



# Research Brief



## Motorcoach Driver Fatigue Study, 2011

### PURPOSE

The objective of this study was to determine if commercial motorcoach drivers work to the limits of the Federal Motor Carrier Safety Administration (FMCSA) hours-of-service (HOS) regulations. Data were collected on duty start times, total duty time per 24 hours, and total sleep time per 24 hours. Performance was measured and subjective fatigue and sleepiness were rated when going on and off duty.

These measures were taken in the context of HOS regulations mandating that 8 hours off duty precede 10–15 hours on duty, effectively permitting work/rest cycles outside of the normal 24-hour cycle of being awake during the day and asleep at night. Work/rest cycles outside of the normal 24-hour cycle were defined as the presence of duty start times distributed across the 24-hour day. If duty start times were found throughout the 24-hour day, it was expected that they would be accompanied by truncated sleep, degraded performance, and increased fatigue and sleepiness.

### PROCESS

Eighty-four motorcoach drivers who self-identified as working for Charter, Tour, Regular Route, or Commuter Express operations were studied for an average of 31 consecutive days, during which they maintained their normal work/rest schedule. Table 1 describes the measures used in the study.

### RATIONALE AND BACKGROUND

The existing HOS regulations for motorcoach drivers at the time this study was conducted allowed 10–15 hours on duty (10 hours driving) after 8

**Table 1. Measures Used in the Study**

Measure	Method
Duty start times, duty break times, and duty end times	Drivers kept a duty/sleep diary.
Sleep/wake history	Drivers wore an actigraph—a wrist-worn device recording arm movements in 1-minute increments from which a minute-by-minute sleep/wake history can be scored.
Performance	Drivers took a computerized test to measure performance going on and off duty.
Subjective fatigue and sleepiness	Drivers rated their level of fatigue and sleepiness going on and off duty.

hours off duty. This cycle if repeated—8 hours off, 10–15 hours on, 8 hours off, 10–15 hours on—would result in 18–23-hour work/rest cycles that are not in sync with the normal 24-hour night-time/daytime sleep/wake cycle. This would mean getting up 1 to 6 hours earlier each successive day, i.e., a “backwardly rotating” schedule.

It is unknown whether motorcoach drivers push the regulatory limits or operate well within them. If they do not push the limits then they likely are maintaining a normal 24-hour work/rest cycle. Pushing the limits would mean that duty start times would be distributed at various times around the 24-hour day, resulting in sleep truncation and associated impaired performance, along with increased fatigue and sleepiness.

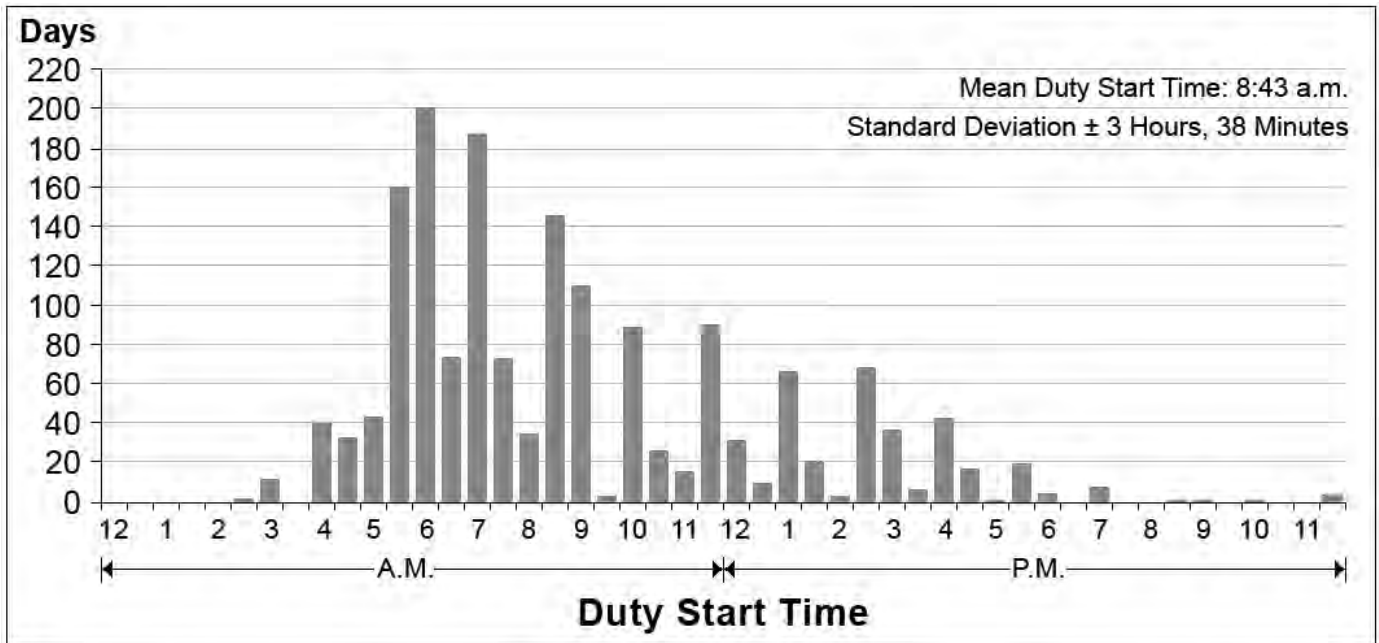


Figure 1. Bar Graph. Total Number of Days by Duty Start Time for All Types of Motorcoach Operations

## STUDY FINDINGS

The 84 motorcoach drivers who participated in this study were, on average, middle-aged, overweight, and male. It is not known if this sample is representative of the motorcoach industry. Drivers from FMCSA HOS-regulated companies were eligible for the study if they were fit for duty according to the standards of their company. Drivers volunteered to participate and gave written informed consent.

The average length of participation per subject was 31 days (range 20–48 days). Duty start times for the sample, derived from the duty/sleep diary, clustered in the early- to mid-morning hours (Figure 1). Regular Route and Commuter Express duty start times were earlier than those of Charter or Tour. Overall, duty start times showed a normal work/rest schedule where drivers work during the day and sleep during the night.

Drivers in the study sample appear to be working well within the limits of the HOS regulations. Mean duty period for the sample was slightly more than 9 hours. Rarely did a duty period exceed the regulatory limit of 15 hours on duty.

The participants were on duty 65 percent of total studied days. In a rough calculation, total on-duty time averaged 43 hours per week. Based on actigraph data, average total sleep time per 24 hours for the drivers was in the recommended range of 7 to 9 hours. Total sleep time per 24 hours was longer for off-duty days than on-duty days, and for on-duty days, the longer the total duty time, the shorter the total sleep time.

Participants demonstrated decreased performance at the end of the duty period relative to the beginning. Similarly, participants reported an increased level of fatigue and sleepiness at the end of a duty period relative to the beginning. The smallest increase in fatigue and sleepiness was with Commuter Express drivers.

In short, motorcoach operations in the present sample involved slightly more than a 40-hour week, start times in the morning or early morning, a typical duty day of approximately 9 hours, and on average a normal 8 hours of TST per 24 hours.

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