Passive Alcohol Sensors Annotated Bibliography
as of November 2006

Cammisa, M.X.; Ferguson, S.A.; and Wells, J.K. 1996. Laboratory evaluation of PAS III sensor with new pump design. Arlington, VA: Insurance Institute for Highway Safety.

> The PAS III passive alcohol sensor was evaluated under laboratory conditions to determine its potential effectiveness as a screening device to assist law enforcement officers in identifying alcohol-impaired drivers. Results indicated the PAS III can identify 95 percent of drivers with 0.10 percent BACs when held at a distance of 5 inches and keep misidentification of low BAC drivers to a minimum. Compared with a previous sensor design, the PAS III was found to have improved performance at test distances greater than 5 inches. The evaluation also demonstrated the PAS III's capability to detect drivers at lower BAC thresholds such as 0.08 percent.

Farmer, C.M.; Wells, J.K.; Ferguson, S.A.; and Voas, R.B. 1998. Field evaluation of the PAS III passive alcohol sensor. *Journal of Crash Prevention and Injury Control* 1:55-61.

> Data from a 1996 nationwide survey, in which 5,392 drivers were evaluated for alcohol using both PAS III and evidential breath test devices, have allowed the determination of appropriate criteria at various BACs for detecting impaired drivers in the field. Using the appropriate criteria, the PAS III can identify about 75 percent of drivers with BACs at or above 0.10 percent and 70 percent at or above 0.08 percent. This is a vast improvement over the 40–50 percent detection rate currently achieved by police officers at checkpoints not using sensors.

Ferguson, S.A. 1995. Use of passive sensors for alcohol-impaired driving enforcement. Presented at Transportation Research Board 74th Annual Meeting, Washington, DC. Arlington, VA: Insurance Institute for Highway Safety.

> The author reviewed research on passive sensors, concluding that passive sensors improve officers' ability to detect impaired drivers and identify nonimpaired drivers more quickly than they otherwise would.

Ferguson, S.A.; Wells, J.K.; and Lund, A.K. 1995. The role of passive alcohol sensors in detecting alcohol-impaired drivers at sobriety checkpoints. *Alcohol, Drugs, and Driving* 11:23-30.

> Police officers using standard checkpoint procedures identified 26 percent of drivers with 0.05–0.10 percent BACs and 55 percent of drivers with BACs of 0.10 percent or greater. When officers used passive sensors, these detection rates increased to 39 percent and 71 percent, respectively. The authors noted that research on checkpoints conclusively demonstrates their value in creating general deterrence and concluded that their value would be further increased if passive sensors were used more widely at checkpoints.

Fields, M. and Hricko, A.R. 1986. Passive alcohol sensors: constitutional implications. *The Prosecutor* 20:45-52.

> Drawing analogies to appearance/demeanor cases, the plain view doctrine, and laboratory testing of passive sensors indicating their reliability as screening devices for the presence of alcohol, the authors concluded that passive sensor use will not be held unconstitutional.

Fiorentino, D. 1997. A laboratory study of passive alcohol sensors. *Proceedings of the 14th International Conference on Alcohol, Drugs, and Traffic Safety (*ed. Mercier-Guyon, C.), 539-45. Annecy, France: Centre d'Etudes et de Recherches en Médecine du Trafic (CERMT).

> Three PAS instruments were examined with 48 subjects. The mean BAC, as measured with an Intoxilyzer 5000 30 minutes after each subject's last drink was 0.08 percent. PAS readings were

obtained before alcohol was ingested, at peak BAC, and at nine post-peak times. One instrument allowed sampling only when positioned 5 to 7.5 inches from the subject's mouth. The other instruments permit variable distances and were tested at 6 and 8 inches. Data were examined with BAC criteria of 0.00 percent, 0.04 percent, and 0.08 percent. There were no false positives: when no alcohol was present, the probability of a positive reading was zero. PAS values were lower and more variable than Intoxilyzer readings. The author concluded that the data support use of a PAS in conjunction with field sobriety tests and preliminary breath test instruments.

Foss, R.D.; Voas, R.B.; and Beirness, D.J. 1993. Using a passive alcohol sensor to detect legally intoxicated drivers. *American Journal of Public Health* 83:556-60.

A roadside survey of 1,181 late-night drivers in Minnesota was conducted using volunteers. Breath measurements were taken with both a passive sensor and an evidentiary quality portable breath test device. BAC estimations made using the passive sensor correlated very strongly with the evidentiary device.

Jones, I.S. and Lund, A.K. 1986. Detection of impaired drivers with a passive alcohol sensor. *Journal of Police Science and Administration* 14:153-60.

In October and November 1984, passive sensors were used at checkpoints in Charlottesville, VA. Police working with sensors correctly identified 80 percent more drivers with BACs greater than 0.05 percent than they did at similar checkpoints working without sensors. The sensors reduced by more than 50 percent the number of drivers with 0.03–0.04 percent BACs who were detained unnecessarily for roadside investigation. Officers who used sensors also detained 50 percent fewer drivers with low BACs (0.00–0.019 percent) than those working without sensors.

Kiger, S.M.; Lestina, D.C.; and Lund, A.K. 1993. Passive alcohol sensors in law enforcement screening for alcohol-impaired drivers. *Alcohol, Drugs, and Driving* 9:7-18.

This study evaluated passive sensor use by police on routine patrol. Sixteen police officers in Columbus, OH, participated in a study in which passive sensors were used on alternate nights. On nights with the sensors, the number of drivers with BACs of 0.10 percent or greater detected by the officers increased from 69 to 77 percent. When combined with other field studies, results indicated a consistent pattern of increase in the detection of alcohol-impaired drivers when patrol officers used passive sensors in routine traffic stops. For the group of drivers with 0.05–0.0999 percent BACs, 37 percent encountered on nights with the sensor were arrested for DUI versus 4 percent when sensors were not used. This sharp increase in detection of drivers with BACs in this range suggests the use of passive sensors may be even more important in states that have lowered their per se BAC thresholds from 0.10 to 0.08 percent and in enforcement of zero tolerance laws for underage drivers.

Leaf, W.A. and Preusser, D.F. 1996. Effectiveness of passive alcohol sensors (DOT HS-808-381). Washington, DC: National Highway Traffic Safety Administration.

This study evaluated the effectiveness of three passive sensors for youth alcohol enforcement (zero tolerance laws applicable to drivers younger than 21). Overall judgment by the officers and the three municipal police departments participating were positive, but there were differences between situations and devices. Few of the sensor's uses led to alcohol-related arrests, and the underage liquor law and DUI data did not show changes over the test period compared to preceding periods.

Lestina, D.C. and Lund, A.K. 1992. Laboratory evaluation of two passive alcohol sensors. *Journal of Studies on Alcohol* 53:328-34.

> The National Patent Analytical Systems (NPAS) passive alcohol sensor and the Life-Loc PBA 2000 were evaluated in a laboratory environment to establish appropriate threshold measurements that indicate probable alcohol impairment. Both sensors were able to identify alcohol in exhaled breath with sufficient accuracy to identify people with high BACs. The accuracy of both sensors was related to the distance from the subject's mouth. Under ideal conditions, the authors estimated the Life-Loc could be expected to correctly detect 80 percent of drivers with 0.10 percent BACs (99 percent with 0.15 percent BACs) yet incorrectly identify only about one in eight drivers with 0.02 percent BACs as being impaired. The NPAS could be expected to correctly detect about 75 percent of drivers with 0.10 percent BACs (97 percent with 0.15 percent BACs) yet incorrectly identifying one in five drivers with 0.02 percent BACs as impaired.

Lund, A.K. and Jones, I.S. 1987. Detection of impaired drivers with a passive alcohol sensor. *Proceedings of the 10th International Conference on Alcohol, Drugs, and Traffic Safety,* 379-82. Amsterdam, the Netherlands: Elsevier Science Publishers B.V.

> The authors examined the impaired driver detection rates with and without passive sensors of officers in San Diego, CA and Chattanooga, TN working special DUI patrol. Special patrols use officers dedicated exclusively to DUI enforcement, and officers selected for special patrols typically have more extensive experience and training in DUI detection than other officers. Results indicated passive sensors improve detection rates of drivers with high BACs, but the improvements were significantly less than those reported for officers working sobriety checkpoints. The authors concluded that passive sensors provide greater benefits at checkpoints than on patrol because patrol officers have greater opportunities to observe driving behavior that is indicative of alcohol-impairment than do officers working checkpoints.

Manak, J.P. 1986. Constitutional aspects of the use of passive alcohol screening devices as law enforcement tools for DWI enforcement. *The Prosecutor* 19(3).

> The author focused on the operational aspects of passive sensors as well as legal issues raised by their use. He concluded that passive sensors use will be upheld by the courts.

Moskowitz, H.A.; Burns, M.M.; and Ferguson, S.A. 1999. Police officers' detection of breath odors from alcohol ingestion. *Accident Analysis and Prevention* 31:175-80.

> Under optimum laboratory conditions, 20 experienced police officers were asked to detect the odor of alcohol from 14 subjects whose blood alcohol concentrations (BACs) ranged from zero to 0.13. Over a 4 hour period, each officer was given 24 opportunities to smell the breath of the subjects, sniffing through a 6 inch tube through which the subjects blew. The subjects were behind screens to avoid officers' picking up cues other than odor. Under these optimum conditions, the odor of alcohol was detected in only two-thirds of the BACs below 0.08. At BACs of 0.08 and higher, 85 percent of the time officers detected alcohol. Detection rates declined significantly after the subjects ate. Officer reports of the strength of the odor was unrelated to BAC. Estimates of BAC by officers was not greater than would have been expected from random guesses.

Voas, R.B. and Layfield, W.A. 1983. Creating general deterrence: can passive sensors help? *The Police Chief* 50:56-61.

> The authors reviewed officer experience with passive sensors and noted officer recommendations for improvement in sensor design. The authors concluded that if all drivers legally stopped could be screened for alcohol use with a passive sensor, the general deterrent value of enforcement efforts would be significantly increased.

Voas. R.B.; Rhodenizer, A.E.; and Lynn, C. 1985. Evaluation of Charlottesville checkpoint operation: final report (DOT HS-806-989). Washington, DC: National Highway Traffic Safety Administration.

> This report is a comprehensive analysis of the effectiveness of a major checkpoint initiative in Charlottesville, VA, which involved 94 checkpoints between December 30, 1983 and December 31, 1984. The authors reported that from January through August 1984, officers worked without passive sensors; from September through November, they used passive sensors. Officers using sensors arrested 2.5 times more alcohol-impaired drivers than were arrested without sensors.

Voas, R.B.; Romano, E.; and Peck, R. 2006. Validity of the passive alcohol sensor for estimating BACs in DWI-enforcement operations. *Journal of Studies on Alcohol* 67:714-21.

> The objective of this study was to determine the accuracy of the passive alcohol sensor (PAS) for estimating the blood alcohol concentration (BAC) of drivers and study its potential use as a screening device for estimating BAC in relation to several factors related to its use (age, gender, light conditions, and police confidence in the PAS measure). A study funded by the National Highway Traffic Safety Administration of the BAC levels of crash-involved and randomly stopped drivers as a control group for comparison provided 12,587 cases in which both a breath test and a PAS measure of BAC were obtained for each driver studied. This research involved a secondary analysis of the data set using regression and receiver operator curves methodology to determine the accuracy and utility of the PAS for use as a screening device for DWI violations. PAS scores were a strong predictor of a driver's BAC status. The only other variable having a significant and consistent relationship independent of PAS was police confidence. Detection sensitivity and specificity for each PAS cut-point score were estimated. By selecting PAS cut-point score appropriate to the enforcement being undertaken, the PAS can be an effective tool for officers when deciding whether to initiate a DWI investigation.

Wells, J.K.; Greene, M.A.; Foss, R.D.; Ferguson, S.A.; and Williams, A.F. 1997. Drinking drivers missed at sobriety checkpoints. *Journal of Studies on Alcohol* 58:513-17.

> Data on the BACs of 9,000 drivers passed through 156 checkpoints held in 15 North Carolina counties in 1994. More than 50 percent of drivers with BACs in excess of 0.08 percent were not detained by officers. The authors found that not all drinking drivers had an equal chance of being detected. Women were missed more often than men, young drivers were missed more often than older drivers, and solo drivers were more likely to be missed than those with passengers. The authors reviewed research on passive sensors and concluded they very likely would have improved the detection rate of impaired drivers had they been used.