

# TRANSPORTATION AND SAFETY IN JAPAN

## The Current State of Drive Video Recorders in Japan and the Outlook for the Future

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### 1. INTRODUCTION

On-board flight recorders have been in airplanes for some time, and have made a significant contribution to our understanding of the causes of accidents and how to prevent them. Drive video recorders, which act like flight recorders for automobiles, have recently been brought to market in Japan and are rapidly gaining popularity in commercial vehicles, particularly taxis. These drive video recorders are capable of recording not only driving data but also video images for the period immediately before and after an accident. In a situation where both parties to an accident assert that the light in front of them was green, for example, the issue could quickly be resolved by replaying the video. Drive video recorders have also begun to be applied not only to the disposition of accidents

but also to driver education, where they are proving effective in deterring accidents. This paper describes the development, diffusion and current use of drive video recorders in Japan as well as next steps and the outlook for the future.

### 2. STATE OF DIFFUSION

The first drive video recorders capable of recording video were developed for tests conducted by what was then the Ministry of Transport as part of research conducted between 1998 and 2000 to establish the technical requirements for drive video recorders. However, in part because memory cards were still very expensive, the product was not brought to market at that time. Later, in 2003, the product was commercialized, adopted by some taxi companies, and recognized as having a dramatic impact in deterring acci-

dents. This sparked the rapid diffusion of the devices among taxi companies; today an estimated 20% of taxis in Japan are equipped with on-board drive video recorders. Meanwhile, there has also been sharp growth in the number of manufacturers entering the drive video recorder market. Today, as shown in Figure 1, more than fifteen manufacturers offer a variety of drive video recorders for sale. In most, the detection of an accident by acceleration sensor triggers the logging of anywhere from a few to a few tens of seconds of video and other data from before and after the accident. Some machines, however, are capable of storing a few days of continuous video and data on an internal hard disk drive. Recently, low-cost drive video recorders targeting the general public have also been developed and are available for purchase at auto parts stores.



(Source: company web sites)

Fig. 1 Drive video recorders sold in Japan by various companies

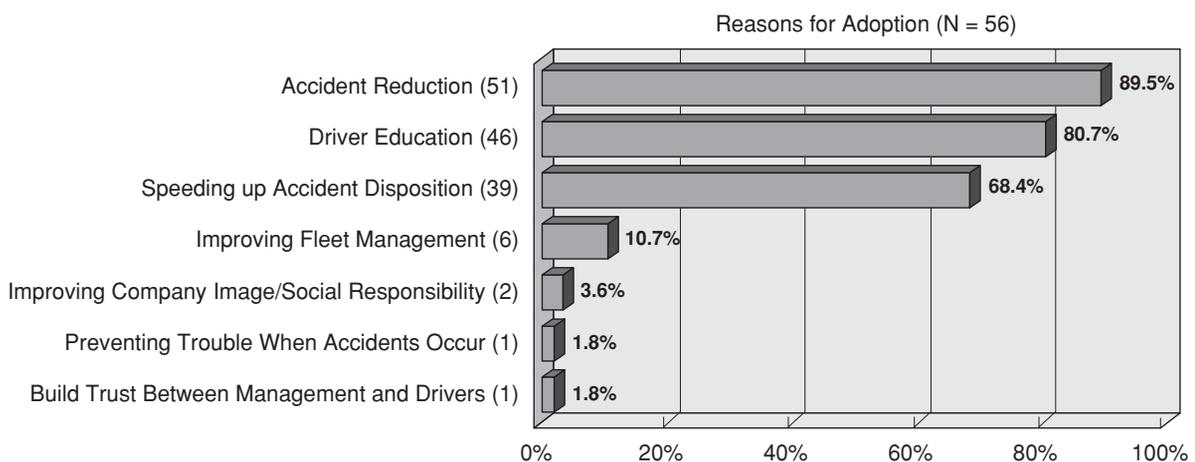
### 3. DATA USE AND ITS EFFECTIVENESS

As mentioned above, the diffusion of drive video recorders in the taxi companies have occurred in the context of their effectiveness in deterring accidents. Figure 2 presents the results of a 2005 survey of taxi companies conducted by the Ministry of Land, Infrastructure and Transport, and shows accident reduction to be the most common reason for adopting drive video recorders. In fact, there are numerous examples where installation of drive video recorders alone resulted in fewer accidents. This is believed to be because drivers are extra careful to drive safely when they know their driving is being monitored, but we cannot expect such an effect to be sustained without driver education. Indeed, the survey results show driver education to be the second most common reason for adoption. Certainly, images of an

accident captured by a drive video recorder have a huge impact not only on the driver involved in the accident but also on co-worker drivers. The survey also researched the drop in accident rates following the adoption of on-board drive video recorders. The results showed a 23% reduction in personal injury accidents in which the driver was primarily responsible, 39% in personal injury accidents in which the driver was secondarily responsible, 13% in accidents involving only property damage and 26% in accident disposition costs.

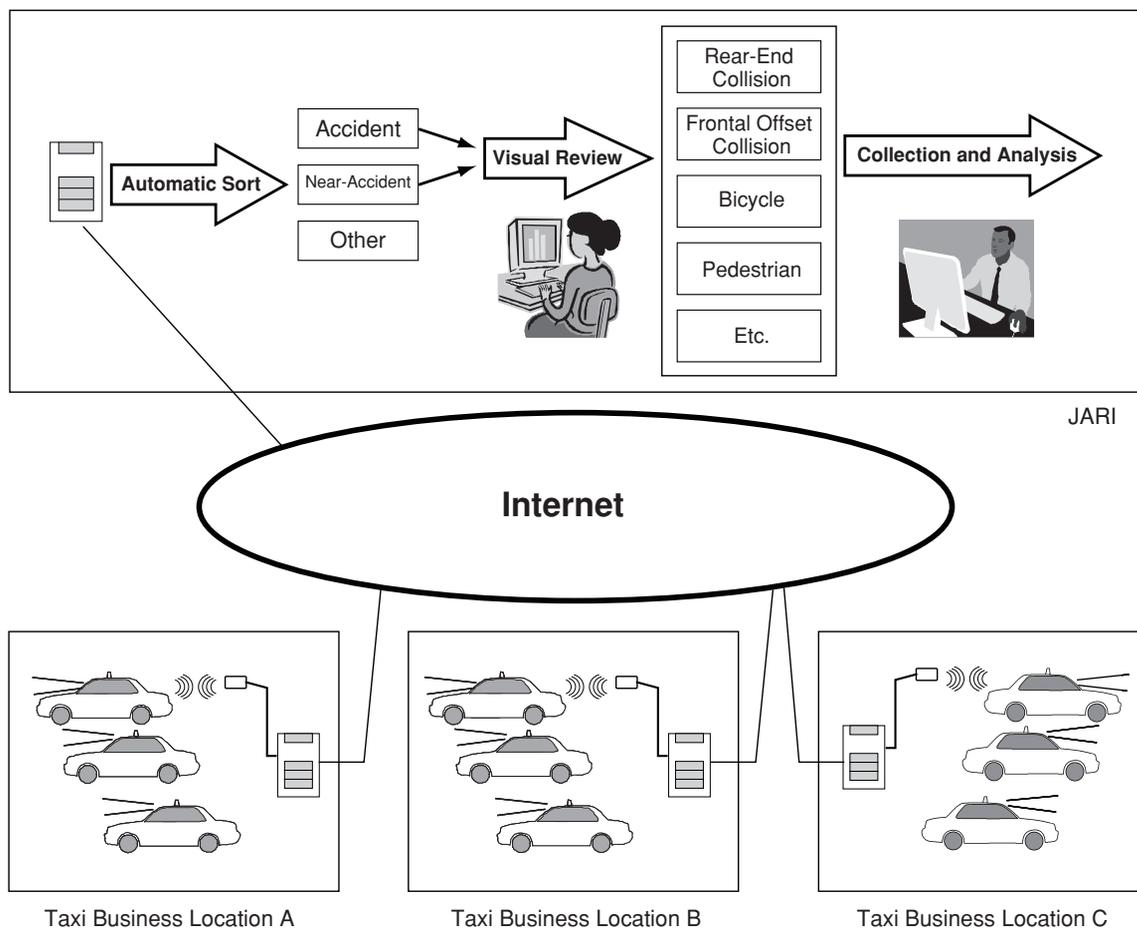
Using the video images and other data recorded on drive video recorders requires recovery of the memory cards followed by computer processing. For taxi companies with large fleets, this work can be a significant burden. For this reason, many companies recover the memory cards only after an accident has occurred. At Japan Automobile Research Institute (JARI),

however, we have been working in cooperation with two taxi companies in Tokyo to collect both accident and near-accident data from a total of 200 vehicles at three business locations in order to test the use of such data in driver education. Figure 3 describes the system used in the experiment. All vehicle data is transferred automatically by wireless LAN to servers at each business location as the taxis return to their lots. This data is collected and forwarded to a JARI server over the Internet. At JARI, data for accidents and near-accidents are extracted from the forwarded data using automatic detection software. Video images for such incidents are then reviewed and entered into a database by category (rear-end collision, frontal offset collision, struck pedestrian, struck bicyclist, etc.). The accumulated data is then used to calculate accidents and near-accidents by vehicle type and time period, to analyze the causes of typical



(Source: Ministry of Land, Infrastructure and Transport web site)

**Fig. 2 Reasons for adopting drive video recorders**



**Fig. 3 Collection and application of drive video recorder data at JARI**

accidents and near-accidents, and to identify avoidance measures. These findings form the basis of a monthly briefing with operational and administrative managers from the taxi company.

#### 4. NEXT STEPS

##### (1) Improved Reliability

The taxi company has complained that the drive video recorders have sometimes failed to record accidents either because the drive video recorders were broken or because

the accidents were minor, low-impact collisions. At the very least, we must ensure that the devices are reliable enough to faithfully record all accidents.

##### (2) Integration with Other On-Board Devices

Commercial vehicles are already equipped with so many on-board devices (digital tachographs, car navigation systems, taxi meters, wireless radios, etc.) that there is hardly any room left to add drive video recorders. Drive video re-

corders, digital tachographs and car navigation systems share many structural similarities and there is a strong possibility that such devices could be technologically integrated. There may be legal constraints or challenges in maintaining reliability, but integration is certainly desirable.

##### (3) Additional Functionality

Video taken by drive video recorders could be used to facilitate real-time warnings of lane departure or insufficient following distance.

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Other additional functionality might include the application of driving data to a diagnosis of driving skill. Some drive video recorders already incorporate simple examples of such additional functionality. It will be important to develop such additional functionality in order to promote diffusion among trucks and buses, where accident rates are lower than for taxis.

#### **(4) More Sophisticated Data Analysis Software**

Drive video recorders include software for viewing and analysis but there are problems with poor usability and an inability to work well with the software that businesses already use to manage their fleets. Furthermore, each drive video recorder manufacturer uses dedicated software that is incompatible with that of other manufacturers. Software improvement and standardization would be desirable in terms of diffusion going forward.

## **5. OUTLOOK FOR THE FUTURE**

### **(1) Diffusion Among Commercial Vehicles**

Given that diffusion among taxis in major metropolitan areas has had a real effect, diffusion is expected to continue steadily, including in cities located in outlying areas. In addition, the obligation of business administrators to ensure safety was clarified in the Ministry of Land, Infrastructure and Transport's motor carrier transportation safety management guidelines, which went into effect last October. Because

these guidelines mention the use of drive video recorders, diffusion is expected to continue also among trucks and buses.

### **(2) Distribution Among Private Vehicles**

We can expect an educational effect for commercial vehicles because of the employment relationship between company and driver, but it seems unlikely that drivers of private vehicles will purchase drive video recorders in the hope of educating themselves. There must be some more effective incentive before drive video recorders will become popular among private vehicles. One first thinks of ways to reduce barriers to purchase such as lowering the price of drive video recorders or an insurance discount for users. Drive video recorders marketed to the general public are currently priced in the range of about 40,000 yen; such devices might well spread rapidly were the price to fall below 10,000 yen. Furthermore, integration with car navigation systems as mentioned in section 4 (2) and the addition of warning or diagnostic functionality as mentioned in section 4 (3) would offer real benefits to drivers of private vehicles.

## **6. IN CONCLUSION**

In the last few years, drive video recorders have spread remarkably in Japan and steadily produced positive results. Going forward, there is a strong possibility that such devices will become more common in trucks, buses and private vehicles.

Because drive video recorders enable objective scientific investigation of accidents and near-accidents that, until now, were matters only of speculation, their range of application and effect is immeasurable. At the same time, the fact that drive video recorders record video images may create a need to discuss how to address the potential danger of privacy concerns. Drive video recorders are expected to make a great contribution to prevention safety measures in the future; one can only look forward to their healthy development.

## **REFERENCE**

Fiscal 2005 Research Report on the Efficacy of On-Board Drive Video Recorders (In Japanese: <http://www.mlit.go.jp/jidosha/anzen/dorareko/dora-houkoku17.pdf>)