contained two or more nighttime periods, versus one nighttime period.

CONCLUSION

Results from this naturalistic field study indicate that having at least two nighttime periods from 1 a.m. until 5 a.m. in the restart break helps to mitigate fatigue as measured both objectively and subjectively. This constitutes evidence in support of the efficacy of the new restart rule.

To read the complete report, please visit: http://www.fmcsa.dot.gov/facts-research/art-public-reports.aspx.