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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

Honorable Elizabeth Dole
Secretary of Transportation
Department of Transportation
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-84-96

About 0514 eastern standard time, on March 30, 1983, Central Airlines Flight 27, a Gates Learjet model 25, crashed during a landing attempt on runway 4 right at Newark International Airport, Newark, New Jersey. Flight 27 was operating as a nonscheduled cancelled bank check courier under 14 CFR Part 135. The airplane was destroyed on impact and the two pilots died as a result of the accident. Toxicological testing done on mucous membrane specimens of both pilots indicated that they had used or been exposed to marijuana within the past 24 hours. In addition, gas chromatography/mass spectrometry testing on the urine of the pilot in command revealed a delta-9-THC level comparable to marijuana use within the previous 24 to 48 hours. The National Transportation Safety Board determined that the probable cause of this accident was: a) the loss of control following ground contact; b) an unstabilized approach; and c) likely impairment of the flightcrew's judgment, decisionmaking, and flying abilities by a combination of physiological and psychological factors. ^{1/}

About 0458 central standard time, on April 22, 1984, Burlington Northern train 7843 struck the rear end of Burlington Northern train 8112 8 miles west of Newcastle, Wyoming. The conductor and rear brakeman of 8112 were killed in the collision. Toxicological testing was performed on specimens of all involved crewmembers. Results indicated that blood was positive for marijuana in five crewmembers. Urine tested by the EMIT and gas chromatography/mass spectrometry processes was positive for marijuana in four crewmembers. It should be noted that these results indicate factual data only and neither represent an interpretation nor a relationship to the cause of the accident.

The Safety Board is concerned by the implications of marijuana usage by operators in these two transportation accidents as well as in other accidents or incidents in the four modes of transportation — aviation, rail, marine, and highway. The documented behavioral effects of marijuana include impaired judgment and concentration, impaired perceptual and motor skills, and reduced short-term memory.

^{1/} For more information read "Aircraft Accident Report: Central Airlines Flight 27, Hughes Charter Air, Gates Learjet Model 25 (N51CA) Newark International Airport, Newark, New Jersey, March 30, 1983" (NTSB/AAR-84/11).

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A 1982 report by the Institute of Medicine summarizes the effects of marijuana on human performance variables. 2/ There is experimental evidence that marijuana seriously impairs psychomotor performance. The acute effects on perceptual and psychomotor functions begin to be seen at 0.050 to 0.150 mg/kg 3/ doses 4/ of delta -9-THC. There is an impairment of motor coordination and tracking behavior (4.5 mg by smoking) 5/ in both naive and chronic users. This disruption in tracking performance can last for 4 to 8 hours. Also, significant decrements in performance on signal detection tasks are found at 2 to 3 mg doses. At moderate doses of marijuana, short-term memory is impaired and subjects perceive events as lasting longer than actual elapsed time. Low to moderate doses of marijuana impair oral communication, especially the "clarity of sequential dialogue with another person." The attentional mechanism appears to be most susceptible to marijuana effects. Tasks or task components involving continuous attention are most likely to be affected and effects on memory are most significant in phases dependent on attention.

Most automobile simulator studies show an impairment of driving skills following 10 to 15 mg doses of marijuana. These impairments have been reported in both perceptual functions as well as car control motor skills. On a closed course, car handling skills were also reduced by marijuana. And in street driving, 5 to 40 mg of delta -9-THC impairs judgment and concentration as well as car handling skills.

In a flight simulator, smoking marijuana cigarettes with 0.09 mg/kg of delta -9-THC resulted in significant impairment of short-term memory. Subjects were unable to recall where they were in the execution of a task. They tended to forget where they were in a given flight sequence.

Regarding marijuana's presence in automobile accidents, using a culpability index 6/ model, 7/ researchers calculated that drivers with cannabinoids present in their urine were found to have a culpability index of 1.7. This is the same culpability level found for the presence of alcohol in automobile accidents, suggesting an excess of delta -9-THC positive drivers in the category responsible for accidents. Furthermore, surveys of marijuana users report that they receive a higher-than-average number of tickets for driving violations and that they are involved in a higher-than-average number of accidents.

In the marine mode, self-reports of crewmen involved in incidents indicated that approximately 9 percent of these incidents had drug-related causes. 8/

During accident investigations, the Safety Board has found that the long-term physiological and behavioral effects of marijuana are not clearly defined. However, the fact that delta-9-THC tends to remain in the fatty tissues of the body for an extended

2/ Marijuana and Health. Report of a Study by a Committee of the Institute of Medicine, Division of Health Sciences Policy, National Academy Press, Washington, D.C., 1982.

3/ This measurement refers to milligrams of THC per kilogram of subject body weight.

4/ Doses in this context refer to measured doses of intake, that is the amount of marijuana smoked; not the amount found in the blood or urine analysis.

5/ This measurement refers to total dose in milligrams.

6/ A culpability index compares the frequency that a drug is found in drivers assigned responsibility for causing a collision with the frequency in individuals from the same sample who had not caused an accident.

7/ As a control condition, aspirin had a culpability index of 1.0, i.e., it was no more frequent in individuals assigned responsibility for a collision than in those who were not.

8/ Human Error in Merchant Marine Safety. Report by the Maritime Transportation Research Board, National Academy of Sciences, Washington, D.C., June 1976.