

# Why We Test for Drugs & Alcohol

*Is chemical drug and alcohol testing of commercial vessel personnel effective? By Walter J. Brudzinski*

In 1988, the Coast Guard implemented chemical testing to discourage drug and alcohol use by commercial vessel personnel, reduce the potential for marine casualties related to drug and alcohol use, and enhance the safety of the maritime transportation industry. While the Coast Guard has been collecting data on drug testing results for more than 20 years, there have not been any studies on the effectiveness of chemical testing in meeting stated goals.

To determine the extent chemical testing achieves these goals, Post-Accident drug and alcohol test results of crewmembers from two vessel categories were compared. The first vessel category consists of minimally regulated commercial fishing vessels (CFVs) with no crewmember chemical testing requirements except for Post-Accident drugs and alcohol. The second category consists of highly regulated small passenger vessels (SPVs) of 100 tons or less with comprehensive crewmember chemical testing requirements. The drug test results that marine employers submit to the Coast Guard each year, 2003-2011, were also compared.

Comparing Post-Accident drug and alcohol positivity rates between crewmembers of the above vessel categories, Post-Accident drug and alcohol positive tests per serious marine incident (SMI) between crewmembers of each vessel category, and Random versus Post-Accident drug test positivity rates from all commercial vessel personnel subject to comprehensive chemical testing as reported by their employers, crewmembers on small passenger vessels were found to have had much lower Post-Accident drug and alcohol positive test results than crewmembers on commercial fishing vessels. Chemical drug and alcohol testing therefore appears to have achieved its goals at least to the extent of the data analyzed in this study.

## Methods

U.S. Documented small passenger vessel (SPV) crewmembers in safety sensitive positions are subject to chemical testing as well as credentialing or licensing requirements. SPVs are also subject to inspection and are the most regulated of all U.S. Documented vessels. Conversely, U.S. Documented commercial fishing vessels (CFVs) are subject to the least amount of Coast Guard regulation. For example, they are subject to safety in-

spections such as firefighting and lifesaving equipment, but are not subject to vessel inspection. CFV crewmembers are not subject to Coast Guard credentialing or licensing requirements; they have no limits on the time they are on duty; and, they are not required to pass a Pre-Employment chemical test or be subject to subsequent Random or Reasonable Cause testing. They are, however, subject to Post-Accident drug and alcohol testing so they present a perfect contrast to SPV crewmembers for comparison.

To determine if the test results between the two vessel types were statistically significant; the two-proportion z-test was used. Yearly and total, overall differences in positivity rates and positive tests per SMI between CFVs and SPVs were compared. The level of significance used for those tests was equal to or less than 0.05, giving less than 5% likelihood the results were due to chance. Linear regression and correlation were used to examine the relationship between Post-Accident drug test positivity rates and Random drug test positivity rates from all vessels with crewmembers subject to chemical testing.

## CFV vs. SPV Post-Accident Positive drug tests

To determine the extent chemical testing has discouraged drug use by commercial vessel personnel, **Figure 1** compares Post-Accident verified positives for one or more drugs between CFVs and SPVs from 2003-2011. Each year, the positivity rates of CFVs are higher than the positivity rates of SPVs by at least 32% and as much as 96%. SPV crewmembers averaged 77% fewer positive drug tests than CFV crewmembers. Overall, the probability that Post-Accident drug test positivity rates between CFV crewmembers and SPV crewmembers was due to chance is much less than five percent and thus statistically significant.

## CFV vs. SPV Post-Accident alcohol tests

**Figure 2** compares Post-Accident alcohol test positivity rates between CFV and SPV crewmembers. Despite some expected year to year variation, all of the Post-Accident alcohol test positivity rates of SPVs were lower than CFVs by at least 14% and as much as 100%. SPV crewmembers averaged 73% fewer positive alcohol tests than CFV crewmembers. Overall, the probability that Post-Accident alcohol test positivity rates between

CFV crewmembers and SPV crewmembers was due to chance is less than 5 percent and thus statistically significant.

### CFVs vs. ALL vessels Post-Accident drug tests

Figure 3 compares Post-Accident verified positives for one or more drugs between CFVs and ALL vessels with crewmembers subject to comprehensive chemical testing from 2003-2011. Recall from Figure 1 that Post-Accident drug test positivity rates of SPV crewmembers subject to chemical testing were much lower than drug test positivity rates of CFV crewmembers not otherwise subject to chemical testing. The differences were even greater when CFV crewmembers' positivity rates are compared to crewmembers of ALL vessels with crewmembers subject to comprehensive chemical testing.

Post-Accident positivity rates of crewmembers subject to chemical testing from ALL vessels were at least 89% lower and as much as 97% lower than Post-Accident positivity rates of CFV crewmembers. Crewmembers from ALL vessels averaged 92% fewer Post-Accident positive drug tests than CFV crewmembers. Overall, the probability that Post-Accident drug test positivity rates between CFV crewmembers and ALL crewmembers was due to chance is much less than five percent and thus statistically significant.

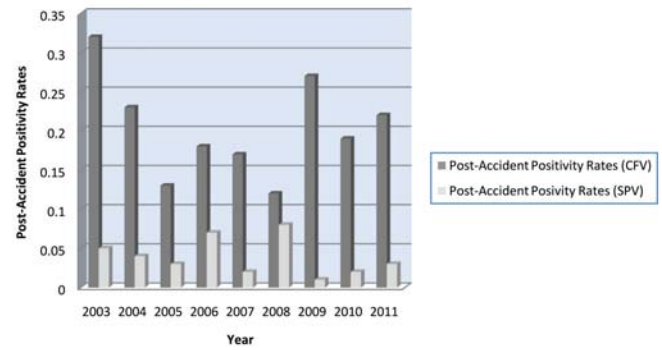
### CFV vs. SPV Post-Accident positive drug tests per SMI

In response to whether chemical testing reduces the potential for marine casualties related to drug and alcohol use, Post-Accident positive drug tests were compared to the yearly 2003-2011 SMIs in which drug tests are reported. Comparisons were performed in the same manner as those presented above except they are per-incident instead of per-person and include only SMIs in which drug tests are reported. As shown in Figure 4, SPV Post-Accident positive drug tests per SMI are much lower than CFV Post-Accident positive drug tests per SMI by at least 17% and as much as 93%. SPVs Post-Accident positive drug tests per SMI averaged 64% lower than CFV Post-Accident positive drug tests per SMI. Overall, the probability that the differences between SPV and CFV Post-Accident positive drug tests per SMI was due to chance is much less than five percent and thus statistically significant.

### CFV vs. SPV Post-Accident alcohol tests per SMI

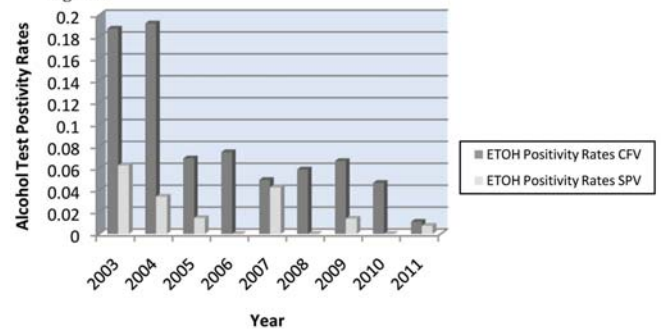
In further response to whether chemical testing re-

Figure 1



CFV vs. SPV Post-Accident alcohol tests

Figure 2



CFVs vs. ALL vessels Post-Accident drug tests

Figure 3

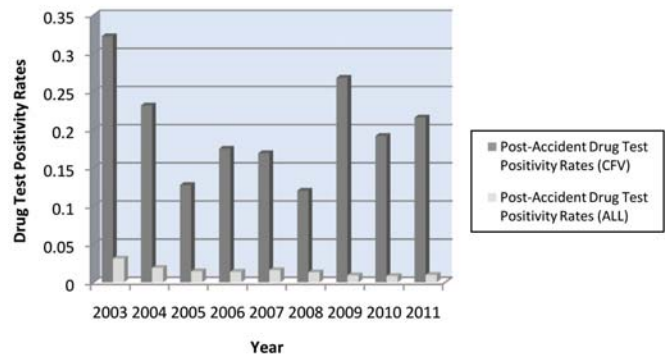
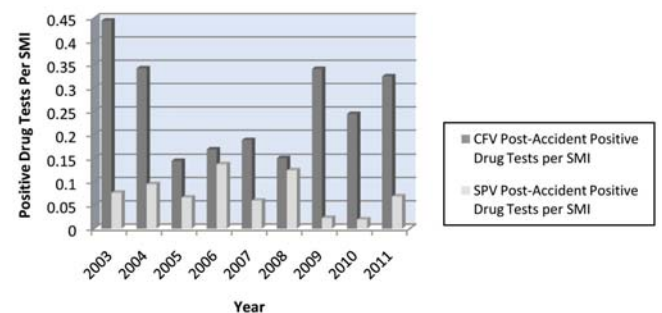
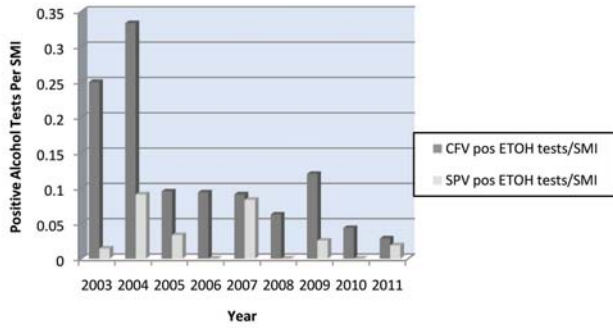


Figure 4

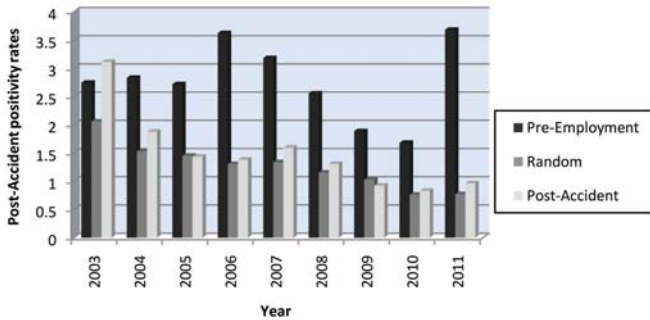


**Figure 5**



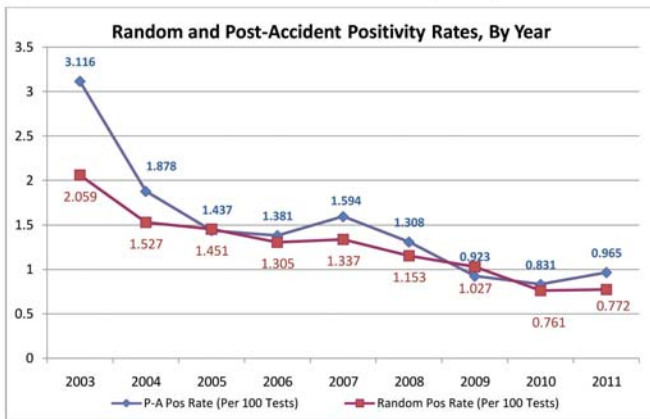
duces the potential for marine casualties related to drug and alcohol use, Post-Accident positive alcohol tests were compared to the yearly 2003-2011 SMIs in which alcohol tests were reported. As shown in Figure 5, SPV positive alcohol tests per SMI were much lower than CFV positive alcohol tests per SMI by at least 8% and as much as 100%. SPV Post-Accident positive alcohol tests per SMI averaged 73% lower than CFV Post-Accident positive alcohol tests per SMI.

**Figure 6**



As with year to year variations in alcohol test results in previous comparisons, similar variations exist here. Two factors are known to contribute to these variations. The first factor is the two hour time period in which alcohol tests must be ordered. This time limitation will leave out many instances in which tests ought to have been ordered but were not due to the remoteness of the vessel's location, especially commercial fishing vessels that ordinarily operate farther offshore than small passenger vessels. The second factor is the relatively small number of tests which could cause wide swings in the percentages of positive tests per serious marine incident. Even with these factors, the ratio of positive alcohol tests per serious marine incident consistently shows crewmembers of small passenger vessels test positive for alcohol less than crewmembers of commercial fishing vessels. Overall, the probability that the differences between SPV and CFV Post-Accident positive alcohol tests per SMI was due to chance is much less than five percent and thus statistically significant.

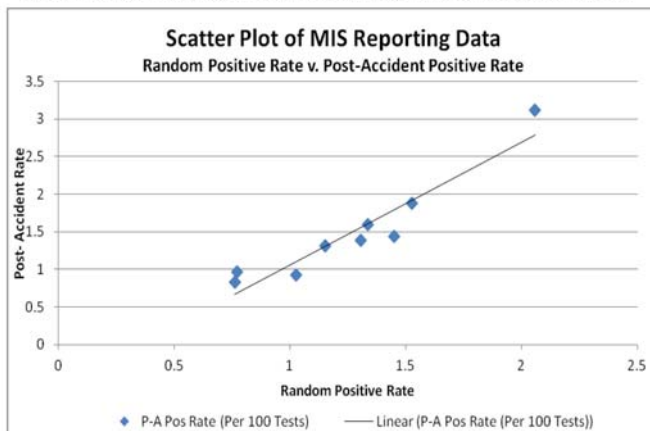
**Figure 7 Trend Line of Random and Post-Accident positivity rates**



**Random vs. Post-Accident drug test positivity rates**

Figure 6 shows yearly 2003-2011 Pre-Employment, Random, and Post-Accident Random drug test positivity rates from ALL vessels with crewmembers subject to chemical testing as reported by their employers.

**Figure 8 Scatter Plot and Regression line for Random versus Post-Accident positivity rates**



**Trend Line of Random and Post-Accident positivity rates**

Crewmembers not passing a Pre-Employment chemical test for dangerous drugs are not hired and thus not subject to further comprehensive chemical testing. Pre-Employment positivity rates therefore do not directly affect Random or Post-Accident positivity rates; however, the differences in positivity rates between Pre-Employment and Random as well as between Pre-Employment and Post-Accident are startling. The data appear to show the Pre-Employment drug test eliminates those persons whose drug use would appear to be so much a part of their lives that they are unable to suspend it sufficiently long enough to pass a drug test even with advance

notice. Random and Post-Accident positivity rates also appear to have a gradually decreasing trend as shown graphically in Figure 7.

### Scatter Plot and Regression line for Random versus Post-Accident positivity rates

Examining annual drug test results marine employers submit to the Coast Guard, random drug test results represent at least 53% and as much as 63.6% of crewmembers eligible for testing. This represents more than a mere sampling of crewmembers subject to Random drug tests; therefore, the trend as shown in Figure 7 is fairly representative of the crewmember population. Figure 8 shows Random and Post-Accident positivity rates in a scatter plot with a regression line.

The scatter plot and regression line show that within the range of values for which there is data (2003-2011), there is a very straight linear relationship between Random and Post-Accident positivity rates. Statistically, this linear relationship has a near perfect correlation coefficient of 0.9464. Beyond the shown data points, the line may no longer be linear and no predictions are made of Post-Accident positivity rates based on Random positivity rates that are not part of the data. It is sufficient to conclude that decreasing Random positivity rates have, on the average, predicted decreasing Post-Accident positivity rates at least from 2003-2011. On vessels where comprehensive chemical testing is required, lower Random positivity rates result in fewer serious marine incidents with drug involvement, thereby enhancing the safety of the maritime transportation industry.

### Conclusion

Chemical testing appears to have discouraged drug and alcohol use. Analysis of 2003-2011 Post-Accident data showed positivity rates from small passenger vessel crewmembers subject to comprehensive chemical testing to be significantly lower than those from commercial fishing vessels not subject to comprehensive chemical testing. Put another way, there is less likely to be drug and alcohol use in the more highly regulated segments of the maritime industry. Further, chemical testing also appears to have reduced the potential for marine casualties related to drug and alcohol use. Again, the 2003-2011 data showed the SPV group had significantly fewer Post-Accident positive drug and alcohol tests per SMI than CFVs. Finally, chemical testing appears to have enhanced the safety of the maritime transportation industry. The 2003-2011 data showed Random positivity rates

are fairly accurate predictors of Post-Accident positivity rates among those vessels with comprehensive drug testing requirements.

### NOTES:

This article is a summary of the dissertation submitted in partial fulfillment of requirements for a Ph.D. in Judicial Studies. Entitled *Chemical Testing of Commercial Vessel Personnel: An Analysis of Archived Test Results*, the views are those of the author and do not necessarily reflect the views of DHS, the Coast Guard or its leadership, or the Office of Chief Administrative Law Judge. The author expresses appreciation to Captain David S. Fish, Chief, Office of Investigations and Casualty Analysis and his staff for their suggestions and assistance, especially Mr. David H. Dickey and Mr. Robert C. Schoening. Mr. Dickey also served on the author's dissertation committee as subject matter expert.

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