

BASICS ON BOOZE

■ ■ "Hangar talk" seems to be essential to pilots. In many cases, it serves a useful purpose, but all too frequently experiences are embellished or distorted.

One subject that often arises for discussion is the effect of alcohol on the pilot and on his capability for flying. Regrettably, misinformation is as abundant as factual data. Although this may be due to the varying effects of alcohol on different people and the many types of alcohol used, one thing is absolutely certain: alcohol and flying do not mix.

The FAA has implemented a regulation (FAR 91.11) requiring abstinence from drinking for an eight-hour period from "bottle to throttle." The airlines and Armed Forces impose an even more stringent restriction of 24 hours' abstinence from intoxicating beverages prior to flying. While these regulations are effective, they relate only to the acute effects of alcohol and invite little consideration of subacute and chronic problems associated with its use.

Like any other drug, alcohol has many effects. The best known, and indeed the most important relative to flying, involve the brain and nervous system. These effects may be divided into two categories: direct effects and withdrawal consequences.

Direct effects may best be understood by reviewing the process by which alcohol is absorbed, broken down, and subsequently removed from the body. The absorption of alcohol in distilled whiskey is extremely rapid, but inconstant. This results in rapidly attained high blood concentrations after oral intake.

Subsequently, alcohol is broken down or changed in the body by a process known as oxidation, which occurs in the liver. In contrast to the rapid and inconstant absorption, however, the breakdown occurs at a constant rate that is a linear function of time—about 10 ml, or about a third of an ounce, per hour. Since 90% to 98% of the ingested alcohol is metabolized in this constant way by oxidation, a prompt fall in blood concentrations does not occur, in contrast to the very rapid rise that takes place on intake. Thus, the alcohol in one ounce of distilled whiskey requires about 1½ hours to be oxidized. A three-ounce martini taken before dinner at approximately 7 p.m. would not be completely oxidized for at least 4½ hours, or until 11:30 p.m.

These figures relate to the consumption of alcohol on an empty stomach. Food that is in the stomach may delay the absorption of alcohol into the blood and thereby prolong its effects. Because the brain has a very rich blood supply,

the content of alcohol in the brain closely approximates blood concentrations. Stated another way, high blood concentrations of alcohol mean high brain concentrations of alcohol.

Early effects of alcohol relate primarily to the more sophisticated structures of the brain—those that are essential for flying. Included are the areas required for vision, hearing, understanding, interpretation, and decision-making. Subsequently, as concentrations of alcohol increase, less sophisticated and deeper brain structures are affected.

As a result of this higher to lower involvement of the brain, the individual demonstrates a number of characteristics. Initially, he is noted to be paradoxically less anxious, more aggressive, more talkative, more mobile, and perhaps even more affable and likable. Any of these characteristics may persuade the pilot that he is capable, indeed more capable, of flying. Additionally, the increased affability may make him seem a better flying companion. Subsequently, as the alcohol becomes even more effective, his coordination, speech, memory, and judgment are more seriously impaired. Finally, in the severe stages, with very high blood and brain alcohol concentrations, the functions of the heart, lungs, and breathing mechanisms may be interrupted, as a result of which death may even occur.

Although abstinence from alcohol for a period of eight to 24 hours—as required by FAA, the commercial carriers, and the Armed Forces—may prevent the acute effects, it does *not* eliminate the withdrawal symptoms that typically occur between 12 hours and five to seven days following cessation of alcohol use. In fact, some of the most devastating symptoms may occur during that period, particularly in individuals who drink with regularity. Among these are nausea, weakness, marked perspiration ("the sweats"), headache, increased anxiety ("the jitters"), tremulousness

("the shakes"), insomnia (sleeplessness), confusion, disorientation, agitation, incoordination, and—in severe phases—hallucinations, delusions, and, finally, unmistakable delirium ("DTs").

While the early or delayed effects of alcohol may be reasonably tolerated—and even concealed—at or close to sea level, the same factors attain monumental significance for the pilot at higher altitudes. At 5,000 feet (which is surface altitude at Denver and Mexico City), the concentration of oxygen is reduced by 5%. Subsequent decrements of oxygen concentration occur with increasing altitude. At 18,000 feet, the amount of oxygen in the atmosphere is reduced by half, as the result of a similar decrease in atmospheric pressure. These reductions in atmospheric pressure may not be recognized, since all reported altimeter settings—which are barometric pressures—are adjusted to mean sea level. Yet the reduction in oxygen content in the atmosphere, even though slight at 5,000 feet, can result in aberrations of normal functions. When associated with other impairments such as those characteristic of alcoholism, the total deficit is markedly augmented.

In addition, many persons who drink also smoke. One of the by-products of smoking even cigars or pipes is carbon monoxide, and CO's effects on vision are well defined and unfavorable. Visual acuity—particularly that type known as "photopic acuity," which is of greatest benefit at night or in the dark—is materially diminished. Combining this deficit with the functional impairments resulting from alcohol and with the effects of decreased oxygenation at altitude creates a serious and hazardous situation, demonstrating how one health problem may overwhelmingly compound another.

Few pilots will deny the concentration and effort required to control an aircraft, particularly a high-performance aircraft. Moreover, the rigorous demands of in-

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strument flying are incontrovertible. Thus, the fullest capabilities of the pilot must be marshalled for safe flight. Factors that diminish these capabilities should be avoided. For these reasons, prolonged flights at altitudes above 10,000 feet during the day and 8,000 feet at night require the availability of supplementary oxygen even for the non-drinking, nonsmoking pilot. Smoking, particularly at night, should be eliminated.

Finally, reference must be made to the personality of individuals who regularly use intoxicating beverages or drugs. First, the inability to exist in society without using unnecessary stimulatory or depressant agents represents a personality disorder of significant proportions. Second, medical studies have documented that alcoholism is inseparably linked to a dependent personality. Such dependency is associated with an inability to formulate and effect decisions promptly and expeditiously, capabilities that are vital for safe flying. In a word, the personality of the "problem drinker" is alien to that of the safe pilot.

Many years ago, Shakespeare recognized the effects of alcohol and described them in the following passage from *Macbeth*. Although the quotation relates to sexual capability, it may be readily extended to flying:

MACDUFF: What three things does drink especially provoke?

PORTER: Marry, sir, nose-painting, sleep, and urine. Lechery, sir, it provokes and unprovokes: It provokes the desire but it takes away the performance. □

THE AUTHOR

Dr. Fermaglich's credentials for writing this article are impressive. He is assistant professor of neurology at the Georgetown University Medical Center, Washington, D.C.; a member of the committees on aviation of the American Academy of Neurology and the D.C. Medical Society; associate editor of the Flying Physicians Association magazine; an FAA aviation medical examiner; and a regional consultant for FAA. As an instrument-rated commercial pilot, he is equally well acquainted with the demands of flying as experienced by the pilot himself. A previous article by Dr. Fermaglich, "Timely Tips For Traveling With Toddlers," appeared in the May 1972 PILOT.