

Effects of Alcohol on Aircrew performance

(A Field Study)

SQN LDR KS SOODAN[†]

Abstract

ALCOHOL is known to affect the performance of individuals. The performance of sixteen pilots has been studied 5 hours and 7 hours after the consumption of 3 Oz of alcoholic drink on simulated flying task. The study revealed decrease in the performance of the aircrew at the 5 hour stage. A decrement in performance of a lesser degree was present even at the 7 hour stage.

Introduction

Large amount of information is available on the ill effects of alcohol in relation to flying and number of instructions have also been issued regarding restrictions on consumption of alcohol by aircrew.

- (a) In UK, the pilots are not to consume alcohol 8 hours prior to flying vide Aeronautical Information Circular No. 32/1972.
- (b) In USA, the restriction is for 12 hours as per Federal Aviation Act.
- (c) In India, an abstinence of 12 hours is required before flying (Indian Aircraft Act).

Billing et al¹ recorded significant mistakes committed by pilots with different blood alcohol levels. The task was given in Cessana 1972 aircraft. With 0.04% blood alcohol concentrations, there was substantial increase in number and potential seriousness of procedural errors. At 0.12%, the pilots flew in a grossly unsafe manner.

After alcohol, reduced tolerance to +Gz has been mentioned by Rai et al² as a delayed effect. They found decrease in the tolerance by 0.3g and 0.2g after 8 and 12 hours of alcohol consumption respectively though the blood alcohol levels were zero mg.

The present study was undertaken to see the deterioration in performance in the case of flight tasks.

Material and Methods

The study was carried out on sixteen volunteers (Pilots) from two high performance aircraft squadron. All the subjects were rated pilots and currently in touch with flying and had 25-70 hours on simulator flying. All were given adequate trial sorties to bring them to desired standard of task which was used subsequently for judging the performance of the subjects.

Alcohol

Two brands of alcoholic drinks were used viz Rum and Whisky. The two were considered at par since their alcoholic and congener contents are the same. For study purposes three ounces of drink was used and was consumed by the subjects in 30-40 minutes.

Simulator tasks

Performance decrement was assessed using a ground simulator of a high performance aircraft (Fig. 1). In this simulator, there is no feel of the forces

[†] Graded Specialist in Aviation Medicine, Institute of Aviation Medicine, IAF, Bangalore 560017.

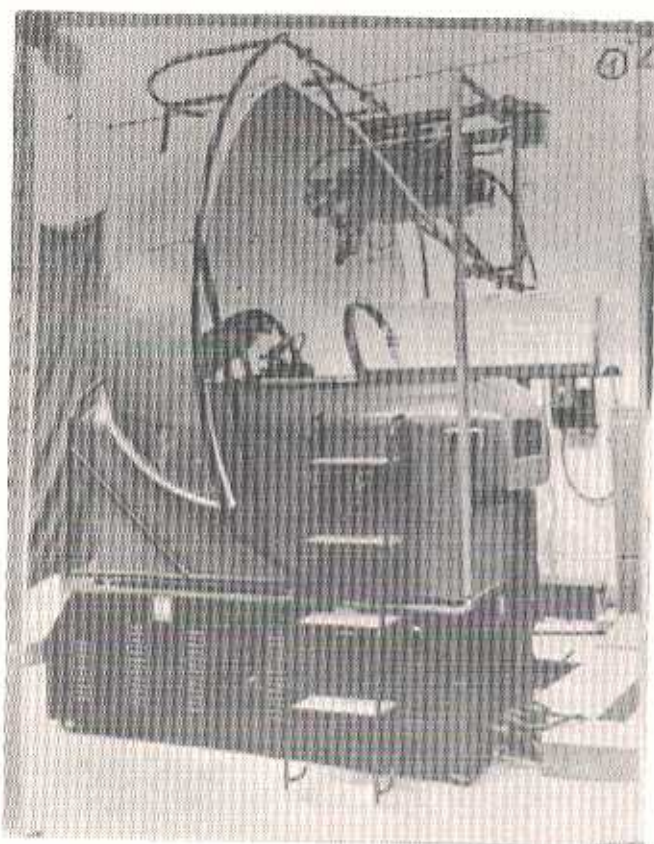


Fig. 1. Ground Simulator of High Performance Aircraft

but the flying is more of a nature of instrument flying. In addition, there is an instructor's desk where the instructor can read the performance of pilot in the simulator (Fig 2). The instructor could also give various emergencies to pilot from his instrument panel.

The subjects were given two sorties in the simulator with 5 minutes interval in between the sorties.

(a) *1st Sortie*: It lasted for 11 minutes and included

- (i) Start up and carry out vital checks.
- (ii) Close hood.
- (iii) Climb to 4 Kms with reheat heading 300/ maintaining 800 Kms speed.
- (iv) Level 5 Km with RPM 82%.

- (v) Turn right with 30° bank then increase 45° at 0360.
- (vi) Roll out on radio compass at 090.
- (vii) Carry out low fuel radio compass let down with out-bound and in-bound check.
- (viii) Check at 1 Km and break off at 50 metres.

During this sortie, the subjects were given minimum of three emergencies to know the perception and recovery action abilities. The emergencies were by and large engine failure, controls jam and fire. The recovery procedures were standardised as per the pilots gen book. The reaction time was determined with the help of a stop watch.

(b) *2nd Sortie*: This sortie was of about 15 minutes duration. It included a low level navigational sortie from point A to B. During the sortie the subjects were given calculative tasks. The tasks included (i) correction for drift (by Double Drift method) and (ii) Diversion calculation for track distance, time and fuel requirements in case of diversion.

Adequate briefing and practice of the standardised task was given to all the subjects before the actual study. Basic recordings of the flying skill, reaction time and ability to do calculative task were obtained without alcohol on the previous day. Three ounces of alcohol were consumed by the subjects in 30-40 minutes. Repeated performance for the similar task was checked 5 hours and 7 hours after the consumption of alcohol. Adequate scoring was awarded allowing the normal permissible variations and simulator limitations. The scoring was awarded based on the experience of the instructor who was observing the performance. The observer was a highly experienced rated pilot.

Results and Discussion

A. *Flying skill*: Flying skill was judged based on the deviations from the performances without alcohol. Table 1 shows these deviations at various stages of flying during the first sortie at 5 hours and 7 hours after the consumption of alcohol.

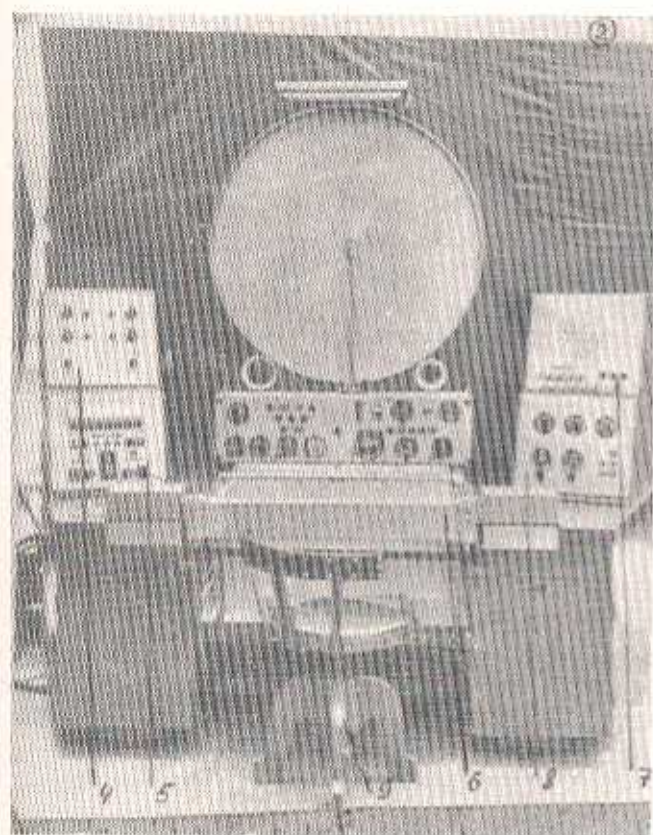


Fig. 2. Instructor's Desk to Monitor Pilot's Performance

TABLE I

Flying Skill Performance : 5 and 7 hours after alcohol

Flying Profile	No. of subjects who deviated from basic performance level	
	5 hours	7 hours
<i>Pre-flight checks</i>	Nil	Nil
<i>Climb to 4 km</i>		
Speed	Nil	Nil
Direction	1	Nil
Levelling	3	Nil
<i>Turns</i>		
30°	1	1
45°		
Roll out	Nil	Nil
<i>RCLD</i>		
Corrections		
in-bound	Nil	Nil
out-bound		
Hight-check at 1 km	1	Nil
Break off	2	1

As may be observed from Table I, there is deviation in the performance from the basic level after 5 hours of consumption of alcohol in few subjects. At 7 hours one pilot did not carry out turns as per the instructions, one committed mistake of break off height and rest of the subjects did return to basic level of performance.

B. Reaction Time: The reaction time included two components i.e. appreciation of the emergency and the time taken by the subjects to go through the recovery drill. Table II gives the average time taken as compared to the basic average time.

TABLE II

Performance during emergencies : before and after alcohol

	Engine failure	Controls jam	Engine fire
A. Base Record			
(a) Average time to appreciate & complete the drill (seconds)	3.0	2.0	5.0
(b) Wrong actions (No. of subjects)	Nil	Nil	Nil
B. 5 Hrs. after alcohol			
(a) Average time to appreciate & complete the drill (seconds)	6.0	3.0	7.0
(b) Wrong actions	1	Nil	1
C. 7 Hrs. after alcohol			
(a) Average time to appreciate & complete the drill (seconds)	3.8	2.0	5.0
(b) Wrong actions	Nil	Nil	Nil

As seen from table II, there is a delay in the reaction time during post alcohol performance checks and more so at 5 hours stage for engine failure and fire in the cockpit. At 7 hour stage, delay was noticed in these subjects for engine failure. There was no delay in other subjects for the other two emergencies.

C. Calculative tasks: Table III shows the number of subjects who did the calculations wrong.

Three subjects did the calculations wrong which in actual flying could be hazardous.

TABLE III
Performance in calculation tasks: before and after alcohol

Nature of task	Basic without alcohol	5 hours after alcohol	7 hours after alcohol
A. <i>Drift calculation</i> (Wrong calculation)	Nil	2	Nil
B. <i>Diversion calculation</i> (Wrong calculation)	Nil	1	Nil

D. *Miscellaneous Errors:* The errors made by the subjects other than the stipulated tasks were also recorded. These errors were mainly related to loss of height, inability to maintain speed and direction and failure to lower undercarriage while landing. None of the subjects committed any such mistake during basic recording. At 5 hour stage five subjects and at 7 hour stage one subject committed mistakes of such nature endangering flight safety.

E. *Subjective Feeling of Pilots:* The subjects were asked to comment on their performance after 7 hour stage recording which was optional. Six subjects volunteered to comment. Three subjects felt that their performance after 7 hour of alcohol was satisfactory and were the U/T Ops. pilots. The other three pointed out an element of boredom at 7 hours recording.

During the basic record (without alcohol) none of the subjects committed any errors while carrying out the standardised task. Adequate practice was ensured to rule out errors due to lack of experience. The flying skill has deteriorated in eight instances which has been judged during the first sortie and in addition there has been a delayed reaction time observed for various emergencies. At 7 hour stage, the performance of the subjects show reversion to the basic stage performance in most of the subjects yet delayed effects have been observed in few.

The inflight calculation forms an important aspect of flying task. As seen from Table III, even the calculative ability of the subjects has been affected and more so at 5 hours after alcohol.

The miscellaneous errors committed by the subjects also are suggestive of deterioration in the performance after alcohol.

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